

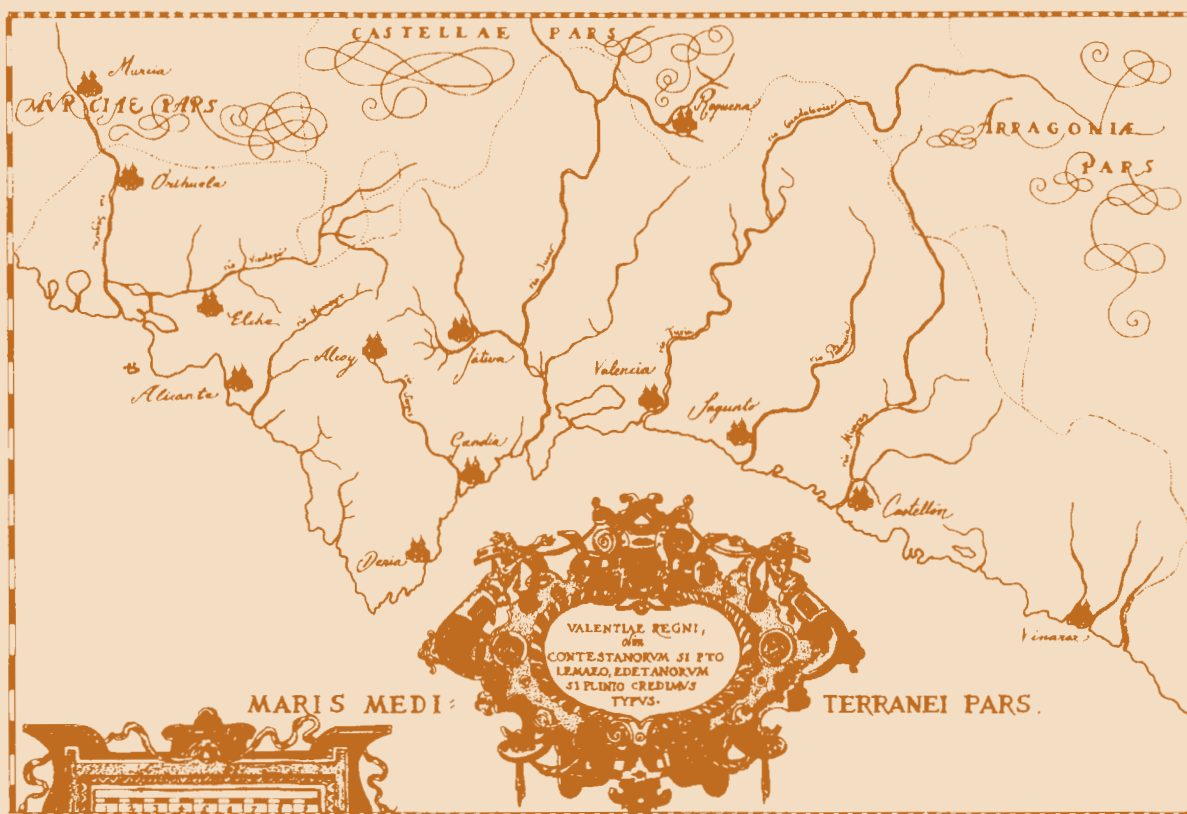
INVESTIGACIONES GEOGRÁFICAS

77

Population and Space in the Mediterranean:
The Challenges of the 21st Century

*Población y espacio en el Mediterráneo:
los retos del siglo XXI*

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INSTITUTO INTERUNIVERSITARIO DE GEOGRAFÍA
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Universitat d'Alacant
Universidad de Alicante



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DE GEOGRAFÍA

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Editores invitados:

Maria Carella (Universidad Aldo Moro de Bari, Italia),
Gil Bellis (Instituto Francés de Estudios Demográficos, Francia),
Alain Parant (Futuribles International, Francia)

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[Instituto Interuniversitario de Geografía](#). Universidad de Alicante
Carretera de San Vicente del Raspeig s/n. 03690, San Vicente del Raspeig - Alicante (España)
Tlfno: (34) 965903400 Ext. 3380 – Fax: (34) 965909485
Correo electrónico: investigacionesgeograficas@ua.es – Sitio web: www.investigacionesgeograficas.com



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Population and Space in the Mediterranean: The Challenges of the 21st Century (Introduction)

Maria Carella^{1*} 
Gil Bellis² 
Alain Parant³

The Mediterranean region features diverse and overlapping socioeconomic and demographic dynamics, with collateral effects that have become increasingly more significant and difficult to solve. The region's demographic evolution has been uneven. Indeed, while natural population increase in the countries of the northern shore has been weak for several decades (when it did not turn negative, as it did in Italy), the southern and eastern shores continue to benefit from a still considerable natural surplus despite a sharp decline in fertility (Angeli & Salvini, 2018; Bellis, Carella, Léger, Parant, 2021a).

Furthermore, the contrasting demographic regimes along the northern (European), eastern (Asian) and southern (African) shores have resulted in a major change in the distribution of the populations whose composition by age group is also very different (Parant & Léger, 2020). In 2020, the countries of the African shore represent the most populated area of the Mediterranean Basin (39% vs. 38% for the countries of the European shore), while in 1950 the northern shore grouped two-thirds of the total population. Moreover, 47% of individuals on the southern shore and 42% of those residing on the eastern shore are now under 25 years old; while the under 25s represent just over a quarter of the population (26%) on the northern shore (Bellis, Carella, Léger, Parant, 2021b). The population of the northern shore is inexorably aging, whereas those of the southern and eastern shores have remained young despite the increase in life expectancy.

The projections of the United Nations show that the differences in demographic dynamics and behaviors between the Mediterranean shores will persist and lead to possible consequences that could stem mainly from intergenerational imbalances—some of the major challenges of the future (Carella & Parant, 2016; Léger & Parant, 2021).

Additionally, these demographic dynamics occur within an economic, political, health, and environmental context disrupted by several crises in recent decades: the Great Recession of 2008, which has particularly affected the southern European countries (Golaz, Lefèvre, & Véron, 2018); the social and political crises of the 2010s in the countries of North Africa and the Middle East, which have had dramatic socioeconomic consequences and have produced numerous flows of migrants (Eljim & Sahraoui, 2021; Fargues, & Fandrich, 2012); the “refugee crises”, which have revealed the fragilities of European migration policies (Jeandesboz, & Pallister-Wilkins, 2016; Schmoll, Thiollet, & Wihtol de Wenden, 2015); the COVID-19 pandemic, which has struck all human populations and all countries, the effects of which are still far from completely understood (Egidi & Manfredi, 2021; Horton, 2021); the environmental crisis related to the spatial constraints and ecological threats (Bergouignan, 2021) that many populations of the southern and eastern shores are facing more and more frequently (Hugo, 2011; Benoit & Comeau, 2012). All these events have upset the expected course of economic and social life in Mediterranean societies.

1 Department of Political Sciences, University of Bari “Aldo Moro”, Bari, Italy. maria.carella1@uniba.it. * Corresponding author

2 Institut national d'études démographiques, France. bellis@ined.fr

3 Futuribles International, France. aparant@futuribles.com

The Mediterranean region is also a space of historical internal circulation, a reminder of the necessity of addressing demographic challenges, not only at the national level, but also at the level of broader regional areas (Carella & Parant, 2014). In this respect, because of the diversity of its past and current migration background, and of varying development levels of the surrounding countries, the Mediterranean Basin is a prime area in which to grasp – in both a specific and a global way – the demographic responses to political, economic, health, and (soon) ecological crises.

This special issue highlights the challenges that have concerned the Mediterranean region and that will shape its future as well as the ongoing efforts to better acknowledge the impacts of the contemporary crises in this area from the point of view of populations in their diversity (social groups, age categories, etc.) and on different geographic scales.

The contributors of the seven articles examine the effects of such crises on populations and demographic dynamics, as well as the role played by the populations themselves in the crises that have affected them. Each article explores what these crises say about our societies and lifestyles, and reflects on the possible responsibility of individuals and/or on the long-term errors of public policy. Most of the contributions contextualize from a geographical point of view the relationship between crises and populations, underlining the specificity of the national or local context and explaining how the geographic dimension is relevant to understanding the analyzed cases.

Each article remains independent and stands firmly on its own. Nevertheless, we have chosen to order them thematically and logically, so as to emphasize convergences in their content, methodological similarities and differences related both to the geographical space investigated and to whether a retrospective or prospective approach is taken.

Thus, the first five contributions focus on the recent crises pertaining to health, the economy, political governance and social equity, pointing to their effects on populations over two different temporalities: the short and the medium term. They explore the demographic ruptures (increase in migration, peak in mortality, depression in fertility, rural depopulation, urban socio-inequalities) arising from the multiple crises at various geographical scales, from the global down to the national, regional, and urban scales.

The relationship between crises and demographic dynamics should be identified as spatial processes related to specific places where it originates partly as a result of the contextual factors and takes on a dynamic of its own that characterizes the uneven development of its consequences. This approach strengthens the importance of geography in capturing the variety of demographic responses to the multiple challenges in the Mediterranean and the relevance of the context in explaining them. In a space analyzed at different degrees of aggregation (global, national, and local), the effects of the diverse crises on the populations should not be interpreted as homogeneous. Nevertheless, the Mediterranean is a privileged area in which these effects can acquire a distinctive connotation through repeated spatial and territorial interactions.

The last two contributions continue the discussion on the critical effects of crises on Mediterranean populations, but they capture them over the long term and stand out for their openness to the many uncertainties of the future, which may themselves result in new crises. Both articles deal with themes (related to genetic diseases and education) that show that crises can operate not only as a sudden event, but also as the end of a long process (Bellis et al., 2021). In this way, the articles are involved with a groundwork to advance the theoretical framework that could evaluate a temporality centered on the long-term demographic response, and they complement the retrospective analysis with a forward-looking reflection on the crises that could be provoked by the demographic changes underway.

In a scenario marked by multiple crises in this century, demographic patterns and dynamics in the Mediterranean remain to be explored. They require further investigations of interrelated political, socio-economic, and environmental dimensions to gain a better and alternative understanding of crises, their genesis, and their effects.

The question of how to face the recent challenges is still open and crucial in policy debate as well as relevant for academic research. Nevertheless, the analysis of future scenarios based on current ones, which has long been neglected in the literature, should be a top priority in order to anticipate potential crises linked primarily to the fragility of existing policies.

We hope that the collection of papers in this special issue contributes to a deeper and broader discussion of this process and encourages grounded analysis for understanding and addressing the relationship between crises and demography in the Mediterranean.

The structure and content of this special issue has been influenced by various studies conducted within the framework of the PHC-Galileo 2019–2020 research program under the leadership of the University of Bari Aldo Moro and the French Institute for Demographic Studies (INED). The funding provided by this program allowed this collaboration to be extended to representatives of two universities (the Institute of Demography of the University of Paris 1 and the University of Thessaly in Volos) and an association specializing in foresight, the Futuribles International group in Paris.

The articles presented here have passed a rigorous peer-review process, and the authors have modified the original submissions versions according to the requirements made during the review. We would like to express our sincere gratitude to the Editors and Managing Editor of *Investigaciones Geográficas*, and the anonymous reviewers for their many insightful suggestions. The individual articles as well as the contribution of this special issue have been greatly improved and strengthened thanks to their work and constructive comments.

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ARTÍCULOS TEMÁTICOS

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Migration in the Mediterranean region: A response to crises and an emergency in its own right

Migración en la región mediterránea: una respuesta a las crisis y una emergencia por derecho propio

Federico Benassi¹ 
Maria Carella^{2*} 
Frank Heins³ 

Abstract

Migration is an obvious response to political, economic, socio-demographic, and ecological crises. In recent decades, several crises have occurred in the Mediterranean region; consequently, migration has intensified, the geography of flows has been altered, and the roles of some countries within the Mediterranean migration system have rapidly changed.

This paper aims to delineate an overview of migration flows in this region over the last 20 years, focusing on the new migration flows related to humanitarian crises. In doing so, the present study also examines similarities and differences between past and current migration factors that shape the decisions of individuals. Migration flows are closely linked to the needs and fears of European societies. Following this logic, and by analysing challenges related to demographic and geopolitical dimensions in the future scenario, this study discusses the necessity of new policy responses.

Keywords: Migrations; Mediterranean region; humanitarian crises; demographic and geopolitical dimensions.

Resumen

Las migraciones son una respuesta obvia a las crisis políticas, económicas, sociales y ecológicas. Durante las últimas décadas se han producido varias crisis en la región mediterránea; en consecuencia, las migraciones se han intensificado, la geografía de los flujos se ha alterado y los papeles de algunos países dentro del sistema migratorio mediterráneo han cambiado rápidamente.

Este artículo pretende ofrecer una visión general de los flujos migratorios en esta región durante los últimos veinte años, centrándose en los nuevos flujos relacionados con las crisis humanitarias. El presente estudio también examina similitudes y diferencias entre los factores migratorios pasados y actuales que influyen sobre las decisiones individuales. Los flujos migratorios están estrechamente vinculados a las necesidades y a los desasosiegos de las sociedades europeas. Siguiendo esta lógica, al analizar los desafíos relacionados con las dimensiones demográficas y geopolíticas en el escenario futuro, este estudio discute la necesidad de una nueva respuesta política.

Palabras clave: Migraciones; región mediterránea; crisis humanitarias; dimensiones demográficas y geopolíticas.

1 Italian National Institute of Statistics (Istat), Rome (RM), Italy. benassi@istat.it

2 Department of Political Sciences, University of Bari "Aldo Moro", Bari, Italy. maria.carella1@uniba.it . * Corresponding author

3 Institute for Research on Population and Social Policies/National Research Council, Rome, Italy. frank.heins@irpps.cnr.it

1. Introduction

The Mediterranean region has always been a unique and important geostrategic region for economic and human interchanges involving the Near Eastern, North African and European states. It is an extremely heterogeneous area which includes countries that are closely connected by geographic proximity, and yet are very diverse historically, culturally and politically.

The varying levels of development, the geographical specificities, and the plurality of settlement configurations across these countries strengthen this diversity. Consequently, the demographic trends also vary significantly (Carella & Parant, 2014).

Two different demographic patterns can be observed in this region. The first concerns the countries of the northern littoral, which are facing demographic changes characterised by a slight increase of population related to international migration gains and a marked decline in fertility accompanied by a rapid population aging. The second involves the countries of the southern and eastern littorals, which are still undergoing the first demographic transition phase, characterised by a relatively young population with relatively high fertility and mortality levels and international migration losses (Parant & Léger, 2020).

Recent studies have documented that over time the entire Mediterranean region has been marked by a downturn in fertility rates and a raise in life expectancy which have both narrowed the range between the extremes (Carella & Parant, 2016). In particular, some of these studies have shown that the advancement of the transitional demographic process has engendered a gradual convergence of the demographic behaviours in the Arab and Near Eastern countries towards those of the European ones (Angeli & Salvini, 2018).

Another strand of literature suggests that a general notion of hypothetical homogeneity, or of demographic duality, in the Mediterranean has to be refuted when carefully analysing the indicators related to natural and migratory movement of populations. In other words, the variety of demographic regimes shaping the real heterogeneities in the Mediterranean region seems to be produced by trends and changes related to the political and cultural peculiarities of each country (Dumont, 2018).

Furthermore, the recent history of the Mediterranean region confirms the persistence of considerable socio-demographic disparities, due to the wide diversity of patterns in population growth and due to the consolidation of socio-economic differentials between the countries.

Over time, in order to compensate for these disparities individuals and families have always reacted by moving within the region, or by leaving it. Thus, as a historical crossroads, the Mediterranean has become an area of internal circulation involving diverse flows of population.

In this region the migratory patterns replicate those observed in other areas of the world in terms of the socio-demographic and socio-economic factors or drivers. The demand for cheap labour in the ageing societies of the European Economic Area is met by the countries of the African and Asian littorals (except Israel) and the Western Balkans. These countries have relatively young populations, as well as a general lack of economic opportunities that create jobs and provide economic stability in general. Obviously, people move not only because of economic disparities, but also for personal as well as political reasons.

Castles and Vezzoli (2009), referring to the financial crises unfolding in 2007, stated:

The current crisis is likely to have deep-reaching effects that we cannot foresee. It is mistaken to believe that migrants will serve as a safety valve for developed economies, by providing labour in times of expansion and going away in recession. When economic conditions get bad in rich countries they may be even worse in poorer origin countries. Moreover, migrants are social beings, who put down roots and form relationships in new countries. At times of recession, the motivation to migrate may be even higher than before, and remittances may prove a resilient form of international transfer. Finally, global economic inequality and the demographic imbalances between the ageing populations of the North and the large cohorts of working age persons in the South will remain important factors in generating future migration (p. 74).

During recent decades, several crises have occurred in the Mediterranean; consequently, migration has intensified, and the geography of flows has been altered. New migration routes have been added to the previous ones and new reasons—including economic ones—have led individuals and households to migrate. In this context, being that migration is extremely sensitive to shifts in the surrounding

environment, the spatial distribution and the roles of some countries within the Mediterranean migration system have rapidly changed.

The principal aim of this study is to investigate the trends and the nature of migration flows affecting the Mediterranean region between 2000 and 2020, a period marked by profound social, economic and political crises. We intend to examine the different effects of the various recent crises on the migration patterns and on the Mediterranean migration system in general. Aspects of emigration and immigration, but to a certain extent also the flows of transit migration along the various Mediterranean routes, are the subject of the analysis presented.

By focusing on contemporary migration patterns concerning the Mediterranean region, this paper complements and updates the literature on this topic showing the similarities and differences between past and current migration drivers. It investigates overall migration flows with a special focus on asylum seekers and refugees.

The article proceeds as follows: The next section provides some background and a short review of the literature on the determinants that have shaped the migratory system in the Mediterranean. A description of the data and methods is then presented. Next, a general analysis of the migration flows over the last twenty years is provided, with a focus on two specific issues: the new migration flows linked to humanitarian crises, and the loss of human lives due to the crossing of the Mediterranean Sea. The results of our analyses are discussed and put into future perspective in the final section.

1.1. Conceptualising contemporary migration in the Mediterranean

In Mediterranean context, the term ‘Southern European model of immigration’ was coined in the 1990s (King & Rybaczuk, 1993; King & Thomso, 2008) when southern Europe has mainly become an area of immigration rather than emigration. Since the 1990s most southern European countries have experienced consistent unregulated immigration flows involving immigrants from a wide range of European, Latin American, Asian and African countries (including Morocco, Tunisia and Egypt in the southern Mediterranean region). King & Rybaczuk (1993) identified diverse factors to explain the rise in immigration in the northern Mediterranean countries, including ease of entry, geographic and/or cultural nearness, economic growth causing greater disparities in income and unemployment levels, and the demographic disparities between an ageing population as compared to growing younger populations in the countries of origin. The migration flows into the northern Mediterranean countries seem to be closely linked to globalisation and the considerable segmentation of their labour markets, with specific sectors (for example, agriculture and the home care sector) relying on the cheap, informal labour provided by immigrants. Nevertheless, it is important to mention that emigration from Southern Europe never stopped, and it gained renewed importance after the great economic recession of 2007-2013.

The Mediterranean region is always experiencing persistent and substantial flows of population, and variations in these flows have often caused changes in net migration. Nevertheless, since in many Mediterranean countries migration statistics are not available or accurate our knowledge on migration flows is limited and the migratory phenomenon is often measured as the difference between natural and total population change. As a result it is often impossible to assess the levels of in- and out-migration that lead to this estimated migratory balance (Lafleur & Stanek, 2017).

To provide a complete picture of migratory movements in the Mediterranean region, it is necessary to combine the migration patterns at different geographic levels (from the local, to the regional, to the national) as well as their determinants and features which have always been very diverse.

Inter-Mediterranean flows have often been identified as a dual migratory system of opposing countries: the suppliers of migrants from the Southern and Eastern Mediterranean (except Israel), and the receiving nations of the Mediterranean European Union bordering the Northern Littoral. In this context the Western Balkans (especially Yugoslavia and its successor states) have been identified as a sub-region of emigration. It seems that until the 1980s most migration flows could be characterised as labour migration or economically active individuals moving to the north for economic reasons. Since then, the nature of migratory movements has changed: Socio-cultural and political as well as economic reasons have favoured further forms of migration, producing new flows alongside the axis of north-north and south-south (King, 2001).

On this last route, the Mediterranean is part of an inter-African regional mobility system that interplays with Euro-Mediterranean or inter-Arab migrations. Indeed, due to even more severe controls at the European frontiers, and to the Mobility Partnerships signed with the European Union⁴, Maghreb countries (especially Morocco, Tunisia, and Libya) have become transit countries through which increasing numbers of Sub-Saharan migrants (regular or irregular) move to enter Europe (Wihtol de Wenden, 2013).

To sum up, the effects of the European integration process, the new logics of spatial mobility related to globalization and the specific migratory patterns in the southeast of the Mediterranean lead us to question the concept of convergence towards a Mediterranean migratory duality based on simplistic push-pull models.

Additionally, during the two last decades financial, socio-economic and political crises have triggered important transformations which have also changed the roles of some countries within the contemporary Mediterranean migration system (Bellis, Carella, Léger, & Parant, 2021).

First, during the economic recession, young people and adults from the southern European countries most affected by the crisis (Greece, Italy, Portugal and Spain) reacted to adverse socio-economic conditions by moving to Northern Europe (Staniscia & Benassi, 2018). This renewed southern European flux of emigration to northern European countries remained attractive despite the crisis, having reconfigured the spatial distribution in some countries where the net migration rate has become negative.

Second, the Arab Spring which started with some protests and uprisings at the end of 2010 has seemingly not led to the formation of additional migration flows, apart from a minor flow from Tunisia, but it has generated two major refugee crises, first in Libya and then in Syria (Fargues & Fandrich, 2012).

During recent socio-economic and political crises in the Mediterranean region the characteristics of immigrants have changed. The number of undocumented migrants, refugees and asylum seekers (persons in need of humanitarian protection), as well as transit migrants, has increased substantially in the past decade enhancing the complexity of the Mediterranean migratory system.

However, migration flows themselves also represent a crisis. The deaths of migrants crossing the Mediterranean Sea are unacceptable for European societies. The operations of the European border protection agency (FRONTEX) seem to not always consider saving lives to be the highest priority. Indeed, European societies are in the midst of a conflict between humanitarian values and populist desires to keep migrants out of Europe. Collyer & King (2016) argue:

On 19 April 2015 around 800 people were drowned in the Mediterranean Sea south of Lampedusa – the small Sicilian island – when the hopelessly overcrowded and unseaworthy boat in which they were trying to reach Europe capsized. This tragic accident, the most significant loss of life in a single such incident ever recorded, marks the beginning of a narrative of crisis associated with the movement of people to Europe. Unfortunately, none of this is new. Over the last few decades, undocumented migration, meaning travel organized specifically to avoid the institutionalized system of state regulation, has become increasingly common across the Mediterranean. These dangerous journeys have often resulted in tragedy (p.2).

Hence, the Mediterranean today is a region open to multiple contrasts that reflect the intensity and diversity of migratory movements within a context of crises. Socio-economic uncertainty, persistent economic difficulties, and political unrest in the Mediterranean countries of Africa, Asia and neighbouring countries have contributed to an increase in migration flows over the past two decades. Faced with these unprecedented migration flows, European countries, as well as the southern countries of this region, have become sending, transit, or receiving areas, and sometimes all three simultaneously (Schmoll, Thiolet, & Wihtol de Wenden, 2015).

Additionally, the financial crisis of 2008 has further promoted South-North-South circular migration for, such as between Spain and Algeria (Cabezón-Fernández & Sempere-Souvannavong, 2019), or return migration from France, Italy and Spain to Morocco and from Portugal to Guinea. In particular, outflows

⁴ The EU has been in negotiations on readmission agreements (EURAs) with Morocco and Tunisia since the beginning of the 2000s, but until now the agreements are still not in sight. However, both Morocco and Tunisia have signed so-called Mobility Partnerships (MP) with the EU in June 2013 and in March 2014, respectively. These MPs provide a general framework for cooperating on border management and on the expulsion of undocumented Moroccan and Tunisian migrants (Abderrahim, 2019). The agreements mandate that the two governments in Rabat and Tunis 'readmit' Moroccan and Tunisian nationals residing irregularly in the EU.

of Moroccans from Spain have increased since 2008, reaching 40,000 individuals in 2013 (UNDESA, 2020). Moreover, in recent decades there has been an increase in flows of older migrants returning home at retirement age or adopting a transnational migration strategy anchored in different locations, often maintaining a residence in both their destination and their origin countries (De Haas, & Fokkema, 2010).

Interestingly, the need to map out a specific migration research agenda for the Mediterranean region was just recently expressed (Zapata-Barrero, 2020), generating an interesting special issue of the journal *Comparative Migration Studies*.

Finally, the themes of bordering and globalization were linked to international migration in the Mediterranean context also by Ribas-Mateos (2017, 2005) in a comprehensive study focusing on several 'gateway cities' of the European Mediterranean shore and on their forms of welfare and migration. Moreover in a recent contribution the concept of borders engaged in the relationship between wealth and poverty has been studied ethnographically comparing the situation in the Mediterranean region with the US-Mexico border one (Heyman and Ribas-Mateos, 2019) and extending the analysis beyond migration.

2. Methodology

The Mediterranean region is defined here⁵ as all 21 countries bordering the Mediterranean, plus four - Portugal, Serbia (with Kosovo), the Republic of North Macedonia and Jordan - that are located nearby.

The choice to include in the region the latter countries that do not have a natural access to the Mediterranean Sea depends on two reasons. First, they are closely associated with the remaining Mediterranean states sharing history and geographical characteristics (Carella & Parant, 2016). Therefore, by joining them the Mediterranean region bring together European peninsulas (Iberian, Italian, Balkan) which advance towards the South of the Mediterranean and Anatolian highland that expands into the sea on an east-west axis between the Eastern Mediterranean and the Black Sea.

Second, the Mediterranean migratory system is characterized by a complexity which cannot be ignored: migrations in this region are not just unfolding in different directions but also interact with geopolitical factors affecting also the neighbourhood. Consequently, all countries of this region, including those without direct access to the Mediterranean Sea, should be considered when analysing current international migration flows in the Mediterranean region.

In the Mediterranean region, as identified in this paper, in 2020 about 550 million people lived across three continents: Africa, Asia, and Europe. Approximately 333 million people are concentrated in the countries of the south-eastern shores and more than half of the Mediterranean population (56%) resides in four countries: Egypt, France, Italy and Turkey (Table 1).

However, the population is not evenly distributed across the region; in some Mediterranean countries people live much more concentrated than in others. Malta, Palestine (especially the Gaza Strip), and Lebanon are the smallest and the most densely populated countries in the area, while Algeria and Libya have the lowest population densities.

Mediterranean countries are also characterized by many inequalities that can be assessed using demographic, social and economic indicators. The disparities between the north and south of the region become evident by analysing the degree of socio-economic development using the Human Development Index (HDI), which takes into account three basic dimensions: longevity, education and per capita income. According to the latest report (United Nations Development Programme, 2020), all the European Union Mediterranean countries, Montenegro in the Western Balkans, and Israel on the Asian littoral have achieved a very high level of human development. The rest of the countries fall in the 'High human development' group, except Morocco and the Syrian Arab Republic, which are in the medium and low HDI groups, respectively. The three countries with the highest HDI ranking in the Mediterranean region are Israel (0.919), Slovenia (0.917) and Spain (0.904), while Syria and Morocco

5 This paper includes 25 countries divided into sub-regions as follows:

- European Littoral
 - European Union countries: Portugal, Spain, France, Italy, Slovenia, Croatia, Greece, Malta, Cyprus;
 - Western Balkans: Albania, Montenegro, Bosnia-Herzegovina, Serbia, Republic of North Macedonia;
- Asian Littoral: Turkey, Syria, Lebanon, Israel, Palestine, Jordan;
- African Littoral: Egypt, Libya, Tunisia, Algeria, Morocco

(0.567 and 0.686, respectively), have the lowest HDI values and rank at 151st and 121st position out of a total of 189 countries in 2019 (United Nations Development Programme, 2020).

Gaps in human development can depend on many factors related to unequal opportunities in access to education, healthcare and employment, or to persistent income inequalities. In the Mediterranean, the weakest value of the indicators that compose the HDI of Morocco concern the mean number of years of schooling for people aged 25 and older: in 2019 it was 5.6 years (estimated), lower than the one observed in Arab countries on average (7 years).

Table 1. Demographic and socio-economic characteristics of Mediterranean countries

Region/Country	Population 2020 (‘000)	Density 2020 (pop/ km ²)	GNI per capita 2019 (2017 PPP \$)	Human Development Index 2019	
				Value	Ranking
European Littoral	218,550				
<i>EU countries</i>	200,943				
Portugal	10,197	111.3	33,967	0.864	38
Spain	46,755	93.7	40,975	0.904	25
France	65,274	119.2	47,173	0.901	26
Italy	60,462	205.6	42,776	0.892	29
Slovenia	2,079	103.2	38,080	0.917	22
Croatia	4,105	73.4	28,070	0.851	43
Greece	10,423	80.9	30,155	0.888	32
Malta	442	1379.8	39,555	0.895	28
Cyprus	1,207	130.7	38,207	0.887	33
West Balkans	17,607				
Bosnia and Herzegovina	3,281	64.3	14,872	0.780	73
Montenegro	628	46.7	21,399	0.829	48
Albania	2,878	105.0	13,998	0.795	69
Serbia	8,737	99.9	17,192	0.806	64
North Macedonia	2,083	82.6	15,865	0.774	82
Asian Littoral	132,625				
Turkey	84,339	109.6	27,701	0.820	54
Syria	17,501	95.3	3,613	0.567	151
Lebanon	6,825	667.2	14,655	0.744	92
Israel	8,656	400.0	40,187	0.919	19
Palestine	5,101	847.4	6,417	0.708	115
Jordan	10,203	114.9	9,858	0.729	102
African Littoral	201,786				
Egypt	102,334	102.8	11,466	0.707	116
Libya	6,871	3.9	15,688	0.724	105
Tunisia	11,819	76.1	10,414	0.740	95
Algeria	43,851	18.4	11,174	0.748	91
Morocco	36,911	82.7	7,368	0.686	121
Mediterranean Region	552,962				

Sources: World Population Prospects: The 2019 Revision; Human Development Report, 2020

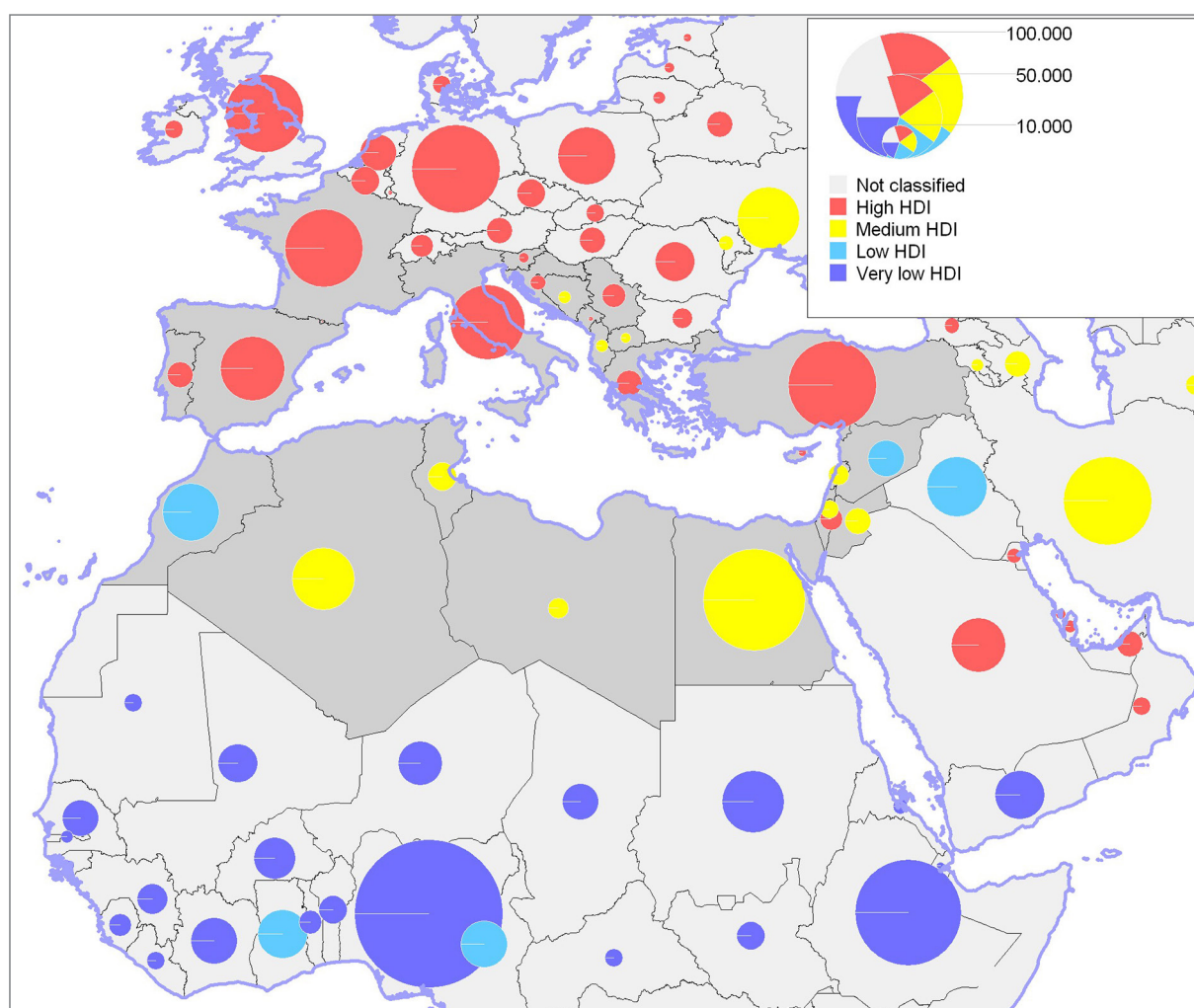
The very low HDI ranking of the Syrian Arab Republic reflects the serious socio-political conflicts that this country has suffered since 2011. The civil war, or proxy war, that began in 2011 has caused the HDI values to fall and the country is now at the bottom of the medium human development group (United Nations Development Programme, 2020). In fact, the Syrian Arab Republic’s HDI ranking fell in only 5 years from the 116th position in 2012 to the 155th in 2017.

Regarding the economic dimension of the HDI, the main disparities in the Mediterranean region consist in the significant inequality observed in terms of gross national income (GNI) per capita between the European littoral and the southern and eastern countries of the Mediterranean. Although the economic living standards of these countries are very heterogeneous, their income values are markedly lower than those of the northern ones.

In this context Israel is the only exception; indeed, the indicators that compose its HDI converge and even surpass those of the countries of the northern Mediterranean. The population of Israel has a life expectancy at birth among the highest in the world (83.0 years for both sexes combined in 2019, 84.5 for women and 81.3 for men) and a high level of education (an average of 13 years of schooling in 2019), as well as a high income per capita (40,187 in PPP\$ in 2019).

The population size and the level of human development is not only very heterogeneous in the Mediterranean countries but also among the neighbouring countries (Figure 1).

Figure 1. The geographical area of analysis. Population size and HDI values of countries of the Mediterranean region and neighbouring countries



Sources: United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects: The 2019 Revision and United Nations Development Programme, Human Development Report, 2020

To conduct our analysis we use data from the UN Department of Economic and Social Affairs (United Nations, Department of Economic and Social Affairs, Population Division, various years) that allow us to investigate the population dynamics and net migration trends concerning Mediterranean countries from 2000 to 2020. Moreover, to analyse the phenomena of refugees and asylum seekers we explore data provided by the UNHCR (United Nations High Commissioner for Refugees, 2020). These same data are

used to examine irregular migrations and interceptions and deaths along the western, central and eastern Mediterranean routes for the more recent period.

An additional source of information is the Frontex data (Frontex, 2021) that refer to the detections of illegal border-crossing by the EU border protection agency. These attempts vary considerably over the years and were obviously the highest in 2015 and 2016. These data reflect certainly the existing migratory pressure at the EU borders, however, the attempted EU border crossings refer to events rather than persons.

In addition to this officially reported statistical information from various international organisations, detailed country-to-country migration flows estimates for the period of 1990 to 2015 (Abel & Cohen, 2019) are used to sketch the migration patterns affecting the Mediterranean and to outline the importance of the Mediterranean crossroads for international migration flows to Europe from Africa and Asia. Abel & Cohen (2019) provide estimates of bilateral migration flows between all countries for the 5-year periods between 1990 and 2015 based on data on stocks and flows of international migration published by the UN Population Division following different methods. The methods include those based on changes in migrant stocks, a method based on migration flow rates, and methods based on global demographic accounting using bilateral stocks of migrants, as well as births and deaths. The analysis in the following section will focus on a method developed by Abel (2018). The different estimation methods and the ensuing different results underline the approximate nature of the information regarding the quantitative scope of the international migration flows, not to mention the qualitative characteristics. These aspects should be kept in mind in the following analysis.

3. Results: Recent migration dynamics in the Mediterranean region

Since the beginning of the 2000s, the classic approach of reducing Mediterranean migratory exchanges to the South-North dimension has lost its value because most of the countries in this region experience simultaneously the three different processes of emigration, transit migration and immigration. Increasing social and economic disparities, as well as socio-political factors, have, over time, altered migration routes between origins and destinations in the Mediterranean, redefining the traditional trajectories of migration flows.

To discuss this assumption in greater detail, we examine in this section the migration dynamics in the region over the last two decades. Our analysis starts with the idea that the Mediterranean cannot be considered a homogeneous and closed space, and that migration flows can be heterogeneous regarding motives. Thus we attempt to delineate different migratory profiles, paying particular attention to the flows and stocks of refugees and asylum seekers. Moreover, we address the implications of recent irregular migration flows by analysing the interceptions and deaths recorded in this region.

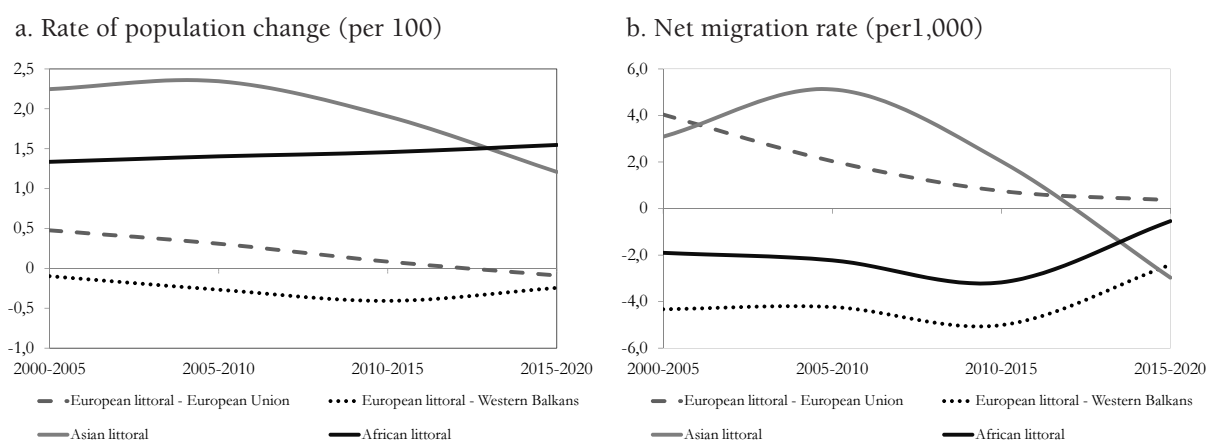
3.1. Population trends and net migration

The demography of the Mediterranean region has always been characterized by a marked heterogeneity, which creates a sort of dual space: a northern shore characterized by developed economies and post-transitional populations (individualistic, with low fertility and mortality rates, delayed family formation, small families, and ageing populations) and a southern shore including less developed economies and still-growing younger populations (Livi Bacci & Veronesi, 1990; Di Comite & Moretti, 1999). The northern shore, as always, plays a role in attracting migration flows, while the southern is an area of origin. However, today these simple demographic and socio-economic juxtapositions are no longer the only determinants of migration flows and, as a result of several changes in the geopolitical scenario and the globalization process, the picture appears more nuanced than in the past.

The population of the European littoral decreased rather significantly in the period considered here even though, in the case of the Balkan countries, we see a weak recovery in the last five years. The Asian littoral recorded increasing values for the average annual rate of population change up to 2005-2010, after which, although still positive, they continued to decrease. In contrast, the African shore shows a constant population growth throughout the period analysed here (Figure 2a.). Taking into account the net migration rates, the differences within the European littoral are marked. The European littoral on the EU side also differs from the other two macro-geographical areas, being the only region that registers positive values for average net migration, even if those values have decreased over time. For this

indicator, the Asian littoral shows a trend similar to that which was commented on previously, though the contraction is more marked here, so much so as to assume negative values in the last 5-year period. In the detail of groups of countries, the geographical element emerges quite clearly by configuring the changing spatial patterns of the net migration rate (Figure 2b.). In the first period (2000-2005) the spatial pattern was pretty clear: The more economically developed parts of the Mediterranean region (i.e., the European littoral–EU countries) attract international migration flows, thus showing positive values for the net migration rate. In comparison, all other countries (i.e., European littoral—Balkan countries and African littoral) are characterized by negative net migration rates. In the case of the Asian littoral the atypical net migration trends are due to military conflicts in neighbouring countries.

Figure 2. 5-year average annual rate of population change (a.) and 5-year average net migration rate (b.) by groups of countries of the Mediterranean region, 2000-2020



Source: United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition. Rev. 1. Own elaboration

The permanent economic disparities, the repercussions of the global financial crisis (2008–2013) or Great Recession, the Arab Spring, and the conflict in Syria have all contributed to significantly change this dual, and quite classic, scheme in recent years. At the end of the time period analysed (2015-2020) the situation is more complex: Portugal and Greece exhibit slight negative net migration rates; Spain, France, Slovenia and Serbia are characterized by slight net migration gains between 0 and 1 per thousand; and Turkey, Lebanon and Jordan display positive net migration rates due to the arrival of Syrians who were forced to leave their country because of the conflict that began 10 years ago.

These migration losses and gains are driven by international migration flows. Table 2 shows the imbalances in the flows and their changes after the year 2000. The European littoral seems to have lost attractiveness especially after the great recession that brought also out-migration flows to the other European countries and the rest of the world. Most migration flows to Africa might be return migrants. We observe persistent emigration from the West Balkans to the European Littoral and the other European countries. The Asian littoral went through considerable changes in the immigration flows especially because of the wars in Western Asia and subsequent return migrations or, probably, onward migrations toward Europe, excluding the European countries bordering the Mediterranean. The European littoral seems to have lost attractiveness to the detriment of other European countries. Unfortunately no estimates are available for the last 5-year period that was marked by the Syrian civil war and the ensuing migratory movements.

Most international migration flows enter Europe by sea and air using regular means of travel. However, the public image is dominated by irregular immigration which has far greater visibility.

The main sea and land migration routes of irregular migration flows in the Mediterranean region are the western (towards Spain including the Canary Islands), the central (towards Italy and Malta), the western (towards Cyprus and Greece) and the Balkan routes. In most cases the first country of arrival is not the country of desired final destination. In the case of transit migrants before reaching the Mediterranean region the migration trajectory over land was usually long and perilous. Important to remember that

migration trajectories are flexible and complex and primarily serve the migrants to achieve their ultimate goal of the migration project. So, the sea and land routes mentioned above are subject to change, and most migrants, certainly not the poorest, are most likely travelling by air.

Table 2. Estimated migration flows related to the Mediterranean region for the periods 2000-2004, 2005-2009 and 2010-2014 (in thousands)

Estimated migration flows from origin to destination groups of countries (in thousands)								
Destination	Mediterranean littoral							
	Europe	European	West Balkans	Asian	African	Western Asia	Africa	Rest of the World
Origin	2000-2004							
Europe	-	1,376	5	49	1	2	88	264
European Littoral	359	-	7	36	1	3	34	66
West Balkans	208	204	-	7	0	0	1	66
Asian Littoral	274	172	0	-	113	377	5	172
African Littoral	96	884	0	74	-	74	100	60
Western Asia	366	66	0	305	42	-	85	260
Africa	597	649	0	29	16	9	-	522
Rest of the World	3,716	3,021	6	563	17	2,357	101	-
	2005-2009							
Europe	-	994	18	36	0	11	71	180
European Littoral	752	-	21	60	16	20	157	251
West Balkans	163	212	-	4	0	0	2	65
Asian Littoral	258	51	1	-	5	124	5	90
African Littoral	171	737	0	159	-	299	27	107
Western Asia	401	22	0	1,032	22	-	32	182
Africa	796	608	0	42	75	548	-	709
Rest of the World	4,279	2,239	2	312	15	5,871	160	-
	2010-2014							
Europe	-	332	3	30	1	38	47	367
European Littoral	940	-	24	21	11	11	118	756
West Balkans	194	180	-	0	0	0	1	40
Asian Littoral	761	62	4	-	73	1,220	5	444
African Littoral	178	425	1	288	-	216	33	238
Western Asia	228	18	0	469	15	-	13	312
Africa	906	722	0	30	30	239	-	1,456
Rest of the World	3,649	1,398	6	218	6	4,547	144	-

Source: Abel & Cohen (2019). Own elaboration

It is difficult to characterize migrants according to the predominant motive for their move, as personal, economic and political motivations are closely related. In the following two sections we would like to focus first on refugees and asylum seekers who should enjoy specific protections, and second on the phenomenon of irregular migration within the Mediterranean region.

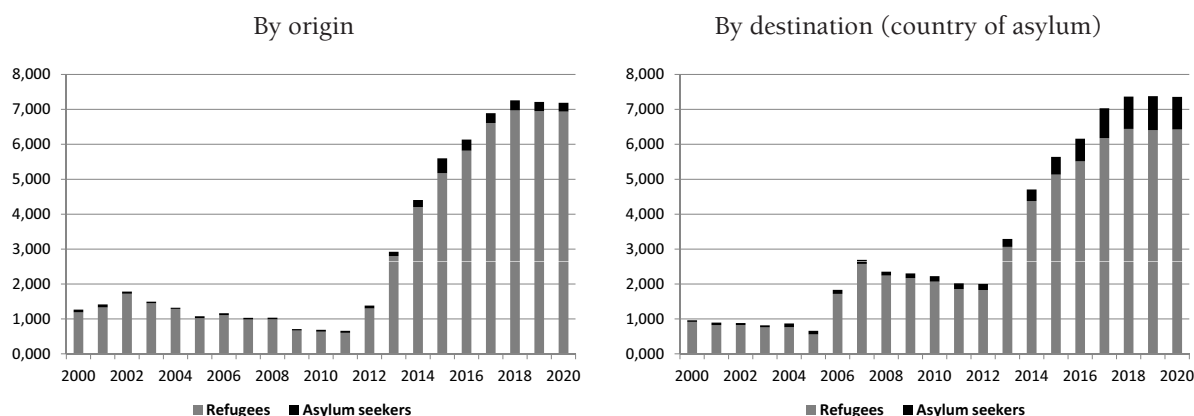
3.2. Refugees and asylum seekers

One of the consequences of humanitarian crises, wars, and political instability is an increase in the number of people obliged to flee their homes. They become internally displaced persons when they stay

within their countries, or refugees and asylum seekers when they are forced to flee their countries. Several major crises causing important displacements in the Mediterranean region have occurred: In the 1990s it was the Balkan War, and in the last two decades the Syrian conflict, the conflict in Afghanistan, conflicts and climate changes in the Sahel region, and other conflicts and crises in Asian and African (such as in Iraq, Libya, Somalia, the Central African Republic). Additionally, in recent years refugee crisis in some Latin American countries resulting from political instability, threats and persecution has generated an exodus of people seeking international protection. In general, the number of refugees and asylum seekers from Latin America has increased since 2019 and some European countries have become destinations for them, especially Spain, followed by Italy and Portugal (Eurostat, 2020).

In the recent past all crises, due to contingent and geographical issues, have found their maximum expression in the Mediterranean region, which connects different worlds. We refer here only to flows involving this area (25 by 25 origin destination square matrix). The data in Figure 3 are extremely revealing: From 2000 to 2020 the number of refugees and asylum seekers grew significantly. The most intense growth started after the second period (2005-2009), with a strong acceleration in the last few years.

Figure 3. Refugees and asylum seekers in the Mediterranean region by origin and destination (country of asylum), 2000-2020 (in thousands)

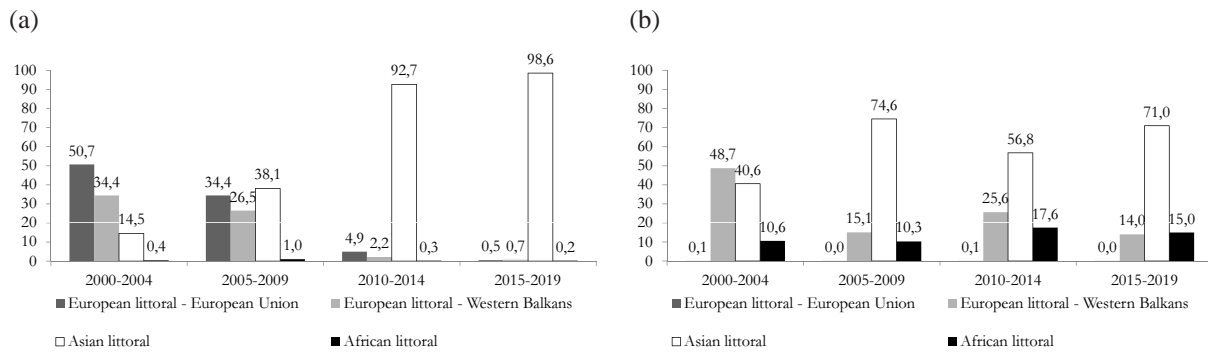


Source: United Nations High Commissioner for Refugees data. Own elaboration

The beginning of the millennium was characterised by the Yugoslav wars and conflicts linked to the breakup of the Yugoslav federation, as well as the emergence of ethnic conflicts in the 1990s that ended only in 2001. This third Balkan war led to high numbers of refugees and asylum seekers from Bosnia and Herzegovina, Croatia, Montenegro, Serbia and Kosovo. All these political crises and conflicts also produced internally displaced persons. Other conflicts are the war in Lebanon (in 2006, after a civil war from 1975 to 1990), and the civil wars after the revolt in 2011 in Libya and especially Syria. The latter two can be linked to the Arab Spring. In addition to the 6.7 million Syrian refugees and asylum seekers living in other countries in 2020, there are an estimated 6.7 million internally displaced persons. And the refugees and asylum seekers from Palestine are a constant presence over the last decades. Another long-lasting conflict is the one between the Kurdish minority and the Turkish government.

The numbers and origins of the refugees and asylum seekers changed during the observation period as a result of new geopolitical scenarios. At the beginning of the millennium (2000) more than 80% of refugees and asylum seekers originated from the European littoral, particularly from Bosnia and Herzegovina, Croatia, Serbia and Kosovo. After 2010 this changed dramatically: Today (2020) 97% of the total refugee and asylum seeker population in the Mediterranean region originate from the Asian littoral, and 93% are from Syria alone. For the stocks of asylum seekers we observe different patterns. In the first period (2000-2004) the highest shares recorded were from the European littoral–Western Balkans and the Asian littoral (48.7% and 40.6%, respectively). In the subsequent periods the number of asylum seekers from the Asian littoral grew significantly, reaching 71.0% in 2015-2019. The opposite is true for those originating from the European littoral-Western Balkans (14.0% in 2015-2019). The share of asylum seekers originating from the African littoral grew as well, rising from 10.6% in 2000-2004 to 15.0% in the last period (Figure 4).

Figure 4. 5-year proportion of (a) refugees and (b) asylum seekers compared to the total number of refugees and asylum seekers, respectively, by macro area of origin. Mediterranean regions, 2000-2019



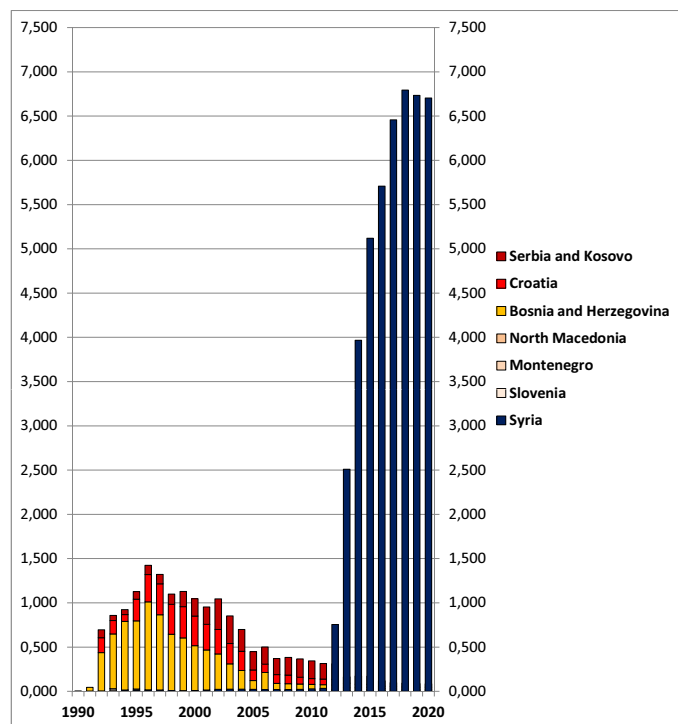
Source: United Nations High Commissioner for Refugees data. Own elaboration

Observing refugees and asylum seekers by country allows us to detect the changing geographies of origin and destination. This analysis concentrates on the two most prominent cases: 1) the breakup of Yugoslavia and the ensuing wars in the Western Balkans in the 1990s, which involved the present countries of Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia and Kosovo and Slovenia; and 2) the still ongoing civil war in Syria. The countries of origin of refugees and asylum seekers reflect past and present political and military conflicts. In addition to these two crises we focus on several conflicts that are creating refugees and asylum seekers. The continuously precarious situation of many Palestinians living outside of their home territory is well known and has been a persistent crisis in recent decades. At the beginning of the observation period, a high number of nationals of Turkey, Lebanon, Syria, Albania and Algeria were living as refugees and asylum seekers in other countries. In the case of Turkey, many reached Iraq and several European countries, particularly Germany. And in the case of Syria, many reached European countries such as Germany, the Netherlands and Sweden. However, the majority is today living in neighbouring countries. In recent years the most prominent countries of origin of refugees and asylum seekers (after Syria) are Turkey and Egypt, two countries characterised by internal political conflicts. Libya is another, having experienced two civil wars, the first in 2011 and the second since 2014. Most of the refugees and asylum seekers from these countries have been hosted by western and northern European countries and the USA. And in the case of Turkey, Iraq also plays an important role.

The first of the two crises caused by armed conflicts (Figure 5) focuses on the break-up of multi-ethnic Yugoslavia after the death of Josip Broz Tito (1980) and the fall of the Iron Curtain. Ethnic conflicts, outright wars of independence, insurgencies in the individual states that had formed Yugoslavia, and ethnic cleansing led to several waves of refugees and asylum seekers, as well as internally displaced persons beginning in the early 1990s and continuing until the early 2000s. Still today UNHCR is assisting persons that were forced to leave their homes then. The consequences of the second crisis were observable immediately after the start of the Syrian civil war in 2011. The civil war grew out of the Arab Spring protests and opposed the government and single forces of factions along political, ethnic and religious lines. Foreign forces also intervened.

In Table 3, data are reported regarding refugees and asylum seekers originating from three countries involved in the breakup of Yugoslavia and Syria, grouped by the most important countries of destination. The year chosen is the one with the highest numbers observed (see Figure 5). In the case of the Balkan countries, the neighbouring countries play an important role: Refugees and asylum seekers moved from Bosnia and Herzegovina to Serbia (25%), and from Croatia to Serbia (84%) and Bosnia and Herzegovina (11%). But western and northern European countries, as well as the USA and Canada, also played a role. In fact, NATO played a political and military role in the conflicts in these countries, and bonds between certain areas were already created in the 1960s and 1970s through the migration of 'Gastarbeiter' to Germany and other European countries. In the case of the refugees and asylum seekers from Syria, the neighbouring countries (Turkey, Lebanon and Jordan) are absorbing the brunt of the exodus. To a lesser degree, European and other Arabic countries are also offering support.

Figure 5. Refugees and asylum seekers in the context of two crises: the breakup of Yugoslavia in the 1990s and the Syrian civil war in the 2010s, 1990-2020 (absolute values in 1,000)



Source: United Nations High Commissioner for Refugees data. Own elaboration

Table 3. Destination countries of refugees and asylum seekers in the context of two crises: the breakup of Yugoslavia in the 1990s and the Syrian civil war in the 2010s

Destinations of refugees and asylum seekers from selected countries of origin and years (in %)							
Country	The breakup of the Yugoslav Federation				The civil war in Syria		
	Bosnia and Herzegovina		Croatia		Serbia and Kosovo		Syria
Year	1996		1999		2002		2018
Refugees and asylum seekers (in 1,000)	994		354		346		6,794
Germany	33.2	Serbia&Kos.	84.4	Germany	54.6	Turkey	53.3
Serbia&K	25.2	Bosnia&Her.	11.2	Sweden	9.9	Lebanon	13.9
Croatia	16.0	Canada	1.2	UK	5.8	Jordan	10.0
Austria	7.5	Australia	1.0	USA	5.0	Germany	8.6
Sweden	5.0	Sweden	0.8	Switzerland	3.9	Iraq	3.7
USA	3.2	USA	0.6	Netherlands	3.1	Egypt	2.0
Denmark	2.6	Others	0.8	Australia	2.9	Sweden	1.6
Netherlands	2.2			Norway	2.3	Sudan	1.4
Canada	1.7			Canada	2.2	Austria	0.7
Slovenia	0.8			Bosnia&Herz.	1.8	Greece	0.6
Italy	0.8			France	1.6	Netherlands	0.5
Switzerland	0.5			Denmark	1.4	Libya	0.3
North Maced.	0.5			Austria	1.2	Denmark	0.3
Others	0.8			Finland	0.8	France	0.3
				North Maced.	0.8	Switzerland	0.3
				Italy	0.6	Bulgaria	0.3
				Hungary	0.6	Others	2.3
				Others	1.4		

Source: United Nations High Commissioner for Refugees data. Own elaboration

When focusing on the Mediterranean region as a destination for refugees and asylum seekers, the destination country that stands out today is Turkey, with about 3,575,000 from Syria, but also 174,000 from Iraq, 117,000 from Afghanistan, and 28,000 from Iran (all data refer to 2020; UNHCR, 2020). This role is internationally recognized, for example, by the controversial agreement with the EU concluded in 2016 that limited the movement of Syrians in particular to the EU in exchange for a financial contribution to cover the expenses of hosting the refugee and asylum seekers. Lebanon (747,000) and Jordan (901,000) admit refugees and asylum seekers from Syria and also Iraq. Egypt, with a total of 329,000, admits Syrians and Palestinians, but also Sudanese, South-Sudanese, Eritreans and Ethiopians. About 90% of the refugee population in Algeria (99,000) are Western Saharans. Also for the EU Mediterranean countries, Syrians constitute a significant share of refugees (especially in Greece); however, the refugee and asylum seeker populations of these countries do not only belong to the Mediterranean region but come from all over the world and often have traditional ties with specific countries or language affinities.

This is a significant change from the beginning of the millennium (2000) when the numbers of refugees and asylum seekers were considerably lower and were influenced by the breakup of Yugoslavia, the conflict in Western Sahara, and the situation of the Palestinians. In France, with a total of about 133,000 asylum seekers and refugees, it was then already possible to observe a multitude of origins for the populations in need of humanitarian protection, which are, in part, still determined by the conflict in Indochina.

So the Mediterranean region is not only the centre of an exchange of migrants, or a migration hub, but it plays a similar role for refugees and asylum seekers from African and Asian countries as well. Migratory flows cross the Mediterranean to reach its northern shore and the economic centres of the European Economic Area or the countries that offer a more open policy of humanitarian protection.

3.3. Irregular arrivals, interceptions and deaths in the Mediterranean regions

Due to the restriction of legal methods of reaching the European countries to secure their economic livelihoods or humanitarian protection, international migrants are obliged to use alternative means to reach the European shore. This includes relying on illegal smugglers and human traffickers that often offer risky land passages to the shores of the Mediterranean and subsequent sea passages that are frequently highly dangerous. The (often estimated) data provided by the UNHCR in “*Data on attempted crossings of the Mediterranean Sea 2016-2019*” shed some light on a crucial topic that has also become a central issue in national and supra-national political debates. The number of irregular arrivals in Mediterranean EU (Spain, Italy, Malta, Greece and Cyprus) exceeded 1 million in 2015, was almost 370,000 in 2016 and 124,000 in 2019, and reached a relative low of 95,000 in 2020 due to the COVID-19 pandemic and the continuous activities of the coast guards of the countries along the southern European shores and FRONTEX (Table 4).

Table 4. Irregular arrivals (number of people) in Mediterranean Europe*, 2016-2019

Irregular arrivals in Europe*	2016	2017	2018	2019
Total arrivals in Europe	369,977/373,652	180,005/185,139	126,370/141,472	114,951/123,663
Total arrivals by sea in Europe	363,581	173,712	119,570	108,606
Total arrivals by land in Europe	6,396	6,293	6,800	6,345
Spain (Western Mediterranean)	14,558	28,452	64,018	29,809
Sea	8,162	22,159	57,218	23,464
Land	6,396	6,293	6,800	6,345
Italy (Central Mediterranean)	181,436	119,370	23,370	11,471
Sea	181,436	119,370	23,370	11,471
Land	-	-	-	-
Malta (Central Mediterranean)	24	20	1,445	3,405
Sea	24	20	1,445	3,405
Land	-	-	-	-
Greece (Eastern Mediterranean)	173,614	29,501	32,742	62,445
Sea	173,614	29,501	32,742	62,445
Land	-	-	-	-
Cyprus (Eastern Mediterranean)	345	2,662	4,795	7,821
Sea	345	2,662	4,795	7,821
Land	-	-	-	-

Source: United Nations High Commissioner for Refugees “Data on attempted crossings of the Mediterranean Sea 2016-2019”: *Spain (Western Med.); Italy and Malta (Central Med.); Greece and Cyprus (Eastern Med.). Own elaboration

Whereas in 2015 Syrian nationals dominated (48%, followed by Afghans 29%, Iraqis 9%, and Eritreans, Nigerians, Pakistanis and Somali), in 2020 the most frequent countries of origin were Tunisia (19%) and Algeria (13%), followed by Morocco, Bangladesh, Afghanistan, Syria, Côte d'Ivoire, Mali and Guinea.

The trend in irregular arrivals is partially explained by the rise in the number of interceptions in the Central and Eastern Mediterranean regions, which grew from 52,000 to 71,000 in the period of 2016 to 2019 (these data refer only to interceptions made by the Libyan, Tunisian and Turkish coast guards) (Table 5).

It should be noted that the increase in the number of interceptions is entirely attributable to the Turkish coast guard. If we look at the data on arrival broken down by pathway (sea or land) we can clearly see that, in reality, the decrease in the volume of irregular arrivals is due to arrivals by sea decreasing from 363,581 in 2016 to 114,951 in 2019 (- 68.3%). The fact is that arrival by land is more difficult to detect and, in fact, data are only available for Spain, where the volume of the flows remained quite stable during the period observed. It is reasonable to suppose that irregular migrants and traffickers are searching for loopholes to reach European countries, be it by land or sea. In fact, migration seems to be a process that is difficult to stop when individuals are really motivated and determined. What emerges from Table 4 is the fact that the real decrease in the number of irregular arrivals occurred in Italy (from 181,436 to 11,471, or -93.6%) and in Greece (from 173,614 to 62,445, or -28.1%). In contrast, in Spain, Malta and Cyprus irregular arrivals increased significantly from 2016 to 2019.

Table 5. Interceptions in Central and Western Mediterranean, 2016-2019

Interceptions in Central and Western Med.	2016	2017	2018	2019
<i>Interceptions by Libyan Coast Guard</i>	14,332	18,900	15,428	9,225
<i>Interceptions by Tunisian Coast Guard</i>	1,105	3,178	4,091	1,028
<i>Interceptions by Turkish Coast Guard</i>	37,130	19,084	25,398	60,543
Total interceptions	52,567	41,162	44,917	70,796

Source: United Nations High Commissioner for Refugees "Data on attempted crossings of the Mediterranean Sea 2016-2019".
Own elaboration

Concerning the number of deaths and disappearances recorded in the Mediterranean region a decrease from extremely high values can be observed in the Eastern and, especially, in the Central Mediterranean (Table 6). But keeping in mind that the Central Mediterranean is composed of Italy and Malta and the Eastern Mediterranean of Greece and Cyprus, we can argue that this decrease is essentially the effect of the reduction of irregular arrivals in Italy and Greece. This argument is partially confirmed by the data regarding deaths and disappearances in the Western Mediterranean (i.e. Spain, including attempts to reach the Canary Islands) that increased from 128 in 2016 to 552 in 2019. Spain was one of the countries in which the number of irregular arrivals grew between 2016 and 2019. Even if the number of deaths and disappearances has recently decreased the loss of human life in the Mediterranean cannot be accepted and European countries have to do everything possible to improve the situation.

Table 6. Deaths and disappearances recorded in Mediterranean regions by area, 2015-2020

Deaths /disappearances	2015	2016	2017	2018	2019	2020
<i>Deaths recorded in Western Mediterranean</i>	102	128	224	811	552	330
<i>Deaths recorded in Central Mediterranean</i>	3,149	4,581	2,853	1,314	1,262	983
<i>Deaths recorded in Eastern Mediterranean</i>	803	434	62	174	71	104
Total deaths and missing	4,054	5,143	3,139	2,299	1,885	1,417

Source: Data from <https://missingmigrants.iom.int/region/mediterranean>. Own elaboration

It seems useful to draw attention to the seasonality of the flows and their relative magnitudes for each Mediterranean area. The total number of attempts is decreasing over time and is characterized by a high seasonality; in the summer and spring periods the number of attempts increases, most likely due to better weather conditions. In the first period (from the beginning of 2016 to mid-2017), the Central Mediterranean (Italy and Malta) show a comparatively high number of attempts. The Eastern Mediterranean

(Greece and Cyprus) recorded very high numbers of attempts in the first three months of 2016, and thereafter, the numbers decreased significantly. In the last part of 2019, the number of attempts in that area rose again. Western Mediterranean (Spain) presents a quite stable profile, with an intensification during the second part of 2018 and the first part of 2019. In relative terms, the central Mediterranean corridor appears to have the highest rates of death and disappearance. No wonder, then, that migration rescue efforts by NGOs are concentrated in this area. In Italy in particular, political positions on protecting the lives of migrants on the one hand and limiting the number of arrivals on the other hand clash most severely. The Mediterranean countries of Europe, and the European Community as a whole, must face this conflict and find a solution that will protect the lives of those coming in search of a better and safer life.

4. Discussion: What's next? Some scenarios

During recent decades, several crises have occurred in the Mediterranean region, producing a sharp increase in the numbers of internal displacements and international migration. These crises are causing terrible suffering to the human beings directly involved. And they lead to social and economic difficulties in all the countries affected by the crisis. Today, in the Mediterranean area, a fairly good knowledge of the determinants and implications related to contemporary spatial mobility is available (de Haas, Castles & Miller, 2020). To formulate hypothetical future scenarios, mechanical and causal arguments such as the push-pull model alone are neither adequate nor sufficient. In fact, the variables influencing the decision to migrate are multiple and are rather difficult to model. A first step to formulate possible future scenarios is to focus on the obvious drivers that underlie the migration flows described above at the macro level, hypothesizing that they will continue to maintain validity in the future. In doing so, it must be emphasized again that the Mediterranean region is not a closed, self-contained space: its particular geographical location touching three continents means that migrants, even from very distant countries, transit through the region, often as the last stage of a long and winding migratory path. It is therefore natural that the following evaluations refer to data and indicators mainly connected to three continents: Africa, Asia and Europe. The main drivers that we have identified are substantially related to demography, environment, economic growth and the political dimension.

Differential population growth leads to significant imbalances in the overall amount and age structure of the population. These aspects are in themselves elements that favour geographical mobility of the population. This mechanism cannot be addressed in a deterministic way, as was often done in the past by demographers and economists, because today's reality is very complex and rapidly changing (Hugo, 2011). However, considering potential future demographic scenarios can help us to focus on some dominant dynamics. According to the demographic projections of the United Nations (United Nations, 2019), significant demographic growth in most African countries will continue into the near future, while we will see a decreasing and ageing population in European countries and a substantial stationarity of the Asian one, leading to changes in the population weights of the countries and increasing disparities in the population age structures in the countries involved. In particular, in the next 30 years the population of Africa will see a rise of almost 86%, the Asian population will increase by about 14%, and the European continent's population will decrease by 5%. As already stated, these differences in numbers are correlated to other structural differences: the percentage of young people (0-14 years) will decrease on all three continents, even though the starting levels are significantly different (if we consider that in 2020 young people represented 40% of the African population and only 16% of the European one). The most significant contraction will be, in relative terms, that in the African countries (-8.3%). On the other hand, future changes in the percentage of the population of working age (i.e., the population potentially economically active, 15 to 64 years old) differ between continents. In this case, the only increase is the one expected in Africa (+6.1%) while there are significant decreases in this population group for Asia and for Europe with an outstanding value of -7.6%. Finally, on all three continents, though with varying degrees of intensity, the percentage of elderly (65 years and over) will increase, although, as with young people, they start from significantly different initial situations, with Europe in the lead (19.1%) (United Nations, 2019). These changes in age structure are accompanied by equally significant changes in the geographical distribution of the population, summarized here by the percentage change in the urban population. This is an important element in understanding international migration phenomena (IOM, 2015). Very often, in fact, international migration is nothing more than the final stage of a wider migration process along the rural-urban axis (Pumain, 2006). On the other hand, urbanization has a very high environmental

cost which, in turn, affects international migration processes, acting as a push factor (Meyerson, Merino & Durand, 2007). The gradient between the different continents is impressive: the percentage increase, again according to the United Nations (2018), of the urban population in the African continent in the next 30 years will be 153%, while it will be 47% in Asia and just 8% in Europe. It therefore seems legitimate to state that, at least from a theoretical point of view, the demographic disparities underlying or furthering international migration do not seem likely to diminish in the near future.

Another important dimension is related to the environmental aspects. These, including climatic aspects, play a fundamental role in determining migratory pressures, especially for countries where the agricultural sector represents a significant share of employment and/or a source of self-sufficiency (Adamo & Izazola, 2010; Black, Adger, Arnell, Dercon, Geddes, & Thomas, 2011). From this perspective, the main drivers related to climate change and its environmental effects are numerous. These and other relevant aspects are well highlighted in the recent contribution of Livi Bacci (2018), emphasizing that, in addition to the explosion of the already mentioned urbanization processes, two particular aspects must be taken into account with regard to the complex relationship between man and the environment: human intrusion into large forest areas and the growth of populations in the most precarious habitats. In this regard, the author reports very striking data that highlight how deforestation in Africa, Asia and Latin America has assumed alarming levels, as has spreading human settlement, especially in coastal areas, which are perceived as being more attractive but are also much more environmentally fragile. In short, it is a process of consuming landscape, indeed of what little is left, which does not bode well in relation to the pressures leading to future migration flows. A sort of mechanism of attraction and repulsion, the inertial force of which, admitted to defuse the causes, seems to be able to continue to produce harmful effects. In addition to these aspects which are general in nature, there are others of a more local nature. Particularly in some areas of Africa, the process of desertification is an increasing phenomenon. Fuelled by global warming, which is a direct effect of human activities, (especially of the More Developed Countries), desertification is taking land and life away from local populations. Consequently, by 2030, some authors expect that there will be 135 million climate refugees due to desertification of land on a global scale. Of these, 60 million are destined to move from Sub-Saharan Africa to North Africa and Europe (Confortin, 2017). This confirms, as we previously discussed, that climate change is an important contributing factor for internal and international migration. A recent report released by the Italian Agency for Development Cooperation states that, according to the United Nations (FAO-IFAD-OIMWHP 2018), in Sub-Saharan Africa, during the period 1960-2000 changes in temperature and rainfall can be linked to a 50% increase in net migration. Some 5 million people have been pushed to migrate from rural areas to urban areas due to agricultural production losses and falling incomes and wages (Dessi, 2019). A sort of self-feeding or self-reinforcing process is thus outlined: the consumption levels of big cities and their CO₂ emissions promote climate change, such as global warming, which speeds up the desertification processes which, in turn, pushes more and more people to urbanize (Livi Bacci, 2018). It is a sort of Malthusian environmental trap that seems to still gain vigour.

The manifest and persistent economic disparities existing in the Mediterranean region and beyond are a further element in driving international migration towards the north of the northern Mediterranean shore, and towards Europe in general. This is especially true when considering economic prosperity, or the lack of it, as an indicator of the possibility of securing the livelihoods of individuals, families and the entire population. However, the decision to migrate depends not only on economic opportunities, or the lack of them, but also on the availability of resources, be it in the form of economic capital or in the form of family and social networks. In the context of the discussion on the Human Development Index above, the importance of the economic dimension was already stressed and the existing disparities in the Mediterranean region (Table 1) were shown. The gradient of economic wellbeing or development becomes yet steeper when considering other African and Asian countries (Figure 1).

The general absence of economic opportunities might be one of the important drivers of emigration. But also specific aspects could lead to the decision to emigrate: the phenomenon of land grabbing. This is now recognized as a cause of mobility of people, especially in continents such as Africa that are rich in land but are otherwise very poor (Pugliese, 2019). In general, external influences can play crucial role on mobility of populations. A recent contribution in "La Voce" by Pasquale, Stucchini & Tronchin (2019) states that since the early 2000s, the main player in Africa has become China, with a very concrete approach: natural resources in exchange for infrastructure projects such as roads, dams, stadiums,

railways and ports. On the other hand, as demonstrated in some recent contributions (Clemens & Postel, 2017), in the short and medium term, economic development of developing countries, typically areas of origin for large migratory flows, would not favour a contraction of the migratory push but, on the contrary, its expansion (Mendola, 2018).

Besides these macro aspects, individual decision making is an important element in understanding migration flows. The disparities in demographic, environmental and economic situations and trends by themselves do not lead to migration. Aspirations and capabilities play a decisive role. De Haas (2021) discusses this concept, which was formulated by Carling earlier (2002) and was further developed by others, putting it in relation to other theoretical approaches and pointing out the limitations of functionalist and historical-structural theories. De Haas (2021) discusses various categories of migrations that highlight the multi-faceted aspects of international migration, referring to the concepts of aspirations to migrate or to stay, as well as to the liberty to either migrate or stay. De Haas (2021) also underlines the role played by migratory agency and its tendency for self-enforcing:

The entire set of structural conditions at home and in imagined migration destinations creates complex opportunity structures, endowing different individuals and social groups with various sets of negative and positive liberties, which, depending on how these structural conditions affect people's capabilities and aspirations and how people perceive these conditions through their social, cultural and personal lenses, may, or may not, make them decide to migrate (De Haas, 2021, p. 27).

Existing migration networks show the tendency to reinforce this process. Moreover the aspirations-capabilities framework can account for increasing propensities to migrate linked to social and economic change (de Haas, 2011). With this framework the individual and the family is put at the centre of the decision to stay or to migrate. Thus, more information and more liberty might increase the number of migrants.

The discussion surrounding the various potential future drivers of international migratory flows affecting the Mediterranean region suggests that migration flows will likely continue be directed to the European shores or to transit to the other European countries. The demographic component regarding potential migrants alone hints at a future increase of migration flows. The COVID-19 pandemic seems to have underlined the importance of foreign labour, especially in essential sectors of the European labour markets, such as agriculture or personal care. And as long as European countries will retain relatively high social and economic living standards, they will remain attractive for migration flows from the Asian and African shores of the Mediterranean and beyond.

5. Conclusions

The scenarios delineated here lead us to revisit Mediterranean migration flows in terms of concepts and aspects of categorization, and they also invite us to rethink policies that could be adapted to the multiple changes and challenges in the region. In other words, two interconnected dimensions become crucial in the analysis of the Mediterranean migratory system: the geopolitical component and the need to reflect on more interventionist policies. Concerning the first dimension, the issue of spatial mobility provides the opportunity to reveal the complex interrelationships among populations, places, and politics; in turn the analysis cannot ignore the geopolitical circumstances under which this mobility occurs. With regard to the second dimension, the inadequacy of the policies adopted in recent decades to gradually manage demographic and socio-economic processes in the origin countries of the migration flows interesting the European Mediterranean countries and other European countries invites discussions regarding measures and political actions to improve the future situation. The failure of the Barcelona Process and the Union for the Mediterranean, the impasse in the Lisbon strategy, and the ineffectiveness of decentralized cooperation in the context of co-development impose strategies to facilitate socio-economic development in less developed countries. In other words, the political management of international migration flows should go beyond the bilateral or multilateral agreements to govern these flows. Even if the issue is controversial, there seems to be no alternative to a proactive government or management of international migration flows in the interest of origin and destination countries. This could be realized within the framework of The Global Compact for Safe, Orderly and Regular Migration and The Global Compact on Refugees. Obviously these policies have to go along with measures to support social and economic development in countries with a low Human Development Index. The policies can only be

virtuous and effective if democratic principles and human rights are respected. In addition to the measures that should apply in ordinary times of permanent crises with regard to demographic, environmental and socio-economic differences, we would like to point out the need to react quickly in times of actual humanitarian, political or socio-economic crises.

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Appendix

Table A1. Net Migration Rates (per 1,000 population) – Countries of the Mediterranean region

	Net migration rate (per 1,000 of population)			
	2000-2005	2005-2010	2010-2015	2015-2020
Portugal	3.4	1.7	-2.7	-0.6
Spain	13.7	10.0	-2.2	0.9
France	3.1	1.4	1.3	0.6
Italy	5.8	3.6	5.5	2.5
Slovenia	1.5	3.9	1.6	1.0
Croatia	-0.1	-0.5	-1.8	-1.9
Greece	2.0	-6.7	-3.0	-1.5
Malta	2.8	2.8	7.3	2.1
Bosnia-Herzegovina	-0.3	-3.2	-14.5	-6.4
Montenegro	-2.6	-0.2	-1.0	-0.8
Serbia	-5.9	-2.6	0.7	0.5
Albania	-11.4	-14.4	-9.4	-4.9
North Macedonia	-1.4	-0.7	-0.9	-0.5
Turkey	-0.1	-0.1	4.7	3.5
Syrian Arab Rep.	-4.4	3.7	-54.7	-24.1
Lebanon	25.8	-1.1	41.5	-4.5
Israel	3.3	7.9	0.5	1.2
State of Palestine	-11.2	-5.4	-7.3	-2.2
Jordan	-3.5	20.0	25.6	1.1
Cyprus	11.7	11.0	4.0	4.2
Egypt	-0.2	-0.7	-0.6	-0.4
Libya	-0.7	-4.0	-9.5	-0.3
Tunisia	-2.9	-0.8	-2.8	-0.3
Algeria	-1.3	-2.1	-0.8	-0.2
Morocco	-4.4	-3.6	-2.2	-1.4

Source: United Nations, Department of Economic and Social Affairs, Population Division (2019).
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Methodological elements for the comparative analysis of the first wave of the Covid-19 epidemic in France, Italy, and Spain

Elementos metodológicos para el análisis comparativo de la primera ola de la epidemia de Covid-19 en Francia, Italia y España

Néstor Aldea-Ramos¹

Abstract

The three European countries included in the northwest littoral of the Mediterranean region – Italy, France and Spain – reported their first cases of the SARS-CoV-2 coronavirus early in 2020. The subsequent epidemic strongly impacted these countries, challenging the healthcare systems efficiency, and the capacity and transparency of their public statistics structures. Because public statistics were not fully adapted to such a new health situation, the available official data could not wholly describe the epidemic correctly. This paper developed an indicator derived from the prevalence of SARS-CoV-2 aiming to describe the time and spatial dynamics of the epidemic. Although the analysis was not applied to France due to the lack of data available, the comparative analysis among Spain and Italy highlighted some similarities and certain divergences, partially attributable to the features of each country's national demographic patterns and the peculiarities of applied health protocols. Finally, mortality during the first wave of the epidemic has been analysed for the three countries, demonstrating higher mortality index in Spain, although the reported number of SARS-CoV-2 declared deaths does not explain a portion of this mortality excess.

Keywords: Covid-19; epidemiology; demography; mortality; health.

Resumen

Los tres países europeos que conforman el litoral noroeste del Mediterráneo —Italia, Francia y España— notificaron sus primeros casos del nuevo coronavirus SARS-CoV-2 al comienzo del año 2020. La consiguiente epidemia impactó intensamente estos países, desafiando la eficiencia de sus sistemas de atención sanitaria, así como la capacidad y transparencia de sus estructuras de estadística pública. Dado que la estadística pública no estaba completamente adaptada a la nueva situación sanitaria, los datos oficiales disponibles no pudieron describir en su totalidad la epidemia de manera correcta. Esta contribución ha desarrollado un indicador derivado de la prevalencia del SARS-CoV-2 con el objetivo de analizar la dinámica espacio-temporal de la epidemia. Aunque el análisis no se ha aplicado en Francia debido a la falta de datos, el análisis comparativo entre España e Italia destaca ciertas similitudes y algunas diferencias, parcialmente atribuibles a las características demográficas propias de cada país, así como a los protocolos sanitarios puestos en marcha. Por último, la mortalidad durante la primera ola de la epidemia en los tres países ha sido analizada, mostrando una mayor tasa de mortalidad en España, si bien parte de ese exceso de mortalidad no se explica por el número de defunciones declaradas por causa de SARS-CoV-2.

Palabras clave: Covid-19; epidemiología; demografía; mortalidad; salud.

¹ Institute of Demography, University Paris 1 Panthéon-Sorbonne (Paris, France). Nestor.Aldea.Ramos@gmail.com

1. Introduction

The Covid-19 epidemic has entailed, since its outbreak, a public health concern and a major mortality event in France, Italy and Spain, the countries forming the north-west littoral of the Mediterranean. In those countries, the first detected cases of the disease took place early in 2020, as noted by Spiteri, *et al.* (2020) and Bernard Stoecklin, *et al.* (2020).

Since, their offices for public statistics have published different data concerning the epidemiological features of the epidemic, mainly the number of deaths and identified cases, as well as some data about the patients in hospitals and intensive care services. The amount and quality of available official public data increases with time and, for the first wave of the epidemic (until summer 2020), available data remains poor and inaccurate, making the analysis of the epidemic difficult.

In Italy, the data published by *Protezione Civile* since the beginning of the epidemic includes the daily number of new Covid-19 cases by region and province, as well as the number of deaths officially attributed to Covid-19 by region. In Spain, the *Carlos III* Health Institute publishes the number of new Covid-19 cases by province, and the Ministry of Health publishes the number of daily fatalities attributed to Covid-19 by region. In the case of France, the number of Covid-19 cases by department, published by *Santé Publique France*, is only available starting from May 13. In addition, the daily number of hospital deaths attributed to Covid-19 by department is published since the beginning of the epidemic. However, fatalities taking place in nursing homes are only published at a national level and bit by bit, by the Ministry of Health (see Appendix 1 for details on data sources).

Besides, a serological study named ENECOVID has been performed in Spain in an effort to establish the proportion of the population having Covid-19 antibodies. Though controversial in some aspects, as shown by Hoffmann & Wolf (2020), the results of the first wave of this study, published by Pollán, *et al.* (2020), suggest that the number of detected cases in the country during the first wave of the epidemic enormously underestimated the actual number of people infected by a factor around 10. Also concerning the first wave of the epidemic, a great underestimation of the number of infections has been estimated by Roques, Bonnefon, Baudrot, Soubeyrand & Berestycki (2020) for the case of France and measured by Stefanelli, *et al.* (2020) for a specific area in northeastern Italy.

This important underestimation can also apply to other countries during the first wave, and the relation between confirmed cases and actual infections is not well known, as it mostly depends on the screening strategies that have been put in place in each country. Therefore, the actual number of people infected by Covid-19 remains unknown and the confirmed cases data cannot be, in any case, a substitute of this magnitude.

Consequently, a classical description of the disease by its incidence, prevalence and lethality must be dismissed, and those indicators must only be used in restricted ways. In this context, the production of indicators that are able to describe the dynamics and mortality of the epidemic, while being little dependent on the accuracy of public data about Covid-19 cases and fatalities, is crucial.

Concerning the number of Covid-19 infections, the inaccuracy of public data makes it unable to describe properly the epidemic by itself, and the potential screening differences between countries for this period make any international comparison based on this data inaccurate. Moreover, the effect of the lockdown policies implemented during the spring 2020 in Italy, France and Spain cannot be apprehended by this row data, as the study of the spatial spreading of the virus needs a more complex indicator.

Proposed indicators for the description of the mortality during the epidemic are often strictly dependent on the accuracy of data in the allocation of the cause of death as Covid-19. If we could assume a certain accuracy in the assignation of Covid-19 as the death cause when it takes place in a hospital, this accuracy can be lower for deaths taking place elsewhere. In addition, the three countries under study have employed different methods when assigning deaths to Covid-19, depending on if the person has been tested for the coronavirus and how, as reported by The Health System Response Monitor (HRSM) (2020). In France, the WHO guidelines for the definition of Covid-19 deaths have been followed, considering any “clinically confirmed or probable Covid-19 case” and therefore “not dependent on the availability of a laboratory test” (HRSM, 2020). By contrast, Spain and Italy would only consider a Covid-19 death under a positive laboratory test (HRSM, 2020). Thus, a clear analysis of Covid-19 deaths will only be possible with individual mortality data including a cause, which is not yet available for this first wave of the epidemic.

This paper will then focus on the first wave of the epidemic in Italy, France and Spain, lasting until summer 2020. The first purpose, concerning the dynamics of the epidemic, is to define an indicator being able to describe properly the spatial and time evolution of the epidemic, being also suitable for comparing this evolution in different countries, which is a key to understanding the epidemic, as highlighted by Pearce, Lawlor & Brickley (2020). There is a limitation to this approach: the necessary regional data for the description of the dynamics of the epidemic is not available in France for the first wave, as *Santé Publique France* has only published regional data on cases starting from May 13, 2020. Consequently, this analysis, as it is detailed in 2.1, will be here limited to Italy and Spain.

Moreover, a clear description of the mortality during the epidemic is here intended using only all-cause non-individual mortality data by age in the three countries, collected and published by the Human Mortality Database (see Appendix 1 on data sources).

2. Methodology

The dynamics of the epidemic will be analyzed here for the first wave of the Covid-19 epidemic. Considering the three countries under study, this period starts in February 2020 and lasts until the summer. The choice of such a short period instead of the whole epidemic rely on the considerable evolution of testing policies and its efficiency: we can assume that the number of new Covid-19 cases gets closer and closer to the actual number of infections, and therefore the first and the second wave should be studied separately when using Covid-19 cases as data.

In a general and rough way, a disease spreading could be described with only four parameters:

1. its prevalence, as a ratio of the number of alive patients to the population exposed to risk;
2. its incidence, as a ratio of the new cases of the disease recorded during a certain period of time to the risk-exposed population;
3. its lethality, as a proportion of those who died in a specific cohort of patients;
4. the mean length of the disease, starting from the infection until death or convalescence.

In the case of an infectious, transmissible and non-fatally mortal disease providing immunity, two other parameters need to be taken into consideration: 1) the duration of immunity (and, subsequently, the period of virus mutation); and 2) the transmissibility of the infection from a sick individual to a healthy, vulnerable one.

However, given the type and accuracy of public data on the epidemic, some of those parameters are unknown or cannot be computed, as it will be discussed below, forcing us to an alternative description of the Covid-19 dynamics and mortality.

2.1. The dynamics of the epidemic

The state of propagation of a disease is often described by its incidence and prevalence. The incidence of a disease in a population x at a time t for a period τ is defined as the proportion between the number of new cases c of the disease during the period τ immediately prior to t and the size of the population.

$$I_x(t, \tau) = \frac{1}{P_x(t)} \cdot \int_{t-\tau}^t c_x(T) dT \quad (1)$$

Statistically, the number of new cases is given by day, so the continuous equation (1) becomes then discrete.

$$I_x(t, \tau) = \frac{1}{P_x(t)} \cdot \sum_{i=t-\tau}^t c_x(i) \quad (2)$$

This incidence can be written, alternatively, as the mean number of daily cases during the period τ multiplied by the period length:

$$I_x(t, \tau) = \frac{1}{P_x(t)} \cdot \tau \cdot \bar{c}(t - \tau, t) \quad (3)$$

As for prevalence, in its most used definition (*i.e.* point prevalence), it represents the proportion of a population suffering from the disease at a certain moment. However, this point prevalence is impossible

to measure or compute in the case of Covid-19, as the duration of the disease seems extremely variable and there is not available data about the recovery of all reported cases. A different meaning of prevalence must be thus adopted, in order to match with the current knowledge of the disease and the available data.

Two alternative definitions of prevalence exist: period prevalence (*i.e.* proportion of a population having suffered from the disease at any moment of a given period) and lifetime prevalence (that is, proportion of a population having suffered from the disease at any moment of their lives). Given the fact that our period of study starts at the very first Covid-19 case reported, and that there is no evidence of an individual having contracted the disease twice during the first wave, those two definitions become one and the same, and that is precisely what will be subsequently called prevalence. Hence, the prevalence of Covid-19 in a population x at a time t can be expressed – in terms of the sum of new daily cases – as:

$$Prev_x(t) = \frac{1}{P_x(t)} \sum_{i=0}^t c_x(i) \quad (4)$$

It is self-evident that equations (2) and (4) become the same when $\tau = t$, that is: the incidence of Covid-19 is equal to its prevalence when the former is set for a period beginning at the very first Covid-19 case reported in the population. Given the period on which this paper aims to focus (*i.e.* the first wave of the epidemic, until summer 2020), the irregularities and measure-induced fluctuations present in public data for that term could generate an immoderate, undesirable variability on incidence, if it is set for a short period. The cumulative character of prevalence makes it less likely to be affected by potential short-term variability in the time series of reported Covid-19 cases, and thus prevalence will be taken on as a more suitable indicator for this case.

However, as stated before, the different testing policies and strategies adopted for each population need to be taken into account when performing and using prevalence. This fact, alongside the evidence that a large part of Covid-19 infections has not been detected and reported as cases during the first wave, impose two constraints. Firstly, reported cases – and their corresponding incidence and prevalence – cannot fully describe the magnitude of the epidemic. In addition and consequently, prevalence itself cannot be the ground for any comparison between countries for this period.

The objective here is limited to the study of the spatial spread of the virus within a large population X (*e.g.* a country), here Italy, France and Spain. For that matter, prevalence data need to be available for k exhaustive, non-overlapping subpopulations (*e.g.* provinces, regions) such as $\{X_1 \dots X_k\} \subset X$. As the individuals within each subpopulation will not be distinguished, each subset or subpopulation X_i can be treated, in practice, as a sole element x_i with attributes P_{x_i} – its population size – and $Prev_{x_i}$ – its prevalence –, at any time. They can therefore be written as $\{x_1 \dots x_k\} \in X$.

With the purpose of avoiding leaning on the accuracy of the Covid-19 screening, the relative prevalence of a subpopulation x_i to the whole population X will be defined. The construction of this relative prevalence is based on the assumption that the accuracy of Covid-19 screening is comparable, to a large extent, in every subpopulation x_i . This means that, if, in the subpopulation x_i , only a certain proportion of infections is diagnosed and reported as cases, that proportion will be similar for the rest of the subpopulations $\{x_2 \dots x_k\}$.

In practice, this assumption will be made for subpopulations within the same country, as testing policies can be considered rather homogenous inside that country. Accordingly, in this case, the population X will be that one of a country (here Italy, Spain or France) and x_i its corresponding administrative subpopulations (provinces or regions for Italy and Spain and departments or regions for France).

Therefore, the relative prevalence of a subpopulation x_i within a population (country) X can be expressed as:

$$RPrev_{x_i}(t) = \frac{Prev_{x_i}(t)}{Prev_X(t)} \quad (5)$$

This relative prevalence is thus equal to one for the population X itself. At this point, an indicator describing the spatial distribution of the epidemic within the territory of a country – population X – can be constructed from this relative prevalence. The use of the relative prevalence, added to the testing policies homogeneity hypothesis, will make this indicator independent of the screening

accuracy and hence suitable for a comparison of the spatial dynamics over time of the epidemic in different populations (*i.e.* countries).

The aforementioned indicator will be defined, for a population X and at an instant t , as:

$$S_X(t) = + \sqrt{\frac{1}{P_X(t)} \sum_{x_i \in X} P_{x_i}(t) \cdot (RPrev_{x_i}(t) - 1)^2} \quad (6)$$

This S , that will be also referred to as “spreading indicator”, has the shape of a “weighted” standard deviation. Indeed, it expresses the standard deviation of each subpopulation’s relative prevalence, weighted by the size of that subpopulation. It can thus be deduced that $S \geq 0$ and that, the smaller its value, the closer the relative prevalence’s values of each subpopulation are. In the limit case, S could be equal to zero if every subpopulation has the same prevalence, that is, every relative prevalence is equal to one.

Yet, it is clear that this spreading indicator depends on how a territory is administratively divided and how its population is split within those divisions. Likely, the smaller the divisions, the higher S will be. Thus, S will be tested with two different levels of division – regions and provinces – in order to prove its validity beyond a specific segmentation of the territory or the population.

In practice, this method will only be applied for Italy and Spain, as the number of Covid-19 cases by region and department in France is only available starting from May 13, 2020 (SIDEPE data on laboratory tests).

2.2. Mortality during the epidemic

Mortality will be studied for a period of twelve weeks covering the higher mortality term of the first wave of the epidemic. Those weeks are 11 to 22 (from March 9 to May 31, 2020) for Spain and France, and weeks 10 to 21 (from March 2 to May 24, 2020) for Italy.

As the actual number of people infected by Covid-19 is unknown, the lethality of the disease (*i.e.* number of deaths caused by Covid-19 divided by the number of people infected during a certain period) cannot be estimated. Therefore, fatalities derived from Covid-19 must be imperatively expressed by crude or specific mortality rates.

The number of deaths officially attributed to Covid-19 for an age group A of a population X within a period $T = [t_0, t_1]$ can be expressed as a sum of daily deaths d , and thus its corresponding specific mortality rate can be put as:

$$MR_{T,A,X}^{C19} = \frac{D_{T,A,X}^{C19}}{P_{T,A,X}} = \frac{\sum_{i=t_0}^{t_1} d_{i,A,X}^{C19}}{P_{T,A,X}} \quad (7)$$

As for the whole of mortality (all causes), the excess mortality – and its corresponding rate – will be here employed as a way to measure the impact of the first wave of the epidemic on mortality. Excess mortality for a certain period is defined as the difference between the observed and the expected deaths for that period. Considering variations of death rates and population negligible for the last five years in the three countries under consideration, the number of expected deaths in an age group A within a population X for a period T in 2020 can be reckoned as the mean of the past five years for that same period, that is:

$$D_{T,A,X}^{exp} = \frac{1}{5} \sum_{i=2015}^{2019} D_{T(i),A,X}^{obs} \quad (8)$$

Then, the excess mortality rate for that age group A , population X and period T will be:

$$EMR_{T,A,X} = \frac{D_{T,A,X}^{obs} - D_{T,A,X}^{exp}}{P_{T,A,X}} \quad (9)$$

Furthermore, the difference between the number of excess deaths and the number of deaths officially attributed to Covid-19 can be expressed by what will be – from this point on – referred to as “balance mortality”. Its correspond rate for an age group A , population X and period T will be:

$$BMR_{T,A,X} = \frac{D_{T,A,X}^{obs} - D_{T,A,X}^{exp} - D_{T,A,X}^{C19}}{P_{T,A,X}} \quad (10)$$

However, the generalization to the whole population of the three mortality rates from equations (7), (9) and (10) (*i.e.* crude rates) could be misleading, as the three countries under consideration show moderate disparities in the age structure of their population. Given the great age gradient of general and Covid-19 mortality – as shown by Kaeuffer, *et al.* (2020), Giorgi Rossi, *et al.* (2020) and Working group for the surveillance and control of COVID-19 in Spain (2020) –, it is thus necessary to standardize mortality rates by age in order to avoid undesirable effects of different age structures.

Therefore, for a population X with m exhaustive, non-overlapping age groups $\{A_1 \dots A_m\}$ whose m corresponding proportions in a reference population Y are $\{q_1 \dots q_m\}$, any of the former mortality rates (MR^{C19} , EMR , BMR) can be standardized for the population X over the age structure of the population Y as follows:

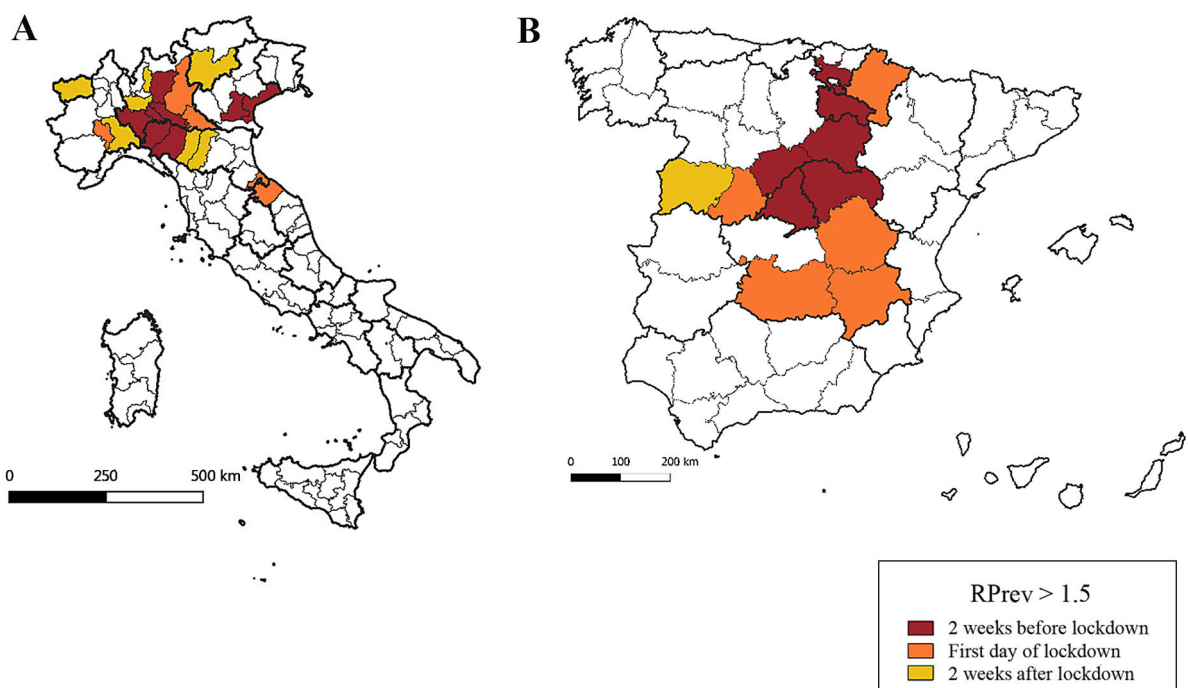
$$SMR_{T,X} = \sum_{j=1}^m MR_{T,A(j),X} * q_j \quad (11)$$

In practice, five age groups will be established for each population, in order to match the used data, from the Human Mortality Database (0-14, 15-64, 65-74, 75-84 and 85 or more years old). Furthermore, the structure by age of the population of Spain will be employed as the reference for the standardization.

3. Results

Eight out of 107 Italian provinces show a relative prevalence higher than 1.5 two weeks before the national lockdown [Figure 1A]. All of them are located in the North, and six of them close to the city of Milan. This number rises to twelve (combining for 11 % of the Italian population) on the first day of lockdown (March 9) and to seventeen provinces two weeks after the implementation of the lockdown (see Appendix 2 for details on prevalence by province). All those provinces are located in the northern part in the country and most of them are in the Lombardy and Emilia-Romagna regions.

Figure 1. Provinces with a relative prevalence higher than 1.5 in Italy (A) and Spain (B), two weeks before the lockdown, the first day of the lockdown and two weeks after the lockdown implementation



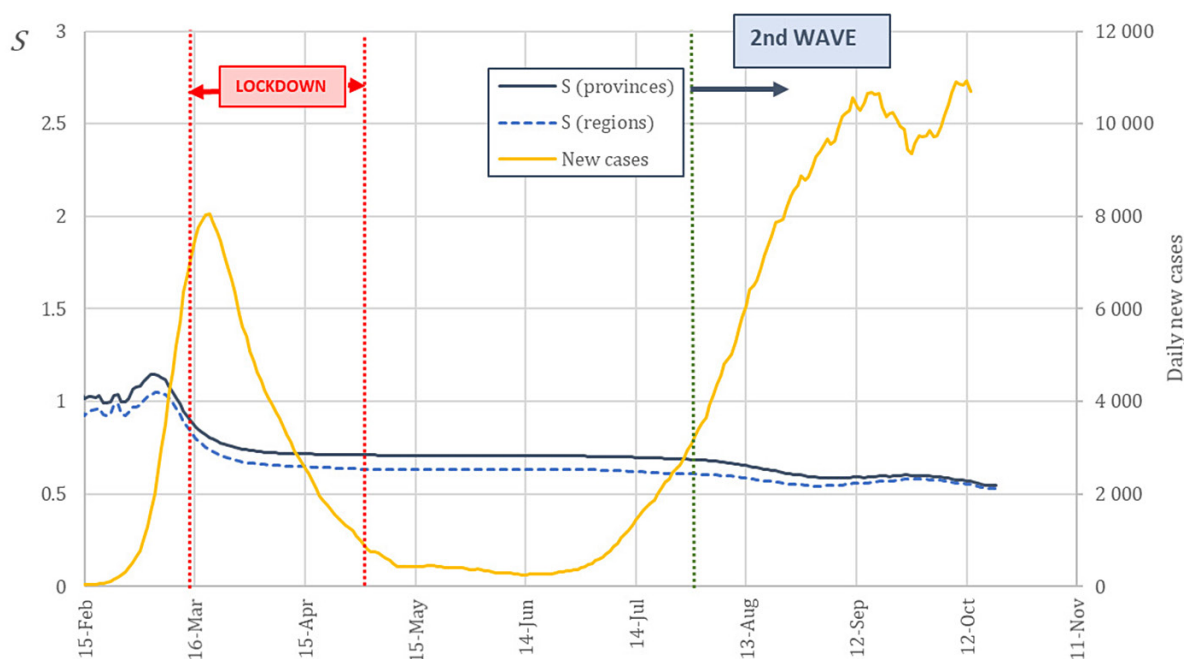
Own elaboration

In Spain, six out of fifty provinces show a relative prevalence above 1.5 two weeks before the national lockdown [Figure 1B]. Those are the provinces in the axis between the cities of Madrid and Vitoria. On the first day of lockdown (March 15), this number rises up to eleven provinces (combining for 21 % of the country population). Two weeks after the lockdown, one more province reaches a relative prevalence of 1.5. Thus, Spain shows a higher spatial spread of the virus than Italy in the weeks preceding and following the effective date of the lockdown.

The spreading indicator S describes properly the spatial evolution of the epidemic. In both Italy and Spain, the evolution of S follows the same pattern: the high values at the very beginning of the epidemic are followed by a stabilization of S due to lockdown policies. In summer, with the termination of those policies, S takes its decrease back as the second wave of the epidemic begins [Figures 2 and 3].

The success of lockdown policies in confining the epidemic within certain regions is shown by the stabilization of S following the implementation of those policies. This stabilization is well seen in both Spain ($S_{provinces} \in [0.704, 0.717]$ and $S_{regions} \in [0.631, 0.649]$ between April 15 and June 30) and Italy ($S_{provinces} \in [0.900, 0.933]$ and $S_{regions} \in [0.761, 0.807]$ between April 15 and July 31), where S even increases slightly from the beginning of May.

Figure 2. Evolution of the spreading indicator S (for regions and provinces) and the daily number of Covid-19 cases (15-day centred rolling average) in Spain between February and November 2020

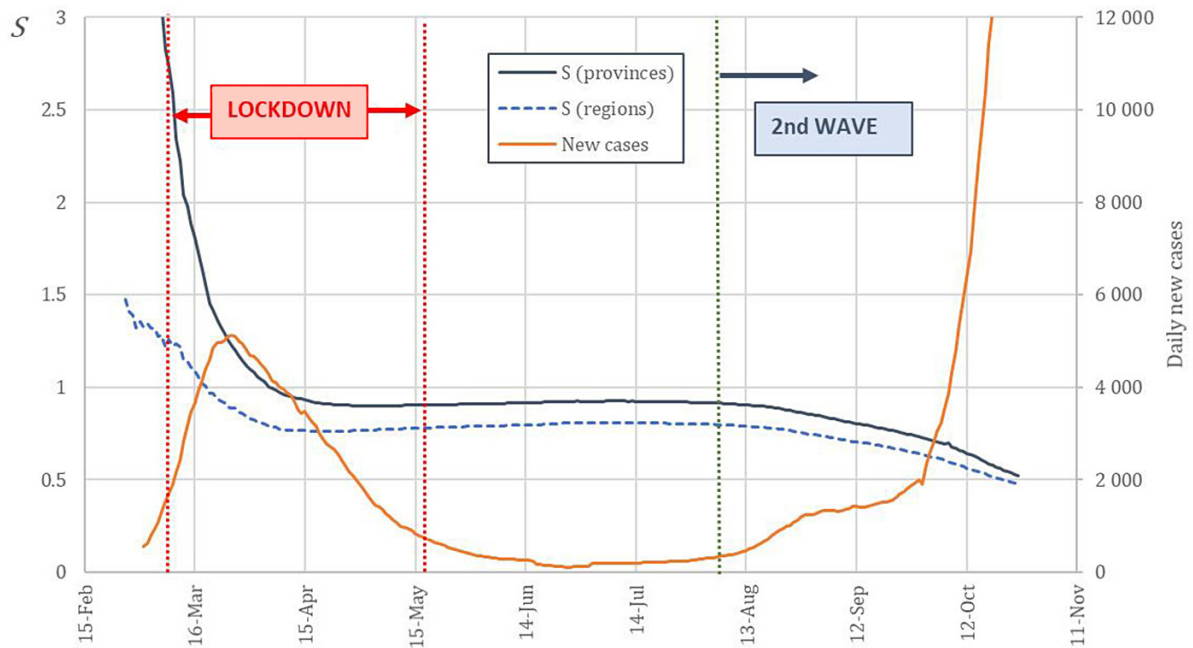


Source: Carlos III Health Institute. Own elaboration

As foreseen in the Methods section, S depends on the division of the territory and is higher for smaller divisions (*i.e.* provinces). Furthermore, this difference is higher in Italy, where twenty regions contain 101 provinces, than in Spain, where seventeen regions contain only fifty provinces plus two autonomous cities.

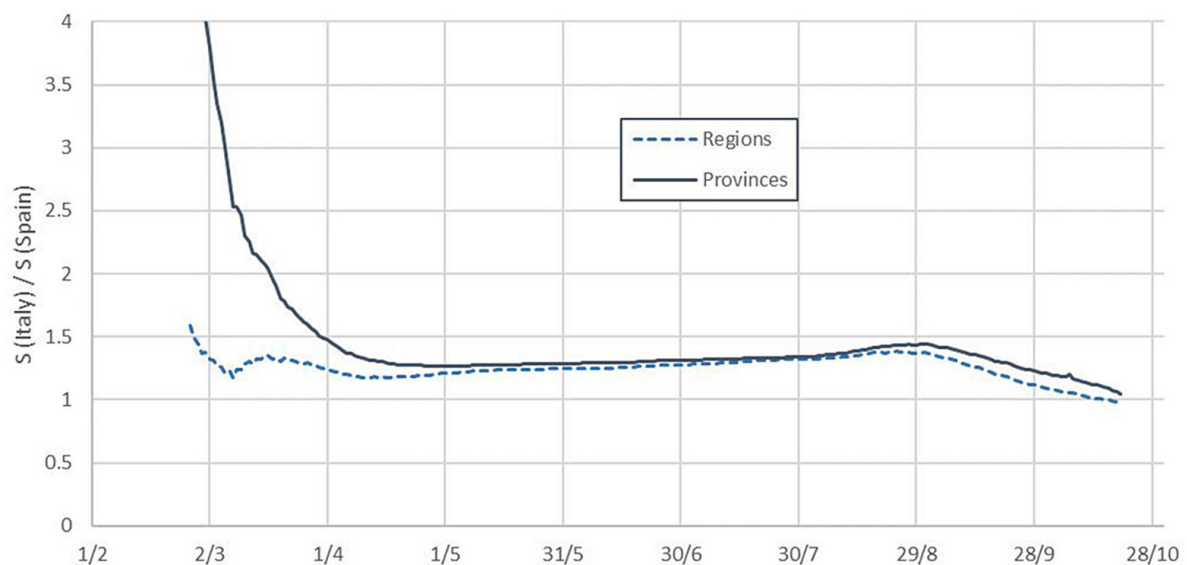
However, the dependence on the territorial division is limited, and S remains smaller in Spain for the whole period (as shown in Figure 1A and 1B), regardless of the territorial division under study [Figure 4]. This shows that, independently of the screening level in those two countries, the epidemic was geographically more spread in Spain than in Italy. Even if lockdown policies do stabilize S , the ratio of S between Italy and Spain increases slightly from April until the second wave, where the decay of S is greater in Italy, due to a more homogeneous distribution of the epidemic in the dawn of that second wave.

Figure 3. Evolution of the spreading indicator S (for regions and provinces) and the daily number of Covid-19 cases (15-day rolling average) in Italy between February and November 2020



Source: Dipartimento della Protezione Civile. Own elaboration

Figure 4. Ratio of the spreading indicator S in Italy to S in Spain. By region and by province



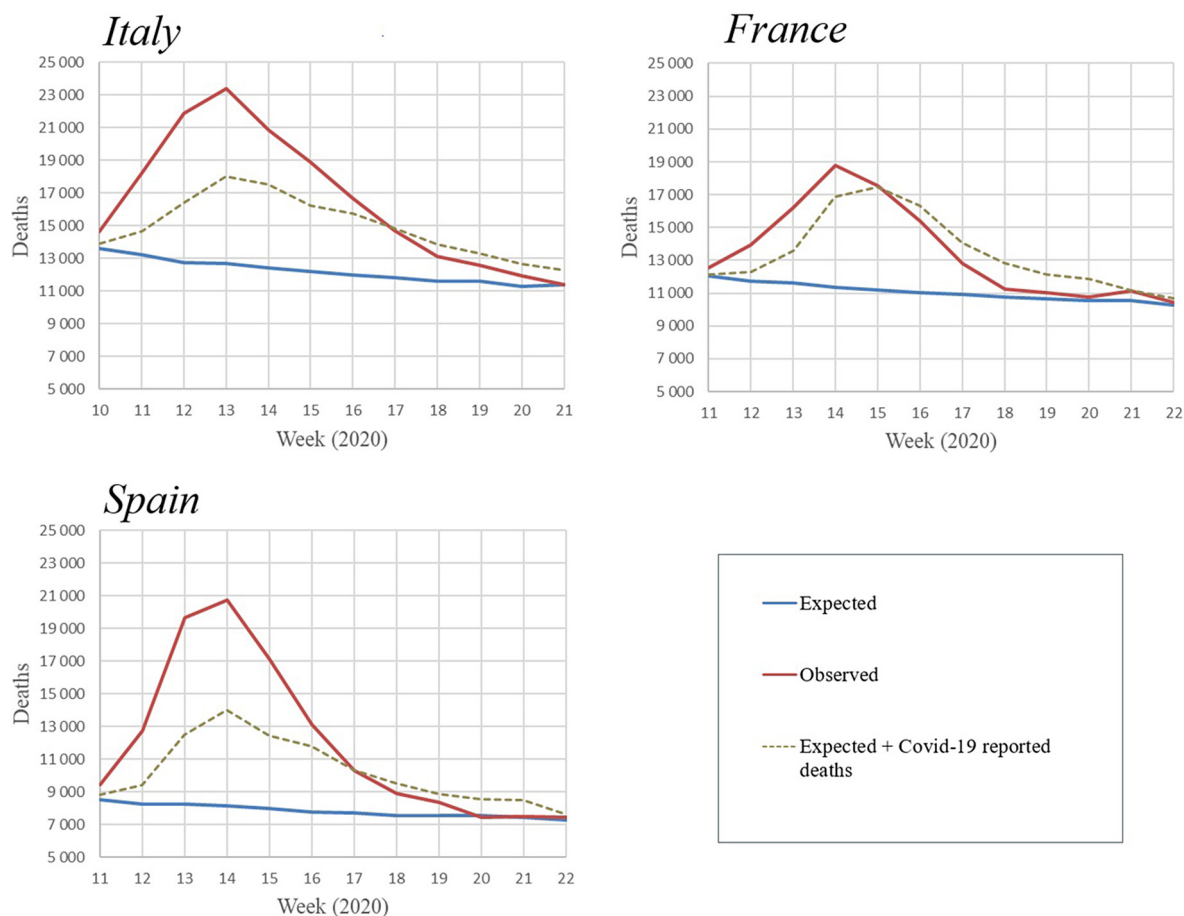
Own elaboration

3.1. Mortality during the epidemic

Limiting the analysis to the twelve weeks within the first wave (weeks 10 to 21 of 2020 for Italy and weeks 11 to 22 of 2020 for France and Spain), the three countries show a high excess mortality [Figure 5]. For this period, Italy presents 51,535 excess deaths (+35 % than expected), France shows 29,151 (+22 %) and Spain shows 48,850 (+52 %).

Besides, the addition of the number of official Covid-19 deaths to the number of expected deaths explains only partially the number of observed deaths. This difference, that have been called balance deaths, is high for Italy (18,785 deaths) and Spain (20,368 deaths), and almost inexistent in France (368 deaths).

Figure 5. Weekly expected deaths, observed deaths and sum of expected and reported Covid-19 deaths for Italy (weeks 10 to 21, 2020), France and Spain (weeks 11 to 22, 2020)



Sources: European Centre for Disease Prevention and Control, The Human Mortality Database. Own elaboration

This increase of the number of deaths in this period is extremely variable by age and, while all the three countries see the number of deaths decrease for people aged under 15, there are indicative increases for the rest of age categories [Table 1]. Excepting the youngest age category, it is Spain where the number of deaths increases the most for every other age category. For the population aged 85 and more, the increases are the vastest, and reach 68 % in Spain, 40 % in Italy and 30 % in France. In this last country, the increase is only indicative starting from 65 years old, while Italy and Spain do observe an increase of 15 % and 18 % respectively within the population aged between 15 and 64 years old.

Table 1. Relative increase (2020 vs. 2015-19) in total deaths by age group in Italy (weeks 10 to 21), France and Spain (weeks 11 to 22)

Age	0-14	15-64	65-74	75-84	85+	All ages
Italy	-15%	+15%	+35%	+35%	+40%	+35%
France	-13%	+3%	+26%	+18%	+30%	+22%
Spain	-34%	+18%	+46%	+47%	+68%	+52%

Own elaboration

The standardization over the structure by age of the population of Spain soothe the excess mortality rate and Covid-19 mortality rate for Italy [Table 2], by 13 and 14 %, respectively. This is due to Italy having an older population structure (23.2 % of the Italian population is 65 or older vs. 19.6 % in Spain). Therefore, the high crude death rates observed in Italy for the period are partly attributable to a great proportion of old inhabitants in its population.

In the case of France, the standardization soothe the crude mortality rates as well, but to a much lesser extent (2 % reduction for each one of the rates). Indeed, and in spite of slight differences, France's population structure by age is much closer to that one of Spain.

Table 2. Crude and standardized (on the reference of the population of Spain) excess mortality rate and Covid-19 mortality rate for Italy (weeks 10 to 21, 2020) and France (weeks 11 to 22, 2020)

	Italy		France	
	Crude	Standardized	Crude	Standardized
<i>EMR</i>	0.86 ‰	0.75 ‰	0.43 ‰	0.42 ‰
<i>MR^{C19}</i>	0.54 ‰	0.47 ‰	0.43 ‰	0.42 ‰

Own elaboration

Having avoided the differences in the structure by age of the population of those countries, the standardized excess mortality rate (*SEMR*) shows high differences between the three countries [Table 3]. While, for the twelve weeks under study, the *SEMR* is only 0.42 ‰ in France, it is as high as 1.03 ‰ in Spain (that is, 143 % higher). Italy shows a middle value with 0.75 ‰.

Concerning the deaths officially published as Covid-19 deaths, the differences between the three countries are much slighter: France shows the lowest value of the *SMR^{C19}* (0.42 ‰) while this rate is equal to 0.47 ‰ in Italy and 0.60 ‰ in Spain.

Moreover, the difference between those two rates (*SEMR* and *SMR^{C19}*) varies enormously within the three countries. In France, both rates are practically equal, and more than 99 % of the excess mortality would be attributable to those Covid-19 deaths.

However, Italy and Spain show huge gaps between the *SEMR* and the *SMR^{C19}*, and the part of the excess mortality potentially attributable to Covid-19 deaths is only of 62 % in Italy and 59 % in Spain. The standardized balance mortality rate is almost inexistent in France, while it is as high as 0.43 ‰ in Spain and 0.28 ‰ in Italy for the period.

Table 3. Standardized (on the reference of the population of Spain) excess mortality rate, Covid-19 mortality rate and balance mortality rate in Italy (weeks 10 to 21, 2020), France and Spain (weeks 11 to 22, 2020)

	Italy	France	Spain
<i>SEMR</i>	0.75 ‰	0.42 ‰	1.03 ‰
<i>SMR^{C19}</i>	0.47 ‰	0.42 ‰	0.60 ‰
<i>SBMR</i>	0.28 ‰	0.00 ‰	0.43 ‰

Own elaboration

4. Discussion

The spatial diffusion of the Covid-19 epidemic in Italy and Spain shows a spread departing from the cities of Milan and Madrid, respectively. Those two cities being the most important economic spots of their respective countries (which leads to a more intense flow of people), they are more likely to be affected by an epidemic in the first place, as shown by Balcan, *et al.* (2009). In the case of Italy, the epidemic disseminates from the Milan area mostly to neighbor provinces while, in Spain, a notable part of the territory shows an important presence of the coronavirus at the beginning of the lockdown. This diffusion matches with the mobility patterns described by Iacus, *et al.* (2020).

This spatial diffusion is well described by our spreading parameter *S* that summarizes the time dynamics of the epidemic. This parameter shows how a rapid initial spread of the coronavirus in Italy and Spain is followed by a stability period further to the implementation of lockdown policies suppressing human mobility. The end of those policies before summer 2020 leads then to the spatial diffusion of the virus and, following the start of the second wave of the epidemic in autumn 2020, the parameter *S* shows a much more homogenous allocation of infections within the aforementioned countries.

Moreover, the S parameter shows little dependency on the administrative regions employed. In addition, it is suitable for international comparisons, as it does not depend on the accuracy of the screening in each country, only supposing a similar level of screening for each region within a same country. However, the age structure of each region could have a slight effect on the level of screening, as infections in older people were more easily detected during the first wave, as we can infer from Working group for the surveillance and control of COVID-19 in Spain (2020).

The lack of regional data on Covid-19 cases in France during the first wave of the epidemic entails, however, a limitation to this study, as the dynamics of the epidemic in France could not be described at all.

4.1. Mortality during the epidemic

The analysis of the first wave of the epidemic reveals a consistent increase of mortality in the three countries. This increase is higher for older groups of the population. The population aged under 15 experiences, however, a lower mortality, that could be linked to lockdown policies reducing the number of accidental deaths.

In Italy, excess deaths have been estimated to more than 51,000 for the period running from week 10 until week 21 of 2020. Scortichini, *et al.* (2021) have estimated between 43,984 and 50,362 (95 % eCI) excess deaths for the period between February 15 and May 15. If our method was applied to that period, we would obtain 50,163 excess deaths, thus approaching the Scortichini *et al.* (2021) estimate. Besides, Magnani, Azzolina, Gallo, Ferrante & Gregori (2020) estimate 45,033 excess deaths between March 1 and April 15, while our method applied to that period would give 49,129 excess deaths. Moreover, Kontis, *et al.* (2020) make an estimation of 48,700 excess deaths between mid-February and the end of May, very close to the 50,073 we would obtain with our method.

In France, Fouillet, Pontais & Caserio-Schönemann (2020) estimate the number of excess deaths to more than 25,000 for the months of March to May 2020. This amount is lower than our estimate by 4,000 deaths, but our period of study excludes the first week of March, where excess deaths are -490 according to our method. For that same period, Santé Publique France (2020) estimates between 25,000 and 30,000 excess deaths. In addition, Kontis, *et al.* (2020) estimate 23,700 excess deaths from mid-February to the end of May, some less than the 26,500 that our method estimates for the same period.

In Spain, the *Instituto de Salud Carlos III* (ISCIII) (2020) estimates 44,118 excess deaths between March 13 and May 22, 2020. Our estimate being 48,850 for weeks 11 to 22, it drops to 48,152 when applied to the period studied by ISCIII (2020). In addition, Kontis, *et al.* (2020) estimates 45,800 excess deaths from mid-February to the end of May, very close to the 46,349 obtained by applying our method to that period.

Our excess deaths estimates are thus close to other publications but produce a slight overestimation. This could be due to the very simple employed method (that do not take into account the evolution of the population or its structure), but also, it could be partially attributable to the fact that this publication is submitted six to nine months after Magnani, *et al.* (2020), Fouillet, *et al.* (2020), Santé publique France (SPF) (2020) and ISCIII (2020), thus employing mortality data that are much more complete for spring 2020.

In the absence of information about the medical cause of death, the proportion of those excess deaths attributable to Covid-19 remains unknown. The computed Covid-19 mortality rate and its complement, the balance mortality rate, are ruled by how deaths have been assigned to Covid-19. The balance mortality itself could be partly due directly to undetected Covid-19, but it could also be partially attributable to other pathologies, as mortality and its causes have been also indirectly disturbed by the epidemic and lockdown policies. This balance mortality is very considerable in Spain, quite important in Italy and almost inexistent in France, as Beaney, *et al.* (2020) – who wrongly refers to as “non Covid-19 excess mortality” – has also shown.

Moreover, the magnitude of this balance mortality could have been influenced by healthcare capacity: in countries with a very limited number of hospital beds, the hospital admission of patients presenting Covid-19 symptoms or other pathologies could have been reduced, and certain specific treatments could have been rescheduled, eventually leading to an increase in mortality. Showing a high balance mortality, Italy and Spain had, respectively, 314 and 297 hospital beds available per 100,000 inhabitants in 2018 (Eurostat, 2020), while France had 591 and presents almost no balance mortality. In addition, the definition

of a Covid-19 death employed by Italy and Spain (HSRM, 2020) could have led to an underestimation of Covid-19 deaths and therefore to an increase of the computed balance mortality, while the following of WHO guidelines by France (HSRM, 2020) could have reduced this balance mortality.

5. Conclusions

In this paper, firstly, an alternative analysis of the dynamics of the Covid-19 epidemic has been proposed considering the inaccuracy of public data on the cases of the disease. This analysis in terms of spatial spreading and the introduction of the parameter S allow us to describe accurately the spatial dynamics of the epidemic in Italy and Spain without relying on the precision in the screening of the disease. This analysis shows how the epidemic was, as the time of the implementation of lockdown policies, much more widespread within the Spanish territory than within the Italian territory. Moreover, the parameter S allows us to track the efficiency of lockdown policies in terms of stopping the spatial diffusion of the coronavirus, as well as the much more homogeneous distribution of the virus at the beginning of the second wave.

Concerning mortality during the epidemic and dealing with all-cause non-individual mortality data, excess mortality has been computed and considered as an indicator of the effect of the epidemic on mortality. This excess mortality has been then split into Covid-19 mortality (according to the official attribution) and balance mortality. All three mortality rates have been standardized by age, allowing us to better compare different countries removing potential effects of the age structure of the population of those countries. Excess mortality has been then shown to be extremely high in Italy, France and Spain during the first wave of the epidemic. Spain presents, by far, the highest age-standardized excess mortality rate of the three countries, being more than twice that one of France. These differences in excess mortality among the three countries have been shown to be much more accentuated than the differences in Covid-19 mortality (as officially attributed). The computed balance mortality is extremely important in Italy and, especially, in Spain, while it is non-existent in France, being possibly related to healthcare capacities in those three countries. The origin of this balance mortality could only be determined by employing individual mortality data including medical cause.

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Appendix 1: data sources

This appendix presents a list of the data sources that have been employed in this study, including details on time and geographical availability, as well as sources and links.

Table A1. Data sources on Covid-19 cases

Country	Source - Institution	Details of the dataset	Link
Italy	<i>Andamento Nazionale Covid-19. Presidenza del Consiglio dei Ministri - Dipartimento di Protezione Civile</i>	Daily update on cumulated Covid-19 cases by province. Available from February 24, 2020.	https://github.com/pcm-dpc/COVID-19/tree/master/dati-province
Spain	<i>Centro Nacional de Epidemiología – Instituto de Salud Carlos III</i>	Daily number of Covid-19 cases by province. Available from January 31, 2020.	https://cnecovid.isciii.es/covid19/resources/casos_tecnica_provincia.csv
France*	<i>SI-DEP Data. Santé Publique France</i>	Daily number of Covid-19 cases by province and age class. Only available from May 13, 2020.	https://www.data.gouv.fr/en/datasets/taux-dincidence-de-lepidemie-de-covid-19/

* This dataset is not employed for this study

Own elaboration

Table A2. Data sources on Covid-19 deaths

Country	Source - Institution	Details of the dataset	Link
Italy	<i>Andamento Nazionale Covid-19. Presidenza del Consiglio dei Ministri - Dipartimento di Protezione Civile</i>	Daily update on cumulated Covid-19 fatalities by region. Available from February 24, 2020.	https://github.com/pcm-dpc/COVID-19/tree/master/dati-regioni
Spain	<i>Situación actual. Ministerio de Sanidad, Consumo y Bienestar Social</i>	Daily update on number of cumulated Covid-19 fatalities in the country. Available from January 2020.	https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm
France	<i>Santé Publique France</i>	Daily update on cumulated number of Covid-19 fatalities in hospitals. Available from March 2, 2020.	https://www.data.gouv.fr/en/datasets/donnees-relatives-a-lepidemie-de-covid-19-en-france-vue-densemble/
	<i>Ministère des Solidarités et de la Santé</i>	Periodic update on cumulated number of Covid-19 fatalities in nursing homes.	

Own elaboration

Table A3. Data sources on all-cause deaths

Country	Source - Institution	Details of the dataset	Link
All	The Human Mortality Database – Department of Demography (University of California, Berkeley), Max Planck Institute for Demographic Research	Weekly number of all-cause deaths by age class (2015-2020) in Italy (retrieved from Istat), France (retrieved from Insee) and Spain (retrieved from INE).	https://www.mortality.org/Public/STMF_DOC/STMFmetadata.pdf

Own elaboration

Table A4. Data sources on population

Country	Source - Institution	Details of the dataset	Link
Italy	<i>Istituto Nazionale di Statistica (Istat)</i>	Total population and population by province and region, by age (1 st January 2020).	http://dati.istat.it/Index.aspx?QueryId=18460&lang=en#
Spain	<i>Instituto Nacional de Estadística (INE)</i>	Population by province and age (1 st January 2020).	https://www.ine.es/jaxi/Tabla.htm?path=/t20/e245/p08/l0/&file=03002.px&l=0
France	<i>Institut National de Statistique et d'Etudes Economiques (Insee)</i>	Population by age (1 st January 2020).	https://www.insee.fr/fr/statistiques/1892088?sommaire=1912926

Own elaboration

Appendix 2: relative prevalence

This appendix presents the data of the relative prevalence by province in Italy and Spain two weeks before lockdown, the first day of lockdown and two weeks after the implementation of the lockdown.

Table A5. Value of R_{Prev} in all of Italy's provinces on February 24, March 9 and March 23, 2020 (bold when $R_{Prev} > 1.5$)

Province	February 24, 2020 (two weeks before lockdown)	March 9, 2020 (first day of lockdown)	March 23, 2020 (two weeks after lockdown)
Torino	0.3	0.3	0.9
Vercelli	0.0	0.5	1.5
Novara	0.0	0.3	1.1
Cuneo	0.0	0.1	0.6
Asti	0.0	1.9	1.0
Alessandria	0.0	1.1	1.9
Valle d'Aosta	0.0	0.9	3.0
Imperia	0.0	0.4	0.7
Savona	0.7	0.9	0.7
Genova	0.0	0.3	0.8
La Spezia	0.0	0.5	0.5
Varese	0.0	0.4	0.5
Como	0.0	0.5	0.9
Sondrio	1.1	0.3	1.1
Milano	0.5	1.1	1.6
Bergamo	3.1	7.9	5.6
Brescia	0.0	4.1	4.5
Pavia	9.5	3.9	2.6
Cremona	28.6	18.2	7.9
Mantova	0.0	1.8	2.3
Bolzano/Bozen	0.4	0.1	1.3
Trento	0.0	0.4	1.8
Verona	0.0	0.6	1.1
Vicenza	0.0	0.4	0.8
Belluno	0.0	1.0	1.2
Treviso	0.2	1.1	1.1
Venezia	1.6	1.1	0.9
Padova	6.2	2.1	1.4
Rovigo	0.0	0.2	0.3
Udine	0.0	0.3	0.7
Gorizia	0.0	0.3	0.4
Trieste	0.0	0.8	1.3
Piacenza	12.1	14.9	6.4
Parma	1.7	4.4	2.9
Reggio nell'Emilia	0.0	1.4	2.5
Modena	0.8	1.2	1.6
Bologna	0.0	0.6	0.8
Ferrara	0.0	0.1	0.5

Ravenna	0.0	0.3	0.9
Forlì-Cesena	0.0	0.3	0.9
Pesaro e Urbino	0.0	4.9	3.6
Ancona	0.0	1.0	1.5
Macerata	0.0	0.2	1.0
Ascoli Piceno	0.0	0.0	0.3
Massa-Carrara	0.0	1.0	1.4
Lucca	0.0	0.6	0.9
Pistoia	0.7	0.4	0.8
Firenze	0.2	0.4	0.5
Livorno	0.0	0.2	0.4
Pisa	0.0	0.3	0.6
Arezzo	0.0	0.3	0.6
Siena	0.0	0.8	0.6
Grosseto	0.0	0.2	0.6
Perugia	0.0	0.1	0.6
Terni	0.0	0.5	0.6
Viterbo	0.0	0.0	0.3
Rieti	0.0	0.0	0.2
Roma	0.1	0.1	0.3
Latina	0.0	0.1	0.3
Frosinone	0.0	0.0	0.2
Caserta	0.0	0.2	0.1
Benevento	0.0	0.1	0.0
Napoli	0.0	0.1	0.2
Avellino	0.0	0.1	0.3
Salerno	0.0	0.1	0.2
L'Aquila	0.0	0.1	0.1
Teramo	0.0	0.1	0.4
Pescara	0.0	0.3	1.1
Chieti	0.0	0.1	0.3
Campobasso	0.0	0.5	0.2
Foggia	0.0	0.3	0.4
Bari	0.0	0.0	0.2
Taranto	0.0	0.0	0.1
Brindisi	0.0	0.1	0.3
Lecce	0.0	0.1	0.2
Potenza	0.0	0.0	0.2
Matera	0.0	0.1	0.1
Cosenza	0.0	0.0	0.1
Catanzaro	0.0	0.1	0.1
Reggio Calabria	0.0	0.0	0.2
Trapani	0.0	0.0	0.1
Palermo	0.5	0.0	0.1

Messina	0.0	0.0	0.2
Agrigento	0.0	0.0	0.1
Caltanissetta	0.0	0.0	0.1
Enna	0.0	0.0	0.3
Catania	0.0	0.1	0.2
Ragusa	0.0	0.0	0.0
Siracusa	0.0	0.0	0.1
Sassari	0.0	0.0	0.5
Nuoro	0.0	0.1	0.1
Cagliari	0.0	0.2	0.1
Pordenone	0.0	0.0	0.5
Isernia	0.0	0.0	0.0
Oristano	0.0	0.0	0.0
Biella	0.0	0.7	1.4
Lecco	0.0	1.4	2.7
Lodi	104.7	28.7	7.7
Rimini	0.6	3.4	3.0
Prato	0.0	0.1	0.5
Crotone	0.0	0.0	0.4
Vibo Valentia	0.0	0.1	0.1
Verbano-Cusio-Ossola	0.0	0.5	1.2
Monza e della Brianza	0.7	0.5	1.2
Fermo	0.0	0.2	0.7
Barletta-Andria-Trani	0.0	0.1	0.1
Sud Sardegna	0.0	0.0	0.0

Own elaboration

Table A6. Value of R_{Prev} in all of Spain's provinces on March 1, March 15 and March 29, 2020 (bold when $R_{Prev} > 1.5$).

Province	March 1, 2020 (two weeks before lockdown)	March 15, 2020 (first day of lockdown)	March 29, 2020 (two weeks after lockdown)
Alicante	0.8	0.6	0.5
Albacete	0.9	1.8	2.0
Almería	0.0	0.1	0.2
Ávila	1.3	1.5	2.2
Barcelona	1.0	1.2	1.3
Badajoz	0.3	0.2	0.3
Vizcaya	0.9	0.9	1.2
Burgos	1.4	1.1	1.1
La Coruña	0.2	0.5	0.6
Cádiz	0.1	0.2	0.2
Cáceres	1.2	1.0	1.3
Ceuta	0.4	0.2	0.4
Córdoba	0.1	0.3	0.4
Ciudad Real	1.3	2.7	3.0

Castellón	0.4	0.5	0.5
Cuenca	0.5	1.7	1.9
Las Palmas	0.1	0.2	0.2
Gerona	0.6	0.7	0.8
Granada	0.2	0.4	0.6
Guadalajara	1.6	1.5	1.4
Huelva	0.1	0.1	0.2
Huesca	0.6	0.3	0.6
Jaén	0.3	0.4	0.5
Lérida	0.3	0.5	0.8
León	0.7	0.6	1.1
Logroño	3.7	2.6	2.6
Lugo	0.3	0.4	0.5
Madrid	3.2	2.8	2.2
Málaga	0.7	0.5	0.4
Melilla	0.0	0.4	0.3
Murcia	0.3	0.4	0.4
Navarra	1.2	1.9	2.0
Asturias	0.1	0.4	0.4
Orense	0.8	0.8	1.0
Palencia	0.8	0.5	1.1
Baleares	0.3	0.3	0.4
Pontevedra	0.1	0.4	0.6
Cantabria	0.3	0.4	0.7
Salamanca	0.3	1.3	2.1
Sevilla	0.3	0.2	0.3
Segovia	1.5	2.7	3.8
Soria	1.8	3.2	3.9
Guipúzcoa	0.1	0.5	0.6
Tarragona	0.2	0.3	0.4
Teruel	0.4	0.5	0.8
Santa Cruz de Tenerife	0.6	0.4	0.3
Toledo	0.8	1.1	1.3
Valencia	0.7	0.6	0.5
Valladolid	0.6	0.8	1.2
Álava	5.7	3.1	2.4
Zaragoza	0.5	0.5	0.8
Zamora	0.3	0.6	0.8

Own elaboration

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Fertility of nationals and foreigners in Spain, Italy, and Greece during and after the economic recession and refugee crisis

Fecundidad de nacionales y extranjeros en España, Italia y Grecia durante y después de la recesión económica y la crisis de los refugiados

Byron Kotzamanis¹ 

Abstract

This article provides an overview of trends in fertility of foreign and national women in Greece, Spain, and Italy during the last decade and before the Covid pandemic. It focuses on the fertility of foreigners and compares this with that of ‘nationals’. The main analysis focuses on a period marked, firstly, by the economic recession and stagnation, and then by the recent wave of the ‘refugee crisis’. Foreigner fertility in the three south Mediterranean countries differs significantly from that of nationals, with the former having higher fertility rates and lower mean age at childbearing. However, although foreigners make a large contribution to births, their impact on period fertility (total fertility rate or TFR) is limited. At the same time, although the fertility of both groups decreased during the first years of the recession, foreigner TFRs fell faster in both absolute and relative terms in Italy and Greece. However, after 2014, the foreigner period fertility among the three countries differs as a relative stabilisation is observed in Spain and Italy, while indicators rise in Greece. This divergence is due to the various composition changes in the settled after-2014 foreigners in the three countries and the strong recovery of foreigner births in Greece (as fertility in Greece was much more affected by the recession).

Keywords: Spain; Italy; Greece; foreigners; nationals; period fertility; economic crisis; refugee crisis.

Resumen

Este artículo ofrece una visión general de las tendencias de la fecundidad de las mujeres extranjeras y nacionales en Grecia, España e Italia durante la última década y antes de la pandemia del Covid. Se centra especialmente en la fecundidad de las extranjeras y la compara con la de las “nacionales”. El análisis principal se centra en un periodo marcado, primero, por la recesión y el estancamiento económico, y luego, por la reciente ola de la “crisis de refugiados”. La fecundidad de los extranjeros en los tres países del sur del Mediterráneo difiere significativamente de la de los nacionales, ya que los primeros tienen tasas de fecundidad más altas y una edad media de maternidad más baja. Sin embargo, aunque los extranjeros contribuyen en gran medida a los nacimientos, su impacto en la fecundidad periódica (TFR) es limitado. Al mismo tiempo, aunque la fecundidad de ambos grupos disminuyó durante los primeros años de la recesión, la TFR de los extranjeros cayó más rápidamente en términos absolutos y relativos en Italia y Grecia. Sin embargo, a partir de 2014, la fecundidad del periodo de los extranjeros difiere entre los tres países, ya que en España e Italia se observa una estabilización relativa, mientras que los indicadores aumentan en Grecia. Esta divergencia se debe a los diferentes cambios de composición de los extranjeros asentados después de 2014 en los tres países estudiados y a la fuerte recuperación de los nacimientos de extranjeros en Grecia, ya que su fecundidad se vio mucho más afectada por la recesión.

Palabras clave: España; Italia; Grecia; extranjeros; nacionales; fecundidad periódica; crisis económica; crisis de refugiados.

1 Laboratory of Demographic and Social Analyses (Lads), University of Thessaly, Greece. bkotz@uth.gr

1. Introduction

European post-war populations are characterized by an increasing share of immigrants and their descendants, and the recent “refugee crisis” has significantly affected migration streams and foreign settlers’ profile in some European countries (Arslan et al., 2014 & 2016; King & Okólski, 2019; OECD, 2019). Especially, Spain, Italy and Greece, traditionally emigration countries before 1980, received thousands of economic immigrants during 1990 and 2010 (Arango, 2000; Cornelius, 2004; Bonifazi, 2013; Bonifazi & Strozza, 2017; Strozza, & De Santis, 2017; Kotzamanis & Karkanis, 2018; Colombo & Dalla Zuanna, 2019), a verified fact by the last censuses as well as by the population estimations of their Statistical Authorities (Table 1).

Table 1. Spain, Italy, Greece, total population, nationals & foreigners (1991-2019)

	Total (million)	Nationals (million)	Foreigners (million)	Nationals, %	Foreigners, %
SPAIN					
1991*	38,872	38,519	0,353	99.1	0.9
2001*	40,847	39,275	1,572	96.2	3.8
2009**	46,746	41,097	5,649	87.9	12.1
2011*	46,816	41,564	5,252	88.8	11.2
2015**	46,624	4,1895	4,729	89.9	10.1
2019**	47,026	41,989	50,37	89.3	10.7
ITALY					
1991*	56,778	56,422	0,356	99.4	0.6
2001*	56,996	55,661	1,334	97.7	2.3
2009**	59,000	55,598	3,402	94.2	5.8
2011*	59,434	55,406	4,027	93.2	6.8
2015**	60,796	55,782	5,014	91.8	8.2
2019**	60,360	55,105	5,255	91.3	8.7
GREECE					
1991*	10,260	10,093	0,166	98.4	1.6
2001*	10,934	10,172	0,762	93.0	7.0
2009**	11,094	10,167	0,927	91.6	8.4
2011*	10,816	9,904	0,912	91.6	8.4
2015**	10,858	10,036	0,822	92.4	7.6
2019**	10,725	9,893	0,832	92.2	7.8

* Population and housing censuses data, usual residents

** Estimated population at 1.1. Year

Source: ELSTAT (2020a & b), INE (2020), ISTAT (2020), EUROSTAT (2020). Own elaboration

The official statistics in all European countries have been collecting more and more information concerning immigrants and their descendants, and immigrant fertility has emerged as an important research topic during the last two decades, especially in countries having long migration tradition (Sobotka, 2008; Kulu & González-Ferrer, 2014; Adserà & Ferrer, 2015; Kulu et al., 2015; Kulu, Milewski, Hannemann, & Mikolai, 2019). A part of the literature is focused on period fertility migrants’ indicators and their impact on overall TFR², and another part on the quantum of fertility, using summary measures. Yet, during the last two decades the largest part of research has been focusing on fertility behavior at individual level, applying a life-course perspective to family formation and subsequent immigrant births³.

While most of the studies focus on Western and Northern European countries, recently, some of them integrate – or focus exclusively – on the analysis of migrant fertility models in Southern European coun-

2 The majority of these works underlines both the heterogeneity in the fertility of various migrant groups and the tendency for a gradual convergence of migrant period indicators with nationals/natives. Especially, with some exceptions (women from Turkey, Maghreb, and African countries), in a considerable number of studies, the fertility of migrant and their daughters do not deviate much from that of the native population as they gradually adjust their reproductive behaviour and adopt the fertility norms and practices of the host countries.

3 Most of them aim to test one or several hypotheses on migrant fertility (assimilation, adaption, selectivity, disruption).

tries, becoming host countries after 1990. Thus, some comparative studies have been examining migrant fertility over the last years (Sobotka, 2008 & 2017; Kulu & González-Ferrer, 2014; Kulu, et al., 2015 & 2019; Bagavos, 2019; Mussino & Cantali, 2020).

At the same time, recognizing the potentially rejuvenating effect of increased migration flows combined with higher migrant fertility in countries with extremely low fertility rates as Spain and Italy, scholars have started to investigate the fertility and childbearing behaviour of migrant women⁴. In Italy, the first studies appeared at the end of the '90s – the beginning of 2000 (Natale & Strozza, 1997; Guerrizio, Sonnino & Strozza, 2003) and attention has been paid more and more to the impact of migrant fertility on the structure and population dynamics, with emphasis on the TFR (Strozza, Labadia & Ferrara, 2007; De Bartolo & Stranges, 2008; Mussino, Iaccarino, Prati & Strozza, 2009; Mussino, Gabrielli, Paterno, Strozza & Terzera, 2012; Ortensi, 2012; Mussino & Van Raalte, 2013; Giannantoni & Strozza, 2015).

More recent works (Mussino & Strozza, 2012a & b; Ortensi, 2015; Mussino, Gabrielli, Paterno, Strozza & Terzera, 2015; Giannantoni, Mussino, Gabrielli & Strozza, 2016; Giannantoni, Ortensi, Strozza & Gabrielli, 2019; Vitali & Billari, 2017; Mussino, Gabrielli, Ortensi & Strozza, 2020; Impicciatore, Gabrielli & Paterno, 2020) rely on new data and approaches (the post-migration fertility analysis, migration patterns, migrant fertility from a spatial perspective, etc.).

In Spain, a country receiving migrants from Latin America par excellence, having at the same time a more open policy of family reunification and acquisition of nationality especially, foreigners from Latin American countries (González-Ferrer & Trilla, 2011; Domingo & Ortega-Rivera, 2015), the first studies, as in Italy, focus on the impact of immigration on the structure and population dynamics using basic fertility indices (Delgado & Zamora López, 2003 & 2006; Devolder, 2006; Escribano, 2006; Devolder & Treviño, 2007). Nevertheless, subsequently, Spanish demographers' work has focused more and more on the differences in fertility between nationals/natives and foreigners/non-natives at national and regional levels, using censuses, registers, and survey data (Roig Vila & Castro-Martín, 2007a & b; Hierro-Hernández & Torre-Fernández, 2010; Castro-Martín & Rosero-Bixby, 2011; Devolder & Bueno, 2011; Del Rey & Parrado, 2012; Bueno & Devolder, 2012; Del Rey & Grande, 2015; González-Ferrer, Castro-Martín & Kraus, 2015; González-Ferrer, Castro-Martín, Kraus & Eremenko, 2017; Kraus & Castro-Martín, 2017). Nationality or country of birth, duration of stay and age at the time of arrival, socio-demographic characteristics, and birth parity are increasingly considered to detect patterns consistent with both the adaptation, selectivity, socialization, and the disruption hypothesis. In these works, we observe a much slower assimilation of the Maghreb and African origin immigrants into the mainstream fertility behaviour (as in Italy), whereas the convergence is observed for the 1.5 generation of Latin American immigrants.

Unlike Spain and Italy, in Greece, foreign/immigrant fertility has relatively been poorly researched, and few articles have investigated this issue (Kotzamanis & Sofianopoulou, 2008; Bagavos, Tsimos & Verropoulou, 2008; Tsimbos, 2008; Sofianopoulou & Siapati, 2009; Bagavos, Verropoulou & Tsimbos, 2018; Kotzamanis & Karkanis, 2019) focusing mainly on period fertility migrant indicators and their impact on overall TFR. At the same time, it must be noted that, to date, comparative studies that have focused particularly on the fertility trends of nationals and foreigners in the south European countries or on the impacts of the recent recession and the "refugee crisis" on the fertility of these two groups are rare (Gabrielli, Paterno & Strozza, 2007; Ferrara, Giorgi, Mamolo & Strozza, 2009; Mamolo & Ferrara, 2009; Barbieri, Bozzon, Scherer, Grotti & Lugo, 2015; Graham, Sabater & Fiori, 2016).

This article intends to fill partially this gap of the literature by estimating period fertility levels and trends between foreigners and nationals in Greece, Spain, and Italy for 2007-2018. The main questions we will try to answer are: i) What was the impact of the recent recession on the fertility of those two groups?; ii) What is the reason for the different trends of foreign fertility in Greece in relation to that in Italy and Spain after 2014?

2. Methodology

2.1. Data and concepts (*Foreigners' fertility versus migrant fertility*)

Our work gives an answer to the above two questions using datasets on births by age as well as on population estimates by gender & age for nationals and foreigners provided from the Hellenic Statistical

⁴ In these countries, a large part of the public opinion and the mass media after 2000 began, due to the increasing number of foreigners' births, to express the fear that their national identity will soon be threatened.

Authority (ELSTAT, 2020b & c), Eurostat (EUROSTAT, 2020), INE (2020) and ISTAT (2020). These data are used to calculate age-specific fertility rates as well as the period TFR⁵ for resident population (overall, “nationals” and “foreigners”)⁶. These indicators enable us to examine the foreigners’ contribution to overall fertility during the past decade and interpret its fluctuations. Yet, it must be noted that our comparative analysis is hampered by limited data availability, as estimations on the age distribution of foreigners and nationals have been available annually only after 2008 in Greece, 1995 in Spain and 1994 in Italy, while the repartition of births per age and nationality varies (from 2004 in Greece, 1996 in Spain and 1995 in Italy)⁷.

In the literature, most studies on the same topic concern the distinction between “natives” and “non-natives” (women born abroad), and many authors like Sobotka (2008 & 2010) consider that the distinction between nationals and foreigners is problematic as: i) many initially foreign women obtain citizenship after a period of stay; ii) some women born to parents with foreign nationality may themselves retain foreign nationality even if they were born and subsequently live in the country. They also claim that this is why fertility rates of women with foreign nationality have to be interpreted as a gross approximation of migrant fertility and with caution. These arguments are reliable concerning European host countries with a long migratory tradition and favourable legislation on citizenship acquisition. In particular, regarding Italy and Greece, which have become host countries mainly in 90’s and do not have an open-door policy on citizenship, are not so valid⁸. In fact, estimations based on natives/non-natives pose more methodological problems, since the first category excludes numerous nationals born abroad.

2.2. The wider environment

The period under study presents particular interest, as, for 2009-2018 decade, two significant events took place, with clearly different intensity in the three countries, i.e.

a) The recession, the longest and the most severe since the Depression of the 1930s which, hit hard south-European households and had an impact on family dynamics – especially on fertility –, as in almost all the developed countries (Sobotka, Skirbekk & Philipov, 2011; Kreyenfeld, Anderson & Pailhe, 2012; Goldstein, Kreyenfeld, Jasilioniene & Orsal, 2013; Bellido & Marcen, 2016; Comolli, 2017; Ayllon, 2019; Alderotti, Mussino & Comolli, 2019; Matysiak, Bignoli & Sobotka, 2020). This recession, which hit Greece much harder than Spain and Italy (OECD, 2014; European Commission 2016-2019; Pissarides, Vafianos, Vettas & Megir, 2020), had also impacts on migration flows in the southern European countries: it caused the departure of part of the population of reproductive age, both nationals and foreigners who had settled in these countries during the previous decades (Larramona, 2013; Recaño, Roig & De Miguel, 2015; Labrianidis & Pratsinakis, 2016; Cerrutti & Maguid, 2016; Bayona-i-Carrasco, Thiers Quintana & Avila-Tàpies, 2017; Bermudez & Brey, 2017; Bonifazi & Strozza, 2017; Tintori & Romei, 2017; Strozza & De Santis, 2017; Kotzamanis, 2018; Kotzamanis & Karkanis, 2018; Prieto-Rosas & Quintero-Lesmes, 2018; Colombo & Dalla Zuanna, 2019).

b) The after 2014 period (“Refugee crisis”), as almost 3 million persons entered Italy, Spain, and Greece illegally (Kotzamanis, Carella, Duquenne & Pappas, 2020). A part of these migrants no originate from ex-socialist countries could not leave and was obliged to stay in the three under consideration countries. At the same time, the distribution by nationality of these new incomers was different, especially in Greece, from that in the near past (EUROSTAT, 2020)⁹.

5 We must, however, note that TFR may not always be the best measure for studying immigrant fertility (Burkimsher, Rossier & Wanner, 2018), especially when the aim is to make inferences about differences between immigrants and non-immigrants (foreigners and nationals) in their fertility quantum. The complementary visual method e.g. proposed by Tonnessen & Wilson (2020) requests data which are not available in the majority of European countries.

6 ‘Nationals’: women having country nationality. They may have had this nationality from birth or acquired it during their lifetime through naturalization. ‘Foreigners’: women with any nationality, not including the nationality of the country under consideration. They may or may not have been born in this country.

7 Fertility measures of the foreign-born population in the three under consideration countries are not available, which in any case precludes a comparative analysis. It should also be noted that almost all births during this period come from women belonging to the first and 1.5 generation (women who arrived at age 0-15 years) as most of their descendants are not yet at reproductive age. Due to this, it is impossible to anticipate how they will behave in terms of childbearing.

8 In Italy and Greece, in the 2011 census, women 15-49 years holding citizenship of these countries and born abroad constituted 3% and 7% respectively in the total of women at reproductive age. A small part of this age group was foreigners that acquired citizenship after their birth and registered as nationals at childbearing. Thus, if we applied the criterion of the country of birth in Greece and Italy, the largest part of citizens 15-49 of age born abroad would be considered ‘migrants’.

9 In this country, which has been the major entry gate for persons entering the EU space using the Mediterranean route, almost a tripling of residents coming from Medium and Low Development countries (MDC/LDC) is recorded between 1/1/2015 and 1/1/2019, together with a considerable increase in their relative proportion of the total of foreigners (from 13.5 to 29.0%). Even though the same trends, in broad terms, are also recorded in Italy, the subsequent changes were minor, while in Spain which, since the end of the 1990s, has been receiving immigrants mainly from Latin America and, secondarily, from Maghreb (Morocco), the part of those coming from LDC/MDC countries during the last decade has slightly changed (Table 4).

3. Results

3.1. Foreigners in South Europe, a large contribution to births

Foreign women in Spain, Italy, and Greece comprise 8-15% of the reproductive age population (Table 2). These percentages and their variations differ during the last decade. While in Spain and Greece minor changes are observed, the % increase continuously in Italy (+4.8 points between 2007 and 2018). These different trends reflected partially in the changes in foreigners' participation in births, as their percentages, higher than the relative proportion on reproductive age population¹⁰, present minor fluctuations in Spain, increase continuously in Italy, and follow a declining course until 2014 in Greece.

Table 2. Women 15-49 years by citizenship (country/foreigner citizens) at the middle of the year

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SPAIN												
W o m e n 15-49 years												
All (million)	11,492.0	11,593.6	11,582.4	11,5012.1	11,406.6	11,278.0	11,088.7	10,892.2	10,736.1	10,617.0	10,528.3	10,560.1
Nationals (%)	86.26	85.06	84.59	84.61	84.75	84.95	86.65	86.51	86.82	86.81	86.52	85.16
Foreigners (%)	13.74	14.96	15.41	15.39	15.25	15.05	14.35	13.49	13.18	13.19	13.48	14.84
ITALY												
W o m e n 15-49 years												
All (million)	13,950.0	10,009.8	13,722.0	13,661.9	13,576.8	13,482.2	13,496.1	13,458.6	13,262.9	13,052.6	12,841.9	12,634.5
Nationals (%)	92.10	90.92	90.88	90.23	89.75	89.27	88.39	87.70	87.51	87.47	87.41	87.28
Foreigners (%)	7.90	9.08	9.12	9.77	10.25	10.73	11.61	12.30	12.49	12.53	12.59	12.72
GREECE												
W o m e n 15-49 years												
All (million)			2,649.0	2,629.0	2,600.8	2,563.2	2,522.5	2,484.0	2,445.1	2,407.0	2,370.1	2,332.0
Nationals (%)			88.41	88.48	88.59	88.76	88.99	89.26	89.58	89.85	90.13	90.39
Foreigners (%)			11.59	11.52	11.41	11.24	11.01	10.74	10.42	10.15	9.87	9.61

Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

3.2. Yet a limited impact on overall TFR and on the mean age at childbearing

Our analyses show that, as expected, foreigners' TFRs for 2009-2018 in Spain, Italy, and Greece are higher than that of the nationals, and differences among these countries are significant (Table 3 & Figure 1). In Spain, foreign women give birth to 0.30-0.43 children more than nationals, and the differences between the two groups' TFRs do not present significant fluctuations for 2009-2018. The same does not apply to Italy and Greece. In these countries, the range is wider, from 1.23 to 0.71 in the former, from 1.14 to 0.39 children in the latter. In Greece especially, any trends towards convergence of TFR halted in 2014, and the differences have increased thereafter. Conversely, the mean age gap in childbearing between foreigners and nationals differs slightly among the three countries. Whether the increasing trends of this indicator in Spain and Italy do not differ between the two groups, on the contrary, in Greece, the mean age after 2014 slightly decreases as far as foreigners are concerned and continue to increase for nationals, exceeding 32 years in 2018 (Table 3 & Figure 2).

In fact, until 2018, foreigners' net contribution to the overall TFR in absolute and relative terms is limited as they increased this indicator (i) from 0.07 to 0.04 children/woman in Spain, 0.13-0.08 in Italy, and 0.12-0.034 respectively in Greece in relative terms, and, (ii) 5.5-3.5%, 8.5-6.0% and 8.3-2.6% respectively in relative values from (Figure 3).

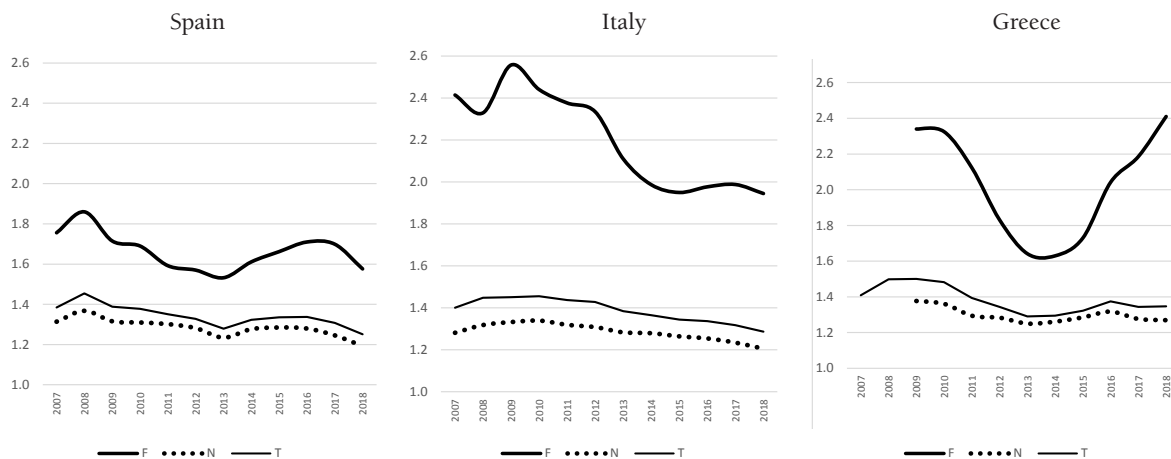
¹⁰ This discrepancy exists, since births are the products of two independent components: the number of women as well as their distribution per age and their fertility.

Table 3. Key data on TRF by citizenship (country/foreigner citizens) in Spain, Italy and Greece and their relative impact on fertility and number of births

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SPAIN												
Births of foreigners, %	18.79	20.65	20.55	20.36	19.30	19.05	18.39	17.60	17.62	18.20	19.02	20.77
TFR - Foreigners	1.756	1.860	1.715	1.690	1.592	1.570	1.532	1.611	1.662	1.710	1.699	1.576
TFR - Nationals	1.314	1.368	1.316	1.310	1.302	1.282	1.235	1.277	1.285	1.280	1.246	1.193
TFR - Total	1.384	1.454	1.388	1.378	1.351	1.328	1.279	1.323	1.335	1.337	1.308	1.251
Difference TFR F-N	0.442	0.492	0.399	0.380	0.290	0.288	0.297	0.334	0.377	0.430	0.453	0.383
Difference TFR T-N	0.070	0.086	0.072	0.068	0.049	0.046	0.044	0.046	0.050	0.057	0.062	0.058
Relative diff (%) TFR T - TFR N/TFR T*100	5.058	5.915	5.187	4.935	3.627	3.464	3.440	3.477	3.745	4.263	4.740	4.636
Mean age at childbearing - Total	30.84	30.83	31.02	31.19	31.43	31.56	31.67	31.77	31.89	31.99	32.07	32.17
Mean age at childbearing - Nationals	31.47	31.52	31.68	31.83	32.02	32.14	32.20	32.26	32.36	32.47	32.56	32.69
Mean age at childbearing - Foreigners	28.14	28.19	28.50	28.71	28.88	28.96	29.17	29.32	29.46	29.58	29.69	29.92
Mean age at childbearing F-N	-3.33	-3.33	-3.18	-3.12	-3.14	-3.18	-3.03	-2.94	-2.90	-2.89	-2.87	-2.77
Mean age at childbearing T-N	-0.63	-0.69	-0.66	-0.64	-0.59	-0.58	-0.53	-0.49	-0.47	-0.48	-0.49	-0.52
ITALY												
Births of foreigners, %	14.62	15.92	17.11	17.67	18.38	19.03	19.22	19.37	19.41	19.70	20.03	20.16
TFR - Foreigners	2.415	2.330	2.558	2.441	2.377	2.335	2.110	1.987	1.950	1.977	1.988	1.945
TFR - Nationals	1.281	1.318	1.332	1.339	1.319	1.308	1.283	1.279	1.264	1.254	1.234	1.205
TFR - Total	1.401	1.448	1.451	1.456	1.437	1.428	1.384	1.365	1.344	1.337	1.318	1.287
Difference TFR F-N	1.134	1.012	1.226	1.102	1.058	1.027	0.827	0.708	0.686	0.723	0.754	0.740
Difference TFR T-N	0.120	0.130	0.119	0.117	0.118	0.120	0.101	0.086	0.080	0.083	0.084	0.082
Relative difference (%) TFR T - TFR N/TFR T*100	8.565	8.978	8.201	8.036	8.212	8.403	7.298	6.300	5.952	6.208	6.373	6.371
Mean age at childbearing - Total	31.04	31.07	31.13	31.23	31.33	31.37	31.45	31.50	31.63	31.73	31.84	31.95
Mean age at childbearing - Nationals	31.55	31.65	31.75	31.86	31.95	31.99	32.05	32.09	32.21	32.31	32.42	32.51
Mean age at childbearing - Foreigners	27.76	27.84	27.81	28.06	28.33	28.38	28.51	28.55	28.64	28.73	28.85	29.01
Mean age at childbearing F-N	-3.79	-3.81	-3.94	-3.80	-3.62	-3.61	-3.54	-3.54	-3.57	-3.58	-3.57	-3.50
Mean age at childbearing T-N	-0.51	-0.58	-0.62	-0.63	-0.62	-0.62	-0.60	-0.59	-0.58	-0.58	-0.58	-0.56
GREECE												
Births of foreigners, %	18.13	18.41	18.84	18.66	17.68	15.34	13.91	13.14	12.91	13.59	13.92	14.20
TFR - Foreigners			2.340	2.325	2.123	1.831	1.642	1.630	1.730	2.042	2.186	2.410
TFR - Nationals			1.377	1.361	1.294	1.283	1.250	1.261	1.285	1.317	1.276	1.269
TFR - Total	1.409	1.498	1.501	1.482	1.394	1.344	1.290	1.295	1.322	1.375	1.344	1.347
Difference TFR F-N			0.963	0.964	0.829	0.548	0.392	0.369	0.445	0.725	0.910	1.141
Difference TFR T-N			0.124	0.121	0.100	0.061	0.040	0.034	0.037	0.058	0.068	0.078
Relative difference TFR T - TFR N/TFR T*100			8.261	8.165	7.174	4.539	3.101	2.625	2.799	4.218	5.060	5.771
Mean age at childbearing - Total			30.35	30.43	30.55	30.71	30.93	31.06	31.27	31.31	31.41	31.51
Mean age at childbearing - Nationals			31.12	31.18	31.24	31.27	31.38	31.48	31.68	31.82	31.93	32.06
Mean age at childbearing - Foreigners			27.10	27.20	27.35	27.60	28.06	28.24	28.38	27.94	27.98	27.90
Mean age at childbearing F-N			-4.02	-3.98	-3.89	-3.67	-3.32	-3.24	-3.30	-3.88	-3.95	-4.16
Mean age at childbearing T-N			-0.77	-0.75	-0.69	-0.56	-0.45	-0.42	-0.41	-0.51	-0.52	-0.55

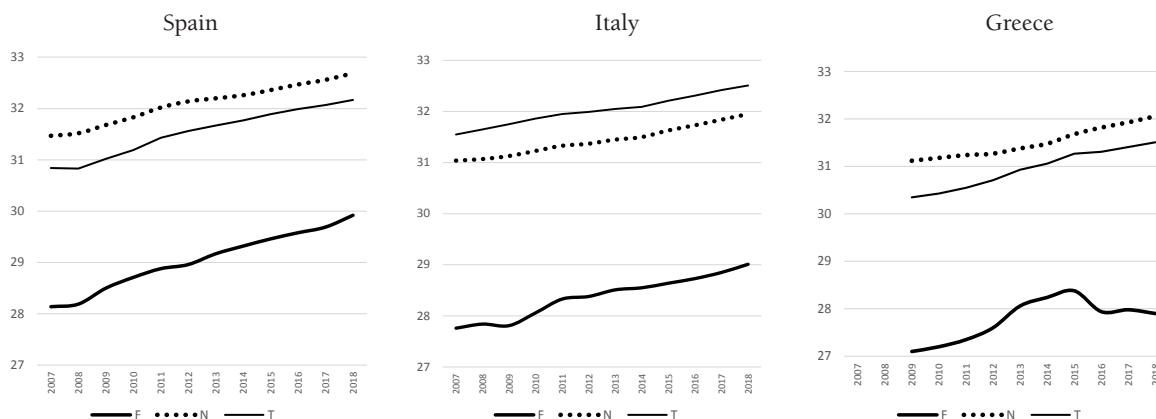
Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

Figure 1. Spain, Italy and Greece, TFR (overall, nationals, foreigners), 2009-2018



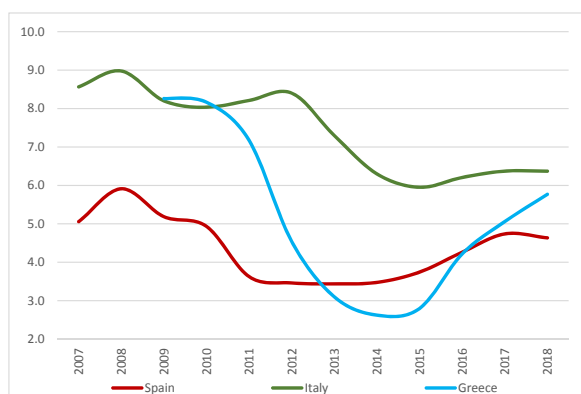
Source: Table 3

Figure 2. Spain, Italy and Greece, mean age at childbearing (overall, nationals, foreigners), 2009-2018



Source: Table 3

Figure 3. Spain, Italy and Greece, Foreigner s fertility impact on overall TFR (%)

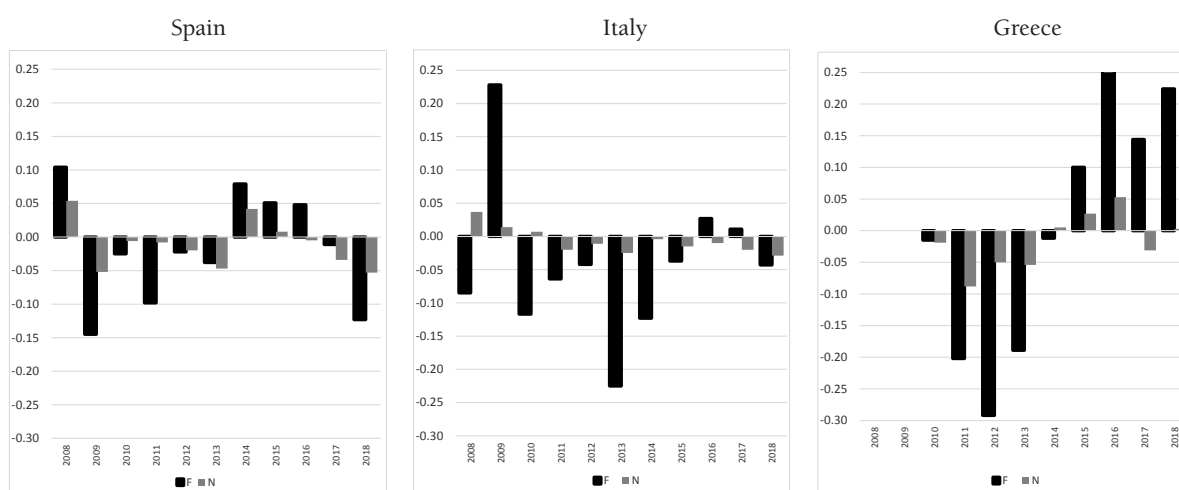


Source: Table 3

At the same time, examining the absolute and relative annual TFR variations (Figures 4 & 5), we confirm the specificity of Greece as, in contrast to Spain and Italy: i) the foreigners' TFR declined much faster than those of the nationals between 2009 and 2014, leading to rendering their overall TFR smaller from 8.3% in 2009 to 2.6% in 2014; ii) in recent years, TFR evolution between nationals and foreigners is clearly different.

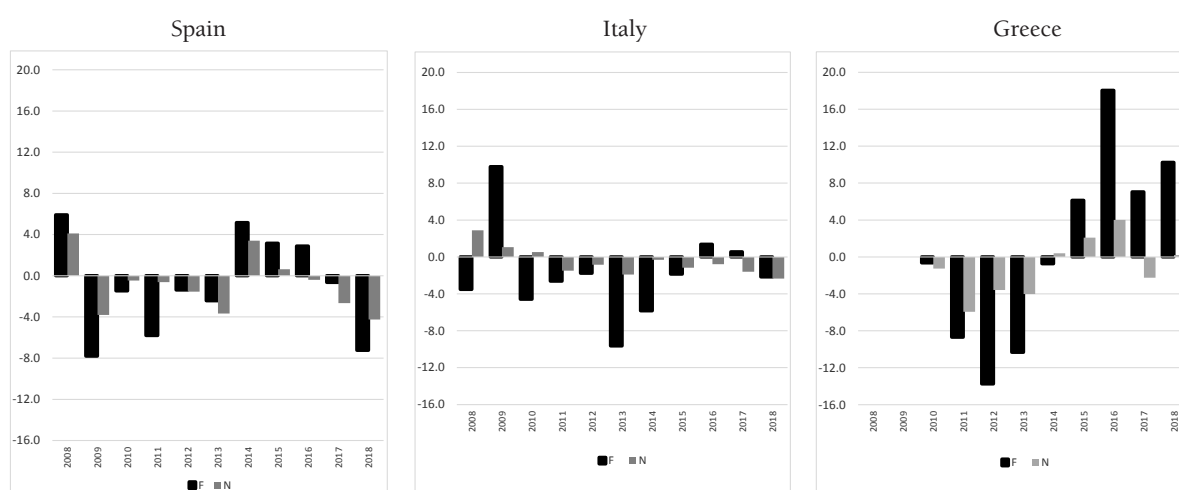
More to the point, we should bear in mind that foreigners' TFR is the resultant of two discrete women subgroups, i.e. citizens from countries (a) having High and Very High Human Development Index (HDC/VHDC) and (b) with medium (MHDI/MDC) – many Asian countries – and Low High Human Development Index (LHDI/LDC) – almost all-African countries –. The relative proportion of women of these two groups, as aforementioned, was not steady during the period under examination. In Greece especially, part of the foreigners from ex-socialist countries that settled before 2010 were obliged to return to their country of origin or migrate to another EU country, resulting in a decrease in their relative proportion (i.e., the percentage of the total foreign population). At the same time, since the first years of the 2010 decade, and more particularly after 2014, the population of foreigners coming from MDC and LDC countries, in the large majority citizens of Syria, Iraq, Afghanistan, Iran, and Pakistan (Kotzamanis & Karkanis, 2018; Kotzamanis et al., 2020), increased significantly. Thus, the percentage of foreign women of reproductive age coming from the two last groups, in the total of women 15-49 years old, doubled between 1/1/2015 and 1/1/2019¹¹. However, the same does not apply to Spain and Italy, where, before 2015, the percentages of women coming from these MDC and LDC countries were rather high (>25%), and their variations (+1.5 - +2.0%) limited (Table 4).

Figure 4. Spain, Italy, Greece, absolute changes in TFR by citizenship (foreigners/nationals, 2009-2018)



Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

Figure 5. Spain, Italy, Greece, relative changes (%) in overall TFR by citizenship (foreigners/nationals, 2009-2018)



Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

11 Simultaneously, the share of these women aged between 15-29 years in the female population of the same age quadrupled between 2015 and 2019, rising from 7 to 28%.

Table 4. Spain, Italy, Greece, foreigners by origin

	Total population*	Foreigners (all)*	(1) From EU28*	(2) From all other countries*/**	(2.1) From EFTA*	(2.2) From Candidates countries *	(2.3) From others*/***	2.3.1	2.3.2	2.3.3	2.3.4
SPAIN											
01/01/2015	46,450	4,454	1,948	2,505	0,032	0,009	2,464	0,829	0,147	0,230	1,258
%	100.00	9.59	43.74	56.26	0.72	0.20	55.32	18.61	3.31	5.15	28.25
01/01/2019	46,937	4,840	1,967	2,872	0,033	0,013	2,826	1,031	0,173	0,240	1,382
%	100.00	10.31	40.63	59.34	0.67	0.28	58.39	21.31	3.57	4.96	28.55
ITALY											
01/01/2015	60,796	5,014	1,492	3,522	0,010	0,634	2,878	0,901	0,043	0,511	1,423
%	100.00	8.25	29.76	70.24	0.20	12.64	57.40	17.97	0.86	10.19	28.38
01/01/2019	60,360	5,255	1,583	3,672	0,010	0,564	3,097	0,909	0,046	0,686	1,456
%	100.000	8.71	30.12	69.88	0.19	10.73	58.93	17.30	0.88	13.05	27.71
GREECE											
01/01/2015	10,858	0,822	0,199	0,623	0,002	0,430	0,192	0,072	0,010	0,052	0,058
%	100.000	7.57	24.21	75.79	0.24	52.31	23.36	8.76	1.22	6.33	7.06
01/01/2019	10,725	0,831	0,213	0,618	0,002	0,297	0,320	0,071	0,011	0,096	0,142
%	100.000	7.75	25.63	74.37	0.24	35.74	38.51	8.54	1.32	11.55	17.09
W o m e n 15-49 years											
SPAIN											
01/01/2015	10,804	1,425	0,572	0,853	0,005	0,003	0,844	0,323	0,051	0,049	0,422
%	100.00	13.19	40.15	59.84	0.37	0.22	59.25	22.65	3.59	3.40	29.61
01/01/2019	10,483	1,527	0,550	0,977	0,005	0,005	0,967	0,380	0,058	0,056	0,472
%	100.00	14.56	36.00	63.98	0.33	0.31	63.32	24.90	3.80	3.69	30.93
ITALY											
01/01/2015	13,366	1,666	0,589	1,076	0,002	0,183	0,892	0,326	0,016	0,117	0,433
%	100.00	12.46	35.35	64.59	0.12	10.98	53.54	19.57	0.96	7.02	25.99
01/01/2019	12,548	1,599	0,564	1,034	0,002	0,161	0,872	0,303	0,016	0,133	0,420
%	100.00	12.74	35.27	64.67	0.13	10.07	54.53	18.95	1.00	8.32	26.27
GREECE											
01/01/2015	2,465	0.261	0.075	0,185	0,000	0.129	0,056	0,031	0,003	0,005	0,017
%	100.00	10.59	28.74	70.88	0.00	49.43	21.46	11.88	1.15	1.92	6.51
01/01/2019	2,312	0.220	0.076	0,144	0,000	0.077	0,067	0,027	0,003	0,010	0,027
%	100.00	9.52	34.55	65.45	0.00	35.00	30.45	12.27	1.36	4.55	12.27

In Spain, both the total population and its distribution to nationals and foreigners is provided by INE

* Population in million

** From all other countries (2) = (2.1 + 2.2 + 2.3)

*** From others (2.3) = (2.3.1 + 2.3.2 + 2.3.3 + 2.3.4)

(2.3.1) Countries with high Human Development Index (HDI/HDC)

(2.3.2) Countries with very high Human Development Index (VHDI/VHDC)

(2.3.3) Countries with Low Human Development Index (LHDI/LDC)

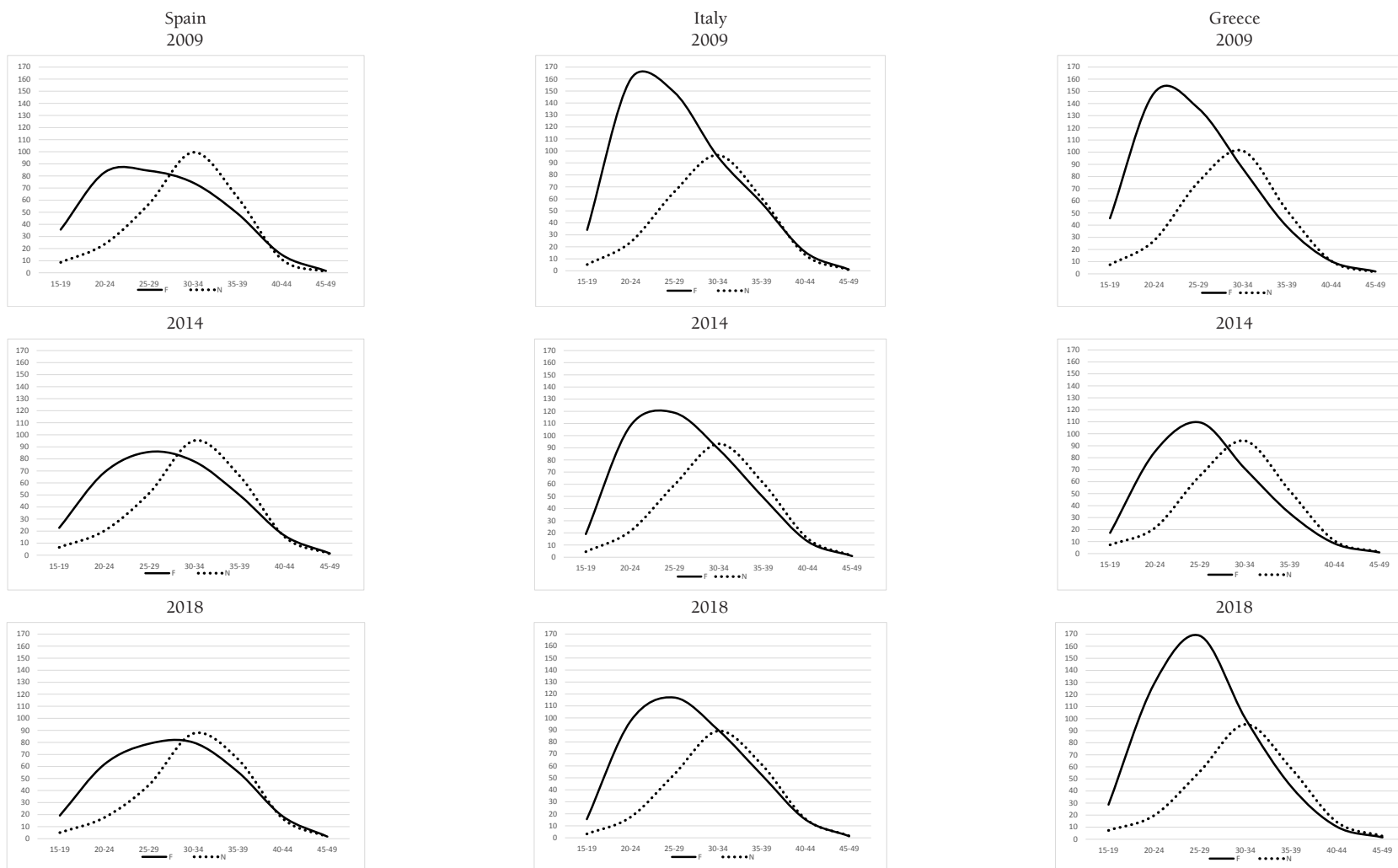
(2.3.4) Countries with medium Human Development Index (MHDI/MDC)

Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

3.3. But different fertility patterns...

The contribution of foreigners to overall TFR, as we have shown, is limited. Their higher TFR is mainly due to the higher age-specific fertility rates at younger ages and the examination of these rates (Figure 6) shows that, although those of nationals do not vary significantly between 2009 and 2018, the same does not apply to foreigners, especially in Greece and in Italy. Certainly, the differences between the two group rates are not only due to the calendar (tempo) but, mainly, to the differences in their period and cohort fertility.

Figure 6. Spain, Italy and Greece, age-specific fertility rates (o/oo), foreigners and nationals, 2009, 2014 & 2018



Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

We ought, therefore, to mention that i) the CFR of the successive generations in Spain, Italy, and Greece after 1940 declines continuously and this indicator for women born 1970-74 (estimation) is less than 1.6 children in Greece and 1.5 in Italy and Spain among the lowest in the EU countries (Breton, Barbieri, Belliot, d'Albis & Mazuy, 2019); ii) in the developed countries (HDC and VHDC) were from the majority of foreigners settled in Spain, Italy, and Greece come from, the indirectly estimated completed fertility of the cohorts 1965-75 is less than 1.8 children/woman¹², while in the MHDI¹³, is around 2.5 and in low HDI countries exceeds 3.5 children (UN, 2019a & b).

4. Discussion

4.1. Fertility between nationals and foreigners during the first years of recession

The economic crisis in Spain and Italy emerged in 2008 and later in Greece. The recession led to a rapid decline of GDP in the following years, resulting in a significant reduction of household income, weakening consumer confidence, and increasing poverty as well unemployment. Although some papers referred – or focus – on the crisis impact on fertility in South European countries (Testa & Stuart, 2012; Lanzieri, 2013; Cazzola, Pasquini & Angeli, 2016; Caltabiano, Comolli & Rosina, 2017; Fiori, Graham & Rinesi, 2018; Kotzamanis, Kostaki & Baltas, 2017; Kotzamanis, 2018; Comolli & Vignoli, 2019; Tragaki & Bagavos, 2019; Puig-Barrachina et al., 2019; Vignoli, Tocchioni & Matei, 2019; Dantis & Rizzi, 2020; Matysiak et al., 2020) rarely examine its differential impact on the two components of the population (foreigners/nationals) and, when they deal with it, their analyses are based on data concerning mostly the period before 2015 (Paggiaro, 2013; Sobotka, 2017; Graham et al., 2016; Sabater & Graham, 2019).

Figure 7 displays the changes during 2009-18 in the age-specific fertility rates for nationals and foreigners, and Table 5 the changes between 2009 and 2014. The results reveal firstly marked differences of different ages among the two groups at national level fertility trends. Thus, in Greece and Italy, (a) foreigners' fertility rates at all ages fell between 2009 and 2014, slightly more in the first country than in the second, (b) Italians and Greeks women rates have fallen only at ages below 35 and (c) between 15 and 35 years the rates decrease is faster for foreigners than for nationals, a fact that can be attributed to the greater vulnerability of the first group to unfavourable economic conditions.

Table 5. Spain, Italy, Greece, 2009-2014, variation (index numbers, 2009=100) of age specific fertility rates, foreigners and nationals

	SPAIN		ITALY		GREECE	
	Nationals	Foreigners	Nationals	Foreigners	Nationals	Foreigners
15-19	74.7	63.50	86.8	55.7	97.4	37.9
20-24	85.0	82.61	88.8	67.5	78.2	57.2
25-29	90.6	101.73	90.5	79.8	85.7	80.5
30-34	95.7	104.52	96.6	93.2	93.2	82.0
35-39	105.5	101.61	100.2	86.7	101.0	87.0
40-44	134.9	107.87	115.2	82.7	100.7	81.5
45-49	127.0	93.34	147.6	89.8	105.9	52.8
ICF	97.0	93.94	96.1	77.7	91.6	69.7

Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

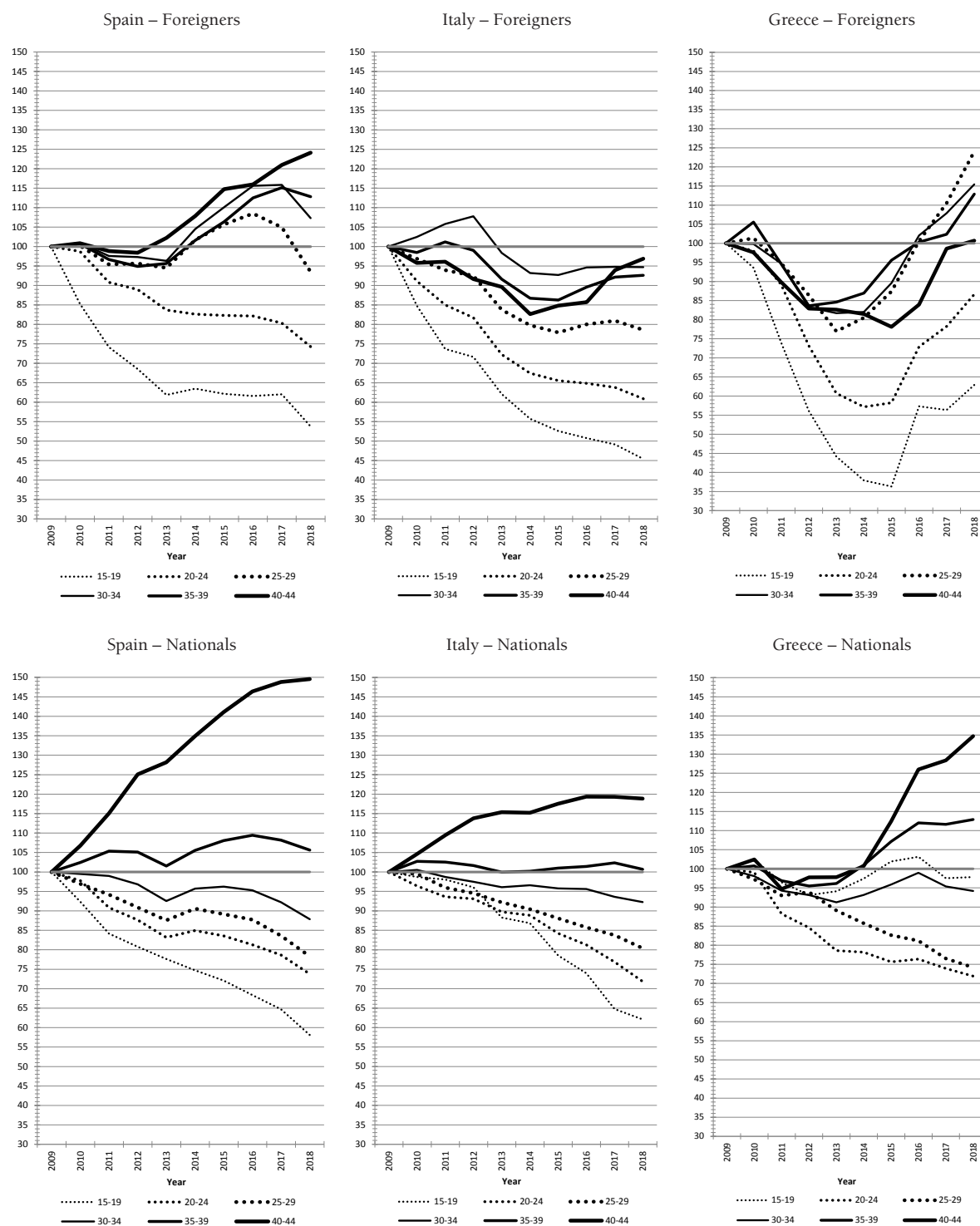
These difference trends conduct to the reduction of the TFRs gap and explain the decline in the overall TFR in those two countries the first years of the recession. On the contrary, in Spain, both among nationals and foreigners, the moderate rates drop concerns only 15-29 years. On the opposite, rates at mature ages (35-44 years) are not seem affected by the crisis, while those between 30 and 34 years behave deviant: in 2014, their values are lower than those of 2009 among Spanish and slightly higher among

12 Except in the majority of Central and South American countries as well as Iran and Tunisia where it exceeds slightly two children/women.

13 China exempt.

foreign women. Indeed, in this country, the recession seems to have a small influence, especially, rather surprisingly, among foreigners. However, a question must be asked about the quality of the data relating to the reference populations. An underestimation of these populations, stronger for foreigners than for Spanish at childbearing ages, if this is the case, gives higher fertility rates for both groups while reducing their differences.

Figure 7. Spain, Italy, Greece, 2009-2018, variation of age specific fertility rates, foreigners and nationals (base 100 in 2009)



Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

4.2. Differences in recent period fertility (before the Covid pandemic) between Greece, Spain and Italy (2014-2018)

The evolution of national and foreign women's fertility indicators after 2014 differs significantly among the three Mediterranean countries (Table 6). If fertility recovers slightly in Spain and Italy, this moderate recovery, slightly more important for foreigners than for nationals, concerns only the mature ages, as the younger one continues to be, in 2018, for both groups, at lower levels than in 2014. Thus, the overall TFR in these countries is slightly lower in 2018 than in 2014, as the limited recovery at older ages did not allow its rise. In Greece, trends differ. The changes in rates between Greeks and foreign citizens are significantly different, and the TFR gap has been widening after 2014. A question, therefore, arises: what is the reason for these?

Table 6. Spain, Italy, Greece, 2014-2018, variation of age specific fertility rates, foreigners and nationals (base 100 in 2014)

	SPAIN		ITALY		GREECE	
	Nationals	Foreigners	Nationals	Foreigners	Nationals	Foreigners
15-19	77.8	84.68	71.5	81.5	100.4	165.9
20-24	86.8	89.90	80.9	90.2	92.0	151.6
25-29	86.5	91.90	88.9	98.5	86.5	154.1
30-34	91.8	102.69	95.5	101.6	101.1	140.8
35-39	100.1	111.03	100.5	106.8	111.8	129.8
40-44	110.9	115.05	103.2	117.2	133.8	123.6
45-49	148.9	122.01	143.5	134.8	195.9	159.2
ICF	93.5	97.81	94.2	97.9	100.7	147.9

Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

To answer, we need to consider, among other facts, the changes that have taken place over the 2010 decade in both fertility and foreigners' profile in this country. It can be first suggested that as the foreigners' fertility has been affected severely by the recession, an important birth recovery thereafter is justified. We can also suggest that major changes in the composition of foreigners' population by nationality after 2014, unlike in Italy and Spain, have reflected in their fertility.

The above hypotheses are supported by the comparative study on fertility rates by age. We can see that nationals' fertility rates under 30 years decreased slightly between 2014 and 2018, while an increase was only recorded at over 30s. In contrast, foreigner rates are rising rapidly at all ages. While this development for both nationals and foreigners aged over 30 years can be attributed mainly to a recovery of births, the significant increase recorded only among foreigners under 30 – an increase also affecting their average age at childbearing – can be reasonably attributed mainly to the increase of the percentages of women from MDC and LDC countries having much higher fertility than that of foreigners from VHDC and HDC countries.¹⁴

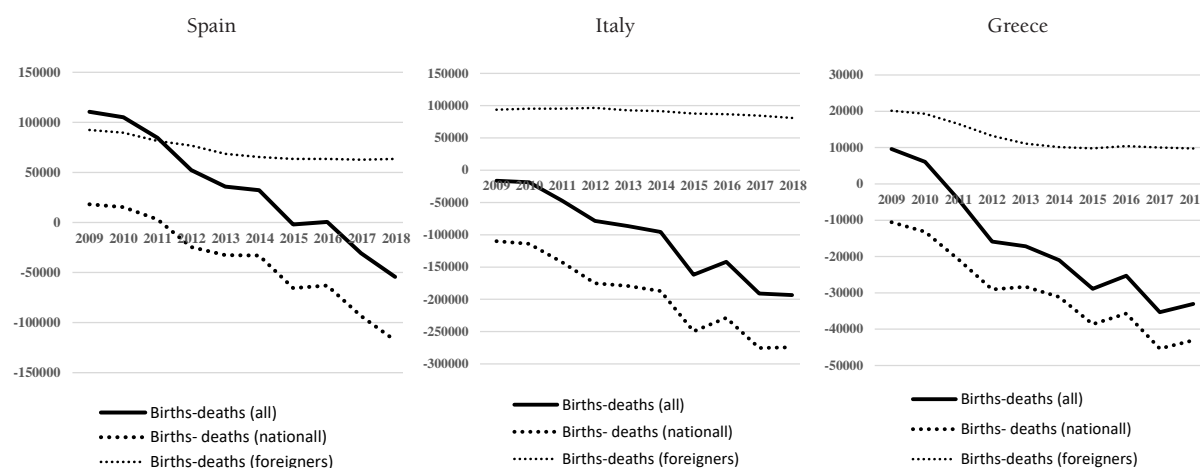
In summary, we can claim that, in Greece, during the last years, there is a coexistence of two discrete fertility models regarding foreigners. The first one concerns women of the first migration wave, coming, in the great majority, from Eastern Europe and the Balkans. Their fertility, slightly higher than that of the nationals, exhibits, even convergence trends like in countries with long migration tradition (Coleman, 1994; Schoorl, 1995; Alders, 2000; Østby, 2002; Andersson, 2004; Gebremariam & Beaujot, 2010; Milewski, 2010; Dubuc, 2012; Persson & Hoem, 2014; Camarota & Zeigler, 2015; Rojas, Bernadi & Schmid, 2018; Kulu et al., 2019). The second one is attributed to women from less developed countries who settled in Greece recently, having much higher fertility than the first migrant wave. In summary, we can claim that, in Greece, during the last years, there is a coexistence of two discrete fertility models regarding foreigners. The first one concerns women of the first migration wave, coming, in the great majority, from Eastern Europe and the Balkans. Their fertility, slightly higher than that of the nationals,

¹⁴ The fertility of the newcomers is also boosted by the "disruption fertility" a phenomenon widely referred to in the literature (Ford, 1990; Kulu, 2005; Persson & Hoem, 2014), as these migrants were obliged to postpone their fertility for some time before their displacement, a fact also pinpointed by Castro-Martín & Rosero Bixby (2011) concerning those foreign women coming to Spain from Africa.

exhibits, even convergence trends like in countries with long migration tradition. The second one is attributed to women from less developed countries who settled in Greece recently, having much higher fertility rate than the first migrant wave.

Finally, regardless of the “Greek” peculiarity, we must point out that, although in all three countries foreigners’ fertility has a limited impact on overall TFR, this group has contributed – and will keep contributing – at relatively high rates (>10%) – to births, and, in this way, reducing their negative natural balance (Figure 8). Thus, if foreigners have not reversed these balances’ negative signs, they significantly reduced the losses.

Figure 8. Spain, Italy, Greece, natural balance, foreigners and nationals, 2009-2018



Source: EUROSTAT (2020), INE (2020), ISTAT (2020), ELSTAT (2020b & c). Own elaboration

5. Conclusions

The present study examines period fertility levels and trends between foreigners and nationals in Spain, Italy, and Greece for 2009-2018. The analysis results indicate that (i) fertility rates in the three South-European countries hold the lowest ranks in Europe because nationals’ fertility is extremely low. (ii) Although foreigners make a major contribution to births, their net effect on overall TFR is moderate. (iii) Foreign women’s fertility fluctuated over a wider range than that of the nationals. (iv) The fertility of those settled in the 1990s and 2000s in Greece and – to a lesser extent – in Italy has proven more vulnerable to the recent economic downturn as their rates declined faster in the first years of the 2010 decade. (v) Foreigners’ TFR, after 2014, increased significantly in Greece, but not in Spain and Italy. This increase is due not only to the recovery of delayed births during the first years of the recession, but also to the composition changes on foreign population by nationality, i.e., to the increase of weight of women from MDC and LDC countries characterized by much high fertility. (vi) Foreigners will keep contributing, at relatively high rates (>10%), to births in Spain, Italy and Greece and, in this way, to the reduction of their negative natural balance.

Comparing Spain, Italy and Greece with other European countries enables us to include them in one of the four existing distinct groups (OECD, 2015; Volant, Pison & Héran, 2019). The first comprises countries where the % of foreigners are too small to influence fertility rates (mainly the former communist countries of Central or Eastern Europe). The second includes countries (such as France, Belgium, Luxembourg and Austria) having both a relatively important part of foreign origin female population and a relatively large difference between nationals and foreigners’ fertility. The third group, countries that even if they have a significant percentage of foreign women, their fertility impacts are quite limited. The last group comprises a relatively small number of countries (Iceland, Denmark and – to a lesser extent – Sweden, Norway and Finland). Immigrant/foreign women in this group have similar to – or even lower – fertility rates than nationals. Based on our analyses, the three South-European countries belong rather to the third group, as the presence of foreign/immigrant women has – and probably will continue to have – a positive but quite limited net effect on their TFRs.

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The representation of the rural exodus in Spanish cinema (1900-2020): evolution, causes and territorial consequences

*La representación del éxodo rural en el cine español (1900-2020):
evolución, causas y consecuencias territoriales*

Antonio Martínez-Puche^{1*} 

Salvador Martínez Puche² 

Francisco Javier García Delgado³ 

Xavier Amat Montesinos⁴ 

Abstract

Rural depopulation has been a constant feature of contemporary Spanish history and has been amply studied from the perspective of geography. Recently, however, there has been considerable media attention given to the consequences of internal migration. Behind the alarming demographic statistics lies a nexus of processes which have been reflected in the cinema since its beginning. This paper explores these processes at work in the rural sending environment and receiving urban destination through an analysis of six representative Spanish films. The fictional representation through film of a complex reality provides insights into the internal and contextual keys to understanding the phenomenon of 'empty Spain' or 'hollowed-out Spain'. The films illustrate the persistence of two conflicting ideas (the rural and urban), divergence about what constitutes development and the quality of life, and the processes leading to 'demotanasia'.

Keywords: depopulation; migration; 'demotanasia'; cinema and territory; rural drama; ageing.

Resumen

La despoblación rural ha sido una constante en la historia contemporánea de España, y ha sido ampliamente estudiada desde la perspectiva de la Geografía. Sin embargo, en los últimos tiempos se ha prestado una gran atención mediática a las consecuencias de las migraciones interiores. Detrás de las alarmantes estadísticas demográficas se esconde un nexo de procesos que se han reflejado en el cine desde sus inicios. Este trabajo explora estos procesos en funcionamiento en el entorno rural de envío y en el destino urbano de recepción a través del análisis de seis películas españolas representativas. La representación ficcional a través del cine de una realidad compleja permite conocer las claves internas y contextuales para entender el fenómeno de la "España vacía" o "España vaciada". Las películas ilustran la persistencia de dos ideas contrapuestas (lo rural y lo urbano), la divergencia sobre lo que constituye el desarrollo y la calidad de vida, y los procesos que conducen a la "demotanasia".

Palabras clave: despoblación; migración; demotanasia; cine y territorio; drama rural; envejecimiento.

1 Department of Human Geography. University of Alicante, Spain. antonio.martinez@ua.es. * Corresponding author

2 Department of Communication. University of Murcia, Spain. s.martinezpuche@um.es

3 Department of History, Geography and Anthropology. University of Huelva, Spain. fcogarci.uhu@gmail.com

4 Department of Human Geography. University of Alicante, Spain. xavier.amat@ua.es

1. Introduction: cinema and the depopulation of Spain, development, and socio-territorial repercussions

Although Spain suffered the process of rural exodus/depopulation later than other regions of Western Europe, the process was more intense and rapid, and its effects (in terms of development/evolution and distribution) have persisted into the present time. The political, ideological, and socio-economic transformations which Spain underwent at the turn of the nineteenth century, and more significantly in the second half of the twentieth century, resulted in widespread territorial changes in the demographic distribution. These shifts can be seen most clearly in the changing patterns of settlement and productive occupation, as well as through examination of the transport networks, basic infrastructures, and telecommunication systems. According to the 1860 Census, 62% of the workforce in Spain was employed in the primary sector (owners, tenants, and farm labourers) (González Pérez and Martín-Serrano, 2018), while in 1950 the figure was slightly above 48% (Spanish Statistical Office [INE], 1950). The population of Spain went from being predominantly rural until the 1960s to agriculture accounting for little more than 30% by the year 2000.

Over the last few years, the phenomenon of ‘empty Spain’ or ‘hollowed-out Spain’ – a phrase used to refer to the acute rural depopulation affecting large swathes of the country – has attracted increased media attention and has become the focus of academic studies from a range of perspectives. Studies such as those by Reher (1999), Sarasúa (1994) and Dubert (1998, 2002) have shown different patterns of rural-urban migration, both temporary and permanent, while Florencio and López Martínez (2000a, 2000b) have studied intra-rural migration associated with agricultural work. Studies into the different types of preindustrial migration during periods and within specific regions have also been reviewed in Eiras and Rey (1994), González Portilla and Zarraga (1996), and Rodríguez Galdo (1999), Roquer and Blay (2008), Collantes, Kerstin and Prados (2016), Reques Velasco (2017) and Camarero (2020). These authors have examined other factors beyond territorial migrations from rural to urban areas and vice-versa, such as low fertility rates, male-skewed sex ratios and the ageing population in rural contexts. This study examines how socio-demographic, economic, political, and ethnographic aspects of the rural flight in Spain have been presented (and represented) in a selection of six films. By doing so, the research aims to shed light on the causes and consequences of depopulation, as depicted by the cinema of the time.

Three chronological periods were established to bring the object of the study and its context into focus. These periods do not represent an equalisation of homogeneous periods (same duration, for example), so much as coherent grouping of relevant socio-economic, demographic, and political situations that imply structural and substantial changes in the evolution of migrations and the evolution of depopulation:

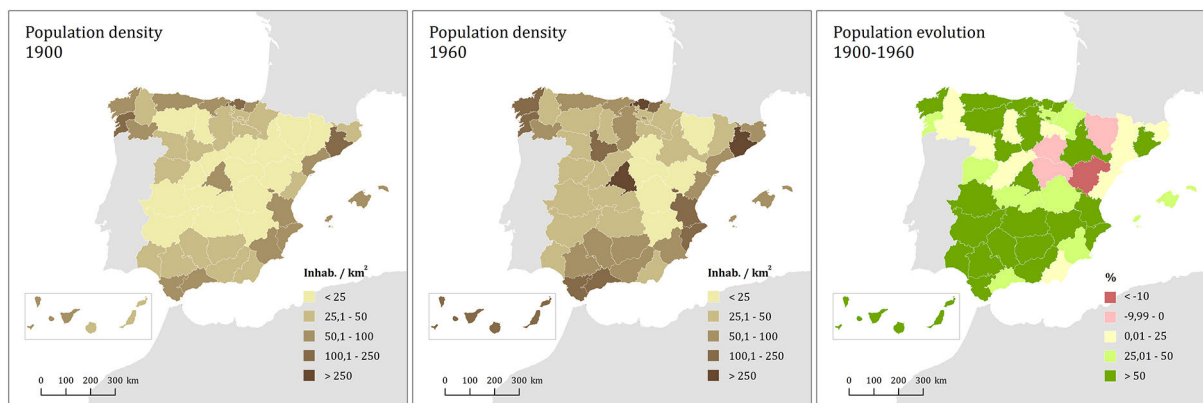
a) From 1900 to 1960. The imaginary of the rural world, popular folklore, and socioeconomic reality

This section shows the dichotomy ‘rural misery’ versus ‘urban progress’. The population of Spain increased steadily from 1900 to 1930, albeit with numerous regional discrepancies and cities grew (Barcelona and Madrid, each with populations of over half a million in 1900, achieved an accumulated growth of over 40% by 1930). The population went from 18,594,404 inhabitants in 1900 to 23,563,867 three decades later (representing an annual growth rate of 0.9%), a growth shared by most of the national territory, with the exceptions of rural areas in Malthusian Catalonia⁵ and the two Castille provinces (Reques Velasco, 2017). Essentially, there were substantial differences between different areas in rural Spain. Most municipalities in rural Castille-Leon, those of the Pyrenees/Pre-Pyrenees, and the interior southern Mediterranean, together with Murcia and Almeria, generally displayed a marked pattern of return, while other regions, notably Castilla-La Mancha, Extremadura, and Andalusia, experienced a sharp increase in emigration from the second half of the twentieth century onwards (Figure 1). The patterns of internal migration associated with the ruralisation of the Spanish economy that took place during the 40s – that is to say, migrant workforces returning to their original regions – have been very poorly studied, in part due to the lack of reliable sources, but also because the period represents an ‘atypical’ pattern going against the trend of rural depopulation which had prevailed since the last quarter of the nineteenth century. Whatever the case, migration figures (for example, García Barbancho, 1967), along with the estimates for net rural migration in Leal, Leguina, Naredo and Tarrafeta (1986), show that, over the course of the decade, the overall rate was negative (in other words, there was net rural depopulation), albeit relatively modest in comparison with previous decades. This trend underwent a substantial change in the 1950s. With just a few exceptions, there was a marked increase in the drift to cities and regional capitals. At the same time,

⁵ This expression, derived from the name of the economist Thomas Robert Malthus, is a synonym for impoverished because of demographic, socio-political, and economic factors.

the population of rural areas, which had remained stable since the beginning of the century, showed little or no growth during the decade. During this period the proportion of young people constituting the rural population was also high, until the stabilisation plan and its consequences, known as 'developmentalism', began to take effect. These processes are analysed in both the 1930 and 1942 versions of *The Cursed Village* (*La aldea maldita*) by Florián Rey and in José Antonio Nieves Conde's 1951 *Furrows* (*Surcos*).

Figure 1. Density and evolution of the population in Spain (1900-1960)

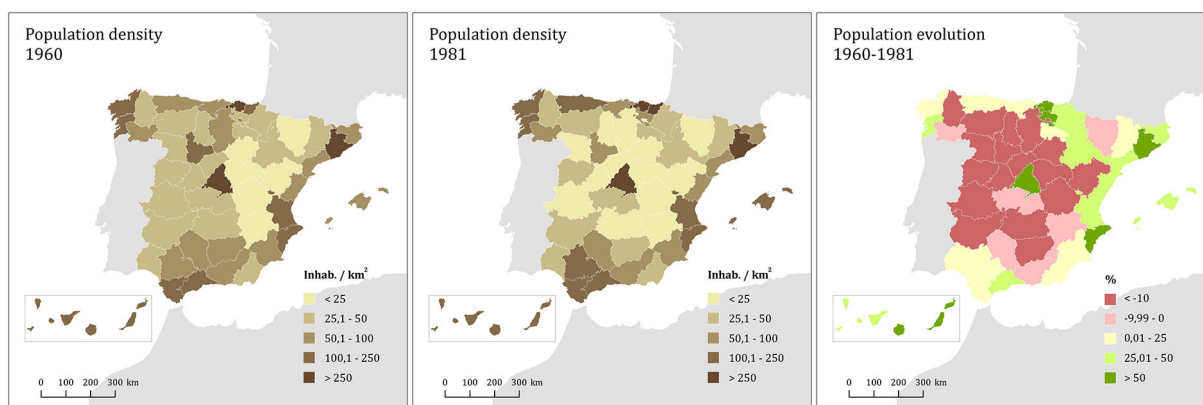


Source: INE. Population and Housing Censuses (1900 and 1960). Own elaboration

b) From 1960 to 1981. Increasing migration from rural to urban areas

This section shows socio-demographic and territorial effects on the Mediterranean coast under the influence of the stabilisation plan. In the 1960s rural Spain underwent a short but intense period of depopulation ('rural exodus'), the main consequence of which was to leave an ageing population with diminished possibilities for replenishment. From being a chiefly agrarian country, Spain rapidly became industrial and urban. It was a process that had occurred in much of Europe during the nineteenth century, and when it reached Mediterranean Europe a century or so later it was especially intense (Figure 2). The resulting territorial shifts were acute, particularly between inland rural areas and coastal towns (Reques Velasco, 2017) with only Madrid and a handful of provincial capitals and regional centres proving the exception. This pattern of internal migration was most notable once emigration outside Spain subsided. Madrid, Barcelona and, to a lesser extent, Seville and the Basque Country were the main destinations, drawing in migrants from a limited number of generally adjacent feeder provinces (Silvestre, 2010). Coastal areas saw rapid development thanks to the growth of tourism and the socio-economic changes taking place in the municipalities along the Mediterranean, brought about by the influx of migrants from rural areas and tourists from the rest of Europe. The period, and the processes driving the tumultuous changes, are well-reflected in the films *La piel quemada* ('Sunburnt' by Josep Maria Forn, 1967), and *El turismo es un gran invento* ('Tourism is a great invention', by Pedro Lazaga, 1968).

Figure 2. Density and evolution of the population in Spain (1960-1981)



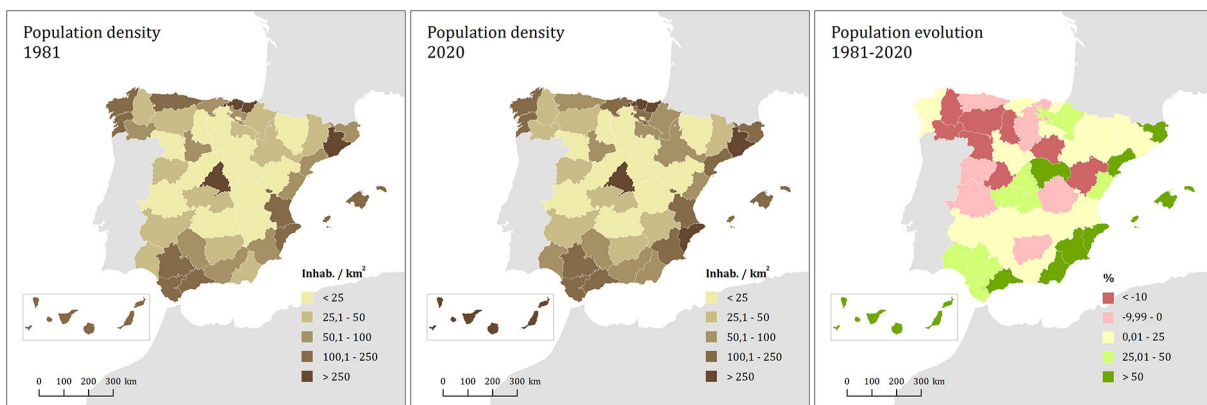
Source: INE. Population and Housing Censuses (1960 and 1981). Own elaboration

c) From 1981 to the present

This section shows the new influxes and confirmation of the demographic, economic, and cultural fault lines around ‘migrants, town and country’. This period witnessed the widening rift between the rural and urban environments in both the socio-economic and cultural spheres, a situation made more complex by the influx of migrants from outside Spain. These issues were especially felt from the beginning of the 1990s, when new contextual and cultural identities (such as urban vs rural, Latin American vs Maghreb) raised the prospect of a multicultural Spain. The film *Flowers from Another World* (*Flores de otro mundo* by Icíar Bollaín, 1999) examines the challenges of assimilation through the story of a farming town which ‘imports’ a group of marriageable women in a bid to halt its decline, a measure that plays out with mixed success.

The decade from 2001 to 2011 can be considered a period of re-equilibrium based on the phenomenon of peri-urbanisation, giving rise to new trends in residential behaviour, facilitated by private transport and communication infrastructures. This resulted in a progressive demographic emptying of the central areas of urban municipalities, halted only by the arrival of foreign immigrants, who also took up residence in rural areas. Significantly, the data from 2006 show that municipal areas of between 2,000 and 10,000 inhabitants (the conventional limits in Spain for defining municipalities as non-urban or ‘intermediate’) had increased their population on average by over 750 people in the previous decade, which represented a marked change in tendency after a long period of decline and exceeded the national average. Of greater interest, as Roquer and Blay (2017) point out, is that in the second half of the same period, the municipalities of between 500 and 2,000 inhabitants (those considered truly rural by the NSI) also achieved growth rates, after having registered negative figures in the first five years, suggesting a widespread territorial demographic ‘recovery’ for the period in question (Figure 3).

Figure 3. Density and evolution of the population in Spain (1981-2020)



Source: Instituto Nacional de Estadística INE. Population and Housing Censuses (1981) and Revision of the Municipal Register (2020). Own elaboration

Current demographic trends highlight many of the phenomena mentioned above. The hollowing out of the interior reflects the large number of municipal districts with a population density of <23 hab./km², located primarily in the two mesetas, the Iberian System, the Sierra Morena, the Pre-Pyrenees, and inland Galicia (Reques Velasco, 2017). The exodus that took place during the 60s and 70s of the last century, coupled with the current ageing population and falling birth rates, have resulted in a deep-rooted economic stagnation and an interminable dwindling of the population, driving many municipalities to critical population density thresholds, and leading the research community and the media to coin the phrase ‘demosthanasia’ (Cerdá, 2017; Burillo, Rubio and Burillo, 2019). This situation was brought to the screen in the film *El violín de piedra* (‘The Stone Violin’ by Emilio Ruiz Barrachina, 2015).

2. Methodology

The French writer Jean Giono once said that ‘to imagine is to choose’. Here, we invert the dictum and arbitrarily chose works of the imagination that travel in both directions: celluloid narratives that transcend the screen to become reality and lived realities which become cultural landmarks when they are brought to the screen – in short, the intersection of cinema, rural life, and depopulation. The criteria

are based on three systematic aspects: thematic (depopulation and rural emigration), synchrony (representation of the sociocultural and economic context of the moment), and diachrony (temporal evolution according to the adequacy of the established historical periods).

To capture a sufficiently wide perspective with regard to the origins and development of the topic six feature-length films were selected from various periods: *La aldea maldita* ('The Cursed Village') (1930, 1942), *Surcos* ('Furrows') (1951), *La piel quemada* ('Sunburn') (1967), *El turismo es un gran invento* ('Tourism is a Great Invention') (1967), *Flores de otro mundo* ('Flowers from Another World') (1999) and *El violín de piedra* ('The Stone Violin') (2015). The films were compared for events, likenesses, and differences in terms of plot, style, and themes. Each is of its time and while reflecting differences at both the narrative and formal levels, they also draw on a taxonomic pool recurrent in Spanish cinema. The range includes rural drama, neorealism depicting pre-democratic socio-political issues, a comedy set in the 'economic miracle' of the late Franco period, an existential retrospective on the effects of migration from the end of the twentieth century, and a blend of the humorous with more personal poetic and artistic expressions.

In each case a mirror is held up to the nature of rural life, creating and sustaining what has been termed the social imaginary:

The imaginary is a variegated repertoire of images shared by a society or social group, the space which holds the objectifications of the collective imagination. The imaginary comprises the representations, evidence and implicit normative assumptions which configure the group imagines the world, social relationships, the group itself, social identities, the collective goals, and aspirations and so on. (Abril, 2007, p. 62).

The films were analysed according to a social semiotic perspective which combined the systems in Verón (1987) and Rodrigo Alsina (1995) and identified discourse and extra-discourse variables. The latter category included technical and cast credits, a synopsis, source (original screenplay or adaptation from literary work), prizes and awards, and critical reception (Table 1).

Table 1. Discourse variables for cinematic analysis. Depopulation and the rural context

<i>Visual realisation and sound</i>	<i>Narrative and plot</i>	<i>Axiological elements</i>
<ul style="list-style-type: none"> * Spatial-temporal setting (representation of places in terms of location and historical time). * Use of photography, light, frames, and shots (visualisation of rural space). * Notable dialogue referencing aspects of the rural experience. * Sound effects and soundtrack (evocative power of the soundscape). 	<ul style="list-style-type: none"> * Film genre. * Characters: description of individual physical, sociological and psychological characteristics, plus relationships between them (lead and support roles). * Summary of plot and context of rural discourse in film: plot development and character arcs, conflicts, and key moments in narrative. * Elements in story representing the rural experience from denotative point of view (descriptive, what it is) and connotative (interpretative, what it represents). 	<p>Specific: Representation of sociocultural values of characters and their milieu:</p> <ul style="list-style-type: none"> * Deployment of rural stereotypes and tropes. * Deep-rooted values, traditions, habits, and customs. <p>General: Themes concerning the rural experience:</p> <ul style="list-style-type: none"> * Depopulation and ageing. * Individual and group identity. * Access to education and levels of education. * Lack of services and public investment. * Scarcity of socioeconomic-work opportunities. * Erosion of a way of life and sense of loss.

Source: Verón (1987) and Rodrigo Alsina (1995). Own elaboration

According to Morin (1970), writing about popular culture, the signification and cognitive function of a film is determined by theme, genre, aesthetics, and style, through the interplay between its semantic structure (the what: the signification of archetypes) and its representation of the everyday (the how: the formal dimension of communication). This is to say that 'certain forms can never be the vehicle of certain

meanings, in the same way that certain meanings can never embodied by certain forms' (Zunzunegui, 2005, p. 14). Nevertheless, it is not possible to identify a 'rural' subgenre of films. Cinema is by nature heterogeneous, iconoclastic, and eclectic. Underlying these films is the dichotomy of rural versus urban as a heterogeneous expression from the plot and contextual point of view (Gómez and Poyato, 2010).

It encompasses the political polemic of Luis Buñuel and his *Las Hurdes, tierra sin pan* (*Land Without Bread*) (1933), the absurdist humour of José Luis Cuerda's *Amanece, que no es poco* ('It's sunrise, which is no small thing') (1989) which defies classification, the meticulously observed existential work of Carla Simón in *Verano 1993* (*Summer 1993*) (2017), Jorge Sánchez-Cabezudo's tense thriller *La noche de los girasoles* (*The Night of the Sunflowers*) (2006), and Pedro Almodóvar's hilarious dissection of everyday life in La Mancha in *Volver* ('Coming home') (2006).

One of the Spanish directors who has had most influence on how rural life is portrayed on screen, Montxo Armendáriz, has distanced himself from any kind of deliberate rural aesthetic. In an interview with Heredero and Reviriego (2009) in 'Cahiers du Cinema' about his 1984 film *Tasio*, which follows the fortunes of a Navarrese coalman, he stated: 'I wasn't particularly going for a portrait of rural life. If I'd found a character of that ilk in another sphere – in a town or in a factory – I'd have been interested in just the same way' (p. 10-21). As Sánchez Navas (2012) points out:

not even the creators themselves ascribe to a notion of ruralist cinema; instead, they admit that the starting point of all cinema is about the eternal laws governing the story, which concern the narrative and the conflict of human beings with the environment and with each other. (p. 191-192)

A difficulty arises when it comes to delimiting the characteristics common to a film production, which compels us to focus not so much on the rural experience and its circumstances per se, as on the rural experience on film and specific representatives of this.

3. Results

3.1. From 1900 to 1960. The imaginary of the rural world, popular folklore, and socioeconomic reality

The urban population, defined as municipalities whose total number of inhabitants exceeds 10,000, accounted for 31.78% of the Spanish population in 1900. By the 1960s this had risen to 56.57% at the expense of rural communities. Expressed inversely, this means that at the start of the twentieth century over two-thirds of the population (68.22%) lived in the country, and that this proportion had declined to well under half (43.43%) within sixty years (Capel, 1967).

3.1.1. 'The Cursed Village' (1930-1942) and the popular imaginary of rural experience

This rural drama directed by Florián Rey, such was the success of the film when it was released in a silent version, that it was later remade as a talking picture. The two films are nevertheless identical visions of the same experience and cannot be considered as distinct entities. The Venice Film Festival awarded this latter version a Biennale Medal that year, and it also won the first prize awarded by the National Entertainment Union (Sindicato Nacional del Espectáculo), which had been set up the same year. The idea for *The Cursed Village* arose during filming scenes for the film *Los chicos de la escuela* ('The schoolboys') (1925) on location in Pedraza (Segovia). Florián Rey became fascinated by the vicissitudes of the town, which had drastically shrunk from 15,000 to just 500 inhabitants within a century and a half, because of the harsh climate which had repeatedly devastated crops and forced generation after generation to abandon their home. So appalled was he that he wrote the screenplay in just a week, which he managed to bring to the screen in 1930. It is considered by many to be his most successful and celebrated film (Sánchez Vidal, 1987). The first version of *The Cursed Village* was filmed on a budget of 22,000 pesetas provided by Florián Rey himself and Pedro Larrañaga. The scene of greatest impact is that of the villagers leaving in their carts, a scene later reproduced with greater means and in more detail in the 1942 version⁶ (Sánchez Vidal, 1987). The lead roles in the first version were played by Carmen Viance and Pedro Larrañaga, while the same roles were played by Florencia Bécquer and Julio Rey de las Heras in the 1942 remake.

⁶ The 1942 version managed to raise a budget of 1,050,000 pesetas.

The silent version opens with the intertitle ‘Over the ruins of Castilla’ and the words: ‘They say that the heavens wished to punish the small Castilian village. For this reason, the earth denied the village its fruit. On seeing the bell tower, everybody made the sign of the cross’. In addition to foregrounding various aspects of rural life, the film presents the viewer with a familiar situation of the time, which had been dealt with in melodramatic fashion in other films that focused particularly on elements of local tradition and lore. Here the treatment is emblematic. The theme of female sexual honour is represented in the role of the wife who abandons her husband to go to the town and is forced to ‘corrupt herself’ in prostitution to survive. It also one of the few films, along with *La bodega* (*Wine Cellars*) (Benito Perojo, 1929) to talk frankly about the social precariousness of life in rural Spain. In its representation of the communion with nature, it is reminiscent of Murnau, but also bears comparison with the contemporary Soviet cinema and its denunciation of the Tsarist exploitation of the peasantry (Gubern, 2007).

Table 2. Discourse variables for cinematic analysis, *The Cursed Village*

<i>The Cursed Village</i> (1930 and 1942)	VISUAL AND SOUND ASPECTS
	<p>Narrative space: Luján. Locations: Pedraza de la Sierra, Ayllón and Sepúlveda, Segovia (1930) and Salamanca (1942). Historical time: 30s s. XX (1930) and year 1900 (1942). Image: Black and white. Photography: Expressionist influence and Soviet cinema on the view of nature. Periodic labeling (30). Historicist labeling (1942). Dialogues and labels: Featured in this paper. Silent movie (1930) and talking picture (1942). BSO Extradiegetic: Piano folk evocation and classical setting (30). Diegetic: Popular carol orchestrated with dances at the beginning (1942).</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Drama (1930) and melodrama (1942). Character: Juan Castilla, his wife Acacia, and his blind father. ‘Tío’ Lucas, the boss or patron of the clientelist social structure, (1930) is replaced by the figure of the moneylender (1942), but this character has no influence on the plot. The first version presents Juan as a simple peasant labourer, tilling the land; in the second, by contrast, he is comfortably off with his own land, and has acquired a brother for the purpose of introducing the theme of the ‘two Spains’. In the first version, when Acacia escapes to town, she is forced into prostitution, while in the second, complying with the mores of the time, she finds work in the cabaret, and seeks the obligatory forgiveness in the final reel. Summary plot and context: Years of poor harvests have brought misery to the village of Luján in the region of Castilla. When the harvest is once again destroyed by storms, the villagers have no choice but to head to the town in search of better living conditions. Juan Castilla has a dispute for which ‘tío’ Lucas goes to jail, thus precipitating Acacia’s decision to abandon her husband and son and seek a better life in town. Rural elements in story: The hunger and misery suffered by the villagers, powerfully evoked in the first version by the scene of the cat seen disappearing into its lair, from which only bones are later taken out, are rendered in the second with saccharine whimsy and little naturalism.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: Hunger (context) and honour (plot). Religion and family. Urban perversion (1930). Precariousness and agricultural exploitation (1930). Morality and traditional and national-catholic content (1942). Ethnographic and social dimension (1930). General: Individual and group identity, scarcity of socioeconomic-work opportunities, erosion of a way of life and sense of loss.</p>

Own elaboration

Under the shadow of Catholic Nationalism, the 1942 version gave a very different treatment to the story than its predecessor, turning up the melodrama and toning down the social and ethnographic commentary. The most significant change, occasioned by the intervening Civil War, is the relocation of the setting to 1900. The original was contemporaneous with the events it depicted on the cusp of the Second Republic in the last days of a failing monarchy. In the 1942 version, the opening credits clearly signal that the film is a «Cinematographic poem», and an intertitle locates the events in the past: ‘When towns became disconnected from the fields that provided for them, they left the labourer unprotected in his struggle against the unfavourable elements. In consequence, abandoned villages, mass emigration and

rural flight drained the lifeblood of the nation'. And for there to be no doubt that what audiences were about to see was definitively in the past, the typeface was gothic throughout. The result is that the film takes on a folkloric, almost archaeological tone, which greatly distances it from the 1930 version, which had a contemporary and lived feel to it, and certainly did not shy away from using a standard news typeface of the time. Worse, the film is divided into four sections, each one a kind of miniature painting of some bygone era with the players window-dressed in outmoded costumes from the province of Segovia. The acting is unrelentingly wooden, punctuated with starchy mannerisms that give the film an archaic and papier-mâché aesthetic (Zumalde Arregui, 1999).

Stylistically, the first version is more suggestive and stripped down, with fewer characters and shot sequences, whereas the second is characterised by a religiosity that displaces the human dimension. Thus, for example, Acacia's return and repentance is heavily prefigured by church bells and the villagers preparing for the patron saint's day celebrations.

3.1.2. 'Furrows' (1951): the gulf between town and country

This 1951 film, directed by José Antonio Nieves Conde from a screenplay by Gonzalo Torrente Ballester (adapted from Eugenio Montes and Natividad Zaro's original script), was considered by contemporary critics as being in the style of Italian neorealism (albeit muted by Francoist restrictions), as can be seen in various scenes styled according to the escapist cinema then prevailing in Hollywood. The film can be interpreted in various ways (post-war cinema, neorealist drama, political commentary, or even semi-documentary), but what is undeniable is that 'Furrows is a slice of living Spanish history' (Castiello, 2010).

Nieves Conde's direction received substantial critical acclaim, and the film won prizes in four categories in the 7th Cinema Writers Circle (best film, best director, best supporting actor, and best supporting actress). The National Entertainment Union also awarded it third prize in the Best Film category, and it was declared of 'National Interest' by the Ministry for Information and Tourism, giving it the right to maximum protection. García Escudero, a Falangist who was named Director General of Cinema and Theatre the same year as the film's release, certainly saw in it welcome signs of a change of direction by a previously stagnant industry with regard to patriotic, folkloric, and popular themes.

The film has been likened to other neorealist Spanish films of the time, particularly those where the Regenerationist and naturalist influence⁷ are more visible than the neorealism, such as *Welcome, Mr Marshall!* (*Bienvenido, Mister Marshall!*) by Luis García Berlanga. In both there are glimpses of post-war Italian cinema, but more significantly each is infused with a disenchanting Falangist ideology – indeed, Berlanga's immortal work, produced by Uninci had various Falangists in the production team, such as the brothers Joaquín and Alberto Reig (Sojo Gil, 2011, p. 104).

According to the director, the film was conceived of as an updated continuation of the first version of *The Cursed Village* (1930). A pall of pessimism and fatalism certainly hangs over the film, and for all its neorealist aesthetic, there is a strong vein of Cervantes running throughout (Sojo Gil, 2011).

The context in which the film was produced is fundamental. The project started life as an idea by Eugenio Montes (one of the founders of the Falange Española), among the hardcore Falangists known as the 'old shirts' (on the left wing of the Falange movement), who felt betrayed by Franco's 'New Spain'. They felt that the new regime had done nothing to tackle the old problems, which had become more acute in some towns because of the steady influx from the country that had intensified in the post-war period in Spain and across Europe. Unfortunately for the ruling party, these recalcitrant Falangists had a social conscience (Del Molino, 2016). Throughout the 50s, José Antonio Nieves Conde's films are rooted in a Falangist disconformity with the socio-political ideology of the Francoist regime, which they believed had betrayed the social spirit of the national syndicalist movement's founding father, José Antonio Primo de Rivera. This old guard clung on to an 'idea of Falangism which was social, renewing and to some degree left-wing ... which between 1945 and 1955 energetically aired ideas and opinions that often bordered on the limits of official censorship' (Mainer, 1972). Nieves Conde aimed to bring a new aesthetic to Spanish cinema by bringing it into touch with everyday reality. But beyond that, his films were saturated with clear ideological intentions and an advocacy of the 'National Catholic Movement' and the drift towards rapprochement with the

7 To name among others: *That Happy Couple* (*Esa pareja feliz*, 1951), co-directed by Juan Antonio Bardem and Luis García Berlanga, and *The Last Horse* (*El último caballo*, 1950) by Edgar Neville.

Western powers (Marcos, 2015). *Furrows* is a work of moral censure (Gubern, 2007). In fact, the message is drilled home in the very first frames of the film projecting Montes' original text:

The attractions of the city reach even the most distant villages, inviting the labourers in the fields to desert their lands with promises of easy riches. Beguiled by metropolitan temptations they are ill prepared to resist or control, these country folk, who have lost the [simplicity of] the countryside and have not learned [the complexities of] civilised life, are rootless trees, shards among the slums which life destroys and corrupts. This constitutes the most painful problem of our times ... This is not symbolic, but unfortunately an all too frequent event today.

Table 3. Discourse variables for cinematic analysis, *Furrows*

<i>Furrows</i>	VISUAL AND SOUND ASPECTS
	<p>Narrative space: The film reflects the growth of Madrid in the 1950s, which saw a housing development belt around the city to accommodate those working in the outskirts.</p> <p>Locations: The main locations for the film were the then deprived Madrid districts of Lavapiés, Ventas, Cuatro Caminos, and other deprived areas in the margins of the city.</p> <p>Historical time: 1950s.</p> <p>Image: Black and white.</p> <p>Photography: In terms of its treatment of city life, it has certain echoes of American film noir, focusing on those on the margins of society.</p> <p>Dialogues: Featured in this paper.</p> <p>BSO Extradiegetic: Classical setting. Diegetic: City ambient sound: traffic, railway station, subway. Artists who perform popular songs from southern Spain perform at the neighborhood party held at the La Latina theatre.</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Melodrama and neorealism (albeit muted by Francoist restrictions).</p> <p>Character: Manuel, the father, finds work at the foundry, but is unable to keep up with the demands of the job, for which his previous life in the fields has not prepared him. Under the influence of his cousin Pili, Pepe, the eldest of the three children, is drawn into the shady world of the black market, and into the orbit of Pili's boyfriend, the gang leader who is known as El Mellao. Manolo, the youngest son, finds work as a delivery boy, but later must be taken in by a family of puppeteers. And lastly, Tonia, the younger sister, begins working as a maid, but it soon transpires that she has been entrapped for the designs of El Chamberlain, 'the boss', owner of the neighbourhood bar and kingpin at the centre of all criminal activity on his patch.</p> <p>Summary plot and context: <i>Furrows</i> follows the fortunes of a poor family from the country who leave their village in search of a better life in post-war Madrid. In this regard it is a familiar story – an attempt to escape from rural poverty to a brighter prospect offered by capitalist industrialisation, which turns out to be implacable, soul-destroying, and full of insurmountable hurdles.</p> <p>Rural elements in story: <i>Furrows</i> driving home the message that the city corrupts; in the struggle to survive, there is little choice but to prostitute oneself and engage in delinquency. The situation, the film argues, might be bad, but the solution does not lie in displacements of whole rural populations.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: The catalogue of social ills, both implicitly evoked and explicitly depicted in <i>Furrows</i>, includes: the precariousness of housing, evinced in the scenes set in the communal patio; the queues at the employment office and the obstacles the protagonists must overcome to find work; the world of scamming, the black market, unlicensed peddling and semi-organised crime, with its promise of easy money for those with time on their hands; the hunger and misery of the destitute waiting for food at the gates of the barracks, accentuated by the shots of buildings in ruins; the unremitting backdrop of dirty, ragged children playing in the street; and the sexual exploitation of women (Marcos, 2015, p. 209). Family, religion, honour, and integrity.</p> <p>General: Individual and group identity, scarcity of socioeconomic-work opportunities, erosion of a way of life and sense of loss.</p>

Own elaboration

A film that focuses on the phenomenon of the 'chabolas' or unregulated self-built slum dwellings⁸ is *Near the City (Cerca de la ciudad, 1952)* by Luis Lucia, the premise of which is that the city is a hostile

⁸ The notion of 'Greater Madrid' began to take shape in 1950 when municipalities such as Aravaca, Barajas, Canillas, los Carabancheles, Hortaleza, Vallecas, Vicálvaro and so on were absorbed into the city. The previous Madrid suburbs beyond the Paseo de Ronda (Tetuán,

environment for immigrants from outlying rural areas, and it is better not to set foot there. In the film *Furrows*, traditional Spanish values (family, religion, honour, and integrity), which had formed the ideological bedrock of Falangism (which fetishized agrarian society), were eroded by the city (Silvestre Rodríguez and Serrano Asenjo, 2012). This can be seen in the official poster, the design of which consists of two parts. In the bottom half, we can see the Pérez family, backs to the viewer, walking over a neatly ploughed field towards the city in the distance, carrying with them all their possessions. In the top half is the representation of a high-rise city, over which presides, like a looming King Kong or Godzilla, a gangster-like figure in a suit, his face shaded by a trilby, stretching his right hand towards the unsuspecting labourers, who are about to be irreversibly engulfed by the city, swallowed by the menacing giant before them, and – should they survive – spat back to the countryside from which they came (Sojo Gil, 2011). The poster caused the director a lot of problems, as it gave explicit shape to what until then had been invisible.

The moral custodians of the time launched a virulent backlash against the film. The church, censors, and most conservative elements within the Francoist regime were alarmed by the potentially subversive threat of the film's premise, suggesting that economic inertia creates the conditions for the flourishing of fraudsters, black marketers, kept women, and women who smoke, frequent bars, and live with men, or have sexual relations with men, outside the bonds of matrimony. Despite the revolutionary focus of the film, certain foregrounded themes and aspects reflect the era, and sharply contrast with the far more conservative 'rural' values. A reference to religious practices as antiquated is given to the eldest child, Pepe, when he returns home to find the family reciting the rosary, saying, 'I've told you before, these things are fine for the village'.

3.2. *From 1960 to 1981. Intensification of migration from the country to the town*

On 21 July 1959, the stabilisation plan was approved, which gave way to the well-known 'Spanish Miracle', making way for the technocrats who liberalised the economy by replacing military uniforms with suits and ties, and Millán Astray with López Rodó (Izquierdo Vallina, 2016, p. 16). A situation that split the Spanish countryside in two. It was what del Molino (2016, p. 61) calls 'the great trauma', which meant that between 1950 and 1960, three Spanish provinces (Madrid, Barcelona, and Vizcaya) registered the highest population growth rates in their history, like many provincial capitals, while the countryside emptied and 14 provinces were plunged into a sociodemographic decline, from which they still suffer the consequences. The Spanish miracle was only for the cities linked to industrialisation and the development of 'sun and sand' tourism.

3.2.1. *'Sunburn' (1967): eternal dichotomies between rural and tourist areas, immigration and emigration, development, and underdevelopment*

This 1967 film, directed by Josep Maria Forn, won the 'Espiga de Plata' ('Silver Ear' – ear of corn, wheat etc) the following year at the 13th Valladolid International Cinema Week, while the actor playing the leading role won the Silver Fotogramas award in 1967, and the Cinema Writers Circle awarded it the prize for Best Screenplay and Best Actress.

The film met with various problems from the board of censors. The most significant of these, according to Forn, was the scripting of expressions in Catalan, something which had not been attempted before under the Francoist dictatorship. Another was the scene in which the protagonist, who has established himself in Lloret del Mar in advance of his family, beds a tourist. Although careful camera angles ensure the woman's naked body is not seen, the censors nevertheless decided that 'the audience's mind gets to work and knows she is naked' (Agencia EFE, 2009).

According to the director himself, inspiration from the film came to him when he was taking a walk in the coastal resort of Roses and saw piles and piles of bricks. Aside from the visual impact of the urban transformation of the Costa Brava which the bricks represented, he was struck by a group of labourers working under a burning sun (Quintana, 2017). The dichotomies referenced in the heading for this section are brought into play by three archetypal figures which were conspicuous during the so-called 'Spanish Miracle' of the Franco dictatorship: the immigrant, the tourist, and the resident. In one scene, during

Prosperidad, Guindalera, Vallecas, etc.) had a network of roads, sewerage, and water supply, albeit not always as far as individual houses (Otero Carvajal, 2010).

a work-break, the main character, José, picks up a guitar and begins to strum a tune from his land in the south. As he sings, the film intersperses a silent flashback sequence showing José's desperation to maintain his family as the landowner picks out the lucky few to work in the fields. The scenes set in the village and on the train as the family travels to Catalonia contrast the entrenched traditions which constrict life in the country with the freedoms enjoyed by the tourists through their affluence and relaxed attitudes.

Table 4. Discourse variables for cinematic analysis, *La piel quemada* (Sunburn)

<i>Sunburn</i>	VISUAL AND SOUND ASPECTS
	<p>Narrative space: Costa Brava. Locations: Lloret de Mar (Girona-Catalonia) and Guadix (Granada-Andalusia). Historical time: The action all takes place within 24-hour period, within which the director conjures a portrait of 60s Spain. Image: Black and white. Photography: The images contrast the poverty and marginality of the countryside with the developmentalism of the coast in an almost documentary representation. Dialogues: Featured in this paper. BSO Diegetic: In the tavern scene, in which José is celebrating the imminent arrival of his family from Guadix (Granada) with some workmates, the group begins to sing and dance to José's guitar. And begins to strum a tune from his land in the south.</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Social drama and neorealism. Character: José (the main character) his wife, Juana, their children, and his brother – and construction co-workers. The comparison between the tourists and the southern 'Spanish male' is foregrounded throughout the film. The northern Europeans, in their trunks and bikinis, are otherworldly – fair haired, statuesque and toned. The Spanish residents are divided into the Catalan bourgeoisie (superior and contemptuous) and the migrant workforce from the south (impoverished and gauche). Summary plot and context: The circumstances forcing the family to make the trek – journeying from rural Andalusia to Lloret del Mar on the Costa Brava to join the head of the family, who has found work as a labourer on a building project for the burgeoning tourist industry – are given in a series of flashbacks, which also make a contrast between the two ways of life. Rural elements in story: The feature film centres on the personal stories of internal rural migrants making their way to Catalonia in the hope of finding 'paradise' (in an almost literal sense given the lack of freedom in their place of origin). The issues had a contemporary resonance, analysing the impact of rural depopulation, and questioning the Fordist model of 'sun and sand' tourism and its territorial consequences.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: The explicit – and at times implicit and symbolic – depiction of the exploitation suffered by the family, both as agricultural labourers under the regime of the local bosses in their home village, and as migrant workers by the part the Catalan bourgeoisie on the building site. Other issues raised by the film include the superior attitude of the well-off Catalonia residents towards the newcomers from other parts of Spain, the antagonism towards the Catalan language as a symbol of identity and cultural manifestation, sexual repression, desire, and the struggle to make a better life for oneself. General: Individual and group identity. Scarcity of socioeconomic-work opportunities. Erosion of a way of life and sense of loss.</p>

Own elaboration

This conflict comes to a head in the tavern scene, in which José is celebrating the imminent arrival of his family from Guadix (Granada) with some workmates. The group begins to sing and dance to José's guitar, and as the volume increases, they are reprimanded by a local demanding in Catalan that they stop and receiving the response that they cannot understand him. The confrontation inevitably escalates, and the migrants are subjected to hatespeech: 'charnegos', 'mursianos' (perjoratives directed at economic migrants by Catalans), and 'Go back home'. When the instigators depart, Andrés, José's workmate, addresses the waiter and owner of the bar:

Antonio, you know me. You're Catalan and you know what I think. That's why don't like it when some self-important prats come here and call me 'charnego'.

To which Antonio replies:

Yeah, I know. You know what we call them round here? ‘Gamarusos’.⁹ Because they think that just because they’ve got a bit of cash to flash they own the world.

Andrés continues:

It isn’t right, you know. With all their talk about ‘If only Catalonia, if only...’

At this point José puts an arm around his neck and cuts him short:

Leave it, don’t keep on about it, just leave off Catalans and all that crap. It’s bad enough having to find some way to feed yourself like we do. And I’d rather have those arrogant berks who at least do a week’s work than the ones we’ve got where I come from. All prim and proper and boy can they talk, but they won’t lift a finger. You’re dying of hunger and they say, ‘Peace, my friend’.

This is undoubtedly a clear declaration of intent by the lead character. A similar scene occurs on the arrival of José wife, Juana, with their children and his brother. As they get their bearings at the Lloret del Mar bus station, some residents sitting at a restaurant terrace across the road look on disapprovingly and exchange the remarks below (originally in the Catalan vernacular):

Look the population of Lloret has just gone up again. There’s no room for any more And these are the sort that stay because they’re grasping.

And their children turn out more pro-Catalonia than you (the waiter interjects).

No way. Nobody’s more pro-Catalonia than me.

They’re like snails, carrying all they own on their backs (says another person at the table).

3.2.2. ‘Tourism is a great invention’ (1967): applying the principles of tourism to the rural sphere as a development strategy for subsistence

El Turismo es un gran invento is typical of the ‘españolada’ supra-genre – films, including musical and broad comedies, based on clichéd portraits of national stereotypes. Directed by Pedro Lazaga and released in 1967, it offers a far less critical or nuanced view of the Spanish miracle than *La piel quemada*. Instead, it represents a direct and explicit reflection of the prevailing attitudes to the role of tourism in Spain in the 60s (Gómez Alonso, 2006). Despite its marked success at the box-office (Crumbaugh, 2007, p. 147), it has been accused by Peris Llorca (2007, p. 363) of being ‘a work of Francoist propaganda’. What is certain is that it has mainstream appeal, and that its plot shows the determined attempt of the political authorities in a small town to capitalise on the growing tourism industry and so improve the economy and the country’s image abroad.

The inexhaustibly upbeat chorus chirrup in the jaunty tune of a song in film say ‘tourism is an exciting way to learn ... Forget about your problems!’ A voice-over then takes up the theme: ‘Tourism, tourism, tourism! A magical word which today is on everybody’s lips, but which yesterday, despite being in the dictionary, nobody knew what it meant.’

The prologue essentially takes the form of a public information newsreel, and like its real-life counterpart, its purpose is effectively to crow an uncritical paean to the regime and its development project that is transforming the physiognomy of the Spanish coastline. The film then switches to a small rural town in the outskirts of Moncayo which is seeing its youth inexorably ebbing away to find work in Zaragoza. The comical and excitable mayor, Benito Requejo, played by Paco Martínez Soria, describes the alarming situation in the following terms: ‘We are forgotten, and what’s worse, we’re left behind. What we must do is change everything. Get up to date and build the Costa de Valdemorillo here.’

The fiction of the personal experience of the mayor and the municipal secretary challenges the audience in a kind of national self-reference. That is to say, the activity of being a tourist acquires a symbolic dimension of collective self-affirmation which provides the key to interpret the significance of the transformations taking place and the possibilities opening to all inhabitants of the country (Crumbaugh, 2007).

In another scene, for example, the mayor gives his young niece a present of a bikini, which she looks at in wonder as an item that is still alien to the rural life that she knows. The resolution finally arrives when the townspeople read the declarations of the minister for Information and Tourism in the newspaper: ‘Let no corner of Spain fail to become a tourist zone for the whole world to admire’. In the end the political authorities contrive to rescue the situation and satisfy the modernising desires by conferring a

9 Catalan: boorish and uncouth.

Parador Nacional (state-sponsored hotel) upon the town. The patriarchal and repressive nature of the Franco regime is thus underlined, something which some authors consider to be the cause of a psychic negotiation involving a ‘Pact of forgetting’ during the transition (Vilarós, 2002, p. 198).

Table 5. Discourse variables for cinematic analysis, *Tourism is a great invention*

<i>Tourism is a great invention</i>	VISUAL AND SOUND ASPECTS
	<p>Narrative space: Valdemorillo, a small rural town (fictional) in the outskirts of Moncayo (Zaragoza-Aragón) and the Costa del Sol.</p> <p>Locations: Valdemoro (Madrid) and Torremolinos (Málaga).</p> <p>Historical time: 1960s.</p> <p>Image: Colour.</p> <p>Photography: The harshness of the rural landscape of ochre fields and stone houses contrasts with the brightness of the coastline, its hotels, and beaches.</p> <p>Dialogues: Featured in this paper.</p> <p>BSO Extradiegetic: The film opens with shots of crowded beaches, parasols, hotels, and apartment buildings to the jaunty tune of a song titled <i>I like holidaying abroad</i> in a sub-Sesame Street style.</p> <p>Diegetic: In the opening celebrations of the Parador Nacional (a state-sponsored hotel) there is no lack of local folklore as a metaphor for the necessary coexistence between traditional local cultural values, heritage resources, and their tourist commercialisation.</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Broad comedies.</p> <p>Character: Benito Requejo is the mayor and Basilio is his secretary. The metatouristic component of the cinematic discourse considers tourism as a ‘representation’, the ‘veracity’ of which must be corroborated by the two lead characters through a trip to Torremolinos on the Costa del Sol.</p> <p>Summary plot and context: After a vacation to a seaside resort, a Spanish mayor attempts to modify his small rural town for tourists to make money.</p> <p>Rural elements in story: The film is an allegory of the dichotomy of the <i>two Spains</i>, but rather than political or ideological divisions, it tackles socio-economic and geographical schisms – between coastal resorts during transformation, opening-up and development thanks to the injection of cash from abroad, and the traditionalist rural backwaters which want to climb aboard the gravy train. The underlying physical and cultural deprivation plaguing the countryside is conveniently toned down and aestheticized.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: The film then switches to a small rural town in the outskirts of Moncayo which is seeing its youth inexorably ebbing away to find work in Zaragoza. The political power uses tourism as the factor that guarantees social modernisation and economic progress in rural areas, preserving identity traits. Deployment of rural stereotypes and tropes.</p> <p>General: Depopulation and ageing, individual and group identity, lack of services and public investment, scarcity of socioeconomic-work opportunities and erosion of a way of life and sense of loss.</p>

Own elaboration

3.3. From 1981 to the present

In this period the tendency to rural depopulation has deepened, albeit at a more moderate and decelerated rate, although unlike the previous period, it has been affected by aging and low population replacement rates (births). To these effects can be added those of the economic crisis and the increase in unemployment, which have likely contributed to a reduction in migration over medium to long distances, and a policy of redistribution, deriving from an increase in decentralisation, along with rising prices in the urban property market and a reduction in the availability of rented accommodation (Silvestre, 2010). These factors have contributed to changes in the directionality of migration, facilitated by return migration, suburbanisation, and changes in the profile of the migrant in terms of a higher level of education and a greater sensitivity to the factors contributing to the quality of life. This in turn has given rise to the phenomenon of counter-urbanisation, which became established in Spain in the second half of the 1980s and which became institutionalised with the application for, and development of, the LEADER Community Initiative. Active recovery programmes began to appear under the auspices of sectorial and territorial perspectives, such as *Abraza La Tierra (Cling to the Earth)*, which over time began to diversify and spread around the country, in response to solid proactive and integrative policies responding to the challenges

of a changing population, as mandated by the EU (Hortelano Mínguez, 2008, p. 84). Nevertheless, such measures are not in themselves sufficient. There is a need for services, multilevel governance, and strategic investment and action (in the medium and long term). Likewise, a comprehensive and integrated vision, where all stakeholders participate in providing new solutions to old problems, from meeting the real needs of each territory and geographical context, to overcoming the old ways of doing politics in favour of a more comprehensive approach (Esparcia, Martínez-Puche and Querol, 2020).

3.3.1. *'Flowers from another world' (1999): restoring the female population and masculinity in rural Spain against a backdrop of globalised migration*

This film directed by Icíar Bollaín, who also shares screenwriting credits with Julio Llamazares, throws up several points of interest. First, it is the only one of the five selected here directed by a woman, and hence it represents a different focus on a phenomenon which has thus far been treated from a predominantly male perspective.¹⁰

Nevertheless, although her films tell stories about women, according to Scholz (2005), the director does not wish her films to be interpreted as 'feminist cinema'. In the words of Fernández Santos (1996), Bollaín is 'a genuine film-maker, who makes films that are uncomplicated but not simplistic, easy to watch, but difficult to see into'. Her dramatisation, filmed with a kind of documentary realism, is characterised by a formal simplicity and a stripped-down aesthetic, so as to present scenes which 'look almost as if they filmed from everyday life' (Leinen, 2009, p. 92). *Flowers from another world* was nominated for best screenplay and revelation actor at the Goya awards and award for best film at the Cannes Critics' Week in 1999.

The tale, as the director recounts (Leinen, 2009), took its inspiration from two distinct but connected real-life events. The first of these was the so-called 'Caravanas de mujeres' (caravans of women) and the singles parties organised by various territories to boost the population, thus emulating the cinematic imaginary of the popular 1951 western *Westward the Women*. The original, or at least the one which captured a great deal of media attention, was organised in the municipal district of Plan in 1985 (Marín, 1985), and was successful in its aims, despite today being criticised for a perceived 'commodification' of women. The second was the plight of immigrant women of various nationalities who took Spanish husbands to legalise their undocumented status and create a better future for themselves in an unfamiliar and not always welcoming environment. This role is embodied in the character of Patricia, from the Dominican Republic, an honest and self-sacrificing housewife and mother of a young son and daughter who she wants to bring to Spain. She is opposed in this enterprise by Gregoria, her widowed mother-in-law-to-be and stoutly intolerant matriarch, but ultimately wins her over, along with the love of a 'good man' in Damián.

Villacadima, on the outskirts of Santa Eulalia (fictitious village), is a completely abandoned ghost village whose crumbling houses serve as the backdrop to the scene in which Alfonso takes Marirrosi for a walk. Marirrosi is a nurse with her own income from the Basque Country, and mother of a teenage boy. As Alfonso acts as an impromptu guide, she admits that 'so much space and so much silence is scary', to which he replies, 'it's scary because it's dead'. That, says Marirrosi, is also how she feels in the town of Santa Eulalia, while Alfonso asserts that it is where he feels most at home, adding: 'I don't think I would be capable of returning to a city'. This gap, quite apart from the physical and emotional distance, is the reason why this romance is ultimately unable to overcome the obstacles in its path. Marirrosi is not prepared to swap her anodyne and solitary life in Bilbao for the country, Alfonso, for his part, is unable to tear himself away from his roots and his beloved greenhouse.

The title of the film itself – *Flowers from Another World* – encapsulates an apt metaphor for those who would set down roots in a new land. This is foregrounded in the dialogue between Alfonso and Marirrosi on the topic of growing exotic orchids. She asks, 'Do you think they'll grow here?' to which he replies as he kisses her tenderly: 'With care, everything grows'. However, the town's womenfolk meet the newcomers with undisguised hostility, and give full vent to prejudice:

We'll see how long that one lasts here (...) they're all looking for the same thing (...). Papers and money, and when they've got them, they're off. (...) That one with Carmelo was here this morning.

10 Only three women had previously directed films widely recognised as 'rural': Margarita Alexandre (*La gata (The Cat)*, 1956), Ana Mariscal (*El camino (The path)*, 1963) and Pilar Miró (*The Crime of Cuenca (El crimen de Cuenca)*, 1980).

What must the house be like! Let's hear it, how did her mother bring her up? To be with men, for sure. I don't want to see that girl round here again!

The menfolk, for their part display a fossilised masculinity which objectifies women as purely sexual beings at the service of procreation. Three old men evaluate the new arrivals as if they were livestock: 'What teeth! What teeth! ... What lips!' Although very different in age, character, and background, Alfonso and the unsophisticated Damián represent a more sensitive, tolerant, and understanding male archetype. By contrast, the middle-aged Carmelo is a violent man who has made his fortune in the construction industry and engages in sexual tourism in the Caribbean. He intends to make a possession of the indomitable, independent, and sensual Milady, whom he has met on one of his trips, without realising that the weaker partner in the one-sided relationship is himself. The bar is the space where people come together and spend their free time away from the daily routine, the men watching the televised football matches and the occasional porn film.

Table 6. Discourse variables for cinematic analysis, *Flowers from another world*

<i>Flowers from another world</i>	VISUAL AND SOUND ASPECTS
	<p>Narrative space: The story takes place in the fictitious village of Santa Eulalia, a bastion of traditional, Catholic Spain.</p> <p>Locations: The film was shot on location in the municipalities of Cantalojas, Condemios de Arriba, Jadraque and Villacadima (Guadalajara).</p> <p>Historical time: 1990s.</p> <p>Image: Colour.</p> <p>Photography: The panoramic outdoor shots of the town, surrounded by a vast plateau in shades of green and ochre, evoke an unfathomable immensity, depict the agricultural labours, and show the passage of time in the seasonal changes. They provide a contrast to the closed, hermetic spaces of the interiors. Some houses such as Damian's, are modest and austere, although homely; others, like Carmelo's, are more recent, and are ostentatious, but gloomy and impersonal.</p> <p>Dialogues: Featured in this paper.</p> <p>BSO: The music, both diegetic and non-diegetic, is also essential for creating moods and narrative contrasts: the pasodoble performed by the village band to welcome the single women as their bus arrives; the Caribbean rhythms playing on the car radio, and as the soundtrack when the young Cuban Milady flees rural oppression and Carmelo's possessiveness; the techno of the Valencia disco; and the evocative instrumental background music as the camera pans over the natural landscapes. There is a special, symbolic significance to the song 'Contaminate me, mix yourself with me' which the local band perform at the feast day dance, an invitation to meet the other and so reconfigure the self.</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Social drama.</p> <p>Character: Patricia, a Dominican, is looking for a home and economic security that her illegal immigrant situation does not allow her to achieve in Madrid. Milady, a twenty-year-old Cuban, dreams of traveling the world. Marirrosi, a woman from Bilbao with a home and a job, lives in complete loneliness, a loneliness like the one shared by Alfonso, Damián, and Carmelo, residents of Santa Eulalia, a town without marriageable women or future.</p> <p>Summary plot and context: A rural town where single men abound and women are lacking decides to tackle the problem of depopulation. Thanks to a party organized by the town's bachelors, three men and three women meet each other, and a bittersweet story of sometimes impossible coexistence begins.</p> <p>Rural elements in story: <i>Flowers from another world</i> sheds a light on cultural, socio-economic, and gender differences between countries, but also the differences between urban and rural Spaniards.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: Prejudices and intolerance towards immigrants in rural areas, but the family is presented as the nucleus of interracial negotiation and potential creation of a more tolerant and multi-ethnic society. Religion and the most conservative customs, however, continue to appear as the definitive feature that culminates the inclusion and acceptance of normality. The old dichotomy between city and country is updated and enriched by the confrontation between national and ethnic stereotypes, male and female loneliness, emigration, xenophobia, sexism, and family models in rural areas.</p> <p>General: Depopulation and ageing, individual and group identity, access to education and levels of education, scarcity of socioeconomic-work opportunities and erosion of a way of life and sense of loss.</p>

Own elaboration

3.3.2. 'The Stone Violin' (2015): a moribund empty town full of memories

This film, directed by the writer and journalist Emilio Ruiz Barrachina, is something of a curiosity and quite unique among the films making up this paper. Its eclecticism, form and narrative structure mark it out from the others, although its audio-visual quality and its representation of a valid historical, socio-economic, geographical, and cultural context more than justify its inclusion.

It specifically focuses on the theme that certain authors have dubbed, in the same vein as the term 'ethnocide', 'demothanasia', defined as:

A process that both political actions, direct or indirect, and omission of them, is causing the slow and silent disappearance of the population of a territory that migrates and leaves the area without generational relief and with everything that it means, such as disappearance of a millenary culture. It is an induced rather than a violent death. (Cerdá, 2017, p. 35-36; Burillo *et al.*, 2019).

Table 7. Discourse variables for cinematic analysis, *The Stone Violin*

<i>The Stone Violin</i>	VISUAL AND SOUND ASPECTS
	<p>Narrative space: Ojos Negros is a village in the fiction without population.</p> <p>Locations: Buitrago, Braojos, Horcajuelo de la Sierra, La Acebeda and La Hiruela which are in the Sierra Norte to the north of Madrid. It was supported with a grant from the community association, Mancomunidad Valle Norte del Lozoya, and the was aided by the participation of the Community of Madrid's Office for Cultural Promotion.</p> <p>Historical time: Present but reminiscent of the past and timeless evocation.</p> <p>Image: Colour and old black and white photos at the beginning of the film.</p> <p>Photography: The images cut to sweeping panoramas of wild mountains and forested landscapes covered in snow. These contrast with the severe and inhospitable austerity of houses whose walls are crumbling into ruins, the shell of a dilapidated car, the wheels long since gone, washed up in an abandoned courtyard overrun by weeds, and the cold, lonely street of a completely deserted village.</p> <p>Dialogues: Featured in this paper.</p> <p>Soundtrack Extradiegetic: The piano accompanies the photographs at the beginning, conveying melancholy, which increases with the orchestra in the subsequent minutes of general shots of snowy nature.</p> <p>Diegetic: A group of musicians performs lively popular music, while a deceased is taken for a walk and greets those present. The music performed by the enigmatic character of the violinist accompanies the elderly protagonist in the most exciting moments to reinforce the dying loneliness.</p>
	NARRATIVE AND PLOT ASPECTS
	<p>Film genre: Drama and comedy.</p> <p>Character: Angel, the main character, talks with the silent and young spectre of his deceased wife. The violinist, clad in a black gabardine, is another enigmatic presence among the group of allegorical characters some sinister, like the mayor, a sexual predator, others ridiculous and parodic, like decamped city dwellers playing at being country folk, whose passage is ill-adapted and short-lived – and the bartender, the tenor, the man in the beret, and the 'Latin Americans'.</p> <p>Summary plot and context: An emotional story about empty Spain. The last inhabitant of a town lives with his memories and his dead just now when a strange violinist comes to take him to the grave. While the most important moments of this place, which will die together with its protagonist, are coming to life in a story of love, execution, and secrets that will never see the light of day. Bitter comedy about rural depopulation and its consequences for a society that is forgetting its essence.</p> <p>Rural elements in story: The concept of the rural does not draw on clichés which identify it as an atavistic, unsophisticated, and traditionalist space in counterpoint to urban modernity. Nor is it the bucolic idealisation of some Francoist 'happy Arcadia' safeguarding the patriotic essence of the nation against the dangers of progress.</p>
	AXIOLOGICAL ASPECTS
	<p>Specific: Claiming the memory of the uninhabited peoples of empty Spain and denouncing the irreparable loss of rural spaces and their sociocultural, demographic, and human dimension in a modern and capitalist society.</p> <p>General: Depopulation and ageing, individual and group identity, lack of services and public investment, scarcity of socioeconomic-work opportunities and erosion of a way of life and sense of loss.</p>

Own elaboration

The film is also quite unlike any other film in the catalogue of 'rural cinema'. To a certain extent, it follows in the line of films that can be classed surrealist or absurdist such as José Luis Cuerda's 1989

Amanece, que no es poco ('It's sunrise, which is no small thing'), and has the intimate poetic aesthetic of Victor Erice's 1983 *El Sur* (*The South*). It has influenced the work of young directors such as Oliver Laxe's 2019 *Fire Will Come* (*O que arde*), Carla Simón's 2017 *Summer 1993* (*Verano 1993*) and Marta Lallana's 2018 *Ojos Negros* (*Dark Eyes*). The latter two works take a feminine perspective with autobiographical shades, approaching the rural environment through memories of childhood and adolescence respectively.

The film's explicit accusatory tone, its condemnation of the disappearance of the rural world and its intention to kindle reflection on demographic aging and depopulation can be seen not only in the origins of the project¹¹ and the fiction it depicts, but also in the news reports about the film on its release.¹²

The prologue is also a homage, a manifesto, and a declaration of love and intentions. Sepia photographs show walled fortresses, churches, manor houses, natural landscapes, and everyday scenes of bygone social gatherings, while a piano plays and the voice of the main character delivers its heartfelt verdict:

The land is fertile; the cemetery sterile. Why force sterility upon us? Thus, have we created a society ruled solely by values which can be given a price. The rural world is in its death throes. The death of a community is much more than that of a handful of people. People are born and then they die. But when a community dies, nothing can be born again.¹³

The story draws liberally on magical realism¹⁴ to freely combine disparate genres, ranging from episodic comedy via docudrama to existentialist monologue, literally conjuring up the main character's memories of youth and his past life, attended by the silent and mournful spectre of Soledad, his young deceased wife. It is impossible not to find clear literary associations with Juan Rulfo's *Pedro Páramo*.

In the words of the central character 'they came when it seemed that money sprouted like beans in the garden, as if by spontaneous generation', when people lived in the town and even people from the city visited or emigrants from other countries resided. Times when life flourished. All now left behind.

4. Discussion of results

There can be no doubt that both versions of *The Cursed Village* (1930-1942) reflect a situation which had affected rural Spain since the second half of the nineteenth century. Seasonal variability in the work, poor harvests, precarious living conditions, urban industrialisation, and the constant drain from the countryside to towns were common features throughout Europe. The 1942 version includes an impressive scene, opening the second section, 'Exodus' features a convoy of horse-drawn wagons filing into the square loaded with farming implements and furniture. One of those remaining asks: 'And are all these people leaving?' and receives the reply: 'All of them. Only the old folk like you and me are staying'. 'And where are they going?' 'Wherever they can. Some to Salamanca, others to the Lands of Aragón'. When Juan also leaves for town, 'Tío' Lucas buys his land, commenting: 'Once you settle in town, you'll forget the village, like everybody else. This is a graveyard, Juan'. It encapsulates the sense of uprootedness and being set adrift implicit in 'the rural versus the urban', a sentiment most keenly felt by the young people when it came to leave, as shall be seen in the other films, and something which has persisted to the present day.¹⁵

Furrows sets the traditional social and religious values, represented by rural life, the family, paternal authority, religion, and order, against the city, which represents libertinism, mass disorganisation, selfish individualism, easy money, capitalism, and the alien. The film is a denunciation of the rural exodus to the city, something the government first tried to halt, and then, in the following decade, tried to encourage (Marcos, 2015). The film certainly gives palpable treatment to the cultural, economic, and social gap

11 The initiative for the film originated in the community association, Mancomunidad de la Sierra Norte de Madrid which comprises 42 small municipalities in De la Cal (2015).

12 'It proclaims the necessity for continuity in rural communities across Spain through belief in a future fashioned out of projects which protect its diversity of heritage and involves its inhabitants', in News (29 May 2016) *El violín de piedra* was premiered on Friday. *El Correo de España*. Retrieved from <https://tinyurl.com/y5yfcxrk>

13 The film director asserted that the root cause of the rural exodus is pre-eminently 'an economic problem', in J.B. (8 July 2015) *El violín de piedra, a communal labour in the Sierra de Madrid. La Nueva España.es*. Retrieved from <https://tinyurl.com/y4ejw75v>

14 After the prologue, and before the film proper, an intertitle offers the following text: 'At the moment of death, memories pertain to feelings and not necessarily to reality'.

15 In the scene just before the start of Section II (Exodus), following the loss of the harvest to a storm, Acacia tells Juan, 'It doesn't matter that we've lost it. We're young, strong. We can start all over. Not here, but down on the plain. Or in the town, Juan. In the town.', to which Juan replies, 'Yes, Acacia, you're right, that's what I'll do'.

between town and country, and it must be said that the new arrivals from the country behave extremely awkwardly in the face of the dangers and temptations of the city.

The poor performance of the Spanish economy in general, and that of Madrid in particular, did not put a brake on the influx to the city. Some sources put the number of migrants to Madrid during the 1940s at 272,125, the equivalent of 18.31% of the population, a pattern which continued in the following decade (Silvestre Rodríguez and Serrano Asenjo, 2012). The main driver of this migration was the worsening conditions of life in the country, as the area of cultivated land diminished, foreign exchange declined, and hunger and misery took hold.

A diachronic analysis of the Spanish films in the social and neorealism tradition would regard the film *La piel quemada* ('Sunburn') as a successor to *The Cursed Village* (1930) and *Furrows* (1951). Set in Lloret del Mar against a backdrop of the opening of Francoist Spain to tourism, it is set in the Andalusian exodus to Catalonia when the first wave of tourists hits the Costa Brava. In Forn's own words:

The 50s saw the rise in migration because of people going hungry, because of absolute misery, because it wasn't possible for people to live in Andalusia, or Extremadura, or Murcia, and so some ended up in Catalonia while others continued into Europe. I wanted my film to reflect all this migratory movement, which continued right up until the 70s. So I asked myself, what was that phenomenon in which people emigrated because they were going hungry, what was it that emigration caused this situation? And the explanation was none other than the agrarian latifundium system in the south, and that people finding themselves in Catalonia were trying to integrate in a place which was very different and had a very different culture. The influx of migrant workers coincided with the arrival of another influx coming for quite the opposite reasons – Europeans benefitting from postwar economic expansion who were beginning to get a taste for the Spanish sun and beaches (Moyano, 2016, p. 31).

In the film *Tourism is a great invention*, the two start out as diegetic spectators and avid apprentices – Requejo¹⁶ constantly says to his secretary 'Goodness! Write that down! Write that down!' – and impressed by the bikini-clad foreign tourists and the hotel facilities, they return to their town converted into active agents of tourism development. Their plans occasion frustrating mismatches between the aspiration for progress and day to day rural life, such as the reluctance of the womenfolk, who see the possible arrival of attractive women from abroad as a threat. This situation foreshadows the theme considered below vis-à-vis the sociocultural interaction with foreign women, albeit as a result not of tourism but rather immigration, in the film *Flowers from another world*.

Today, this flow is reversed as rural tourism in the interior of the country is being promoted¹⁷ as an alternative leisure activity which can diversify and complement the standard beach-based holiday model, while at the same time providing business initiatives for combatting increasing depopulation.¹⁸

The film *Flowers from another world* belongs to a long list of Spanish films from the 70s and 80s which revisited the theme of post-liberalisation. It takes the perspective of social drama and class conflict and shows what happens when the 'industrial progress promised by the social conscience, hits a crisis point' (González Requena, 1988, p. 24). Bollaín directs the focus onto the theme of depopulation, the consequences of the phenomenon of migration, and coming to terms with all that is foreign. For Robertson (2002), the film can be classed as an innovative cinematic introduction to 'glocalization', by which Spain transformed from being a sending country to a receiving country.¹⁹

For his part, Ballesteros claims that the film 'exposes the prejudice and intolerance towards immigrants in the rural environment, but the family is presented as the centre of interracial negotiation and the possible creation of a more tolerant and multi-ethnic society' (2016, p. 257). All to the good, but religious beliefs and conservative traditions remain the yardstick for inclusion and acceptance when, towards the end, Patricia's daughter Janay celebrates her first communion. The old dichotomy of town and country is

16 'Requejo' is an archaism meaning 'terrain, territory, place, location'.

17 García Marcos, E. (18 October 2019). *A group of experts propose 10 measures to halt rural depopulation* Hosteltur. Retrieved from <https://tinyurl.com/y6od5j32>

18 *Technology for preventing rural depopulation and promoting tourism* (18 April 2019), Hosteltur. Retrieved from <https://tinyurl.com/yycrx8t>

19 The arrival, in this case unexpected and by chance, of African immigrants in a town at risk of depopulation also forms the plot of the comedy *A Remarkable Tale* (*Lo nunca visto*, Marina Seresesky, 2019).

brought up to date and enriched by the themes of the confrontation between national and ethnic stereotypes, male and female solitude, xenophobia, sexism, and family models in the rural sphere.

In the representation of *The Stone Violin*, the concept of the rural does not draw on clichés which identify it as an atavistic, unsophisticated, and traditionalist space in counterpoint to urban modernity. Nor is it the bucolic idealisation of some Francoist ‘happy Arcadia’ safeguarding the patriotic essence of the nation against the dangers of progress. The recovery, or rescue, of these territories is the responsibility of the public administration and a recognition of the irreparable loss from a sociological and anthropological point of view. The nostalgia evoked by the memories of the last inhabitant of a village Ojos Negros, in the fiction depicted in the film, an elderly man called Ángel – a name replete with presentiment – becomes a symbol and common thread in the chronicle of a death foretold of a man and a community.

5. Conclusions

The process of migration from the countryside to the city began in the second half of the eighteenth century and gathered force in subsequent centuries. Camarero (2020, p. 51), citing Fermín Caballero, whose work *Promotion of the Rural Population* was published in 1864, draws attention to the uneasiness transmitted by this and other authors of the time with regard to the vast depopulated wastelands across Spain. He also quotes Costa (1911), for whom the best panacea to prevent depopulation were the reservoirs, ‘because the mountains are condemned to depopulation, as the mountain population has to move onto the plains, and it is necessary that this happens, and it cannot happen while the plains are not watered’ (Costa Martínez, 1911, p. 61). Franco’s *National Plans for Agrarian Colonisation* drew heavily on the ideas espoused by Caballero and Costa, aiming to incorporate the expansion of irrigation, and to establish a population to bring territory perceived as wasteland under control. Despite the continuing rural exodus, however, the issue of depopulation would remain a secondary concern until the second half of the twentieth century.

The harsh conditions of the farming areas, restricted by the latifundium system, and the processes of industrialisation and urbanisation inevitably led to a population shift from country to town. This is underlined in the two versions of *The Cursed Village* (1930 and 1942). Nor did the situation of the shattered Spanish economy in general prevent the drift of migrants to the towns in the post-war period. This was because the quality of life in the country worsened considerably due to the reduction of land under cultivation. This, added to the decline in international trade, meant that there was widespread lack of food and suffering. Conditions for agricultural labourers were not only intolerably hard, but also precarious: ‘with inadequate daily rates ... when an especially bad year arrives, or when with every new season there are fewer workdays available, then no other option remains but to find another route. And the only route remaining is to leave’ (Silvestre Rodríguez and Serrano Asenjo, 2012, p. 107).

What was to come was hardly any better. The stabilization plan (1959) involved industrialisation and the development of tourism, but also led to the intensification of agriculture, the establishment of patents (plants and animals), irrigation, and the Minimum Wages Act, which accelerated the mechanisation of farming to avoid paying decent daily rates (García-Delgado, 2009) and which led to the rural exodus and uprooting depicted in *Furrows*.

The migratory flows began to impact capital in the Francoist economy in 1957, at which point the regime felt compelled to liberate internal and external population movements, the best cinematic example of which is the 1971 Pedro Lazaga release *¡Vente a Alemania Pepe! (Come to Germany, Joe!)*. With respect to internal migrations, these were from the poorest regions – Andalusia, Extremadura, and Castilla La Mancha – to mostly Madrid and Barcelona. It is calculated that between 1962 and 1973 nearly four million people changed their place of residence. One area which received more people than most was Catalonia, in particular the Barcelona metropolitan zone, followed by the tourist areas because of the growing demand in the service and construction sectors. The relationship between the myth of tourism promoted by the Francoist regime and the social reality resulting from internal migration to the coastal areas is a key factor in understanding the context and story of *La piel quemada* (1967). It is, in fact, the only film of that decade to directly tackle the contradictions generated by tourism and the transformations caused by migration in Spain (Quintana, 2017). In total contrast is the film *El turismo es un gran invento* (1968), in which the ingenuous awestruck villagers are rewarded by the dictatorship with a state-sponsored luxury hotel.

Neither democracy nor the aimed-for agrarian reforms managed to reduce the rural exodus. Indeed, there has even arisen a process which has been denominated 'perverse development' by which agricultural income is targeted at youth training programmes in cities, but those taking part never return for lack of opportunities (García-Delgado, 2009, p. 26), or because of the suffocating prospects of the rural world. It is in this context that a new wave of intercultural migration emerged, whereby a country which was formerly marked by the experience of emigration became one which had to adapt to the new experience of immigration. The theme of the expectations of individual or family 'repopulation', in which immigrants, 'neorurals' and the local population coexist, are explored in *Flowers from Another World* (1999). However, the process requires a period of adaptation and cultural metabolization, which is not always easy, especially if the cultural substrate is different. Migration from the city to the country should not be an end in itself, but rather a means.

Meanwhile, despite subsidies and reverse migration from the city to the countryside, the phenomenon of 'hollowed out Spain' continues unabated. It may be that the neoliberal discourse demanding fiscal responsibility from public services has effectively committed demosthanasia. Spain's Economic and Social Forum noted in its 2018 report that of the 8,131 municipalities in Spain, 73% have less than 2,000 inhabitants while accounting for 55% of the area.

The need to face population challenges as a matter of state policy is evident from the evolution of the population of Spain, and of developed countries as a whole, over the last decade, as can be seen in the data published by the Spanish Statistical Office (INE), Eurostat and the World Bank, and is further underlined by the commitment of those Spanish regions which have been most affected by demographic imbalances. For this reason, the *VI Conference of Presidents*²⁰ was held in 2017 (17 January), at which the Commission for the Demographic Challenge was created and charged with establishing a common strategy. In addition, the regions themselves have initiated actions and developed structures, such as the *Agenda Valenciana Antidespoblament (AVANT) (Valencia Counter-depopulation Programme)*, created in 2017 and responsible to the Valencia Regional Government. In 2018, the programme ratified four AVANT university chairs (Jaume I, Valencia, Politècnica de Valencia, and Alicante), and in August 2019 established a general directorate responsible to the presidency of the regional government. One of the programme's first actions was to draft the *Valencia Counter-Depopulation Strategic Plan (PLESVANT)*, coordinated by the University of Valencia. Despite difficulties, 2020 saw the development of various widely agreed measures and actions, in which the public participation of all stakeholders and the contributions of the AVANT interuniversity chairs were particularly noteworthy.

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²⁰ 'The Conference of Presidents is the body of highest political level of cooperation between the state and the Regional Governments'. Retrieved from http://www.mptfp.es/en/portal/politica-territorial/autonomica/coop_autonomica/Confer_Presidentes.html

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The internal socio-economic polarization of urban neighborhoods, the case of Marseille

La polarización socioeconómica interna de barrios urbanos, el caso de Marsella

Argyro Gripsiou^{1*} 
Christophe Bergouignan² 

Abstract

The socio-economic inequalities of the different metropolitan neighborhoods have been carefully documented and analyzed in the social science literature. Starting from this premise, this article focuses on the less common neighborhoods in which two extremes coexist: very low-income households and high-income households. The objective is to identify the neighborhoods with a high internal socio-economic polarization, geolocate them in the urban space, characterize their population and housing stock, and measure their recent evolutionary trends.

The empirical analysis focuses on the neighborhoods of Marseille (France), a city characterized by strong socio-spatial segregation between poor neighborhoods in the north and rich neighborhoods on the southern coast, and the presence of neighborhoods in which populations coexist with unequal resources. This empirical study is based on the fiscal and social data (Filosofi file) that allow knowing the income distribution and based on the census data to characterize the socio-demography and the type of housing of the population. In order to identify neighborhoods with intense internal socio-economic polarization and measure their evolution of income distribution, original poverty and wealth indexes have been developed, which synthesize the two extremes of this distribution. These neighborhoods with a high internal socio-economic polarization usually present certain distinctive aspects, such as their geographical location or a more or less rapid and intense gentrification process. However, some of them seem to escape this process, as evidenced by the contrasting trends in the recent evolution of income distribution and structural heterogeneity of the housing stock, in which small apartments and old buildings are very overrepresented.

Keywords: internal polarization; socio-spatial segregation; incomes; degraded buildings; gentrification; Marseille.

Resumen

Las desigualdades socio-económicas de los distintos barrios metropolitanos han sido documentadas y analizadas acuradamente en el ámbito de las ciencias sociales. Partiendo de esta premisa, este artículo se centra en los barrios, poco frecuentes, en los que coexisten dos extremos: hogares con muy bajos ingresos y hogares con altos ingresos. El objetivo es identificar los barrios con una alta polarización socio-económica interna, geolocalizarlos en el espacio urbano, caracterizar su población y su parque de viviendas, así como medir sus tendencias evolutivas recientes.

1 COMPTRESEC, Université de Bordeaux, France. argyro.gripsiou@u-bordeaux.fr. * Corresponding author

2 COMPTRESEC, Université de Bordeaux, France. christophe.bergouignan@u-bordeaux.fr

El análisis empírico se centra en los barrios de Marsella (Francia), una ciudad caracterizada por una fuerte segregación socio-espacial entre los barrios pobres del norte y los barrios ricos de la costa sur, además de la presencia de barrios en los que conviven poblaciones con recursos desiguales. Este estudio empírico se basa en los datos fiscales y sociales (fichero Filosofi), que permiten conocer la distribución de la renta, y en los datos censales, para caracterizar la socio-demografía y la tipología de vivienda de su población. Para identificar los barrios con una fuerte polarización socio-económica interna y medir su evolución de la distribución de la renta, se han desarrollado índices originales de pobreza y riqueza, que sintetizan los dos extremos de esta distribución. Estos barrios con una fuerte polarización socio-económica interna suelen presentar ciertos aspectos distintivos, como su ubicación geográfica o un proceso de gentrificación más o menos rápido e intenso. Sin embargo, algunos de ellos parecen escapar a ese proceso, como demuestran las tendencias contrastadas en la evolución reciente de la distribución de la renta y una heterogeneidad estructural del parque de viviendas, en la que los apartamentos pequeños y los edificios antiguos están sobrerrepresentados.

Palabras clave: polarización interna; segregación socio-espacial; ingresos; edificios degradados; gentrificación; Marsella.

1. Introduction

The city, as a privileged space for the manifestation of social inequalities, is often divided into neighborhoods that are very different according to the socio-economic resources of their inhabitants. This division of urban space according to these resources is frequently described in the social science literature as the social segregation of the city and is most often approached by measuring the differences between neighborhoods. Without ignoring this urban reality, this paper focuses on a few neighborhoods in Marseille where there are strong differences in income between residents, which we describe here as internal socioeconomic polarization. It is based on a methodological approach that defines the indexes that make it possible to identify these neighborhoods and on an analysis of the socio-demographic characteristics of these neighborhoods. These empirical elements serve as a basis for discussing the various hypotheses that could explain this internal socio-economic polarization. These hypotheses derive from the social science literature on socio-spatial segregation and gentrification, which considers these phenomena as the result of urban planning policies, the play of residential preferences and the initial structure of the housing stock.

1.1. Socio-spatial segregation: a reality structuring major cities

Generally accepted in a broad sense³, the socio-spatial segregation of large cities is widely documented in the literature. From the first works on the subject, carried out by the Chicago School in the 1920s, or, in the 1950s, those of factorial urban ecology (Shevky, Williams & Bell), to the most recent works, the unequal distribution of social groups within large urban areas is an important subject in the social sciences (Madoré, 2005).

In France, interest in the social division of the city emerged later, in the 1950s, notably the studies of Marcel Roncayolo, beginning in 1952, on the working-class suburbs of Marseille (Madoré, 2005).

Approaches to social segregation are linked to the context of each city and the socio-political history of each country (Oberti & Préteceille, 2016; Maloutas & Fujita, 2012). In the United States, research mainly analyzes ethno-racial differences in the occupation of urban space (Maloutas & Spyrellis, 2019). In France, for a long time, the approach to segregation was rather analyzed from the perspective of social classes (according to socio-professional categories) as a consequence of the virtual absence of publicly disseminated territorialized ethnic data (Safi, 2013, McAvay & Verdugo, 2021). However, in the mid-2000s, some studies attempted to address the ethno-racial dimension of socio-spatial segregation (Pan Ké Shon & Verdugo, 2015; McAvay & Verdugo, 2021; Préteceille, 2009; Safi, 2009).

³ Initially, the term segregation, of Latin origin, meant "to separate from the herd" (Lehman-Frisch, 2009). The semiology of the term has expanded over time, from the physical distancing of a dominated group through direct intervention by dominant groups, as in South African apartheid, to a systematic distortion of the spatial distribution of social groups, sometimes without any deliberate action (Lehman-Frisch, 2009).

1.2. The internal socio-economic polarization of some central neighborhoods

While the vision of a socially segmented urban space largely structures representations of the city as a privileged place for the territorial manifestation of social inequalities, housing transformations and population movements also create some spaces where very different social groups can cohabit for varying lengths of time. The purpose of this article is precisely to analyze the frequency of these atypical situations, which we will describe as internal socio-economic polarization of neighborhoods. This article will be based on the identification of this internal socio-economic polarization using original indexes that synthesize the distribution of incomes within the neighborhoods of Marseille.

1.2.1. Some situations of geographical coexistence of social groups

Although socio-spatial segregation has been observed in many large French cities, it does not always manifest itself in the same way and is not limited to a center-periphery opposition. Indeed, central neighborhoods often present a great diversity of social composition (Oberti & Prêteceille, 2016; Prêteceille, 2006). Some of these central neighborhoods may concentrate low-income populations that seek proximity to service jobs, public services, and, sometimes, social solidarity networks. Other central neighbourhoods, on the other hand, tend to attract members of the wealthy classes who benefit from the proximity of their jobs in the higher functions of the urban economy and from access to a greater diversity of goods and services, particularly in cultural and social areas. This explains the very large differences in social status and income between the populations of the different central districts, sometimes with a very clear demarcation between these areas. Finally, there are neighborhoods, generally much fewer in number, where both low-income populations and materially well-off or even very well-off populations reside (Prêteceille, 2006; Oberti & Prêteceille, 2016; Authier, 2003). In the social science literature, these socially differentiated neighborhoods are often seen as resulting from residential practices associated with very distinct individual identities and trajectories. This co-presence may thus not lead to truly deep social relationships but to a rather passive cohabitation (Authier, 2008). Social hierarchies continue to exist reminding us of the absence of equivalence between social interaction and spatial proximity (Oberti & Prêteceille, 2016; Prêteceille, 2006; Audren, Baby-Collin & Dorier, 2016; Launay, 2016; Maloutas & Spyrellis, 2019). In 1992, Mike Davis had even evoked, on this subject a “segregative mix” in Los Angeles just as Marcel Roncayolo did in 2001 (Lehman-Frisch, 2009). We can speak of an imperfect mix of social groups that reflects the hierarchical and fragile nature of French society (Oberti & Prêteceille, 2004; Le Bras, 1994). However, it would be very simplistic to consider that these neighborhoods with internal socioeconomic polarization do not reflect any specificity in the urban organization and its evolution, or that this co-presence does not produce any particular economic and social dynamics. Indeed, quite frequently, the profiles of these socially polarized neighborhoods do not correspond to the typical model of the dualisation of the global city (Maloutas & Spyrellis, 2019; Oberti & Prêteceille, 2016).

1.2.2. Internal socio-economic polarization: assumptions and explanatory factors

Several factors can explain the coexistence of different social groups observed in certain central neighborhoods.

Based on the idea that the internal socio-economic polarization of neighborhoods is not always a situation that is fixed in time but often an intermediate phase, it is sometimes considered as a transitional state during gentrification (Giroud & Ter Minassian, 2016; Oberti & Prêteceille, 2016; Authier, 2003; Bouzouina, 2007). The internal socioeconomic polarization of a neighborhood would then be a stage of gentrification and thus one of the components of the geographic dynamics of socio-spatial segregation.

According to a Marxist approach, this gentrification is the result of public and private interventions put in place to attract national and international investors (Harvey, 2000, 2009). These urban planning policies would ultimately promote the eviction of socially disadvantaged populations (Prêteceille, 1995; Lehman-Frisch, 2009). David Harvey thus highlights the correspondences between the urbanization of Paris by Haussmann, gentrification and suburbanization in the United States and urban development in China (Harvey, 2009).

Without explicitly rejecting the influence of these planning policies, other approaches would rather interpret the internal socio-economic polarization of neighborhoods as the stage of gentrification

resulting from the play of residential preferences. Based on the work of T.C. Schelling (1978) and J.M. Sakoda (1971) on the social stratification of urban space, these approaches show that these preferences are based on the search for the “entre soi” (Decamps, 2009), especially by the privileged classes (Pinçon & Pinçon-Charlot, 2014). The weight of the socio-economic and cultural identification of individuals corresponding to different urban lifestyles would weigh significantly on the choice of place of residence and, by extension, on residential co-presence relations (Oberti & Préteceille, 2016). These approaches thus allow for the addition of individual differential tastes and specific contexts in their analyses (Madoré, 2015; Lehman-Frisch, 2009; Oberti & Préteceille, 2016). Thus, during the first 2 decades of the 2000s, the greater attractiveness of the central parts of many large French cities, reflecting a change in the educational level of new generations and their preferences, was accompanied by tension in the real estate market. In these central neighborhoods, low-income households, which were sometimes initially very present, are now in increased competition with the wealthy for access to housing. In some of these neighborhoods, gentrification has been observed, which may initially have resulted in a polarization of income distribution, with high-income and low-income households coexisting in the same neighborhood. Often, the rise in housing costs resulting from this recent attractiveness to high-income populations has led to the eviction of low-income populations. The internal socioeconomic polarization of these neighborhoods will thus have been a transitional state in the transformation from a “poor” to a “rich” neighborhood.

Also during the first 2 decades of the 2000s, other forms of gentrification, related to tourism, have been observed (Lopez-Gay, Cocola-Gant, Russo, 2021). They correspond to a broader definition than the classical sense of the term such as “touristification” or transnational gentrification (Jover, Diaz-Parra, 2019). The latter is related to young immigrants from the middle and upper classes, mobile and highly educated. Their presence in the neighborhoods, known primarily for their touristic aspect, accelerates the social restructuring of the area. They are situated between visitors and residents (Lopez-Gay, Cocola-Gant & Russo, 2021). Their effects on urban processes are different from those of tourists because of their long-term settlement (Jover, Diaz-Parra, 2019). For them, moving to a central touristic neighborhood is a transitional step in their life course, as it is for many “gentrifiers” (Lopez-Gay, Cocola-Gant & Russo, 2021). These visitors and transnational immigrants coexist with long-time residents and pioneers of gentrification with a tendency to replace them. The decrease in the local population also means, in this case, a decrease in the proportion of occupied housing and the loss of neighborhood identity (Lopez-Gay, Cocola-Gant & Russo, 2021).

The composition of the built environment (age, quality, size of dwellings, ownership structures) can be a gas pedal or a brake on gentrification processes (Chabrol & Launay, 2016), especially when they are linked to housing programs. This is particularly the case when there is a large social housing stock and/or many run-down buildings scattered throughout the neighborhood. In this case, the internal socio-economic polarization of these neighborhoods could be maintained for a long time. To characterize situations of relatively permanent internal socioeconomic polarization in neighborhoods, some authors speak of sporadic or incomplete gentrification (Jourdan, 2008; Bacqué & Fijalkow, 2006), combining the installation of well-off households and the maintenance of poverty cells. Considering the internal socio-economic polarization of neighborhoods as a simple phase of a continuous gentrification process resulting in the eviction of the working classes and the massive installation of the privileged classes thus seems far too simplistic (Giroud & Ter Minassian, 2016; Oberti & Préteceille, 2016). The combination of this specificity of the built environment with cyclical shocks associated with serious macroeconomic crises (as in Greece) or more sectoral and geographically concentrated crises (as in certain French regions) could even make the internal socio-economic polarization of these neighborhoods a transitional stage towards their impoverishment.

Regardless of the effects of the economic and financial crisis and outside of neighborhoods affected by gentrification, the Greek example also shows how strong internal socio-economic polarizations of neighborhoods can be maintained in the long term. This can be explained by the high proportion of owner households and the desire for spatial proximity within family networks (Maloutas & Spyrellis, 2019). Thus, we observe in Athens a so-called vertical “segregation” (internal social stratification by floor in the same building). The structure of the built environment and the post-war housing production system played a major role in this type of spatial coexistence of social groups. Thus, the low level of social segregation in downtown Athens measured between neighborhoods corresponds to significant inequalities

within neighborhoods (Maloutas & Spyrellis, 2016, 2019). In France, the hyperspecialization of housing in certain central neighborhoods in very small flats often associated with a large student population, could explain that beyond students alone, the small surface dwellings of sometimes degraded buildings are occupied by low-income households. This could explain the coexistence in these neighborhoods of well-off owner-occupiers of the largest flats with students and low-income households renting small flats. The composition of the housing stock could therefore, according to different mechanisms in Greece as in France, have its own influence on the internal socio-economic polarization of neighborhoods.

These internally socially polarized neighborhoods remain marginally studied in the field of urban geography (Oberti & Prêteceille, 2016). Gentrification, used as a Trojan horse to interpret socio-urban change, has often monopolized interest without taking into account, for themselves, these situations of internal social polarization, whether they are transitory or lasting. Moreover, focusing on the opposition between “rich” and “poor” neighborhoods can have perverse effects on the understanding of the whole socio-urban fabric (Oberti & Prêteceille, 2016). This is why this article focuses not only on identifying the Marseilles neighborhoods where this internal socioeconomic polarization is observed, but also on analyzing their sociodemographic characteristics and the specificities of their housing stock.

1.3. The Marseille context

In many ways, Marseille is a city particularly suited to the analysis of the internal socio-economic polarization of neighborhoods:

- the city has indeed undergone significant socio-demographic changes likely to promote the renewal of the population of the urban space,
- the level of poverty and inequalities are very high there, favoring socio-spatial segregation while making possible the co-occurrence of phenomena of gentrification and pauperization,
- the buildings are particularly degraded, which can more frequently result in an incomplete gentrification process.

1.3.1. Major socio-demographic changes

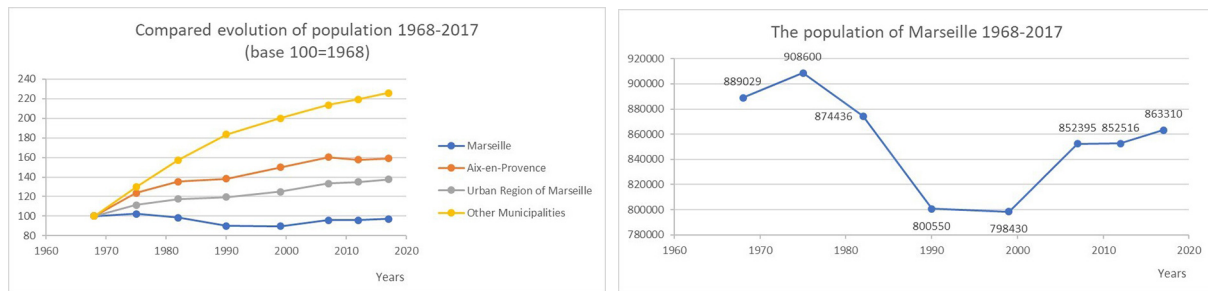
Marseille is located in the South-East of France, on the shores of the Mediterranean Sea. It is the second French urban region after the Paris and the third French urban area after Paris and Lyon. In 2017, the Aix-Marseille-Provence urban region brought together 92 municipalities for a population of 1,878,061 inhabitants and an area of 3,150 km². Its polycentric urban structure is not limited to the city center/periphery diptych (AgAM, 2020), with, in particular, a polarizing effect of Aix-en-Provence (Godoye & Oliveau, 2019). It is a highly peri-urbanized area, in 2017, 54% of inhabitants and two-thirds of jobs are located outside of urban cores. It is sparsely populated (600 inhabitants/km²). Within urban region of Aix-Marseille-Provence, the municipalities of Marseille and Aix-en-Provence include more than half of the population (863,310 in Marseille for a density of 6,000 inhabitants/km², and 142,482 in Aix-en-Provence), (AgAM, 2020).

Since the end of the 1960s, the different parts of the present Aix-Marseille-Provence metropolis have experienced different demographic developments (Figure 1). During the 1970s and 1980s, characterized by peri-urbanization, the municipality of Marseille lost more than 100,000 inhabitants while, at the same time, there was strong demographic growth in Aix-en-Provence, but, even more, in other municipalities, particularly peripheral to the metropolis. In the early 2000s, the city of Marseille experienced a population increase which did not completely compensate for the previous drop in the number of inhabitants, but which led to less heterogeneous demographic growth within the Aix-Marseille-Provence metropolitan area. Over the past decade (between 2007 and 2017), Marseille has seen its population grow more moderately, while that of Aix-en-Provence varied little and the other municipalities in the metropolis continued to grow moderately.

The composition of the population of the municipality of Marseille presents some peculiarities compared to other large French cities. These particularities come from the polycentric structure of the Aix-Marseille-Provence metropolis. Thus, compared to the central cities of other large provincial agglomerations, students and young adults are poorly represented in the municipality of Marseille, in particular because a large part of the university center is located in Aix-en-Provence. For this same reason,

executives and intellectual professions are less represented in the heart of the Marseille metropolis than in the central parts of many large French cities (AgAM, 2020).

Figure 1. General demographic trends of Marseille metropolitan area



Data source: Population Censuses, INSEE. Own elaboration

1.3.2. A high level of poverty

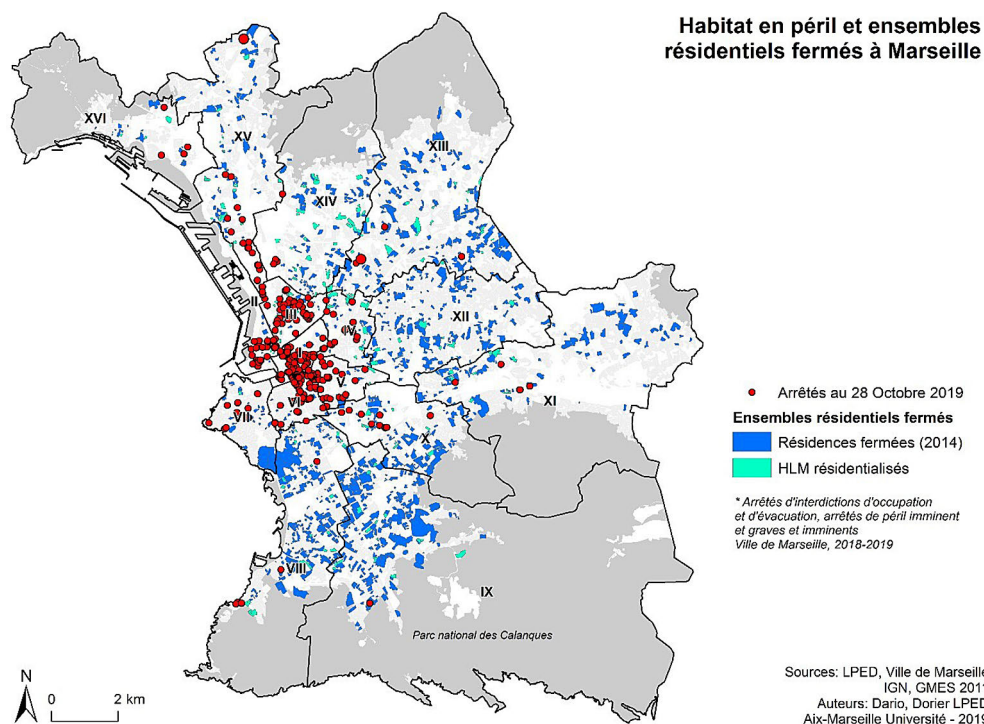
The economy of the Marseille agglomeration was based, like that of many other coastal towns, on port activities and associated industrial activities. In fact, the development of port activities and the installation of industrial companies around the Etang de Berre in the 1960s attracted working populations who settled nearby in the surrounding municipalities or in the north of the municipality of Marseille. In the 1980s, economic restructuring engendered the decline in industrial employment and was accompanied by strong growth in unemployment among the least qualified, particularly in the northern arrondissements of Marseille (Ronai, 2009; Donzel, 2005). Gradually, the increase in the share of services in employment, has, perhaps even more than in other large cities, favored a stagnation of the income of the less qualified people whose professional career passes through many periods of unemployment or through precarious work in these services (short contracts, interim, part-time not chosen, self-employment under constraint). On the contrary, this change in the economy has benefited to certain categories of graduates, leading, no doubt more than elsewhere, to strong inequalities within the working-age population. These inequalities, visible in the structure of the working-age population, are also visible in the urban geography, with, schematically, the “poor” neighborhoods in the North and the “rich” neighborhoods near the southern coast (Jourdan, 2008; Donzel, 2005; Ronai, 2009). In 2017, the 3rd Arrondissement of Marseille was the poorest administrative entity in metropolitan France with a poverty rate of 53%, versus 14.1% for France mainland and 18.2% for the whole of Aix-Marseille-Provence metropolitan area. The poor neighborhoods of Marseille are not only the poorest neighborhoods in France, but they are among the poorest neighborhoods in Europe (AGAM, 2020). This is nothing new, the Urban Audit of 2000 already asserted that in terms of urban inequalities, Marseille presented a situation comparable with the poor Italian and British cities. (Donzel, 2005).

1.3.3. A lot of very degraded old buildings

In the 1970s and 1980s, peri-urbanization encouraged the decline in the residential function of the municipality of Marseille, which helped accelerate the degradation of degraded buildings in its historic center (Maurin & Mazery, 2014; Audren et al., 2016). Thus, between 1975 and 1999, the urban center of Marseille lost 12% of its inhabitants, resulting in around 35,000 dilapidated vacant dwellings located in the city center (Ronai, 2009). If these evolutions have also been observed in other cities, according to Roncayolo, the singularity of the Marseille situation reflects the political “laissez-faire” of an urban management based mainly on the private production of housing (Roncayolo, 1996; Dorier & Dario, 2018; Figure 2). The city center of Marseille is characterized by a severe deterioration of the private rental stock despite the few actions to fight substandard housing carried out over the past 20 years. Thus, with a view to economic attractiveness and positioning in the Mediterranean area, the city of Marseille is developing urban projects and programs, such as Euro-Mediterranean which, since 2001, has been working for the rehabilitation of the center and the operation “Grand Centre-Ville”. However, the degradation of the housing of the city center has only slightly decreased and the logic of private urbanization of this part of the urban space continues to prevail (Dorier, Berry-Chikhaoui & Bridier, 2012; Dorier & Dario, 2018;

Nicol, 2015). According to the report for the requalification of the private real estate stock in Marseille, insalubrity concerns 13% of main residences in Marseille and more than 35% of those in the private stock in the central arrondissements (Nicol, 2015).

Figure 2. Localisation of degraded buildings (2019 ; red points) and gated communities (2014 ; in blue) in Marseille



Source: Dario, Dorier, Urbanicités, 2019. <https://urbanicites.hypotheses.org/author/urbanicites>

Thus, it appears that the production of social housing is too low to welcome low-income populations to the city and the urban region scale. These populations therefore are inclined to settle in the unsafe/unhealthy housing in the 1st, 2nd, 3rd arrondissements. Financial and social toughness that encounter the population living condition in the unworthy housing accommodation in the historical center, dispatched in small co-ownerships, make revalorization of housing complex and pricy, as for its urban environment (Nicol & al., 2015). This aspect of commodity, its inhabitants and property structures can curb the gentrification's completion, where it started and contribute in the internal socio-economic polarization of some of the central neighborhoods.

2. Methodology

2.1. The neighborhood level apprehended by IRIS INSEE⁴

Territorial scales play a very important role in interpreting social segregation, the extent of which can vary depending on the scale of analysis. Social segregation as well as polarization are associated with the spatial proximity of social groups and their social interactions (Fowler, 2016). The neighborhood level allows us to distinguish units of social polarization and units of social proximity. It is at this micro-local level that one can examine the residential preferences of households. In this article, the geographic mesh used to understand the district is IRIS. The IRIS (Îlots Regroupés pour l'Information Statistique⁵), are the result of sub-municipal divisions, set up by INSEE for the 1999 census and respecting geographic and demographic criteria. It is a division of municipalities with at least 5,000 inhabitants into entities of 2,000 to 5,000 inhabitants. They consist of areas that are assumed to be homogeneous in terms of housing and population size. However, this division does not always guarantee internal social homogeneity (François

⁴ French statistical office.

⁵ Urban blocks grouped for Statistical Information.

et al., 2012), which this article illustrates for Marseille. Thus, the division into IRIS makes it possible to carry out an analysis on a fairly fine scale to verify our hypothesis of socio-economic polarization within the neighborhoods.

For reasons of statistical validity and interpretation of the data, only the residential IRIS for which the INSEE does not mention any particular precaution⁶, are retained in the analysis, the IRIS of business and miscellaneous not corresponding to the objective of this analysis.

2.2. An analysis of income distribution

2.2.1. Income rather than PSCs

In France, most analyzes of socio-spatial fragmentation are based on the study of the spatial distribution of urban populations according to their profession or socio-professional category (PSC). However, these PSCs present a certain internal heterogeneity, in particular linked to the differences in income between generations but also due to the development of new forms of work (self-employed persons associated with order platforms) which are booming, particularly in large cities. Even when the PSCs are available in a very detailed way (PSC in 40 groups), not all of these distinctions can be implemented. However, at the level of the IRIS, for reasons of statistical confidentiality, only very grouped PSCs (in 8 groups) are available, which in particular do not allow to know the previous PSC of retired people, which is even more problematic. Although they have other limitations (in particular their one-dimensional character ignoring cultural preferences and their opacity with regard to informal intra-family transfers), the estimates of disposable income allow us to better consider these differences in living conditions (linked to the wage differences between generations within the same profession, linked to the remuneration of the different forms of work, linked to the differences in the previous professional career of retirees). Above all, since the cost of housing constitutes an essential element in the processes of social segmentation of space, it is essential to consider the resource that allows one to overcome this cost and not a variable indirectly correlated with this resource (Piketty, 2015 ; Ribardi re, 2018 and 2019 ; Labrador, 2013). Without always acting as the ability to pay a «price» for access to housing in the private market, income also plays a role in benefiting from social housing (Fran ois & al., 2012 ; Dabet & Floch, 2014). The income-based approach, proposed here, therefore constitutes a necessary complement to the previous approaches based on PSCs.

2.2.2. Income data at the IRIS level

To study segregative phenomena and internal socio-economic polarization, it is necessary to take into account elements describing the social position and the resources of the resident populations. Here, it is based on the disposable income per consumption unit⁷ of resident households which most accurately reflects the standard of living of the inhabitants at fine geographic scales. This is the income that households have available to consume and save. Thus, disposable income includes earned income (net of social contributions and direct taxes), income from assets, transfers from other households and social benefits (including social minima), including retirement pensions and unemployment benefits.

The data come from the device on localized social and fiscal income, FiLoSoFi. This system replaced Localized Tax Revenues (RFL) and Localized Disposable Revenues (RDL). It was implemented to disseminate indicators on declared and available income from 2012 for Metropolitan France. This localized social and fiscal file (FiLoSoFi) is the result of the matching of exhaustive tax data from the General Directorate of Public Finance and data on social benefits from the main institutes managing these services (National Family Allowance Fund , National old-age insurance fund, Central fund for agricultural social mutuality). It includes all ordinary taxable households, but not people who are homeless or living in institutions (retirement homes, collective accommodations, etc.) (Aerts et al., 2015).

6 The precautions surrounding the use of the data correspond, according to the INSEE, to difficulties in interpreting the changes observed, either due to a strong variation in the number of dwellings possibly associated with large-scale real estate operations, or due to problems that arose during the data consistency check.

7 Consumption units: The first adult in the household counts for 1 consumption unit, other adults and children over 14 years old for 0.5 consumption unit and children under 14 years old for 0.3 consumption unit.

At the level of each IRIS belonging to a municipality of at least 10,000 inhabitants, the data in the FiLoSoFi file include the poverty rate and the distribution deciles of the household population according to the disposable income of these households per consumption unit. It is in particular from these income distribution deciles that we can build summary indicators from which to assess the internal heterogeneity of urban areas and to trace the socio-economic profiles of the districts but above all to identify situations of neighborhoods internal polarization.

We will not use the distributions of income provided at the IRIS scale for the periods prior to 2012. Unlike the data from the FiLoSoFi system for 2012 and 2017, the data from the previous systems do not correspond to disposable income but to declared income. The declared income is made up of the accumulation of income from salaried or self-employed activity, unemployment benefits, sickness benefits, invalidity or retirement pensions, as well as part of the income from assets net of social contributions and the generalized social contribution (CSG). On the other hand, it does not take into account the social benefits received by households. This restriction tends to underestimate the resources of people with the lowest incomes. This is the reason why we will not analyze variations over time, prior to 2012.

2.2.3. Indicators summarizing the ends of the income distribution

To synthesize the low end of the income distribution, we often use the poverty rate (the proportion of the population belonging to households whose income is less than or equal to 60% of the national median income per unit of consumption). The idea being here, also, to synthesize the high end of the income distribution, it would be necessary to be able to construct a complementary index which would correspond to a “wealth rate” according to the same type of approach (estimation of the proportion of the population belonging to households whose income is equal to or greater than 167%⁸ of the national median income per unit of consumption). In absolute terms, micro-data from fiscal and social sources would make it possible to construct this type of indicator. However, being provided in an aggregated mode, the accessible data is limited to the proposed indicators (such as the poverty rate or the income distribution quantiles), which prevents the construction of such a “wealth rate” which could be compared with the poverty rate then to combine the two ends of the income distribution. In addition, in some IRIS, the “poverty rate” is not provided while the income distribution quantiles are⁹. This is why we propose here to construct original indexes of wealth and poverty based on the proportional difference between the deciles of the ends of the income distribution of each IRIS with the corresponding deciles for the whole of metropolitan France.

From a practical point of view, these poverty and wealth indexes are constructed as follows.

Regarding the poverty index, we calculate the weighted sum of the negative relative differences between the first 3 deciles ($D1_z$, $D2_z$ and $D3_z$) of each IRIS z , with the corresponding deciles for the whole of metropolitan France ($D1_{FM}$, $D2_{FM}$ and $D3_{FM}$)¹⁰. The weighting coefficients decrease over the deciles in order to weight more the differences associated with the lowest incomes.

$$IPoverty_z = 0.4 \frac{|D1_z - D1_{FM}|}{D1_{FM}} + 0.35 \frac{|D2_z - D2_{FM}|}{D2_{FM}} + 0.25 \frac{|D3_z - D3_{FM}|}{D3_{FM}}$$

Regarding the wealth index, we calculate the weighted sum of the positive relative differences between the last 3 deciles ($D7_z$, $D8_z$ and $D9_z$) of each IRIS z , with the corresponding deciles for the whole of metropolitan France ($D7_{FM}$, $D8_{FM}$ and $D9_{FM}$)¹¹. The weighting coefficients increase over the deciles in order to weight more the differences associated with the highest incomes.

8 166.6% being the mathematical inverse of 60%.

9 For the year 2017, we have the income distribution quantiles for 11,972 IRIS corresponding to neighborhoods of municipalities with more than 10,000 inhabitants, while we only have the poverty rate for 9,079 of these IRIS.

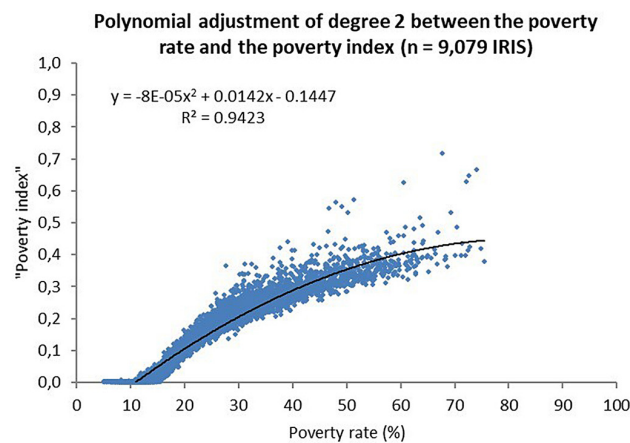
10 In other words, a difference between the income decile D_{i_z} of an IRIS z and the corresponding income decile $D_{i_{FM}}$ of metropolitan France is taken into account in the poverty index $IPoverty_z$ only for the first 3 deciles (therefore for $i < 4$) and only if this difference is negative (therefore for $D_{i_z} - D_{i_{FM}} < 0$).

11 In other words, a difference between the income decile D_{i_z} of an IRIS z and the corresponding income decile $D_{i_{FM}}$ of metropolitan France is taken into account in the wealth index $IWealth_z$ only for the last 3 deciles (therefore for $i > 6$) and only if this difference is positive (therefore for $D_{i_z} - D_{i_{FM}} > 0$).

$$I\text{Wealth}_z = 0.25 \frac{|D7_z - D7_{FM}|}{D7_{FM}} + 0.35 \frac{|D8_z - D8_{FM}|}{D8_{FM}} + 0.4 \frac{|D9_z - D9_{FM}|}{D9_{FM}}$$

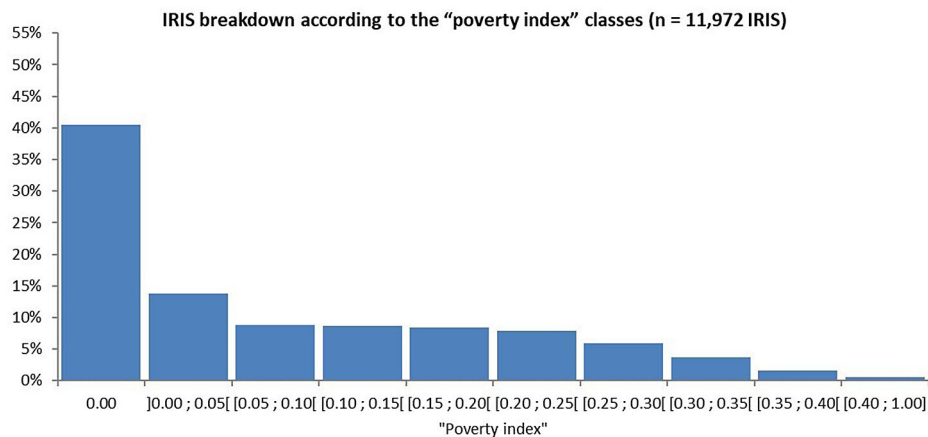
To check the ability of the poverty index to account for the differences in poverty between the IRIS, we can measure its correlation with the poverty rate at the scale of the 9,079 IRIS of France mainland for which we have the 2 information in 2017. Thus, in 2017, at the scale of the 9,079 IRIS for which an estimate of the poverty rate is available, the correlation between the poverty index proposed here and the poverty rate is very high ($R^2 = 92.2\%$ linearly correlated and even $R^2 = 94.2\%$ with a polynomial fit of degree 2, Figure 3).

Figure 3. Scatter plot of 9,079 French IRIS according to poverty rate and poverty index



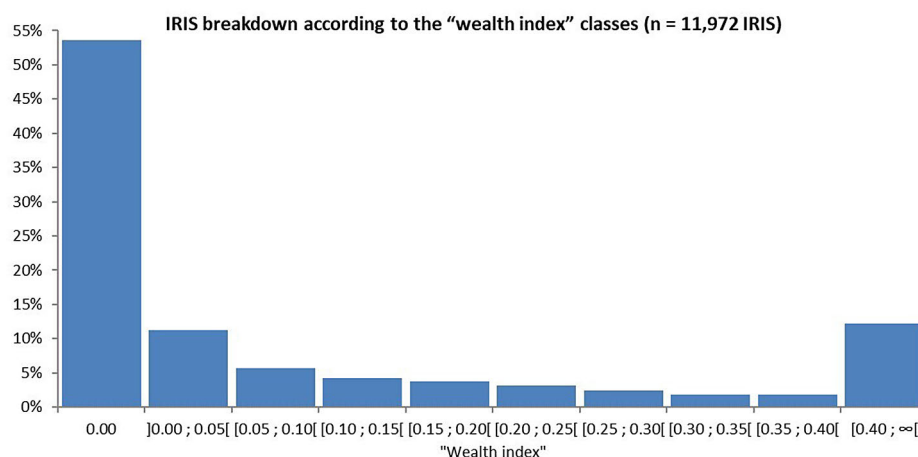
The distribution, according to the poverty index, of the 11,972 IRIS in mainland France for which quantiles of the distribution of household income are available, shows a very strong asymmetry, with 40% of IRIS whose poverty index is equal to 0 (Figure 4). The proportions of IRIS then decrease with the increase in the poverty index, which exceeds 0.25 in less than 12% of IRIS.

Figure 4. Distribution of 11,972 French IRIS according to poverty index



The distribution, according to the wealth index, of the 11,972 IRIS in mainland France for which quantiles of the distribution of household income are available, shows a very strong asymmetry, with more than 50% of IRIS whose index of wealth is equal to 0 (Figure 5). The proportions of IRIS then decrease with the increase in the wealth index, with, however, a not insignificant proportion (12%) of IRIS whose wealth index exceeds 0.4 and 18% of IRIS whose wealth index exceeds 0.25.

Figure 5. Distribution of 11,972 French IRIS according to wealth index



Data sources: Filosofi file, INSEE. Own elaboration

These poverty and wealth indexes thus show a geographic concentration of poverty and wealth, but it is higher for wealth. However, we notice a difference between the distributions of IRIS according to the 2 indexes, with a greater frequency of IRIS presenting a very high wealth index. This illustrates the existence of neighborhoods where very wealthy households are grouped together. This also illustrates a structural dimension of the distribution of household income which is mechanically bounded downwards but not upwards. Thus, the poverty index cannot exceed 1 (which would require that at least 30% of the population belong to households with zero income). On the contrary, the wealth index can exceed 1 (in 2017, nearly 2.5% of IRIS had a wealth index greater than or equal to 1, meaning that, in these IRIS, the highest incomes are, on average, more than twice the income corresponding to the top 3 deciles of the distribution for the whole of France mainland). The use of these 2 indexes synthesizing the 2 ends of the income distribution obviously does not exclude the use of the poverty rate, for some IRIS for which it is provided (its frequent use facilitating an easy representation of its range). This will broaden the perspective of interpreting the situation in certain neighborhoods.

2.2.4. Classify IRIS according to the ends of the income distribution of the resident households

From the poverty and wealth indexes, it is possible to classify IRIS into 3 categories (poor IRIS, rich IRIS and internally polarized IRIS), to which a residual category is added. The following table shows this categorization. The categorization threshold of 0.04 is obtained from the poverty rate for France mainland (14.1%) and the adjustment by a degree 2 polynomial of the relationship between the poverty rate (PR) and the poverty index (PI) for the 9,079 IRIS for which the poverty rate is available. This 0.04 threshold will also be used for the wealth index (Table 1).

$$PI = -0.00008PR^2 + 0.0142PR - 0.1447 + \epsilon$$

$$\text{then } -0.00008(14.1)^2 + 0.0142(14.1) - 0.1447 \approx 0.04$$

Table 1. Categorization thresholds of IRIS

		Wealth Index	
		≥ 0.04	< 0.04
Poverty Index	≥ 0.04	« polarized » IRIS	« poor » IRIS
	< 0.04	« rich » IRIS	Other IRIS

Own elaboration

IRIS whose poverty index is greater than or equal to 0.04 and whose wealth index is less than 0.04 are considered “poor”, i.e., in 2017, 5,204 IRIS out of 11,979 (therefore 43.4% of IRIS in mainland France).

IRIS whose poverty index is less than 0.04 and whose wealth index is greater than or equal to 0.04 are considered “rich”, i.e., in 2017, 3,869 IRIS out of 11,979 (therefore 32.3% of IRIS in mainland France).

IRIS whose poverty index is greater than or equal to 0.04 and whose wealth index is greater than or equal to 0.04 are considered to be internally “polarized”¹², i.e., in 2017, 506 IRIS out of 11,979 (therefore 4.2% of IRIS in mainland France).

The other IRIS whose poverty index is less than 0.04 and whose wealth index is less than 0.04, i.e., in 2017, 2,400 IRIS out of 11,979 (therefore 20.0% of IRIS in mainland France) are :

- IRIS whose income distribution differs only very little from that of mainland France as a whole,
- or IRIS whose lowest income deciles (D1, D2, D3) are higher than the corresponding deciles of the income distribution of mainland France and whose highest income deciles (D7, D8, D9) are lower than the corresponding deciles of the income distribution of mainland France. It is therefore about IRIS whose income distribution is concentrated around central values, thus referring to greater socio-economic homogeneity of residents. The analysis here focusing on areas characterized by their internal socio-economic polarization, IRIS characterized by greater socio-economic homogeneity, are not, despite the general interest they may arouse, the object of a separate category.

2.3. Identify the characteristics of the population and the housing stock associated with a strong internal socio-economic polarization of the neighborhoods

Beyond the only distribution of income, the internal socio-economic polarization of neighborhoods is likely to be associated with other characteristics of the population and with particularities of housing¹³. These additional characteristics of polarized neighborhoods constitute both possible factors of this internal polarization (notably the age and specialization of the housing stock), but also elements making it possible to specify the socio-demographic form that this internal polarization of income takes. The absence of an a priori causal structure of the link between these characteristics and the intensity of this polarization of income within the neighborhoods, implies resorting to a method that does not mobilize this type of causal model. A principal component analysis therefore seems particularly suitable for synthesizing all the correlations between the income distribution indicators of the neighborhoods (making it possible to identify their internal socio-economic polarization) and the characteristics of the population and housing in these neighborhoods.

More specifically, the following table (Table 2) gives the list of variables used in this principal component analysis whose statistical individuals will be the 309 IRIS of the municipality of Marseille for which we have income distribution data¹⁴.

Table 2. Variables taken into account in the Principal Components Analysis

Categories of variables	- List of variables used
Income distribution	- Poverty Index (IndPov) - Wealth Index (IndWeal)
Age distribution	- Proportion under 18 years old (-18yold) - Proportion of 18-24 years old (18-24yold) - Proportion of 25-39 years old (25-39yold) - Proportion of 40-64 years old (40-64yold) - Proportion of 65 years old and over (65+yold)
International immigration	- Proportion of immigrants (Immig)

¹² Here, the term polarized IRIS expresses a socio-economic polarization within the IRIS.

¹³ These characteristics are measured here with data from the 2017 summary of the renovated population census.

¹⁴ The municipality of Marseille has 340 residential IRIS and 53 other IRIS (including 31 business IRIS). For 31 residential IRIS in the municipality of Marseille, there is no information on the distribution of income due to too few tax households or no census information. According to the tax authorities, a too small number of tax households does not guarantee the impossibility of an indirect identification of taxpayers.

Residential mobility	- Proportion of households settled for less than 5 years (Settl –5years)
Living arrangements and family structures	- Proportion of people living alone among 25-54 year olds (Alone) - Proportion of single-parent families among families with children (1parent) - Proportion of families with 4 or more children among families with children (4child)
Housing stock	- Proportion of vacant dwellings (Vac) - Proportion of second homes (Secon) - Proportion of flats (Flats) - Proportion of households occupying dwellings with less than 3 rooms (1-2_room) - Average number of rooms per flat (Nbroom_flat) - Proportion of flats belonging to buildings completed before 1945 (Oldflat) - Proportion of owner-occupant households (Owner) - Proportion of households renting in social housing (Socialhous) - Proportion of over-occupied dwellings (Overoccup)
Degrees and education	- Proportion of students in the population (Stud) - Proportion of tertiary graduates among those who have completed their education (Tertdegr) - Proportion of people without any degree among those who have completed their education (0degr)
Socio-professional structure	- Proportion of inactive among 25-54 year olds (Inact) - Proportion of unemployed among 25-54 year olds (Unempl) - Proportion of manual workers among the employed people (Manwor) - Proportion of executives and intellectual professions among the employed people (Exec) - Proportion of intermediate occupations among the employed people (Intocc) - Proportion of independent workers among the employed people (Ind) - Proportion of the employed people hired on precarious contracts (Prec) - Proportion of the employed people working part-time (PT)
Daily mobility	- Proportion of the employed people walking to work (Walk) - Proportion of the employed people commuting to work by bicycle (Bicyc) - Proportion of employed people commuting to work by public transport (PubTrans)

Source: Description of the sub-municipal census file, INSEE. Own elaboration.

2.4. Recent trends in the internal socio-economic polarization of neighborhoods

Beyond the identification of neighborhoods with strong internal socio-economic polarization, we seek to understand recent trends in the evolution of income distribution among their inhabitants. To account for these recent trends, we will measure the change in the poverty and wealth indexes between 2012 and 2017 in the “polarized” IRIS in 2017, but also in the “polarized” IRIS in 2012. Several hypotheses will be used to interpret these recent trends in the evolution of income distribution in “polarized” IRIS. The strong internal socio-economic polarization of a neighborhood can reveal a dynamic of gentrification (high-income populations gradually settling in a district initially occupied by low-income populations, some of whom still exist there). The strong internal socio-economic polarization of a neighborhood can also reveal a tendency towards the impoverishment of residents through the departure of part of the high-income populations. There may also be situations where the internal socio-economic polarization of a neighborhood is not of a transitory nature but persists over time, in particular due to the heterogeneity of buildings and the profile of housing.

3. Results

3.1. A city with strong disparities between neighborhoods

At the scale of the Aix-Marseille-Provence metropolitan area, we notice a fairly divided urban space between “poor” IRIS and “rich” IRIS, since the majority (77%) of IRIS in the metropolitan area belong

to the one or the other of these 2 categories. Less than 20% of IRIS in the Aix-Marseille-Provence metropolitan area are either IRIS whose income distribution is quite similar to that of mainland France, or IRIS whose income of resident households is more concentrated around central values.

Internally “polarized” IRIS are a small minority (around 3%) and their geographic extension is very limited since they are almost exclusively present in the heart of the city of Marseille and, to a much lesser degree, in the heart of the city of Aix-en-Provence.

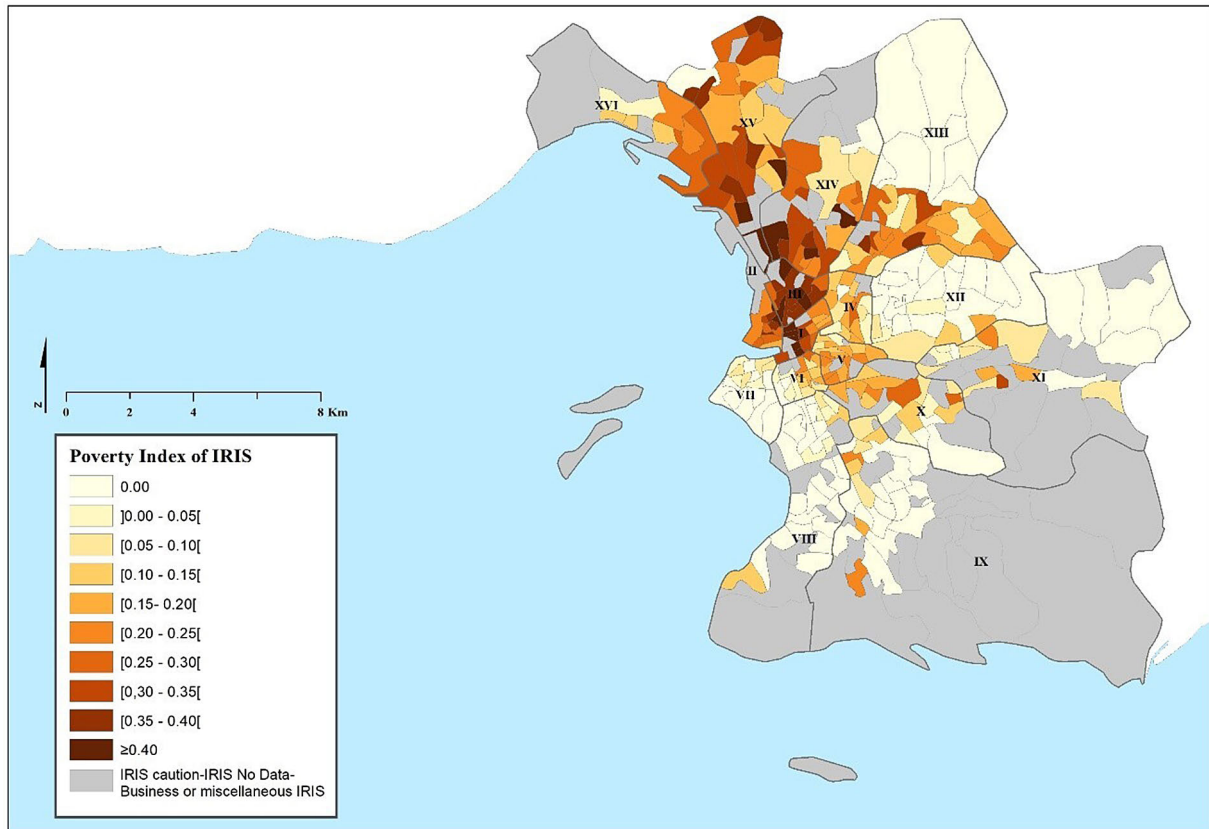
Although less concentrated in space, the very many “poor” IRIS (nearly half of the IRIS in the metropolitan area) are not widely dispersed geographically since they are mainly found in the municipality of Marseille in which they form a vast ensemble ranging from a portion of the hyper-center to the northern limits and certain eastern limits of the municipality. The other “poor” IRIS are found in small parts, often quite close to the center of other municipalities in the metropolitan area (especially in Aix-en-Provence).

The “rich” IRIS are quite widely dispersed in the Aix-Marseille-Provence metropolitan area. They are mainly found in peripheral areas of low density, but also in more central parts of the two main municipalities (Aix-en-Provence, but especially in the southern part of Marseille, between the Corniche, the basilica and the parks where the indexes of wealth reach very high levels).

The municipality of Marseille alone constitutes here our area of analysis since it concentrates almost all the IRIS concerned by internal socio-economic polarization (in 2017, 13 of the 17 in the metropolitan area). Despite their concentration in the municipality of Marseille, these “polarized” IRIS constitute a minority because if we consider the whole municipality of Marseille, we observe a space mainly split between “poor” IRIS and “rich” IRIS (nearly 86% of IRIS belonging to one of these 2 categories).

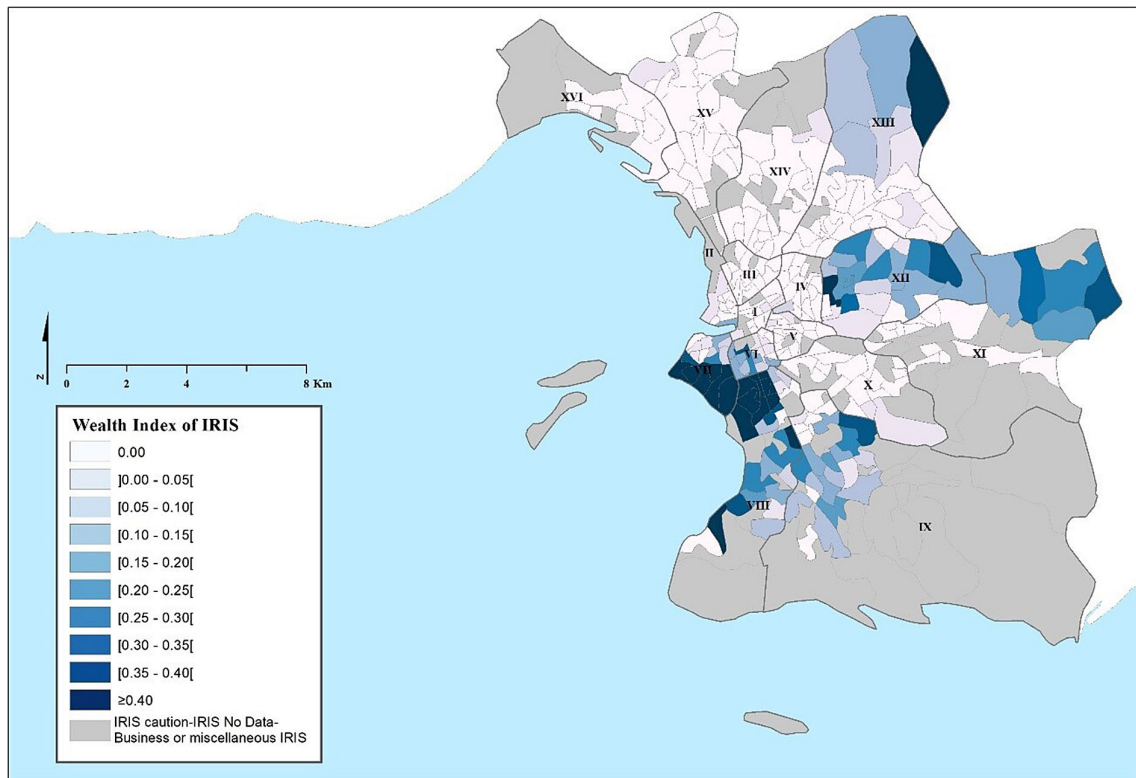
The mapping of the municipality of Marseille shows a particularly clear demarcation between “poor” IRIS (over 60% of IRIS) and “rich” IRIS (over 25% of IRIS), which, if not unique in the French urban space has an extreme form, drawing almost 2 distinct cities (Figures 6, 7 and 8).

Figure 6. Poverty Index of the 309 IRIS of the municipality of Marseille



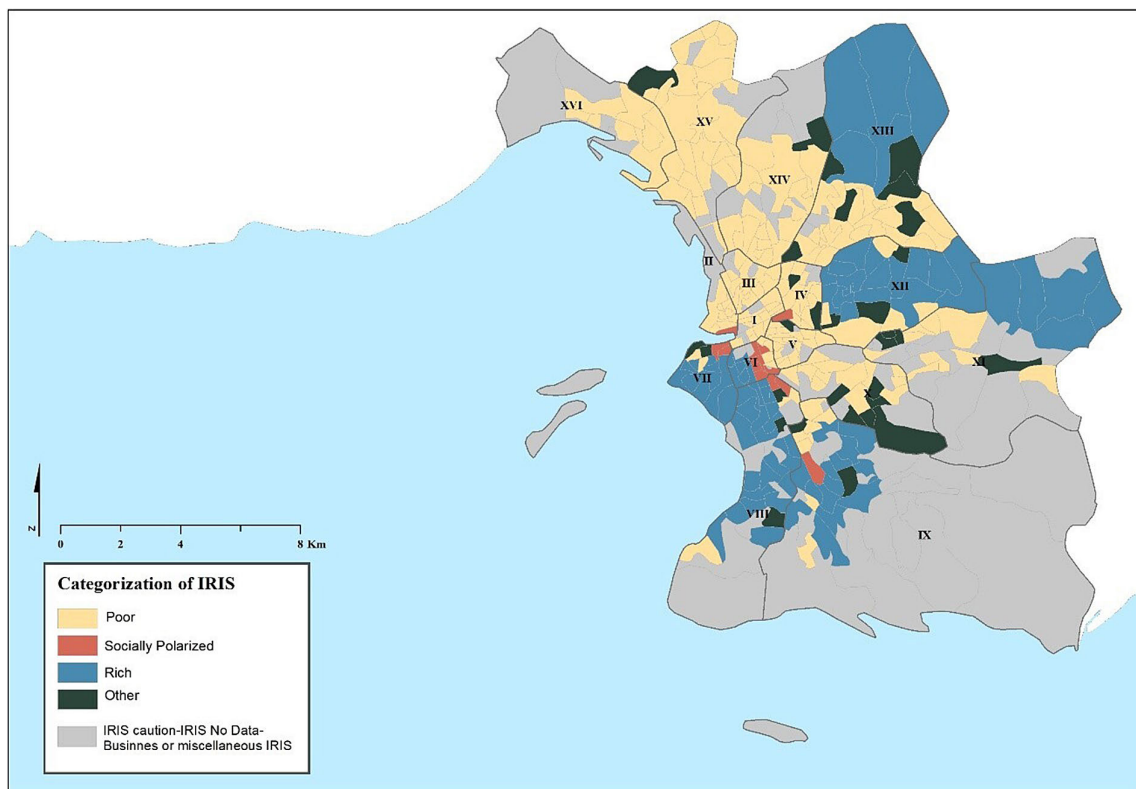
Data sources: Filosofi file, INSEE, IGN. Own elaboration

Figure 7. Wealth Index of the 309 IRIS of the municipality of Marseille



Data sources: Filosofi file, INSEE, IGN. Own elaboration

Figure 8. Categorization of the 309 IRIS of the municipality of Marseille.



Data sources: Filosofi file, INSEE, IGN. Own elaboration

3.2. Some neighborhoods with internal socio-economic polarization

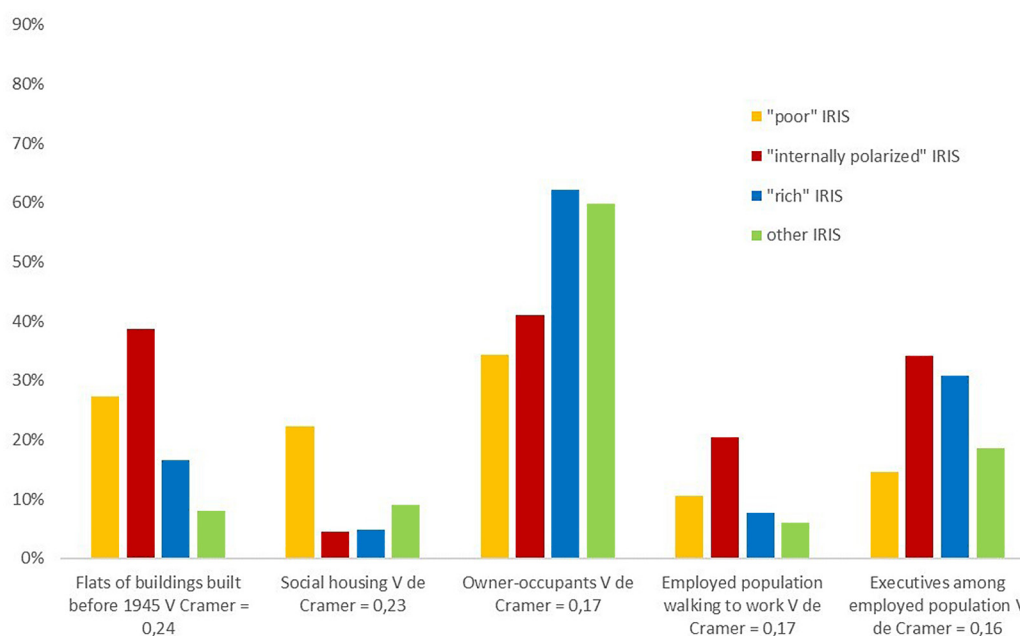
Although “polarized” IRIS are relatively rare, their geographical arrangement presents a very characteristic aspect. The geographical position of the 13 IRIS in which we observe an internal socio-economic polarization in 2017, seems to draw a “border” zone between rich neighborhoods and poor neighborhoods, with the exception of 2 of them which are surrounded by “poor” IRIS, although at a moderate distance from the parts of the city where the “rich” IRIS are concentrated. The existence of this “border” zone goes in the direction of gentrification with a gradual extension of neighborhoods with wealthy residents to neighborhoods inhabited by populations with more modest resources, without demonstrating this.

At the level of the 309 IRIS of the municipality of Marseille, certain characteristics of the housing stock and its inhabitants show a significant correlation with internal socio-economic polarization. In a bivariate form, this correlation can be measured by Cramer’s V¹⁵. For the municipality of Marseille, 5 proportions expressing binary qualitative variables are correlated with the 4 IRIS categories previously determined with a Cramer’s V greater than or equal to 0.15 (Figure 9). These are the proportions of :

- flats belonging to a building built before 1945,
- households residing in social housing,
- owner-occupants,
- employed population walking to work,
- executives among the employed population.

For 2 of these variables, these correlations express a fairly clear specificity of IRIS with strong internal socio-economic polarization (here called “polarized” IRIS). The “polarized” IRIS thus comprise, on average, higher proportions of flats belonging to relatively old buildings (built before 1945), with 12 percentage points above what is, on average, measured in the IRIS “Poor”, and between 20 and 30 percentage points above what is, on average, measured in the other 2 categories of IRIS. “Polarized” IRIS also include, on average, higher proportions of employed population walking to work, which indirectly expresses their greater centrality compared to the other 3 categories of IRIS.

Figure 9. Proportion of various characteristics according to IRIS categories, municipality of Marseille



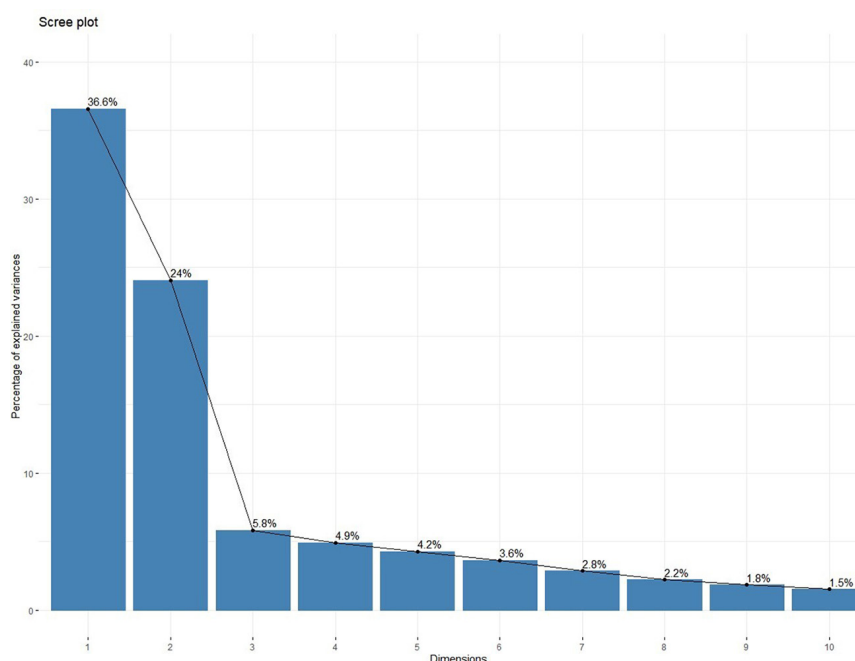
Data sources: Filosifi file, Population Census, INSEE. Own elaboration

¹⁵ Cramer’s V is a measure of the correlation between 2 qualitative variables. In the event of a total absence of correlation, the Cramer’s V will be equal to 0, in the event of absolute correlation, it will be equal to 1. It is generally considered that a Cramer’s V of less than 0.1 expresses a very weak correlation and a Cramer’s V greater than 0.3 expresses a strong correlation.

However, these correlations do not always express a specificity of “polarized” IRIS. Indeed, the proportions of households residing in social housing oppose the “poor” IRIS where this proportion is, on average, quite high, and the 3 other IRIS categories where it is very low. The proportions of executives among the employed population are very similar in the “polarized” IRIS and the “rich” IRIS and clearly higher than the average value of these proportions in the other 2 categories of IRIS. The proportions of owner-occupants are quite similar in the “poor” IRIS and the “polarized” IRIS and significantly lower than the average value of these proportions in the other 2 IRIS categories. It is interesting to note that the “polarized” IRIS are sometimes similar to the “poor” IRIS (with modest proportions of owner-occupants), sometimes similar to the “rich” IRIS (with relatively high proportions of executives among the employed population).

To better represent the correlations between the wealth and poverty indexes and the set of proportions used to express the characteristics of the IRIS population and their housing stock, a principal component analysis was carried out at the scale of the 309 IRIS exploitable from the municipality of Marseille. The first axes resulting from the analysis of principal components synthesize a significant part of the statistical information (more than 60% for the first 2 axes, Figure 10).

Figure 10. Percentage of explained variance by the dimensions of principal components analysis



Data sources : Filosofi file, Population Census, INSEE. Own elaboration

Schematically (Figure 11), the first factorial axis opposes:

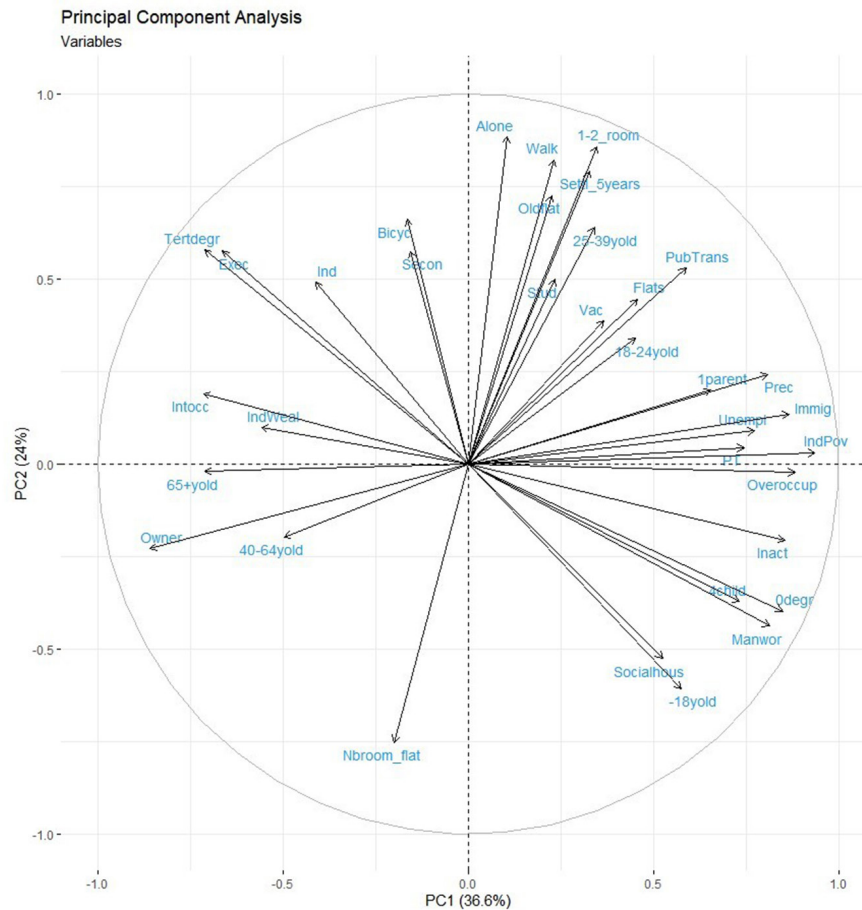
- very clearly (by its positive coordinates), the characteristics of IRIS associated with poverty (unemployment, precarious employment, strong immigrant presence, part-time work, over-occupation of housing, single-parent families, inactivity) and the poverty index himself,
- and, to a lesser extent (by its negative coordinates), the characteristics of IRIS associated with material wealth (elderly population, owners, strong presence of intermediate professions) and the wealth index itself.

Schematically (Figure 11), the second factorial axis opposes:

- by its positive coordinates, the characteristics of IRIS associated with centrality (going to work on foot or by bike, flats in old buildings, small housing, student presence, population of young adults, high residential mobility, people living alone), as well as other characteristics such as the presence of occasional or secondary residences,
- by its negative coordinates, the characteristics of IRIS associated with family life (under 18 years old persons, large flats, social housing).

Other characteristics, very well represented in the first factorial plane, have both relatively high coordinates (in absolute value) on the first axis and on the second axis. First, these are characteristics that seem to be associated with both poverty and centrality (high proportion of flats, use of public transport to get to work). These are also characteristics that seem to be associated with both material wealth and centrality (higher education graduates, managers and intellectual professions). Finally, these are characteristics that seem to be associated both with poverty and with family life (manual workers, lack of qualifications, families with 4 or more children).

Figure 11. Correlation circle of the principal components analysis (first factorial plane)



Data sources: Filosofi file, Population Census, INSEE. Own elaboration

The position of the 309 IRIS of the municipality of Marseille for which we have a complete set of data (Figure 12), shows, quite logically, that the “poor” IRIS form a vast “cloud” going from the center of the first factorial plane to the part of the plane corresponding to the positive coordinates of the first axis. Likewise, the “rich” IRIS form a narrower “cloud” located in the part of the first factorial plane corresponding to the negative coordinates of the first axis. “Polarized” IRIS and other IRIS form a narrow “band” between “poor” IRIS and “rich” IRIS. Polarized IRIS constitute the part of this narrow “band” which almost always corresponds to the positive coordinates of the second axis. The other IRIS rather constitute the part of this narrow “band” corresponding to the negative coordinates of the second axis. This relatively distinct arrangement of the different IRIS categories on the first factorial plane confirms the consistency of all the socio-demographic characteristics here measured with the poverty and wealth indexes used to construct these categories.

If we examine more precisely the position of the “polarized” IRIS on the first factorial plane, we observe a relatively concentrated “cloud” indicating a strong correlation with the characteristics associated with centrality (old buildings, small dwellings, people living alone, “soft” home-work mobility, high residential mobility, and, to a lesser extent, students and second homes). Other characteristics of

“polarized” IRISs seem to be shared with “rich” IRIS (executives and higher education graduates) or with “poor” IRISs (flats, using public transport to get to work).

Beyond this observation of the relative coherence of the “polarized” IRIS group with regard to the socio-demographic characteristics analyzed here, we notice 3 IRIS whose position on the first factorial plane differs significantly from that of the other “polarized” IRIS. It’s about :

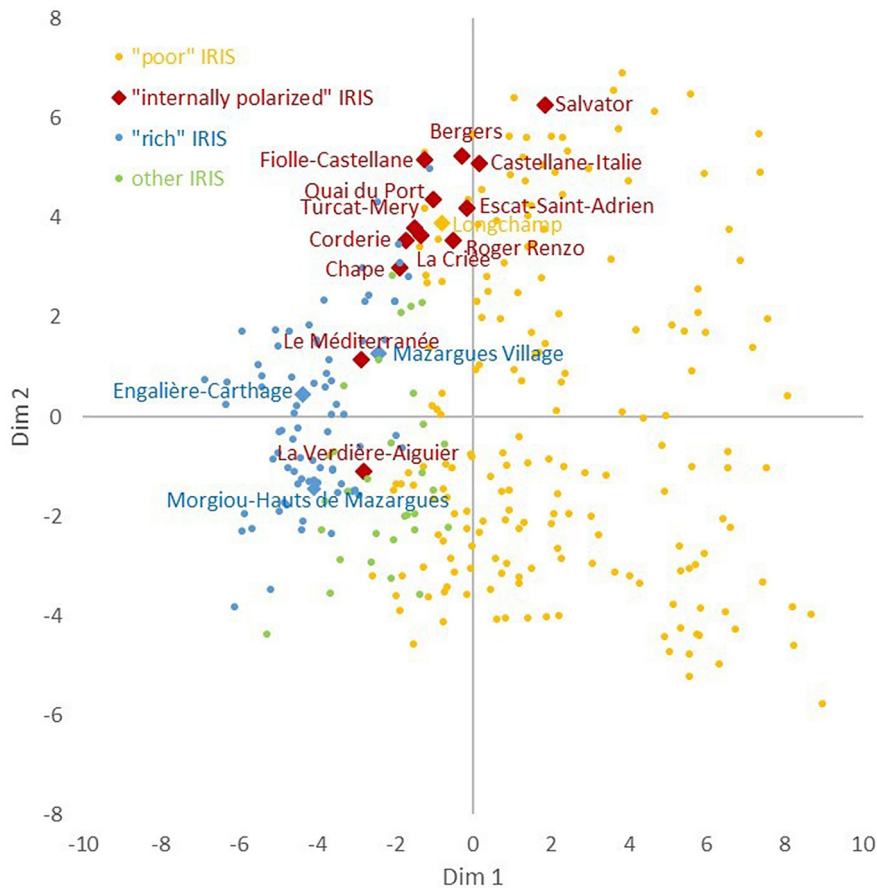
- IRIS “Salvator” whose poverty index is particularly high,
- and the IRIS “Le Méditerranée” and “La Verdrière-Aiguier”, whose “wealth” indexes are very high compared to what is observed for most “polarized” IRIS.

On the other hand, it is less clear to associate a position of the IRIS polarized on the first factorial plane with the trends of the poverty and wealth indexes indicating that the internal socio-economic polarization could be:

- a transitional step of a possible gentrification, we would then have, in recent years, an increase in the wealth index and a decrease in the poverty index,
- a transitional step of possible impoverishment, we would then have, in recent years, a decrease in the wealth index and an increase in the poverty index,
- a more permanent state, with, in recent years, little variation in the poverty and wealth indexes or even an increase in the wealth index and, jointly, an increase in the poverty index.

In other words, the trends in the wealth and poverty indexes over the past few years measured in the polarized IRIS of Marseille seem to be moderately correlated with their socio-demographic characteristics. We can, however, identify a few regularities associating socio-demographic characteristics and trends in the wealth and poverty indexes.

Figure 12. Principal component analysis. Representation of the 309 IRIS of the municipality of Marseille on the first factorial plane



Data sources: Filosofi file, Population Census, INSEE. Own elaboration

3.3. Recent trends in income distribution in socially polarized neighborhoods

By examining the recent trends of IRIS in which we observe an internal socio-economic polarization, we observe both a possible gentrification dynamic in a large number of neighborhoods, but also other evolutions: poorer residents or lasting maintenance of internal disparities in income. To interpret these recent changes in the income distribution of “polarized” IRIS, we analyze their socio-demographic characteristics and the evolution of this distribution, not only for IRIS exhibiting internal socio-economic polarization in 2017, but also for IRIS presenting this internal polarization in 2012. In this perspective, we can distinguish different situations among the “polarized” IRIS in 2017 and / or among those that were polarized in 2012.

3.3.1. A possible gentrification which reinforces the geographical concentration of wealth

In 10 IRIS in Marseille, the evolution over time of the distribution of disposable income is in line with the hypothesis according to which the coexistence, in the same neighborhood, of very low-income households with high-income households, or even very high, is a transitional stage in the gentrification process. In these neighborhoods that are socially polarized or have been recently, we observe, between 2012 and 2017, a drop in the poverty index and / or an increase in the wealth index. Almost all belonging to the 6th, 7th, 8th and 9th arrondissements, their development would strengthen the separation of the city between the part comprising the poorest populations (mainly in the North) and the part comprising the richest populations (mainly in the South).

For 7 IRIS of Marseille (Chape, La Criée, Corderie, Escat-Saint Adrien, Mazargues-Village, Morgiou-Hauts de Mazargues and Roger-Renzo), the income distribution in 2017 shows a moderate decrease in the poverty index and a slight to moderate increase in the wealth index, compared to what they were in 2012. In terms of the characteristics of the population and the housing stock 5 of these 7 IRIS present fairly similar situations (Chape, La Criée, Corderie, Escat-Saint Adrien and Roger-Renzo), as evidenced by their relative concentration within the “cloud” of “polarized” IRIS in the first factorial plane of the PCA. Within these 5 IRIS, the overrepresentation of small apartments is even more marked than within all of the “polarized” IRIS, where it is already higher than in the other IRIS categories. The proportion of households installed for less than 5 years is also higher there than it is in all of the polarized IRISs, where it is already also higher than in the other categories of IRIS. For the other 2 of these 7 IRIS (Mazargues-Village, Morgiou-Hauts de Mazargues), the poverty index, already moderate in 2012, fell to zero in 2017, so that belonging to the category of “polarized” IRIS in 2012 they pass into the category of “rich” IRIS in 2017. This change of category is in the direction of rapid gentrification and these 2 IRIS are therefore quite far from the “cloud” of “polarized” IRIS. In 2017, these two formerly “polarized” and recently “rich” IRISs are characterized by fewer small old rental apartments and by fewer people living alone than in the “polarized” IRIS where these characteristics are very over-represented. Still in comparison with the “polarized” IRIS, these 2 IRIS which have become “rich” have a lower proportion of households settled for less than 5 years, undoubtedly illustrating the lower residential mobility logically associated with the lower presence of tenants.

In 1 IRIS in Marseille (Engalière-Carthage) also moved from the “polarized” to “rich” category, the very strong increase in the wealth index and the very sharp decrease in the poverty index between 2012 and 2017 goes into the meaning of an even faster gentrification process (with a poverty rate dropping from 22.3% in 2012 to 9.4% in 2017). Even more than in Morgiou-Hauts de Mazargues and Marzagues-Village, Engalière-Carthage is characterized by fewer small old apartments for rent than in the «polarized» IRIS where these characteristics are very over-represented. Again in comparison with the “polarized” IRIS, this IRIS which has become “rich” has an even lower proportion of households settled for less than 5 years, again illustrating the lower residential mobility associated with the lower presence of tenants.

2 IRIS of Marseille with high poverty indices in 2012 as in 2017 (Castellane-Italy and Salvator), could experience the start of gentrification with, between 2012 and 2017, a slight decrease in their poverty index (the remaining poverty rate still close to 25%) or a moderate increase in their wealth index. As a result of this slight increase in the wealth index between 2012 and 2017, IRIS Castellane-Italy went from the category of “poor” IRIS in 2012 to the category of “polarized” IRIS in 2017. These 2 IRIS may experience the start of gentrification, are characterized by their attributes of centrality as evidenced by their position in the first factorial plane of the PCA. We can thus observe in these 2 IRIS an over-

representation of people walking to their work and an over-representation of small old apartments still much more marked than within the whole of the “polarized” IRIS where they are already higher than in the other IRIS categories. The proportion of households settled for less than 5 years is also higher there than it is in the set of “polarized” IRIS where it is already higher than in the other categories of IRIS, a logical consequence of the low proportion of households owning their home.

3.3.2. A recent trend of household impoverishment

In 5 IRIS of Marseille (Bergers, La Verdrière-Aiguier, Le Méditerranée, Longchamp, Turcat-Mery), internal socio-economic polarization does not seem to constitute a step towards gentrification, but on the contrary a step in a trend towards an over-representation more pronounced of low-income households.

These may be IRIS where a gentrification process seems to have been interrupted to evolve either towards a situation of rather marked poverty already observed in the past (Longchamp), or towards an internal social polarization where poverty is more present than wealth (Bergers). Within these 2 IRIS, the overrepresentation of small older rental apartments is even more marked than within all of the “polarized” IRIS, where it is already higher than in the other IRIS categories.

It can also be IRIS categorized as “rich” in 2012 and that became “polarized” in 2017 (Le Méditerranée, Turcat Mery and La Verdrière-Aiguier). In these 3 IRIS, between 2012 and 2017, the frequency of low-income households increased (with, in 2017, poverty rates reaching over 17%), at the same time as that of high-income households decreased, although it remains quite important. With regard to all the “polarized” IRIS, these 3 recently “polarized” IRIS are characterized by an over-representation of relatively recent large dwellings partly belonging to the social housing stock. This is all the more noticeable as, in most of the other “polarized” IRIS, social housing remains very rare and old housing is very over-represented.

3.3.3. Persistent internal socio-economic polarization

In 2 IRIS of Marseille (Fiolle-Castellane, Quai du Port), internal socio-economic polarization varies very little, and it is above all very marked¹⁶. In terms of the characteristics of the population and the housing stock, these 2 IRIS present situations that exacerbate that of all “polarized” IRIS, as evidenced by their fairly central position within the “cloud” of “polarized” IRIS in the first factorial plane of the PCA. Compared to the average of all the “polarized” IRIS, we can thus observe an even clearer over-representation of people living alone and of small rental flats, knowing that in relation to all the IRIS of Marseille, these characteristics are already very over-represented in “polarized” IRIS.

4. Discussion

The example of the city of Marseilles confirms the existence of neighborhoods characterized by large differences in income among their inhabitants. Although these neighborhoods remain a very small minority in a city where the social segmentation of the area is very marked, with well-defined groups of very rich and very poor neighborhoods, they are nonetheless a clear reality. Thus, in several neighborhoods, we observe the residential coexistence of populations with very low resources (with poverty rates often higher than 20%) and very well-to-do households (with incomes often between 15% and 30% higher than those of equivalent households in metropolitan France).

This coexistence of populations with very different income levels, especially when it is transitory, does not mean a great social mix (Chabrol & Launay, 2016). Even within small entities such as the IRIS, which are used here to statistically understand the notion of neighborhood, people can live in the same area without very frequently sharing the space. Indeed, it is often within the same street, or even the same building, that neighborhood relations are organized. Several studies have shown that spatial proximity does not necessarily lead to social proximity but, on the contrary, encourages the development of separatist practices, particularly in school choices (Maurin, 2004; Audren, Baby-Collin & Dorier, 2016;

¹⁶ with low-income households poorer than elsewhere (in 2017, D1 and D2 are more than 12% lower than the corresponding national deciles, the 2 poverty rates exceeding 20%) and with well-to-do households much richer than elsewhere (in 2017, D8 and D9 are more than 17% higher than the corresponding national deciles).

Launay, 2016). Socioeconomically endowed classes practice a “controlled” mix in a logic of protection and social differentiation even though social diversity of the neighborhood is appreciated (Oberti, Prêteceille, 2016; Launay, 2016; Tissot, 2011). Indeed, although there are fairly strict residency criteria for children’s schooling, recourse to private education can make it possible to circumvent them. As for associative activities, they generally do not involve residence criteria, even at the municipal level. Travel for shopping or other daily activities due to the inadequacy of the neighborhood’s supply to meet the daily needs of some residents reflects the different modes of appropriation of neighborhood life (Chabrol & Launay, 2016). Also in Athens, the socioeconomic inequalities increased by the 2009 crisis are not only manifested by differences between neighborhoods but also within the same neighborhood with a strong distance between inhabitants (Maloutas, Spyrellis, 2019). As a result, internal social polarization can result in an artificial social mix and micro-fragmentations within neighborhoods. Despite these possible limits to social mixing in neighborhoods with strong internal socioeconomic polarization, there are still spaces (local shops, traffic lanes, etc.) where different populations are likely to cross paths quite frequently. In some cases, physical proximity has generated positive effects for the social life of the neighborhood (Oberti, Prêteceille, 2016; Pinçon, Pinçon-Charlot, 2014). This is therefore very different from the situation in some neighborhoods in the north of Marseille, where almost all of the inhabitants live in households with incomes below the median income for all of metropolitan France. It is also very different from some neighborhoods in southwestern Marseille where not only do almost all of the inhabitants live in households with incomes above the median income for metropolitan France as a whole, but also some of the roads are privatized outside of any legal framework (Dorier & Dario, 2018; Dorier, Dario, Rouquier & Bridier, 2014).

Unlike other large provincial cities, such as the Mediterranean city of Montpellier, whose center includes a fairly large number of ‘polarized’ IRIS, student overrepresentation (Dasré, 2009; Kersuzan, Caillet & Bergouignan, 2009) does not seem to have any impact on the internal socio-economic polarization of Marseille’s neighborhoods. Not only is the student population only marginally overrepresented in the municipality of Marseilles as a whole, but student overrepresentation in the socially polarized neighborhoods of Marseilles is quite minimal. The absence of a very marked over-representation of students in neighborhoods with strong internal socioeconomic polarization does not, however, prevent a form of specialization of their housing stock towards very small flats. This specialization towards small flats can also be observed in certain “poor” neighborhoods.

In a city such as Marseilles, which is very marked by the social delimitation of housing, the persistence of old degraded buildings in the central parts of the city would explain both the maintenance of a very high level of poverty in the heart of the city and the existence of neighborhoods with a high degree of internal socio-economic polarisation in this heart of the city. Indeed, the over-representation of flats located in old buildings appears to be the main characteristic of neighborhoods with high internal socioeconomic polarization compared to other parts of the municipality of Marseille. The influence of building heterogeneity on socio-spatial inequalities and/or social mix is moreover evoked by some studies on large cities, in the French context (Lévy-Vroélant, 2001; Chabrol & Giroud, 2016), but also in other Mediterranean countries (Maloutas & Spyrellis, 2019). Recent trends in income distribution within some of these socially polarized neighborhoods in Marseille thus seem to correspond to a fairly advanced gentrification dynamic, or simply the beginning of such a process. However, micro-data associating income and residential mobility would be needed to analyze in greater depth the gentrification processes that may affect these neighborhoods. For obvious reasons of confidentiality, the Filosofi file does not offer extractions of such micro-data. The only mobility data available at the neighborhood level are the proportions of recently settled households (for less than five years), provided by the renovated population census. These proportions of recently settled households do not appear to be correlated with trends in income distribution within socially polarized neighborhoods, and thus with possible gentrification processes. These proportions of recently settled households seem to be more closely associated with the share of renting households, whose residential mobility is, as is often the case, greater than that of homeowners. Interpreting these proportions of recently settled households is, moreover, made tricky because it is not possible to know whether these households have moved from another address in the neighborhood or whether they come from another part of the city. The existence of neighborhoods with strong internal socioeconomic polarization in which the poverty index has recently risen or remained high suggests, moreover, that the coexistence of rich and very poor households in the same neighborhood is not necessarily the result of ongoing gentrification.

Since the reference period of the data used here (2017), the reality of the presence of very degraded buildings in Marseille has been tragically confirmed with the collapse of buildings in the Rue d'Aubagne in 2018. The dilapidated private housing stock in the city center was then affected by peril orders with numerous evacuations and rehousing (Dorier & Dario, 2018; AgAM, 2020). Following these evacuations, several urban areas were recovered by the Metropolis and the City for the renovation of buildings or their demolition. This recent, but apparently proactive, policy could, in the future, have a very significant impact on the internal socio-economic polarization of Marseille's neighborhoods. On the one hand, it could, through the renovation of buildings, attract higher-income populations to "poor" neighborhoods where they are, for the moment, very rare, thus creating new neighborhoods affected by internal socioeconomic polarization. Depending on whether these urban renovations include a significant social housing component or whether they are carried out according to a logic based mainly on private development, the internal social polarization of these currently "poor" neighborhoods will be permanent or transitory and will lead to gentrification. Although the evacuations of buildings and the renovation policies planned since 2019 do not affect the majority of the neighborhoods identified here as "polarized", they are nevertheless concerned in a significant way and they could contribute to accentuating their internal social polarization or to accelerating gentrifications that are already underway or re-launching gentrifications that have stopped.

It is always difficult to determine in advance the extent and social consequences of a housing policy. This is particularly true in a city such as Marseille, where dilapidated buildings and poverty are widespread and make the objectives difficult to achieve, while future economic and social uncertainties, following the current health crisis, may further complicate their realization. The attractiveness of the Marseilles real estate market for wealthy populations from outside the city and the region is another uncertainty regarding future socio-spatial dynamics.

5. Conclusions

The dualism of Marseille, between the southern and northern neighborhoods has been noted by numerous works (Donzel, 2005; Roncayolo, 1996; Dorier and Dario, 2018, 2020, Audren et al., 2016). Analysis of income distribution within neighborhoods (captured by INSEE IRIS) confirms this dichotomy of the city. Nevertheless, we can identify neighborhoods with a strong internal socioeconomic polarization associating overrepresentation of high-income households and very low-income households. From a methodological point of view, the poverty and wealth indexes developed here to characterize Marseille's neighborhoods and, therefore, to identify these neighborhoods with strong internal socioeconomic polarization, can be used to analyze other cities and lead to comparative studies. From the point of view of the analysis of socio-spatial inequalities, this observation makes it possible to nuance a perception of urban space that is most often characterized only by the differences between neighborhoods presenting a relative internal social homogeneity. Thus, neighborhoods of Marseille with strong internal socioeconomic polarization have specific characteristics in terms of population, but especially housing, with a particularly old housing stock. From the point of view of the transformation trajectories of these neighborhoods with strong internal socioeconomic polarization, we note a relative diversity of recent developments (gentrification, impoverishment, or maintenance of significant income differences between inhabitants). The limited residential mobility data available at the neighborhood level does not, however, allow for a complete analysis of these dynamic trajectories resulting from population renewal.

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Beta-thalassemia in Mediterranean countries. Findings and outlook

Beta-talasemia en los países mediterráneos. Adquisiciones y perspectivas

Gil Bellis^{1*} 
Alain Parant²

Abstract

Beta-thalassemia is one of the most common genetic disorders among humans. It occurs in many world regions, but the highest levels are recorded in the Mediterranean countries. This study reviews the epidemiology of β -thalassemia in these countries, as well as their resources for fighting the disease, and establishes an outlook on the trends in the pathology between now and 2050. The epidemiological parameters are based on information from specialised databases, while the outlook is derived from the global population forecasts of the United Nations. With an incidence rate at birth of 15.9 cases per 100,000 newborns, the Northern coast of the Mediterranean is the least impacted and has significant health infrastructures; the number of newborns concerned could decrease by 2050. The incidence rate on the Eastern Mediterranean coast, where numerous prevention programmes are available, is twice as high, at 31.4 per 100,000 newborns; over the next 30 years, the number of new cases at birth could increase. The incidence rate on the Southern Mediterranean coast is highest, at 36.8 per 100,000 newborns, and the region continues to suffer from a shortage of health infrastructures; the number of new cases at birth could increase considerably in the region between now and 2050. These long-term projections are based on population growth in the Mediterranean countries and will be changed only by the widespread use of antenatal practices against β -thalassemia. The findings of this study could enable the countries concerned to adapt their healthcare policies.

Keywords: Mediterranean countries; beta-thalassemia; incidence; prevalence; demographic outlook.

Resumen

La beta-talasemia es una de las enfermedades genéticas más comunes en el género humano; está presente en casi todo el mundo pero alcanza sus niveles más altos en los países mediterráneos. Los objetivos de este estudio son realizar un balance de la epidemiología de la enfermedad en dichos países, de los medios de control de que disponen, para luego realizar perspectivas de la evolución de esta patología de aquí al año 2050. Los parámetros epidemiológicos se construyeron a partir de información obtenida de bases de datos especializadas; las perspectivas se establecen a partir de las previsiones de la población mundial elaboradas por las Naciones Unidas. Con una tasa de incidencia al nacimiento de 15,9 casos por 100.000 recién nacidos, los países del norte del Mediterráneo son los menos afectados y disponen de infraestructuras sanitarias importantes; el número de recién nacidos enfermos podría disminuir para 2050. Los países del este del Mediterráneo están afectados casi dos veces más (31,4 por 100.000) pero cuentan con numerosos programas de prevención; en los próximos 30 años, el número de casos nuevos al nacer podría aumentar. Los países del sur son los más afectados (36,8 por 100.000) y siguen estando

1 Institut national d'études démographiques, France. bellis@ined.fr. * Corresponding author

2 Futuribles International, France. aparant@futuribles.com

mal equipados en infraestructuras sanitarias; el número de nuevos casos al nacer podría aumentar significativamente hasta 2050. Estas perspectivas a largo plazo están ligadas al crecimiento demográfico de la cuenca mediterránea y sólo se verían modificadas por la generalización de las prácticas antinatales contra la β -talasemia. Los resultados de este estudio podrían permitir a los Estados implicados llevar a cabo las acciones de salud adecuadas.

Palabras clave: Países mediterráneos; beta-talasemia; incidencia; prevalencia; previsión demográfica.

1. Introduction

Thalasseмии are genetic diseases characterized by a deficit in the production of hemoglobin, the protein contained in red blood cells that transports oxygen in the bloodstream. The disease is qualified as α -thalassemia or β -thalassemia depending on whether the anomaly results from a defect in the synthesis of the alpha (α) chains or beta (β) chains making up the protein. This study will focus solely on the latter, owing to its frequency and severity.

The synthesis of the β chains of human hemoglobin is controlled by a gene located on chromosome 11, mutations of which make it defective and non-functional (Cao and Galanello, 2010). The transmission of the gene corresponds to a recessive hereditary mode leading to one of three situations: the two chromosome 11s of an individual's genome both contain a non-mutated gene, in which case the individual is not affected (healthy homozygous); one of the two chromosomes contains a mutated gene, in which case the individual is not ill but a carrier (healthy heterozygous); or both chromosomes contain a mutated gene, in which the individual has β -thalassemia (diseased homozygous).

β -thalassemia is one of the most common genetic disorders among humans. It mainly occurs in the Mediterranean countries but is also found in the Middle East, West Africa, India, and South-East Asia. The total number of individuals with β -thalassemia is unknown. This lack of knowledge can be attributed to the existence in some countries merely of patient registers and, above all, to early mortality occurring before the disease is diagnosed among children with the most severe cases, the number of children born with β -thalassemia every year having been estimated at 60,000 worldwide (Angastiniotis and Lobitz, 2019).

Symptoms vary among individuals. Those with major and intermediate forms of β -thalassemia suffer from severe anaemia (Cooley's anaemia), growth disorders and febrile illnesses occurring from the first year of life. To offset the lack of hemoglobin, bone-marrow activity is overstimulated, leading gradually to an enlargement of the liver (hepatomegaly) and the spleen (splenomegaly). If these symptoms go untreated, they generally result in death before the age of five (Galanello and Origa, 2010). Various treatments are available according to the patient's age and the severity of the disorder. These include regular blood transfusions in the most common cases; the removal of the spleen (splenectomy) where transfusion requirements become excessive; bone-marrow transplants, which have lasting therapeutic effects but require grafts by experienced medical specialists from a non-affected and compatible family member (Higgs, Engel and Stamatoyannopoulos, 2012; Weatherall and Clegg, 2001). Despite their efficacy, repeated blood transfusions lead to an excessive accumulation of iron, though this may be addressed through regular doses of iron chelators (Ceci, *et al.*, 2006). Substantial resources are harnessed to treat β -thalassemia, a UK study having estimated that the cost of complete life-long treatment is between €210,000 and €250,000 (Karnon, *et al.*, 1999).

The persistence of what is a lethal disease can be explained by two factors (De Sanctis, *et al.*, 2017). The first is the positive selection of heterozygous individuals against malaria. The slight decrease in the globulin levels of these patients (microcytosis) lends them a certain degree of resistance against the destruction of red blood cells caused by the malaria parasite, plasmodium (Allison, 2009; Flint, Harding, Boyce and Clegg, 1998). It has been established that the clearing of forests and savanna starting in the Neolithic period for the purposes of agriculture and livestock farming created ecological conditions favourable to the proliferation of plasmodium. In response to this environmental pressure, natural selection retained the genetic variations ensuring reproductive advantages to certain individuals. This gradually led to today's situation, whereby in malaria-impacted areas heterozygous individuals survive but, in the event of union with another heterozygous individual, have a 25% risk on each conception of giving birth to a diseased homozygous child. The second factor is the consanguinity corresponding to the reproduction in a population of couples in which both members share one or more common ancestors. These

unions are based on cultural traditions and concern around 20% of the world population, the highest consanguinity rates being observed in North Africa and the Middle East, where the proportion of consanguine marriages stands at 30% to 40% in rural or disadvantaged areas (Bener and Mohammad, 2017; Bittles, Mason, Greene and Rao, 1991; Tadmouri, *et al.*, 2009). Consanguinity doubles the risk of genetic anomalies, from 2% to 3% for non-related individuals to 4% to 5% for a couple of first cousins. The recessive hereditary mode alone is related to the increase in this risk. A genetic mutation that is rare among a population has a high probability of existing in two parents where they have one or more common ancestors, and the child of such a couple may be homozygous diseased as a result of inheriting two copies of the same ancestral mutation.

Given the prevalence and severity of β -thalassemia and the cost of treatment, the World Health Organization (WHO) recommends a prevention-based approach (WHO, 2005). Aimed at preventing the birth of diseased children, this strategy combines several methods (Godard, Kate, Evers-Kiebooms and Aymé, 2003), including genetic advice, to inform heterozygous couples of the risks for their offspring; prenatal diagnoses, to identify the genetic anomaly at the foetal stage and enable the voluntary termination of the pregnancy; and pre-implantation diagnoses, to detect the genetic anomaly in the embryonic stage and enable the elimination of the affected embryos. Prevention has proven effective in Mediterranean countries strongly impacted by the disorder and which have opted for the approach, among them Cyprus, Greece, and Italy (Cao, Rosatelli, Monni and Galanello, 2002).

Addressing the multiple aspects of β -thalassemia and the health and socio-economic difficulties involved for the countries concerned, this study focuses on one of the most affected geographical regions, the countries on the Mediterranean coast. Our aim is to review, on the basis of carrier prevalence, the incidence rates of the disorder in these countries and the medical resources at their disposal. We then draw on a comparative approach to establish a long-term outlook on the possible trends in the disease consistent with population growth in the Mediterranean Basin. The aim with our findings is to direct the attention of the health authorities to a number of public health challenges likely to be posed in the future.

2. Methodology

The countries included in the study have a Mediterranean coastline. They belong to three groups: the European coast (or Northern coast), comprising Spain, France, Italy, Malta, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania, and Greece; the Asian coast (Eastern coast), composed of Turkey, Cyprus, Syria, Lebanon, Israel, and the State of Palestine; and the African coast (Southern coast), comprising Egypt, Libya, Tunisia, Algeria, and Morocco. Gibraltar and Monaco (Northern coast) and the autonomous Spanish cities of Ceuta and Melilla (Southern coast) have been excluded for reasons of statistical consistency.

For each country, the data on the epidemiology of β -thalassemia (prevalence and incidence), health services and monitoring tools (special medical centres, availability of blood transfusion and iron chelators, existence of patient registers) and prevention systems (existence of national or regional programmes) come from specialized databases: IthaGenes (Kountouris, *et al.*, 2014), the data of which, published internationally on the genetics, clinical trials and epidemiology of haemoglobinopathies, are regularly archived by an expert curator groups³; and CTGA database (Tadmouri, Al Ali, Al Haj Ali and Al Khaja, 2006), the genetic, clinical and epidemiological data of which concern the Arab world more specifically. These data were cross-referenced and checked with data from journal articles (Al-Gazali, Hamamy and Al-Arrayad, 2006; Alwan and Modell, 2003; Modell and Darlison, 2008). Missing data (incidence rates unavailable for some countries) were supplemented through the assumption of equivalent epidemiological rates with the closest countries on the same coast. The demographic data (population, crude birth rates) come from the latest forecasts of the United Nations Population Division (United Nations, 2019). To annualize all these data, the crude birth rates, initially provided per five-year period, were smoothed in a linear manner to obtain the most regular variations possible.

For each country, an epidemiological parameter and an estimated margin of error for the parameter were determined on the basis of previous data (number of new cases, average population size exposed):

3 The IthaGenes haemoglobinopathy collection method is uniform and systematic for all countries.

- the incidence rate at birth on an annual basis, equal to the ratio of diseased newborns to the total newborns in a given year:

$$TI = \frac{Nm}{N}$$

- the 95% confidence interval of the incidence rate at birth:

$$IC\ 95\% = [TI - 1,96 \times SD ; TI + 1,96 \times SD] \text{ where } SD = \sqrt{\frac{Nm}{N^2}}$$

For each country, a projection of the sub-population of diseased newborns was derived from the average variant of the United Nations forecast. The process consisted in applying, for each year, the incidence rate at birth of 2020 to the annual number of births forecast by the United Nations through 2050:

$$Nm_a = TI_{2020} \times N_a \quad \forall a \in [2020; 2050]$$

The forecasts thus established for each country can be used to estimate the proportion of diseased newborns out of the total number of births, taking account solely of the demographic trends likely to occur through to the end of the period under review.

For reasons of statistical significance, the comparisons concerned the country groups (European, Asian and African coasts) and their incidence rates at birth with 95% confidence intervals in 2020 and 2050.

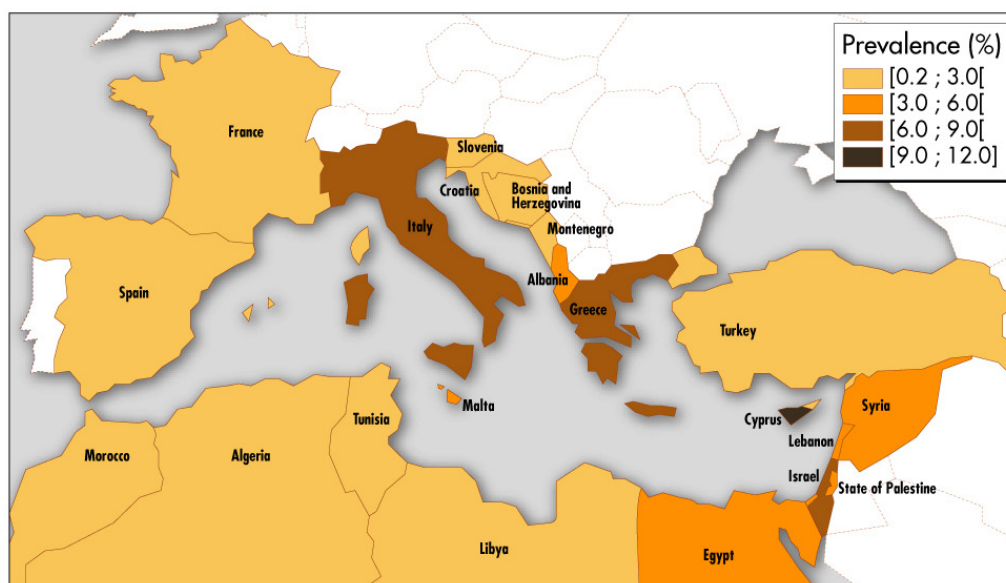
3. Results

3.1. A review of β -thalassemia in the Mediterranean in 2020.

In 2020, the population of the 21 Mediterranean countries under consideration in this paper was 522 million. The African coast is the most populous, accounting for 38.7% of the total, followed by the European coast (37.6%) and Asian coast (23.7%).

The number of β -thalassemia heterozygous individuals, i.e. those at risk of giving birth to diseased homozygous individuals, is 17.1 million, for a carrier prevalence of 3.3%. For the entire geographic region under review, prevalence is distributed according to a gradient (Figure 1), where the proportion of carriers is 3.0% on the European coast (the highest being in Albania (5.0%), Italy (6.0%) and Greece (8.1%)), 3.2% on the Asian coast (the highest rates being in Syria (5.0%), Israel (6.0%) and Cyprus (a full 12.0%)), and 3.6% on the African coast (the highest proportion being observed in Egypt, at 5.3%).

Figure 1. Prevalence of β -thalassemia carriers in the countries on the Mediterranean coast, in 2020 (%)



Own elaboration

Overall, the β -thalassemia incidence rate at birth for Mediterranean countries is 31.0 per 100,000 newborns. But the epidemiological data, along with the distribution of health services and surveillance instruments, vary considerably from one country to the next (Table 1 and Figure 2).

On the European coast, the incidence rate at birth is 15.9 per 100,000, ranging from 1.4 in France to 56.9 in Albania. Five of the ten countries on the Northern coast are relatively well equipped in terms of β -thalassemia infrastructure: Spain (which lacks special medical centres or prevention programmes but where the incidence rate is just 1.6), France, Italy (an incidence rate of 52.0 and a targeted prevention programme at the regional level in Sardinia), Malta (no blood transfusions or iron chelators despite an incidence rate of 23.3) and Greece. Besides Greece, the countries on the Northern coast lacking special infrastructure are in the Balkans region.

The incidence rate at birth on the Asian coast (31.4 per 100,000 newborns) is nearly twice as high as on the European coast, varying from 3.0 in Israel to 458.3 in Cyprus. The six countries on the Eastern coast have prevention programmes, all of them national excluding the State of Palestine, which has a regional programme in the Gaza Strip. Israel and Cyprus are the only countries with special medical centres, blood transfusions and iron chelators, as well as national patient registers. The healthcare offering and epidemiological surveillance instruments are less substantial in Turkey, Lebanon, Syria and, above all, the State of Palestine, where the incidence rate is 42.5 per 100,000.

The African coast is the most affected, with an incidence rate at birth of 36.8 per 100,000. The Southern coast is also the least well equipped in infrastructure terms. Egypt (with an incidence rate of 58.9) has special medical centres at regional level together with a prevention programme, and Morocco (incidence rate of 8.0) has regional medical centres and blood transfusions and iron chelators at national level, but Libya, Tunisia and Algeria do not have β -thalassemia infrastructure.

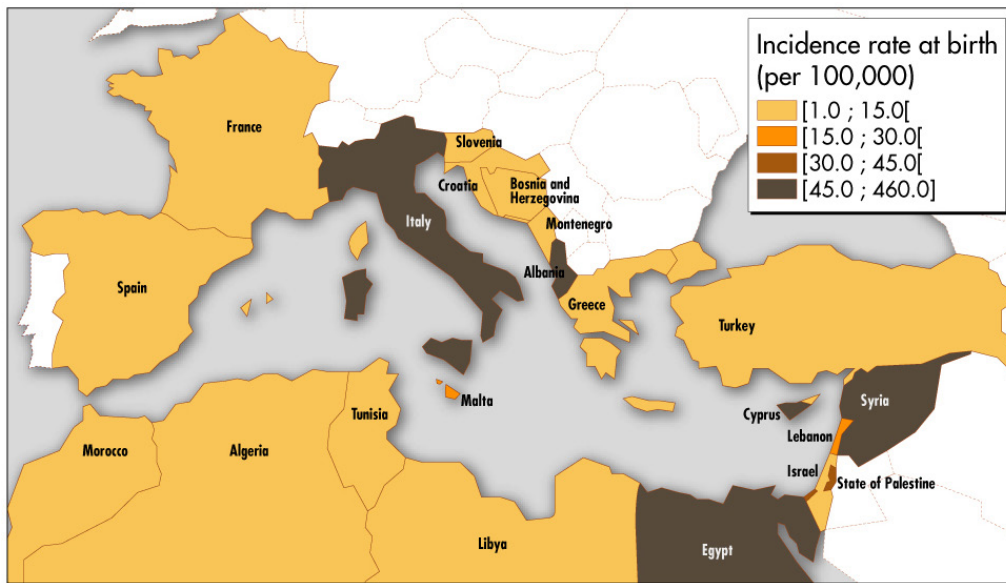
Table 1. β -thalassemia incidence rate at birth and special infrastructure in the countries on the Mediterranean coast, in 2020

Country	Incidence rate at birth (per 100,000)	Special medical centres	Availability of blood transfusions and iron chelators	Patient registers	Prevention programmes
Spain	1.6	-	National	National	-
France	1.4	National	National	National	National
Italy	52.0	National	National	National	Regional
Malta	23.3	National	-	National	National
Slovenia	5.4*	-	-	-	-
Croatia	2.9	-	-	-	-
Bosnia and Herzegovina	4.1	-	-	-	-
Montenegro	14.1*	-	-	-	-
Albania	56.9	-	-	-	-
Greece	13.9	National	National	National	National
Turkey	13.8	-	National	National	National
Cyprus	458.3	National	National	National	National
Syria	90.7	National	-	-	National
Lebanon	16.9	National	National	-	National
Israel	3.0	National	National	National	National
State of Palestine	42.5	-	-	-	Regional
Egypt	58.9	Regional	-	-	National
Libya	7.8	-	-	-	-
Tunisia	11.0	-	-	-	-
Algeria	6.8	-	-	-	-
Morocco	8.0	Regional	National	-	-

* The annual number of new cases for Slovenia and Montenegro (missing incidence data) was determined as 1, the same as in Croatia and Bosnia and Herzegovina.

Own elaboration

Figure 2. Incidence rate at birth of β -thalassemia in the countries on the Mediterranean coast, in 2020 (per 100,000)

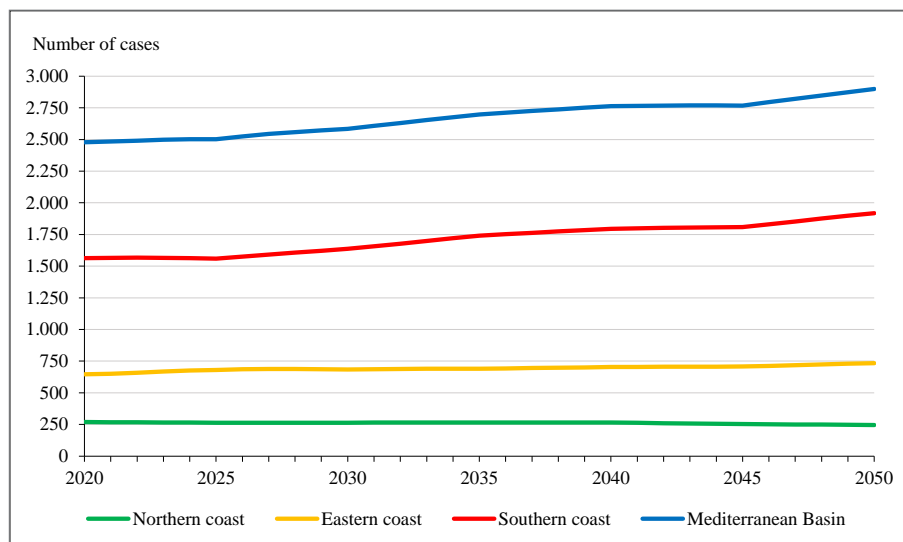


Own elaboration

3.2. β -thalassemia in the Mediterranean in 2050. Population outlook

According to the average variants of the United Nations forecasts, the number of newborns affected each year by β -thalassemia in the countries of the Mediterranean Basin will increase from 2,479 in 2020 to 2,899 in 2050, for annual average growth of 0.5% over 30 years. The three coasts will contribute differently to this trend (Figure 3).

Figure 3. Trend in the number of newborns affected by β -thalassemia from 2020 to 2050 in the Mediterranean Basin



Own elaboration

The countries on the European coast have the lowest level of cases, from 269 diseased newborns in 2020 to an expected 246 in 2050, for negative annual average growth of -0.3% . The headcount mainly results from Italy, with 220 new cases in 2020 (81.8% of Northern coast cases) and 206 new cases in 2050 (83.7%).

The countries on the Asian coast have an intermediate level, with the number of new β -thalassemia cases expected to increase from 646 in 2020 to 734 in 2050, for annual average growth of 0.4% . The

largest proportion of new cases is in Syria, totaling 338 in 2020 (52.3% of Asian coast cases) and expected to increase to 445 in 2050 (60.6%).

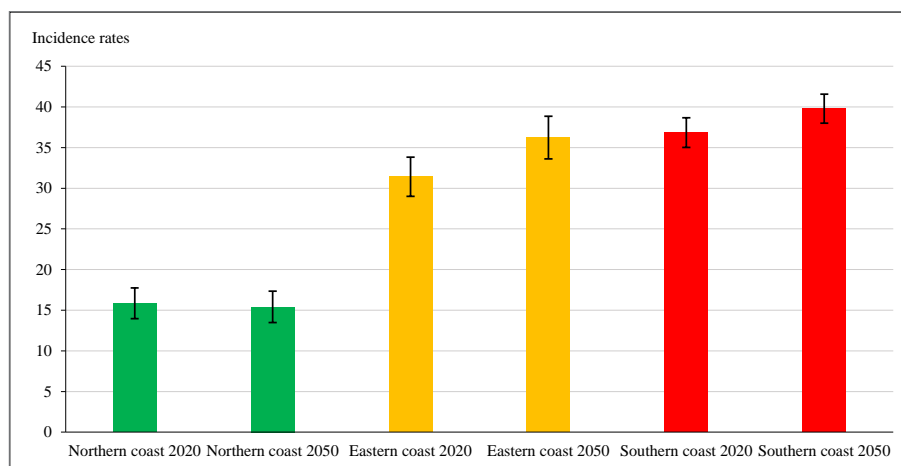
The countries on the African coast have the highest level of cases, with the number of affected newborns expected to rise from 1,564 in 2020 to 1,919 in 2050, for average annual growth of 0.7%. Egypt accounts for almost all of the new cases, from 1,423 diseased newborns in 2020 (91.0% of Southern coast cases) to an expected 1,781 new cases in 2050 (92.8%).

Figure 4 shows the trend in incidence rates at birth with 95% confidence intervals in 2020 and 2050 for the three coasts.

For the European coast, the rate is expected to fall from 15.9 [14.0; 17.8] per 100,000 in 2020 to 15.4 [13.5; 17.3] 30 years later, the slight decrease being non-significant as demonstrated by the confidence intervals.

Incidence rates at birth are considerably higher on the Eastern and Southern coasts ($p < 0.05$) and are expected to trend substantially upwards in the future. From 31.4 [29.0; 33.8] per 100,000 in 2020, the rate is expected to reach 36.2 [33.6; 38.9] in 2050. Incidence rates on the African coast are predicted to rise from 36.8 [35.0; 38.7] per 100,000 to 39.8 [38.0; 41.6] between 2020 and 2050. It should be noted that the differences estimated for the rates of the Eastern and Southern coasts between 2020 and 2050 are at the limit of statistical significance.

Figure 4. β -thalassemia incidence rates at birth in 2020 and 2050 in the Mediterranean Basin (per 100,000)



Own elaboration

4. Discussion

The β -thalassemia incidence rate is highly contrasted between different Mediterranean countries and regions. The European coast is the least impacted, with an incidence rate at birth of 15.9 per 100,000 newborns, and five out of the ten constituent countries have consequential health infrastructures. By 2050, the number of diseased newborns could decrease slightly, by 0.3% a year, for an incidence rate of 15.4 per 100,000. The incidence rate at birth in the six countries on the Asian coast is nearly twice as high, at 31.4 per 100,000. These countries are characterized primarily by the existence of prevention programmes. In the next 30 years, the number of new cases at birth could increase in this region, by 0.4% a year, for an incidence rate of 36.2 per 100,000. The five countries on the African coast are more affected (with an incidence rate of 36.8 per 100,000) and less equipped in terms of special infrastructure. In addition, the incidence rate at birth in this region is expected to increase the most between 2020 and 2050, by 0.7% a year, for an incidence rate of 39.8 per 100,000. These results suggest that, failing adapted prevention measures, the health authorities could be faced with an increasing number of individuals with β -thalassemia.

While large-scale demographic forecasts are common, those on sub-populations of diseased individuals are rare. To our knowledge, this study is the first attempt to estimate a future number of newborns with β -thalassemia in the countries of the Mediterranean Basin. The review and long-term outlook proposed in this paper could help decision-makers relative to future needs for health and education services (Al-

Sabbah, *et al.*, 2017). Given the health equipment, economic resources and specialized staff resources of the countries, future trends can be drawn on when deciding between curative measures and preventive approaches in health policies and programmes. The relative insufficiency in the healthcare offering and the growing weight of the disorder have led Egypt, for example, to implement a strategy combining genetic advice, prenatal diagnoses, and voluntary pregnancy terminations. To gain the approval of the population, this prevention programme is accompanied by medical and religious considerations as part of in-depth discussions with couples at risk of having children with β -thalassemia (El-Beshlawy, *et al.*, 2012).

The average variant of the UN projections, from which the outlook for diseased newborns was derived, demonstrates a few notable characteristics in the Mediterranean countries. The European coast has completed its demographic transition. The average number of children per woman, which in 2015-2020 stood at 1.9 in France (which currently has the highest fertility rate) and as low as 1.3 in Spain, Italy, Bosnia and Herzegovina, and Greece, is expected to remain at these levels between now and 2050. The natural growth rate (equal to the difference between the gross birth and death rates) was low in 2020 and could become negative by 2050 in all the countries on the Northern coast (from -1.3‰ in France to -7.2‰ in Croatia). The situation is different on the Eastern and Southern coasts, which have yet to complete their demographic transitions. On the Asian coast, the total fertility rate, ranging today from 1.3 children per woman (in Cyprus) to 3.4 (in the State of Palestine), is expected to trend downwards between now and 2050, with rates for the same two countries of between 1.5 and 2.5. Despite this decrease in fertility, the natural growth rate on the Eastern coast will remain high, trending in the State of Palestine, for example, from 23.7‰ to 14.6‰ between 2015-2020 and 2045-2050. The demographic situation is similar on the African coast. The average number of children per woman, ranging in 2015-2020 from 2.1 (in Tunisia) to 3.3 (in Egypt), could stand at between 1.9 and 2.5 by 2050. But the natural growth rate on the Southern coast could remain high, in Egypt decreasing from 17.9‰ in 2015-2020 to 12.6‰ in 2045-2050.

β -thalassemia incidence rates at birth, based on the birth rates in the countries on the Mediterranean coast, are influenced by the trend in fertility⁴ as well as the age pyramid of the population and, in particular, the number of women of child-bearing age. Barring a gradual, though unlikely, change in the headcount of this population category, the incidence rate at birth could be influenced by the widespread implementation of antinatal practices against the disease. As things stand, uncertainty over the epidemiological data was corrected in this study, both for 2020 and 2050, by 95% confidence intervals on incidence rates. A more precise approach would have consisted in having exhaustive patient registers for each country. This would help to measure the intensity of inflows (new diseased individuals by age, reappearance of missing individuals in monitoring) and outflows (deaths by age, missing individuals in monitoring) contributing to the predictable trend in the number of diseased individuals year after year, as is the case for cystic fibrosis in Europe between 2010 and 2025 (Burgel, *et al.*, 2015).

The heterogeneity observed in special infrastructure (special medical centres, availability of blood transfusions and iron chelators, prevention programmes) results from several factors, at least two of which may be mentioned here:

- the economic situation of the countries, which is extremely uneven. In 2019, gross national product per inhabitant averaged USD 33,400 for the countries on the European coast, USD 31,100 for those on the Asian coast (excluding the State of Palestine, for which data are not available), and USD 11,640 for those on the African coast (The World Bank, 2019);
- the major crises, such as conflicts and wars, having occurred in the Balkans and which could weigh on health policies on a lasting basis.

5. Conclusions

An overview of β -thalassemia epidemiology and currently available medical resources, as well as data on the potential trend in affected children in the coming decades, could help to mobilize the countries

⁴ With a lower fertility rate (low UN variant), the effect of which would be seen in the number of women at child-bearing age and in the number of births, β -thalassemia incidence rates at birth would be lower; with a higher fertility rate (high variant), incidence rates would, for opposing reasons, be higher.

concerned as regards healthcare initiatives and strategies. Depending on the national situation, these actions could address forecasts on the allocation of resources, the development of medical centres and surveillance systems, and the implementation of prevention programmes. At supranational level, transfers of knowledge and biomedical techniques for prenatal diagnoses could also be envisioned.

The analysis carried out for β -thalassemia on the diversity of peoples living on the Mediterranean coast must not be isolated. To the benefit of public health, the same approach could be implemented for other genetic hemoglobin diseases (for example, sickle cell anemia in Africa, the Middle East and India), since these monogenic diseases are the most widespread in the world, the number of heterozygous carriers accounting for a full 7% of the world population.

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Downgrading among higher education graduates in Italy and France: exploring regional differences

La sobreeducación de los graduados universitarios en Italia y Francia: explorando las diferencias regionales

Maria Carella^{1*} 
Jean-François Léger²

Abstract

In France and Italy – like all the countries of the European Union – the proportion of higher education graduates in the working population has continued to increase. At the same time, the number of jobs requiring this level of education has not grown as quickly. In France and Italy, this has meant a decrease in the proportion of tertiary graduates who occupy managerial positions, and a growing share of these graduates hold jobs as middle and low ranking employees.

Several studies have investigated the phenomenon of professional downgrading, focusing on its structural determinants and socio-economic implications at the national level and examining international differences. Nevertheless, only a few studies explore disparities in over-education and compare nations at the regional level.

By addressing the need for a spatial approach to this subject, which is so far lacking in the scientific literature, this paper examines the downgrading of higher education graduates in Italy and France at the regional level and discusses the real occupational returns for high levels of education. Using data from the Italian and French censuses, the findings of this analysis show significant sub-regional heterogeneities regarding access to managerial positions for graduates according to the territorial unit observed.

Keywords: over-education; higher education graduates; access to managerial positions; regional inequalities; France; Italy.

Resumen

En Francia e Italia, como en el resto de los países de la Unión Europea, la proporción de los graduados universitarios sigue aumentando en la población activa. Al mismo tiempo, los trabajos que requieren este nivel educativo no están creciendo tan rápidamente. En Francia e Italia, esto se traduce en una disminución de la proporción de titulados superiores que ocupan cargos directivos, y en un aumento de la proporción de los que ocupan puestos de trabajo como obreros o empleados de categoría media o baja. Varias aportaciones han analizado el fenómeno de la sobreeducación, centrándose en sus determinantes estructurales y en las consecuencias socioeconómicas a nivel de país y examinando también las diferencias entre países. Sin embargo, solo algunos de ellos han intentado explorar las disparidades en la sobreeducación comparando los países a nivel regional. Abordando la necesidad de un enfoque espacial/territorial de este tema, que hasta ahora falta en la literatura científica, en este artículo se examina la desvalorización de los graduados universitarios en Italia y Francia, a una escala regional, y se examinan los verdaderos beneficios profesionales de la obtención de un título de educación superior. Utilizando datos de los censos italiano y francés, los resultados de este análisis muestran importantes heterogeneidades interregionales en el acceso a puestos directivos para los titulados superiores.

Palabras clave: sobreeducación; graduados universitarios; acceso a puestos directivos; disparidades regionales; Francia; Italia.

1 Department of Political Sciences, University of Bari “Aldo Moro”, Bari, Italy. maria.carella1@uniba.it. * Corresponding author

2 Demography Institute (IDUP), University of Paris 1 Pantheon-Sorbonne, Paris, France. jfleger@univ-paris1.fr

1. Introduction

For at least thirty years, in many Western countries, ‘the professional integration of young people in access to employment has been characterized by an increasing downgrading’ (Chabault, 2008, p. 185). This phenomenon, also known as over-education, refers to individuals whose education exceeds those required for the job they occupy (Green, McIntosh & Vignoles, 2000; McGuinness, 2006). Long spared from professional downgrading, higher education graduates are increasingly confronted with it, especially since the proportion of young people entering higher education has grown significantly. Indeed, the median value of the percentage of tertiary-level graduates aged 30 to 34 has risen from 22% in 1993 to 46% in 2018 in EU-15 area countries (Eurostat, 2019).³

In Europe, studies on over-education were more widespread in the 1990s, when a significant increase in the educational level of the population produced an excess in the educated labour supply. Over time the literature on this topic has been significantly enriched (see Chabault, 2008 for a review), and interest in higher education graduates has even been seen in seminal contributions (Gautié & Nauze-Fichet, 2000; Doazan & Eckert, 2014).

Nowadays, the debate on the risk of professional downgrading remains current and open; nonetheless, most studies either focus exclusively on the determinants of country-level education-work mismatch or tend to assess the effects produced on earnings, productivity, career mobility and job satisfaction (Brynin, 2002; Lemistre, 2014) or on specific sectors of activity, such as public service (Moulet, Véro & di Paola, 2005). To date, cross-national studies based on a spatial approach to this phenomenon are even scarcer and usually limited in identifying convergences and/or differences in the factors driving over-education across countries (Verhaest & van der Velden, 2013; Budría & Moro-Egido, 2018).

This paper aims to add to the existing literature by conducting a comparative analysis of professional downgrading in France and Italy at an infra-national level. The decision to analyse this phenomenon in France and Italy is based on two factors. Firstly, more recent downgrading of higher education graduates has been substantially shaped by the second education explosion in the 1990s, namely, by the expansion of access to higher education and an increase in the number of tertiary graduates. In this regard, in the European context, France and Italy take up peculiar positions: France because its pathway almost perfectly matches the average of European countries, and Italy because it is the country where this second education explosion occurred most recently. Moreover, in Italy the proportion of higher education graduates among younger generations is the second lowest in Europe (28% for people aged 30 to 34 in 2018, although this percentage has tripled in 25 years).

Secondly, France and Italy are interesting to compare because of their different urban mesh. Urban structures can play an important role in the geography of higher education graduates’ downgrading. In general, very large cities tend to concentrate a significant proportion of managerial positions and higher-level intellectual professions. This is the case in France, where intellectual, management and decision-making functions converge (Van Puymbroeck, 2010), particularly in Paris and the Île-de-France region, where more than a third of these jobs are found (Aubry & Léger, 2015). On the other hand, the urban network in Italy is very different from that of France, which is characterised by a hyper-concentration of political, economic, cultural and media powers in the Parisian agglomeration and, to a much lesser extent, in a few regional metropolises (Lyon, Lille, Toulouse, Nice)⁴. In Italy, if two cities dominate the urban hierarchy (Roma and Milano), there are also several large cities of importance on the European stage (Firenze, Torino, Napoli, Venezia, Bologna, etc.)⁵ and more than a hundred cities of between 30,000 and 200,000 inhabitants, often active, well-equipped, and even welcoming for a few higher functions (universities; major head offices, such as the Benetton headquarters in Treviso) (Delpirou & Rivière, 2013). As a result, managerial jobs are better distributed in Italy than in France. Finally, in Italy there is no ‘diagonal of the void’.⁶ There is, however, a significant north-south division.

Based on this comparative approach, our study investigates the professional downgrading in France and in Italy, especially with respect to access to managerial positions, (1) exploring territorial disparities

3 The term EU-15 refers to the 15 member states of the European Union before the new member states joined the EU. For these countries, statistical series are available for the last twenty-five years.

4 The territories mentioned in this article for France are shown on map A1 in Annex 1.

5 The territories mentioned in this article for Italy are shown on map A2 in Annex 2.

6 The ‘diagonal of the void’ (*diagonale du vide*) is a broad band that crosses metropolitan France from north-east to south-west, within which population densities are relatively low compared to the rest of France.

within and across countries at a small regional level and (2) examining some implications produced by this phenomenon such as the redistribution of higher education graduates.

The differences between these two countries suggest a priori, on the one hand, that the downgrading of higher education graduates is less evident in Italy than in France and, on the other hand, that this expected result, joined to the more balanced urban mesh in Italy, should lead to less marked territorial disparities in this country compared to France. We will show that this is not the case.

1.1. Theoretical Background: Determinants and Consequences of Professional Downgrading

In Europe two main strands of literature have, over time, investigated the implications produced by the increase in professional downgrading in general, and by that of higher education graduates in particular. The first strand highlights the effects shaped by a greater number of highly educated workers that accentuates the phenomenon of 'queuing' within the labour market (Salais, 1980), where candidates are placed according to their educational qualifications and also according to the theory of competition for employment (Thurow, 1975). Conforming to this postulate, the growing number of candidates for managerial positions has increased the 'queue' for this type of position. As a result, the lowest ranked individuals are strongly encouraged to choose between waiting for a job corresponding to their level of qualification (and in this case remaining unemployed or being inactive) or changing 'queues' and applying for a job where the required qualifications are lower than the education level possessed. In this case, they displace even further those whose level of qualification corresponds to the jobs of this 'queue,' inducing them to confront the same dilemma.

This empirical evidence seems to have dominated mainly in France, where the research conducted since the second half of the 1990s has focused on the risk factors of downgrading, analysing the socio-demographic characteristics of individuals (the size of the municipality of residence, sex, mode of residence, father's profession, etc.) (Nauze-Fichet & Tomasini, 2002), the dimension of the job held (sector of activity, size of the employer, type of contract) (Giret, Nauze-Fichet & Tomasini, 2006), and the level of education and/or training (Giret, Lopez, & Rose, 2005). Moreover, detailed studies, such as those resulting from the use of the generation surveys carried out by the Centre for Studies and Research on Qualifications (Céreq), have documented the trajectories of individuals with regard to access to jobs (Nauze-Fichet & Tomasini, 2005).

Another strand of literature reverses this logic related to the professional downgrading pointing to the shortage of skilled jobs. This is precisely what Italian research does, often focusing on the structural factors driving over-education that stem from the development of activity sectors requiring less-qualified workers to the detriment of activities in the advanced tertiary sector (Bernardi & Ballarino, 2014). Some studies have explored the diffusion of the professional downgrading in Italy in the area of public service during the 1990s (Argentin & Triventi, 2011) when some institutional reforms and the significant presence of the baby boomer generation in management positions had further reduced recruitment opportunities for higher education. The development of the private sector has certainly helped young Italian graduates to access employment, but most often they occupy intermediate professions (Fullin & Reynieri, 2015).

Other studies have shown that structural imbalances in the labour market play a greater role in determining over-education rates than does the education system. In other words, there would not be a surplus of higher education graduates in Italy, but rather there would be an insufficient number of medium- or high-skilled jobs (Ballarino & Schizzerotto, 2011; Argentin & Ballarino, 2014). Not surprisingly, the spatial dimension has also been emphasised in this country given the development gap between the northern and southern regions. Iammarino and Marinelli (2015, 2017) have investigated interregional migrations in Italy, examining the relationship between over-education in workers and spatial mobility, while Meliciani and Radicchia (2016) have measured the effect of migration on the education-to-work transition. Both of these studies apply econometric models and seek to identify individual characteristics (sex, type of training, father's level of education, region of origin, etc.) related to the risk of experiencing internal migration.

Concerning the geographical implications of the downgrading, few studies have examined this feature but only through analysis of the individual trajectories and their determinants. Plassard argues that, 'a part of over-education would result from trade-offs between employment and the advantages of the place of residence' (Plassard, 2015, p. 52) and in line with this assertion, scholars have compared levels

of downgrading of one country with another. For example, empirical evidence has documented an increase in the rates of over-education on the labour market in Portugal, especially between 1985 and 1992, and in the Netherlands between 1960 and 1995 (Brynin, 2002; Chabault, 2008). Nevertheless, to our knowledge, the demographic translation of the downgrading on geographic disparities has not yet been explored at the sub-national level. Several questions regarding over-education remain to be addressed by an in-depth and systematic spatial analysis.

Indeed, when tensions within the labour market are so strong that they force workers to occupy a job for which they are overqualified, the issue of residential mobility within a region or a country – but also externally (migration to a foreign country) – is essential.

Internal and international migration can play an important role in shaping regional differences related to the phenomenon of downgrading. At the individual level, some studies show that interregional migrants have lower rates of over-education than local populations (González-Leonardo & Gay, 2019); conversely, over-education seems to be higher for international immigrants than for the native population (Hidalgo, Calderón & Pérez, 2006). On the other hand, a growing stream of research at the national and regional levels is exploring the impact of internal migration, by level of education attained, on the redistribution of human capital, focusing on the changes this phenomenon implies in the number and composition of skills in both the regions of origin and of destination (Faggian, Rajbhandari & Dotzel, 2017; Bonifazi, Heins, & Tucci, 2018). A recent study has shown that in Spain the educational selectivity of internal migrants has produced different internal migration patterns related to the existing territorial imbalances of this country. In particular, the growing mismatch between workers' skills and the labour market, and strong competition for the few qualified jobs available, has increased migration of graduates from some inland regions towards more economically developed regions over time, while out-migration rates of less educated individuals have remained stable (González-Leonardo, et al. 2020).

Conversely, by examining the effects of internal mobility on regional labor markets, some authors have revealed mixed findings in Italy. For interregional migration flows of low-skilled workers, the spatial differences in the unemployment rates are reduced. In contrast, south-north flows of high-skilled workers have had a negative impact, increasing unemployment rate differentials and deepening the disparities between northern and southern regions and provinces (Basile, Girardi, Mantuano & Russo, 2019). This article is devoted more precisely to the 'geographical translation' in Italy and France of these residential mobilities which is partly related to the 'fear of downgrading' (Eckert, 2014, p. 87) of higher education graduates.

2. Methodology

To characterise and then measure downgrading, several methods have been used over the past forty years. The first, the *normative* approach, consists of establishing a priori a correspondence table between 'the diplomas which usually match to a profession (entry by profession) or, conversely, the profession or professions traditionally associated with a level of education (entry by diploma)' (Forgeot & Gautié, 1997, p. 55). The second method, the *statistical* approach, refers to a correspondence table between diploma and profession based 'on a criterion of a statistical nature in the sense that it takes account both of the relative importance of social categories at each level of education, and, symmetrically, of the relative shares of the various diplomas in each social category (without referring to a specific threshold)' (Forgeot & Gautié, 1997, p. 56). In this way the norm is statistically defined. Finally, there is a third *subjective* approach (Di Paola & Moullet, 2012), which is based on the sense of satisfaction that individuals experience in their professional positions and social categories related to their level of education.

To perform our spatial analysis in France and in Italy we adopted the normative method, which proposes downgrading measures for a considerable number of diploma levels (Lemistre, 2014). Nevertheless, since our purpose is to provide a measure of downgrading on a small sub-national scale, we have limited the number of categories used to characterise diploma level and socio-professional category.

Concerning diplomas, we gathered three categories of workers and brought them together within the same category: those whose highest diploma is lower than a baccalaureate; those whose highest education level is a baccalaureate degree, including general, technological or professional degrees; and, finally, all active higher education graduates, whatever the number of years of study.

On the employment side, we have differentiated two main categories. The first includes managers and higher intellectual professionals whose level of skill unequivocally corresponds to higher education; the

second includes employees/workers whose required level of skill is still (and in principle) unequivocally below the baccalaureate.

Even though we are attempting to expand the knowledge of downgrading on a detailed geographic scale, our study is mainly based on an analysis of the following simple indicators:

- the proportion of managers among workers with higher education qualifications aged 25 to 54, which measures the proportion of higher graduates who access a job corresponding to their level of education/qualification;
- the proportion of employees/workers among the same active graduates aged 25 to 54, which assesses the proportion of these graduates that unambiguously occupy a downgraded professional position in relation to their level of education.

We analysed indicators for Italy and France across time and space even though the implementation of the comparison between these two countries has limitations.

The first one stems from significant differences between professional nomenclatures in the two countries. Rather than trying to reconstruct categories of professions exactly identical to the ones existing in France, we have gathered those that are significant with respect to the topic of our analysis in each country. For executives/managers, we regrouped functions and jobs which 'normally' target higher education graduates.⁷ For workers/employees, we brought together functions and jobs which, if occupied by tertiary graduates, would undoubtedly represent a clear professional downgrading.⁸ In order to clearly differentiate these two social groups (managers on the one hand, and workers/employees on the other), certain socio-professional categories, which can include significant proportions of higher education graduates, baccalaureate holders and non-baccalaureate holders, have been excluded from our field of study. These are mainly intermediate professions (for example, senior technicians, who may hold a short-cycle higher education qualification, but might also be non-higher education graduates who have benefited from social promotions), artisans and traders, farmers and the military.

The second limitation concerns the sub-national divisions adopted for France and Italy. For France, we have focused on the *arrondissement*, which is a sub-departmental administrative unit (three to four per department) whose name corresponds to the main city where administrative functions are concentrated (sub-prefecture or prefecture when the capital of the *arrondissement* is also that of the department). There are around 330 in mainland France. Their number may vary over time depending on local territorial redevelopments, although this is quite rare. Statistically, these districts have the advantage of dividing France into a sufficiently large number of spatial units to distinguish between the living areas of cities and large, medium and small towns, with rural towns, while providing large enough numbers of individuals to produce robust descriptive statistics. In Italy, these administrative units do not exist. However, we can refer to the provinces (110 provinces in 2011), which have the same advantages as the French districts in studies that explore spatial disparities.

Finally, the time periods compared are different. While for France it is possible to construct a harmonised series of professional downgrading indicators since 1968, for Italy this is only possible for the years 2001 and 2011. Indeed, the available data does not allow us to construct indicators that might intersect the educational level and socio-professional category for the years 1981 and 1991 due to changes in occupational classifications. Nevertheless, this does not detract from our approach of comparing the sub-national intensity of downgrading since the beginning of the significant growth in the proportion of tertiary graduates in the labour force aged 25 to 54. Given the demographic inertia, a time lag is needed between the moment when the share of higher education graduates within a generation increases and the moment when this phenomenon materialises within a set of three generations. The earlier emergence of this phenomenon in France explains why we have gone back to 1982 to draw broad outlines of the initial situation, whereas starting from 2001 is pertinent for the case of Italy.

Despite the methodological difficulties encountered in ensuring a comparison between France and Italy, the changes observed over time have allowed us to obtain solid findings.

We used available data from the National Institute for Statistics and Economic Studies (INSEE) for France and from National Institute of Statistics (ISTAT) for Italy concerning people aged 25 to 54. This

7 Professional, intellectual, scientific activities requiring higher skills or artistic activity; management of a company or management of public or private organisations.

8 These categories concern occupations that involve simple and routine tasks requiring manual labour or service functions or require skills at the second ISCO skill level (i.e., stationary plant and machine operator assemblers, drivers and mobile plant operators).

aggregated age category has the advantage of bringing together most of the working population. Its reduction to three generations also allows us to measure the changes between two generations that completely differ with respect to the phenomenon of downgrading. Thus, by examining this age group it is possible to compare workers aged 25 to 54 at the beginning of the 1980s with those of the 2010s, two sets completely separate from a generational point of view. Indeed, during the 1980s the number of baccalaureates, and then the number of students, began to significantly increase in France, producing a significant change in the composition of the working population. Also, at the beginning of the 1980s, a policy of decentralisation was implemented in France to rebalance power between the central administrations in Paris and the territorial administrations in the provinces.

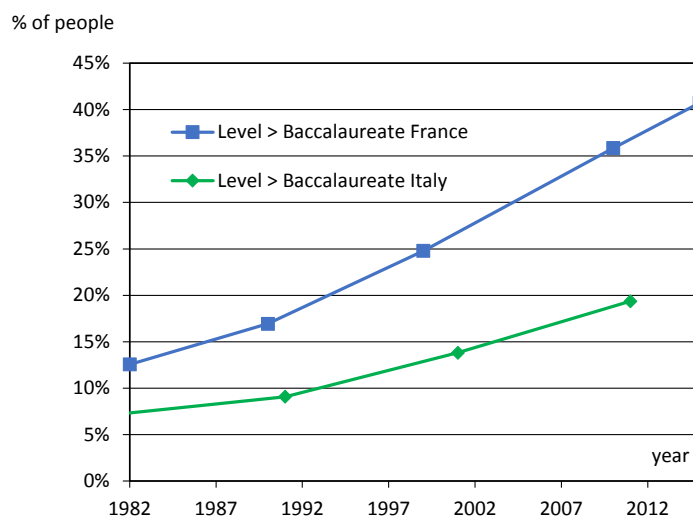
3. Results

3.1. Evolution of educational levels at the national level in Italy and France

Before exploring the territorial differences in professional downgrading in Italy and France, we present the trend at the national level, examining the same indicators used at the sub-national level. This framework allows us to better understand this phenomenon at the level of the entire country and, thus, to better illustrate the geographical disparities.

In France as in Italy, with the growth in the proportion of tertiary graduates in the working population (Figure 1), the share of these graduates aged 25 to 54 who occupy positions as manual workers or employees has increased considerably: It has risen from 7% to 21% between 1982 and 2015 in France, and from 8% to 22% in just 10 years in Italy (from 2001 to 2011). At the same time, the proportion of the higher education graduates aged 25 to 54 in managerial positions has dropped from 45% to 36% in France, and from 70% to 55% in Italy. In these two countries, the extent of this decrease is therefore comparable to the increase in the proportion of downgraded higher education graduates in the labor market. These two symmetrical trends both highlight the same phenomenon: the growing tension related to access to jobs corresponding to the highest levels of education and/or qualification.

Figure 1. Evolution in France and Italy of the proportion of higher education graduates among the active population (employed or not) aged 25 to 54



Source: Insee, French Population Census; Istat, Italian Population Census. Own elaboration

The entry into the labor market of ever more qualified generations, and the departure of older ones possessing lower education levels logically leads to an increase in the proportion of workers (employed or not) who have earned a tertiary level degree. Thus, in France, between 1982 and 2015, the share of workers aged 25 to 54 with a higher level of education more than tripled, from 13% to 41% (Figure 1). But at the same time, the number of working people in this age group occupying managerial positions has only increased by a factor of x2.4. Among higher education graduates, competition for access to managerial jobs has therefore intensified considerably: In 1982 there were 2.1 million higher education graduates among workers aged 25 to 54 and 1.6 million managers in this age group, a ratio of 13 higher

education graduates for every 10 executives. In 2015, this ratio rose with 9.1 million higher education graduates for every 3.9 million executives. In Italy, where the share of workers aged 25 to 54 with a higher education level only doubled between 1981 and 2011 – from 9% to 19% (Figure 1) – the ratio between the number of managerial jobs and the number of higher education graduates was much more favorable than in France. In 2011, there were 3.3 million managers among workers aged 25 to 54 for 3.9 million higher education graduates in Italy, a ratio of 12 higher education graduates for every 10 executives.

Nevertheless, in Italy the decrease in the number of managerial jobs between 2001 and 2011, which was also exacerbated by the crisis of 2008 that hit Italy particularly hard, combined with the increasing flow of higher education graduates, probably explains the surge in downgrading for this category of workers. Indeed, the number of executives aged 25 to 54 lost 250,000 units in ten years, while the number of graduates gained one million.

To sum up, in France, the increase in the share of higher education graduates within each generation has led to a rise in the proportion of active people with a tertiary education level. This trend has contributed to the downgrading of all those who do not attain higher education: In 1982, 41% of managers did not have tertiary level qualifications; in 2015, that percentage is only 15%. While it was possible even thirty years ago to access managerial positions without a tertiary level diploma, this is not true today. In 2015, only higher education graduates can hope to access professional functions.

However, the increase in the number of tertiary graduates has been greater than the increase in the number of jobs for which such qualifications are required; consequently, their chances of becoming managers have decreased quite markedly. As a result, a significant proportion (one in five) of workers who have obtained a tertiary level diploma are employed as manual workers or employees. In other words, the increase in the number of higher education graduates has reduced their access to managerial functions and, therefore, effectively blocks entirely any possibility of becoming a manager for a person who chooses not to pursue higher studies. Briefly, the increasing and respectable ambition to pursue higher education has translated into a strengthening of inequalities in access to managerial functions and a weakening of the conversion of university qualifications in the job market.

This pattern is completely comparable in Italy. Managerial positions are becoming increasingly reserved for higher education graduates: In 2011, 66% of executives were tertiary-level graduates, compared to just half (49%) ten years earlier. This reality has also intensified competition for these types of jobs among higher education graduates which, with the consequent drop in the proportion of managers among tertiary graduates, has increased professional downgrading.

The situation has become critical over time: Maestriperi and Ranci (2016) write that Italy, “Is not a country for graduates”. Furthermore, it is not impossible that the figures on downgrading underestimate the reality. Indeed, especially since the crisis of the late 2000s, emigration from Italy has increased significantly, and higher education graduates have represented an important percentage of these outflows (Bonifazi & Heins, 2019; De Rosa & Strozza, 2015; Dubucs, Pfirsch, Recchi & Schmoll, 2017). In general, this skilled migration has reduced the demographic pressure on managerial jobs in Italy. Nonetheless, the Italian job market only partially succeeds in offering suitable positions to the many tertiary-level graduates. Consequently, these individuals are often forced to choose to either accept a downgraded job in their own country or to expatriate.

These departures have consequences for the statistics: If in Italy the migration of higher education graduates due to a lack of professional positions corresponding to their qualifications were not a reality, the proportion of managers among higher education graduates would be lower, while the proportion of intermediate occupations and workers/employees would be higher.

Therefore, the migration of graduates mitigates, in a way, these findings. Nonetheless, the figures presented lead unambiguously to the fact that Italy is currently experiencing difficulty in ensuring the conversion of tertiary-level diplomas in the labor market, despite the fact that less than 30% of the younger generations reach this education level⁹.

⁹ This proportion likely underestimates the real share of tertiary graduates within a generation. Eurostat statistics for each country only relate to the resident population within each of them. And if, as we have mentioned, the rate of emigration of graduates is significant, these departures of higher education graduates lead to an underestimation of the growth in the number – and probably the share – of higher education graduates among 30 to 34 years old. If, in Italy, this statistic lags behind those of all the other European countries, it is perhaps also because some of its graduates, or even most of its graduates (engineers, researchers, doctors, architects, etc.) no longer reside there.

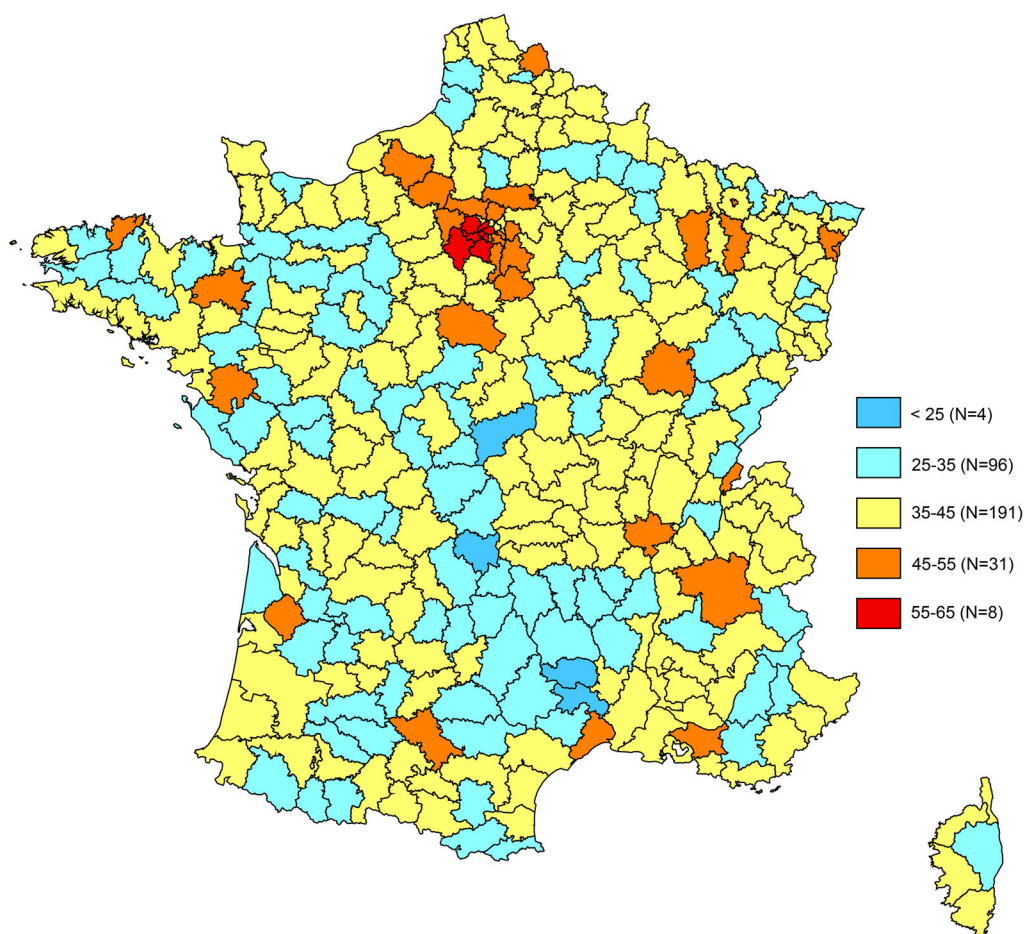
However, in France and Italy, depending on the territory, this difficulty in ensuring a suitable conversion of university degrees in the labor market can be quite unequal. Statistics show significant disparities between those territories integrated into the globalization process (the big cities in France, the northern regions in Italy) and the rest of the country. This is precisely what the sub-national spatial analysis shows in this paper.

3.2. Slight territorial disparities in Italy as in France with a downgrading rate below 10%.

In the early 1980s when only 7% of higher education graduates aged 25-54 were employed as manual workers, France was a homogeneous country with regard to the local capacity for higher education graduates to reap the rewards of their educational capital in the job market. In 7 out of 10 arrondissements, more than 35% of higher education graduates were able to access managerial jobs (Figure 2). If, at the beginning of the 1980s, access to managerial positions was certainly not equal everywhere – with the Paris region and, to a lesser extent, regional capitals already being an obligatory passage for many higher education graduates – the possibility of making use of a tertiary-level education presented only moderate disparities according to territory. Only in rural districts, such as those of the Massif Central (a mid-mountain area which is quite isolated), were the professional opportunities scarce for working people with higher education qualifications. In all parts of France, the risks of a professional having to downgrade (as a manual worker or over-qualified employee) were low.

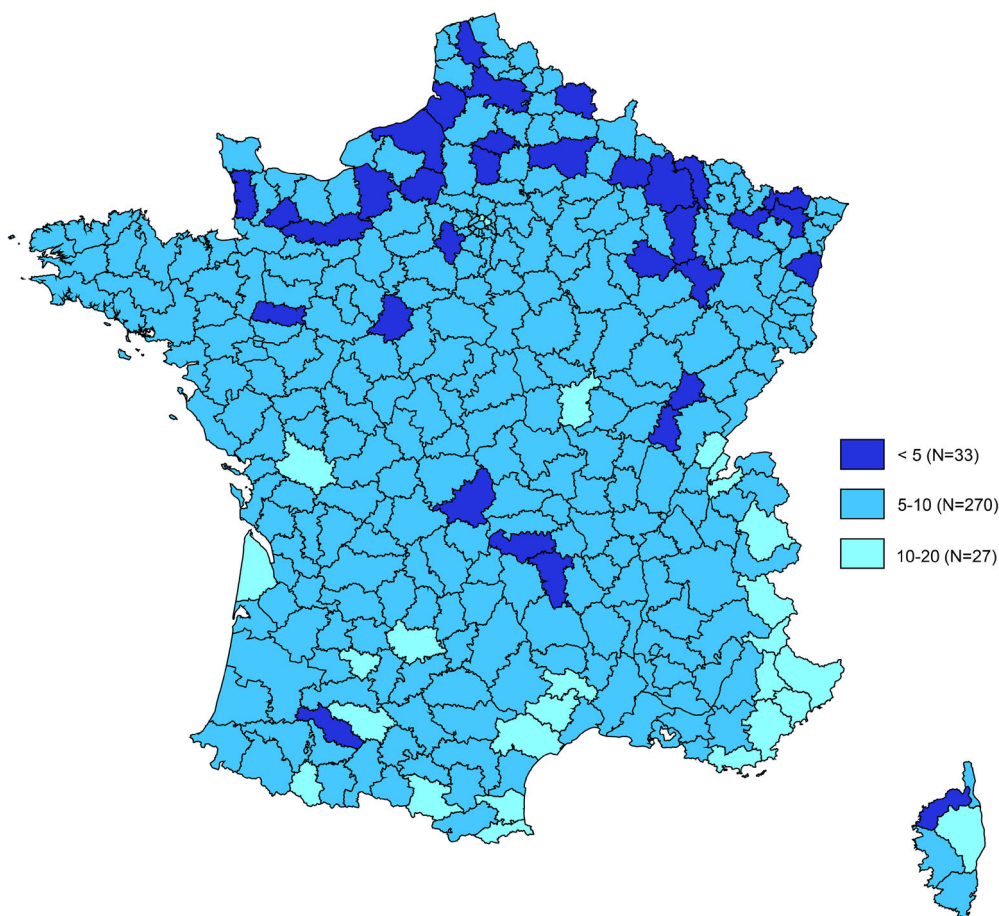
With the exception of 27 arrondissements (more or less) throughout France, in Paris as well as in the arrondissements of small and medium-sized towns, and even in the rural arrondissements, the proportion of higher education graduates occupying worker/employee positions did not exceed 10% (Figure 3).

Figure 2. Proportion (%) of executives among tertiary graduates aged 25-54 in 1982



Source : Insee, 1982 French Population Census. Own elaboration

Figure 3. Proportion (%) of manual workers among tertiary graduates aged 25-54 in 1982



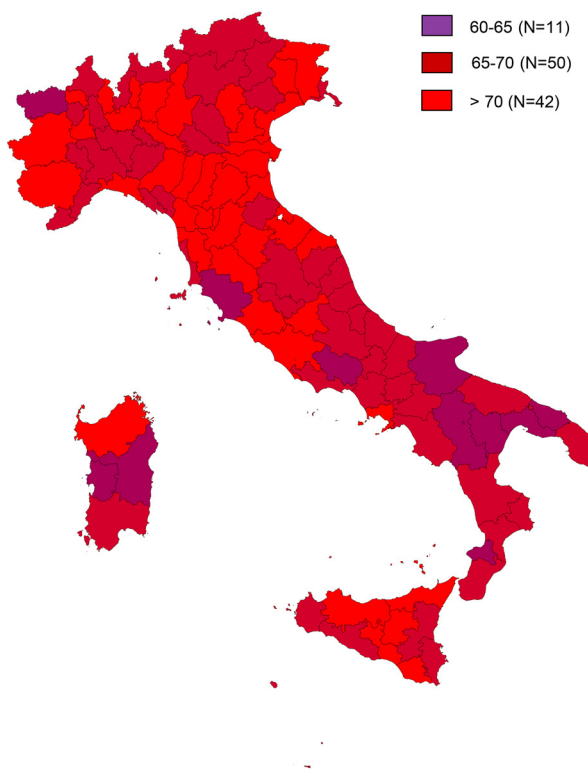
Source: 1982 French Population Census. Own elaboration

The same observation could be made in Italy in 2001, when only 8% of higher education graduates were manual workers or employees. Undoubtedly, at the beginning of the 2000s in northern Italy, which is the most productive area of the country, the proportion of managers among tertiary graduates was the highest on average. In all the regions of the North (Piemonte, Emilia-Romagna, Friuli-Venezia Giulia, Veneto, Lombardia, Toscana and Liguria) with the exception of Valle d'Aosta, this proportion was higher than or equal to the national average (70%).

However, between the north and the south of the country, on a regional scale, the differences remain relatively small (from 73% in Piemonte to 63% in Basilicata), as well as at the provincial level (Figure 4). In the northern regions, not all the provinces have a higher proportion of managers among tertiary-level graduates than the national average. Nevertheless, the differences are limited except in very rare cases, such as in Piemonte (76% of managers with tertiary degrees), where the province of Torino, which holds more than half the managers in the region, weighs considerably in the regional average. The difference in the extreme regional values related to the proportion of manual workers or employees among higher education graduates was also small (from 5% in Campania to 10% in Valle d'Aosta). This is also the case at the provincial level (from 3% in the province of Caserta, in Campania, to 11% in Savona, in Liguria). Nevertheless, the spatialization of this indicator reveals the first surprise: In the southernmost regions of the country the values are lowest (Figure 5). In other words, while in the southernmost part of the *Mezzogiorno*¹⁰ higher education graduates have the least chance of working in a profession corresponding to their level of education, nevertheless, they also represent the smallest proportion to occupy clearly downgraded professional functions. In Campania, Calabria, Basilicata, Puglia and Sardegna, this proportion is lower than the national average (7%). In the northern regions, a similar situation can be observed only in Piemonte.

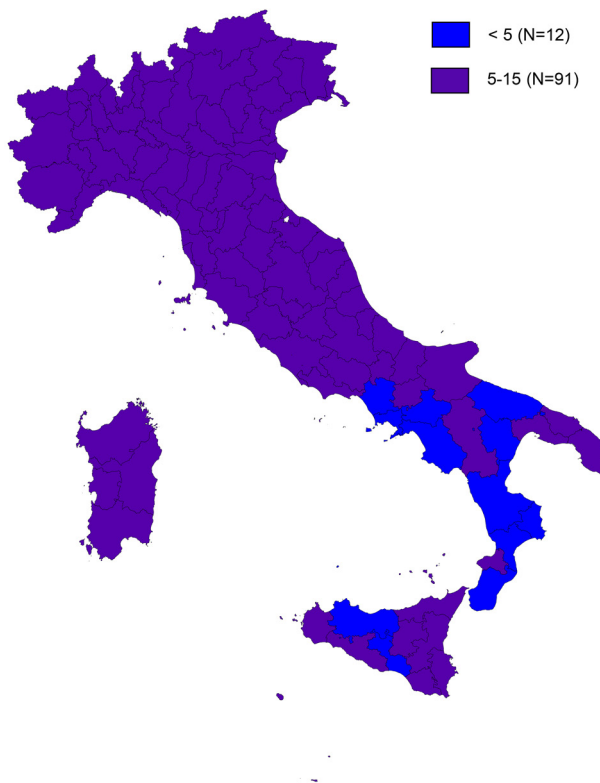
10 These are the peninsular and island regions of southern Italy.

Figure 4. Proportion (%) of executives among tertiary graduates aged 25-54 in 2001



Source : Istat, 2001 Italian Population Census. Own elaboration

Figure 5. Proportion (%) of manual workers among tertiary graduates aged 25-54 in 2001



Source : Istat, 2001 Italian Population Census. Own elaboration

These results, and the maps for Italy, cannot be properly apprehended without considering internal migration, the dominant historical movement of populations along the axis of south to north. Houdaille had already echoed it in 1970, insisting that, “these migrations do not depend solely on economic factors”, but that, “to reverse this trend it is quite a state of mind that would have to be transformed” (Houdaille, 1970, p. 1091). Recent studies confirm that this movement of individuals in Italy involves not only workers but also more qualified young people (Basile et al., 2019). Furthermore, while the reasons for migration to the north of the country cannot be reduced solely to the economic aspect, it remains an important explanatory factor. In fact, since the early 1970s the value of gross domestic product (GDP) per capita in purchasing power parity in the south of Italy corresponded to only 70% of that of the central and northern regions (Bonifazi, 2015). Pugliese (2015) also indicates that, at least for current internal migrants from the regions of southern Italy, the conditions of departure are not much different from those experienced by the earlier wave of workers who left with their ‘cardboard suitcases’. Today, “many university graduates leave their regions with the equivalent of the cardboard suitcase, that is to say with little hope, little security and very low chances of finding a stable job suited to the university title possessed” (Pugliese, 2015, p. 34). The statistical translation of these migratory movements on the map shows that in 2001, in Northern Italy, the proportion of higher education graduates who held managerial jobs was greater than in Southern Italy. On the other hand, in the southernmost regions the share of higher education graduates occupying manual worker/employee positions is the lowest.

Internal migration explains this apparent paradox. Higher education graduates from the southern regions have the opportunity to try their luck in the northern regions, which consequently reduces the proportion of higher education graduates in the South occupying downgraded professional functions. But these same graduates do not necessarily manage to find professional positions corresponding to their educational qualifications in the wealthier regions of the North, where the opportunities are more numerous but the proportion of graduates who occupy a position corresponding to their level of tertiary education is also greater. They therefore exert additional demographic pressure for the most qualified jobs, which in the receiving regions tends to increase the proportion of downgraded managers and also to decrease the proportion of managers among higher education graduates in these same regions. In 2001, however, this did not prevent the northern regions from presenting higher management rates among tertiary graduates than those in the South which, given the effect of internal migration on the value of this indicator, reveals how much more plentiful professional opportunities were in the north.

3.3. Strong territorial inequalities in France (2015) and Italy (2011) with a downgrading rate above 20%

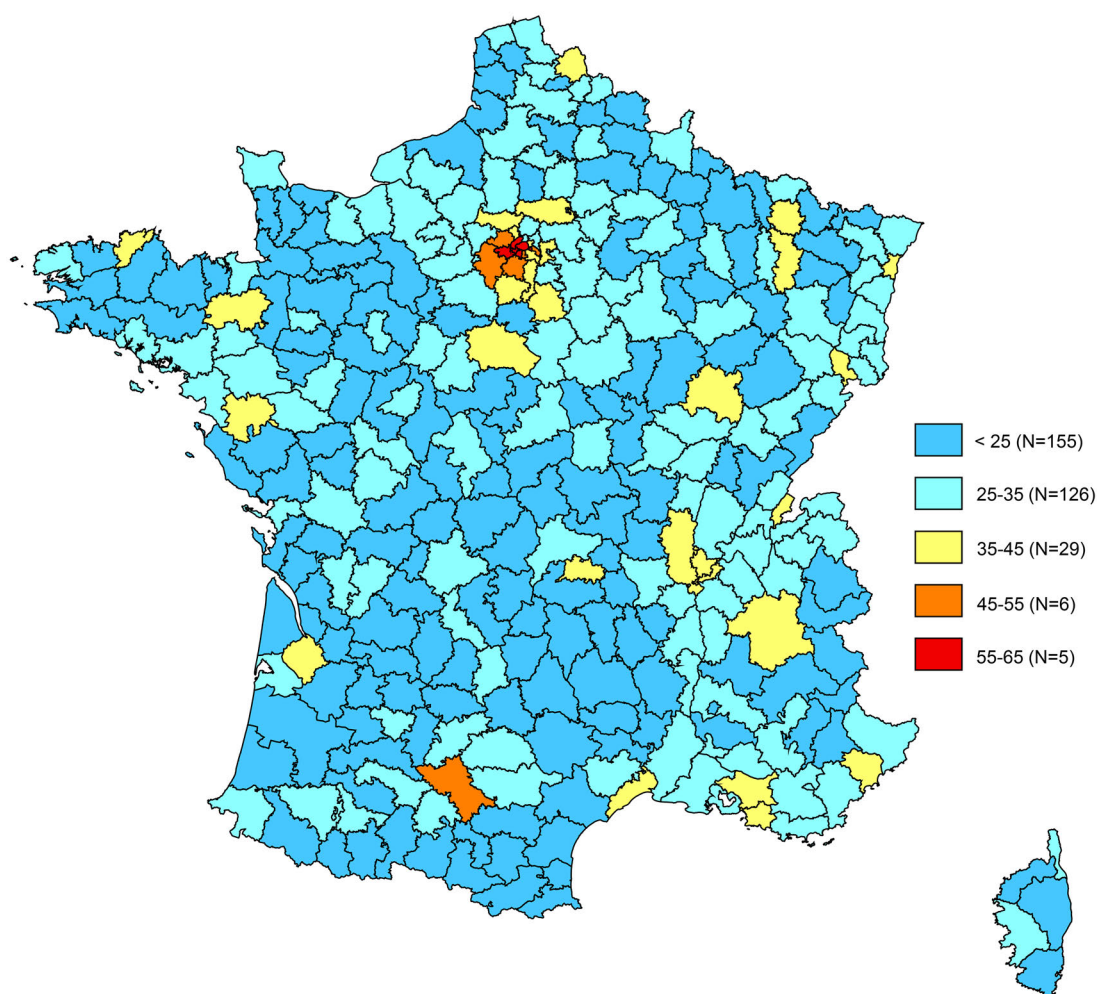
In France, “activities implying strong economic development potential and high decision-making content” are concentrated in Paris and in a small number of very large cities, and, “in these activities, the jobs are occupied mainly by managers” (Brutel, 2011, p. 2). Thus, at the start of the 2010s, 36% of executives resided in Île-de-France, one-third of which were in intramural Paris, and 20% of them were concentrated in the districts of the main provincial cities (Aix-en-Provence-Marseille, Lyon, Toulouse, Nice, Lille, Nantes, Montpellier, Strasbourg, Bordeaux, and Grenoble). In 2010, 56% of the managerial positions in France were concentrated in the 25 *arrondissements* of Île-de-France and the 12 *arrondissements* covering the 10 main regional large cities (i.e. in just 37 of the 330 districts in mainland France). This order of magnitude remained the same in 2015. In Paris, nearly one in two workers aged 25-54 (45%) is a manager, and this proportion is higher than 25% in eight other Parisian *arrondissements*. In the provinces, only the *arrondissement* of Toulouse reaches this value. In the districts corresponding to the other large provincial metropolises, the proportion of executives among the working population aged 25-54 is only about 20%. Elsewhere in the province, this proportion can fall significantly below 10%. Therefore, it is in Paris and in the main regional cities that higher education graduates are most likely to find a job corresponding to their level of qualification. This is why they choose to live there.

Generally, in the employment areas of these cities the proportion of executives among higher education graduates reaches its highest values (Figure 6), and it is also in these areas that the risks of professional downgrading are the lowest (Figure 7). Not surprisingly, in the Paris region the proportion of executives among working people with higher education qualifications is highest. In 2015, it also reached

or even exceeded 60% in the arrondissements of Paris and Boulogne-sur-Seine (a district contiguous to the one containing Paris). Moreover, it is only in the arrondissements of the Paris region that more than half of higher education graduates hold managerial positions. In the provinces, the maximum values are found in the large cities (Lyon, Toulouse, Grenoble, Strasbourg, etc.), where they exceed 40%; this is twice the proportion in some arrondissements in Central and Northeastern France. This mapping of the percentage of executives among higher education graduates reflects, almost symmetrically, the proportion of downgraded higher education graduates. Except in the large metropolitan areas where this proportion is less than 10%, it reaches or exceeds 20% in 299 of the 330 arrondissements in France. Professional downgrading is therefore experienced by at least 20% of higher education graduates practically everywhere in France, except in very large cities. This is an unprecedented partition of space that contrasts sharply with that which was observed thirty years earlier (Figures 6 and 7).

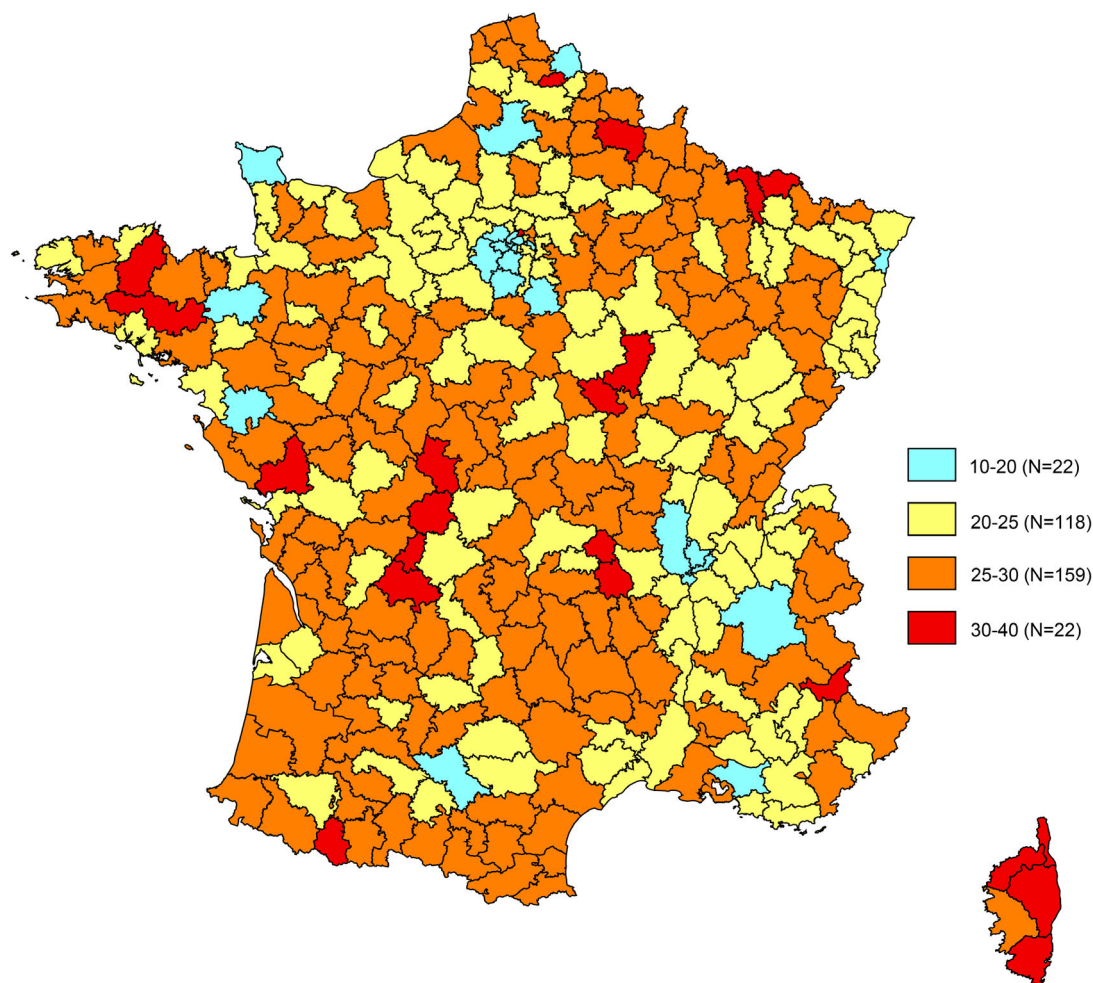
In thirty years, considerable spatial inequalities have therefore emerged between Paris and the major regional metropolises, as well as the rest of France. Certainly, here and there, some territories still managed to perform well, but these exceptions do not mitigate a particularly marked territorial split. And it is important to note that these territorial disparities, paradoxically, have widened since 1982 when administrative reorganization (geographical displacement of the decision-making power of Paris towards the territories) began to accelerate. The main beneficiaries of this policy are the large regional capitals. Conversely, within regions this has manifestly occurred to the detriment of rural livelihoods and of small and medium-sized towns.

Figure 6. Proportion (%) of executives among tertiary graduates aged 25-54 in 2015



Source : Insee, 2015 French Population Census. Own elaboration

Figure 7. Proportion (%) of manual workers among tertiary graduates aged 25-54 in 2015



Source: 2015 French Population Census. Own elaboration

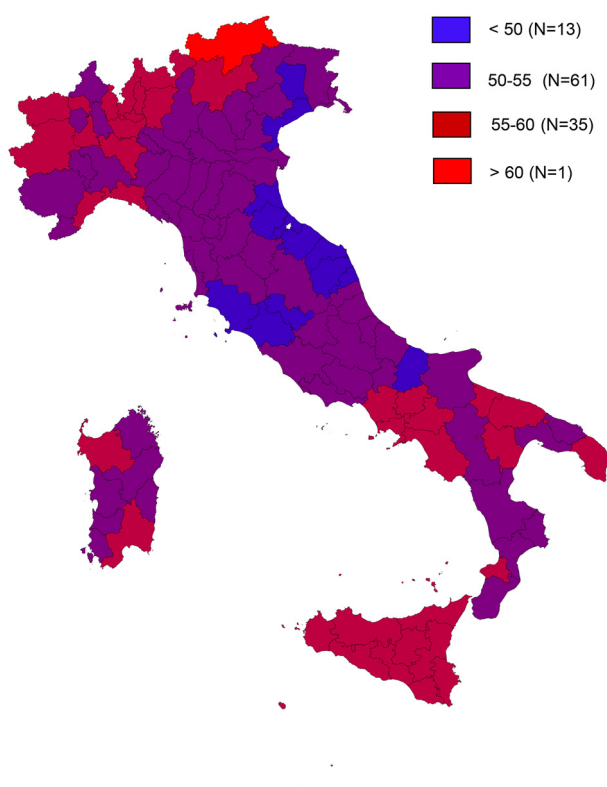
Managerial jobs are also unevenly distributed in Italy. In particular, in most parts of the South, they are scarce in number. In 2011, there were fewer managers aged 25-54 in the group of regions including Sicily (6.8% of the 3.3 million executives aged 25-54), Calabria (2.8%), Puglia (5.5%), Basilicata (0.9%), Molise (0.5%) and Abruzzo (2.2%) than in the region of Lombardia (18.9%). These results are comparable to those for 2001. Within the regions, the province corresponding to the main city also concentrates a significant proportion of this type of employment. Thus: in Lombardia, the province of Milano concentrates 39% of the executives of this region (48% if we add the provinces of Monza and Brianza, which until 2004 was part of the province of Milano); in Lazio, 80% of managers aged 25-54 live in the province of Roma; in Piemonte and Campania, the provinces of Torino and Napoli also have more than half of the regional workforce in this category of workers. However, unlike in France, management jobs are much more evenly distributed among the territories. In France, in 2010, the districts of the 11 main metropolises brought together 56% of managers aged 25-54. In Italy, in 2011, the 11 provinces which hosted the most managers (Roma, Milano, Napoli, Torino, Bologna, Bari, Brescia, Firenze, Padua, Bergamo, Monza and Brianza) only concentrated 37% of this category of active workers. Gini coefficients summarize these very unequal territorial concentrations from one country to another (0.67 for France and 0.47 for Italy). But what this indicator does not reveal is the north-south division of the country. On the other hand, the increase in the downgrading rate and, at the same time, the reduction in the proportion of executives among working people with higher education qualifications highlight it clearly.

At the sub-national level, while the proportion of managers among working people aged 25-54 was greater than 60% everywhere in Italy in 2001, ten years later no regions present such data. In 2011, in

only one province (Bolzano, in Trentino Alto Adige) does this proportion still exceed 60%, in contrast with 2001, when all the provinces were in this situation.

But above all, in 2011 the regions and provinces of the South had managerial ratios for higher education graduates among the highest in the country (Figure 8). For example, in 2011 Puglia was at the same level as Piemonte (55%), while ten years earlier 7 percentage points separated these two regions (66% and 73% respectively). The same observation can be made at the provincial level: Whereas in Torino the proportion of executives among higher education graduates has dropped 20 points (from 76% in 2001 to 56% in 2011), in the province of Bari the decrease was more measured (from 67% to 56%). It should be remembered that this statistical catching up took place while the GDP gap in purchasing power parity between the northern and southern regions remained remarkably constant over the entire period (Svimez, 2013). Therefore, a relative improvement in the conversion of higher education diplomas on the labor market in the southern regions cannot explain this statistical reversal. Rather, it is a combination of three factors: an increase in the number of higher education graduates in the labor market, the likely increase in migratory flows of young graduates from the South to the North, and a contraction of managerial jobs in the provinces of the northern regions. For example, in 2011 in Lombardia and Piemonte, there were fewer executives aged 25-54 than in 2001 (the 10-year deficits were 10,000 and 40,000, respectively). The northern provinces were therefore no longer able, at least in 2011, to absorb the growing number of higher education graduates, both those trained locally and those arriving from the southern provinces. The very marked deflation of the proportion of executives among tertiary graduates in the northern regions, and their lower values than those of the southern regions, reflects a particularly high strain on the Italian labor market.

Figure 8. Proportion (%) of executives among tertiary graduates aged 25-54 in 2011

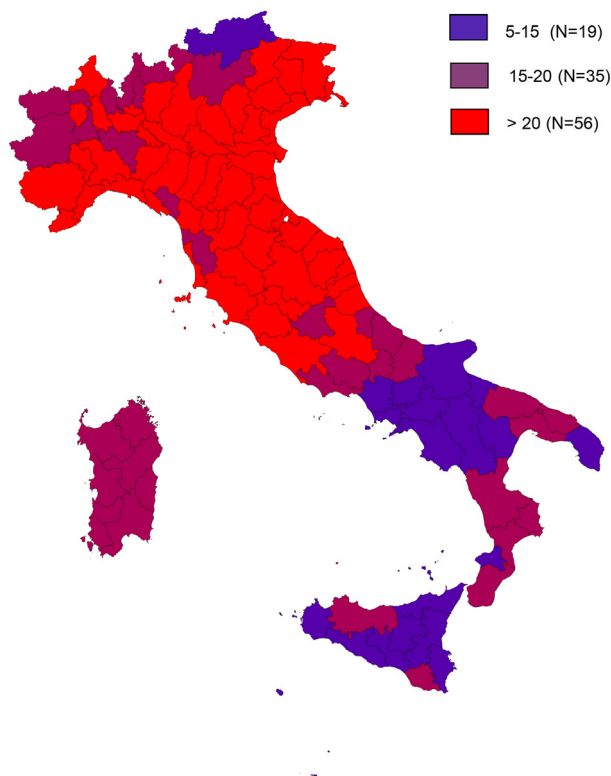


Source : Istat, 2011 Italian Population Census. Own elaboration

Migration tends to select those populations to remain in the South that manage to integrate well into the labor market. Therefore, the existence of this demographic bias in the interpretation of the data also explains why the proportion of downgraded tertiary-level graduates is lowest in the southern regions and provinces (Figure 9). It is, on average, less than 16% in Basilicata, Puglia and Calabria, while it reaches 20% in Lombardia and Piemonte (two regions that welcome a “surplus” of graduates

into a harsh local context). Within the regions, the values of this indicator are very homogeneous. The spatial disparities, therefore, primarily follow a north-south axis, but we do not note (as is the case in France) any significant sub-regional distinctions. In the North, the density of the urban network and the communication infrastructure between different towns within the same region promote commuting and, therefore, probably attenuate interprovincial differences.

Figure 9. Proportion (%) of manual workers among tertiary graduates aged 25-54 in 2011



Source : Istat, 2011 Italian Population Census. Own elaboration

4. Discussion and conclusions: Can the geographic concentration of skilled jobs be considered a model that is running out of steam?

The faster growth in the number of tertiary graduates than that of the jobs requiring this level of education is now reflected in a decrease of the proportion of active higher education graduates who are able to convert their qualifications on the labor market. In turn, the rate of professional downgrading has increased: In Italy as in France, the proportion of workers aged 25-54 who are engaged as manual workers or employees is now over 20%. The analysis of this phenomenon on a sub-national scale enhances this evidence. Our findings show that the rate of professional downgrading of highly educated workers has become very unequal depending on the region. The territories best integrated into the global economic context (the northern provinces in Italy; Paris and the large regional cities in France) are those with the greatest supply of highly skilled jobs and, consequently, offer higher education graduates a better chance of finding a job that corresponds to their level of qualification.

In both France and Italy, pursuing higher education often leads to geographic mobility. While a diploma can protect against unemployment, it does not guarantee a professional position that corresponds to the degree earned, nor does it necessarily allow the individual to reside where they would like. The ambition to be a member of management, therefore, can have a significant residential cost. For an Italian from the *Mezzogiorno*, it means going to live in the north of the country where the cost of living is higher and the opportunities are scarcer. It also often means accepting precarious living conditions – especially in terms of housing – when employment does not precede mobility. This is potentially even more true for those who relocate to other countries where they are more likely to find a job and/or salary corresponding to the expectations raised by the studies they pursued.

This migratory response of active higher education graduates to territorial inequalities in Italy is already reaching its limits, as evidenced by the values of the provincial downgrading rates. In 2011, they were higher in the provinces of the North than in the South. This means that the northern provinces no longer have the capability of absorbing the ever-increasing number of workers in this category as they did in the early 2000s. In France, the downgrading rates of metropolitan areas, primarily Paris, are still significantly lower than those of other territories. The country's largest cities, therefore, seem to be able to accommodate working people with higher education qualifications. But for how much longer?

In France, the salaries of executives are certainly much higher on average than those of other social categories. But what about purchasing power when you have to find accommodation in a city where the selling price of housing exceeds 10,000 euros per square meter, as in Paris, or reaches 4,000 euros per square meter, as in Lyon, Bordeaux and a few other big cities? And what about the quality of life? Long before Covid-19 (which has only exacerbated this trend), in recent years, all the surveys carried out in France among executives/managers reveal a weariness for life in the large urban centres. The latest survey, which was carried out by *Cadremploi* in August of 2019 – a major recruitment site for executives – indicates that 8 out of 10 Parisian executives would be ready to leave Paris for an average-sized city. The stress of living in the capital, the cost of living, travel times, pollution, and very high rents are among the factors most often mentioned to explain the desire to live elsewhere. And even if these intentions will most often not be carried out, emerging phenomena are pointing in the same direction. There are more and more reports regarding early retraining of executives in the crafts, in education, or in other sectors that allow people to live someplace other than in the centres of the largest cities in France. It is no longer rare to hear students who have just finished their master's degrees talk about their desire to work in another profession, and very often a manual one. According to a survey carried out in France in 2015 by the Association for the Employment and Promotion of Executives (APEC) among 4,674 young graduates with a bac +5 level, 14% of them, "declared having experienced a professional change", and as the authors of this report point out, this reorientation may be, "an option imposed by a lack of opportunities and an unsuccessful job search" (APEC, 2015). The decrease in the proportion of higher education graduates holding managerial jobs in France and Italy would, therefore, be the result of increased tensions in the managerial market.

Pursuing a higher education level and accessing dominant professional positions (executives) is still widely considered to be the best way to enhance and control one's life course. Nevertheless, our results show that strong residential constraints weigh on workers with higher education qualifications due to the geographic concentration of these jobs, in Italy as well as in France. In addition, the very early reorientation of young graduates, "is also - unlike the initial orientation, marked by the weight of family influences - the opportunity to be an actor of his own destiny and to exercise a real personal choice" (APEC, 2015, p. 3). Therefore, to some of these people, the decrease in the proportion of executives among graduates of higher education could also be due to a generational shift in attitude. Younger generations may be more likely than their elders to distance themselves from the social pressure to pursue higher education and attempt to access the same social category as those who participated in their training (i.e. managers and those in so-called higher 'intellectual' professions).

So far, graduates of higher education have agreed to follow the jobs (« people follow jobs »). But the residential cost has become less and less profitable, with access to employment becoming increasingly difficult and the cost of living rising precisely where these jobs are concentrated. The health crisis linked to the SARS-Covid-19 epidemic, which particularly affected the northern provinces in Italy and large metropolitan areas in France, was also an opportunity to question this model. The development of teleworking in response to this health crisis has enabled a number of workers to move their work to the places where they reside. Granted, there is still a long way to go before jobs follow people (« jobs follow people »), but it is clear that at least part of the population seems ripe for a new settlement dynamic.

Funding

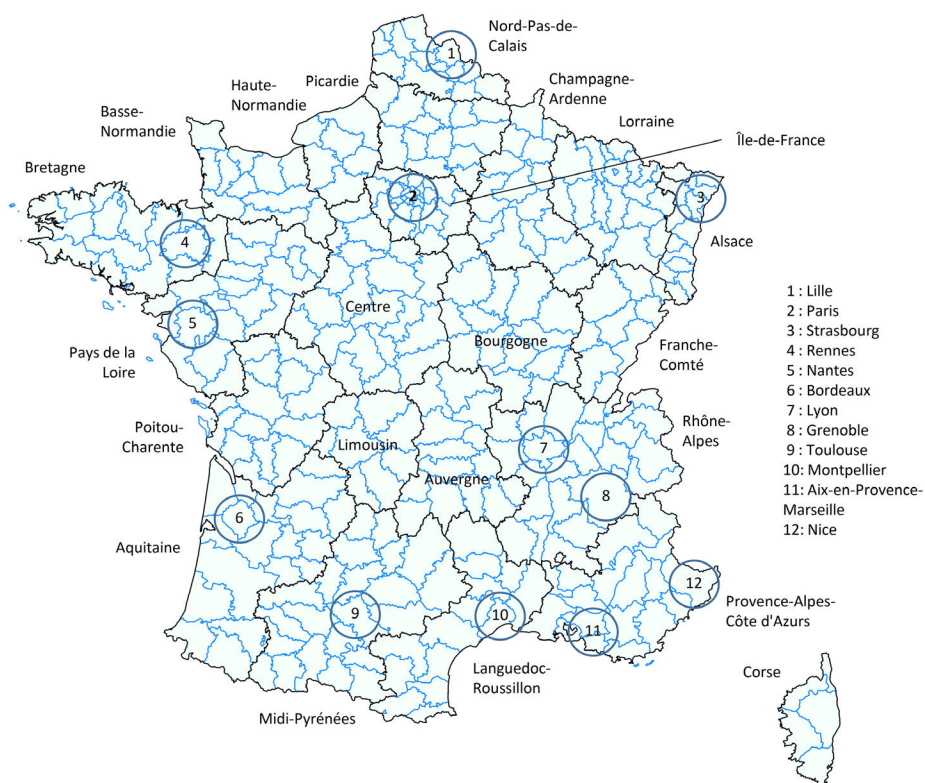
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Annexes

Annex 1. Map of French regions (pre-2016 limits) and districts (“arrondissements”) mentioned in the article



Own elaboration

Annex 2. Map of Italian regions and provinces mentioned in the article



Own elaboration

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ARTÍCULOS MISCELÁNEOS

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The construction of a growth-oriented global climate agenda: a critical historical analysis

La construcción de una agenda climática global pro-crecimiento: un análisis histórico crítico

Cati Torres^{1*} 

Joan Moranta² 

Ivan Murray³ 

Abstract

By the end of 2019, more than 11,000 world scientists declared Planet Earth is facing a climate emergency, which signals the failure of the global climate agenda (GCA). Since it took off thirty years ago, emissions have continued to increase at the planetary level. We add to the literature focusing on the economic and political dimensions shaping the GCA. In particular, we examine its economic growth roots under the umbrella of sustainable development (SD) or green growth to shed some light on whether the rules driving the world economy are shaping it. Such rules are built on the growth ideology fuelling the current extractivist socioeconomic metabolism, which in turn lies behind the socioecological crisis. We review the main international climate-focused events and document a shift in the guiding principles of climate politics from the 1980s onwards under which growth is no longer viewed as a driver of climate change (CC) but as its solution. We argue that the strategy to promote growth-based SD represents the main cause of policy failure. Indeed, the result is a policy that is highly reliant on technological solutions and market-based instruments and leads to the belief that green growth is both possible and the solution to CC. Such a belief restricts the debate to the economy's 'decarbonisation' and CC adaptation and overlooks other important socio-political aspects involve in climate action.

Keywords: Greenhouse gases; climate change; climate governance; technological solutions; green growth; sustainable development.

Resumen

A finales de 2019, más de 11.000 científicos declararon que afrontamos una emergencia climática que obliga a actuar con urgencia, lo que muestra el fracaso de la agenda climática global (ACG). Desde sus inicios hace treinta años, no se ha revertido la tendencia creciente de las emisiones globales. Este artículo contribuye al debate existente en torno al análisis de la influencia de factores económicos y políticos sobre el diseño de ACG examinando su objetivo de crecimiento económico. Buscamos aclarar si las reglas del juego económico mundial, sustentadas en la ideología del crecimiento, impulsora del actual metabolismo socioeconómico extractivista que subyace a la crisis socioecológica planetaria, determinan dicha agenda. Así, revisamos los principales eventos internacionales en torno al cambio climático (CC) y documentamos un giro en los principios de la política climática a partir de los años ochenta del siglo pasado, según el cual el crecimiento dejó de verse como la causa del CC para verse como su solución.

1 Applied Economics Department, Universitat de les Illes Balears, Spain. cati.torres@uib.cat. *Corresponding author.

2 Instituto Español de Oceanografía (IEO, CSIC), Centre Oceanogràfic de Balears (COB), Ecosystem Oceanography Group (GRECO), Spain. joan.moranta@ieo.es

3 Department of Geography, Universitat de les Illes Balears, Spain. ivan.murray@uib.cat

Argumentamos que el hecho de promover un desarrollo sostenible basado en el crecimiento explica el fracaso de la política climática. Y es que esto resulta en una política demasiado optimista hacia las soluciones tecnológicas y los instrumentos de mercado que lleva a creer que el crecimiento verde es posible y la solución al CC, lo que limita la acción a la “descarbonización” de la economía y la adaptación al CC ignorando otros aspectos sociopolíticos relevantes.

Palabras clave: Gases de efecto invernadero; cambio climático; gobernanza climática; soluciones tecnológicas; crecimiento verde; desarrollo sostenible.

1. Introduction

Anthropogenic climate change (CC) is one of the world's biggest ecological challenges (Ash et al., 2013; McNutt, 2013; Romero & Olcina, 2021). Since the Study of Critical Environmental Problems conference held half a century ago, many scientists have warned about the serious consequences of CC and their cumulative impacts on ecosystems and their dependent human systems (Gil & Olcina, 2021; Ripple et al., 2017). Higher temperatures, eutrophication, ocean acidification, lower precipitation rates, sea-level rise or more frequent and intense extreme events among others are expected to affect terrestrial and aquatic ecosystems as well as water and energy facilities, infrastructures, human health, the economy, and human rights and social justice (IPCC, 2014, 2018; Martín & Gallego, 2010).

To face this challenge, a global climate agenda (GCA) was initiated with the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988 and the UN Framework Convention on Climate Change (UNFCCC) in 1992. However, the political commitments derived from the UNFCCC-related international agreements have not changed greenhouse gas (GHG) emissions trends and global emissions have continued to increase (Kuyper, Schroeder, & Linnér, 2018; Wamsler et al., 2020). From 2000 to 2010, emissions grew on average by 2.2% per year almost doubling the mean annual growth rate for the 1970-2000 period (IPCC 2014). Friedlingstein et al. (2020) show total CO₂ emissions passed from an annual mean of 4.5 GtCyr⁻¹ for the decade of the 1960s to one of 10.9 GtCyr⁻¹ during 2010-2019, thus increasing by 142.2%. Emission trends have only been interrupted during global economy collapses such as the aftermath of World War II, the oil crisis of the late 1970s or the 2008 financial crash. The dramatic 8.8% fall in global CO₂ emissions in the first half of 2020 (compared to the same 2019 period) due to the COVID-19 pandemic (Liu, Ciais, Deng, & Al., 2020) is the latest example. Nevertheless, this drop is likely to be temporary as it does not reflect structural economic, transport or energy systems changes (Le Quéré et al., 2020).

Evidence shows the international CC mitigation efforts made during the last thirty years have not been sufficient, thus signalling the failure of global climate policies (Stevenson, 2021; Stevenson & Dryzek, 2013). Most of the advanced capitalist countries who ratified the 1997 Kyoto Protocol failed to meet their 2012 emission reduction targets which were after all only to make a very small difference to the global GHG concentration trends (Dryzek, Norgaard, & Scholsberg, 2013; Helm, 2008). The outcome of the 2009 Copenhagen Conference was a last-minute Accord negotiated by the US and China resulting in loose commitments on both targets and funding which were endangered by countries' disagreements on responsibilities' distribution (Bailey, 2017; Dryzek et al., 2013). The 2012 Doha Amendment adopted for the Kyoto Protocol's 2013-2020 commitment period has not yet entered into force. The link between the Paris goals and the nationally determined contributions (NDC) is not well defined in the Paris Agreement either, thus resulting in the NDCs being insufficient to achieve the Agreement's objectives (Kuyper et al., 2018). Nieto et al. (2018) estimate that, in the best of cases, this Agreement will lead to an increase in annual world emissions by approximately 19.3% in 2030 for the 2005–2015 period, resulting in a global temperature rise of at least 3°C minimum. At the 2018 Katowice Conference, no agreement on the development of voluntary market-based mechanisms was reached moving this decision into the 2019 Santiago Conference (finally held in Madrid). However, the Madrid outcomes were not promising either as developed countries were reluctant to undertake ambitious climate action and had yet to enhance support to developing countries in finance technology and capacity.

The question of why has so little been achieved within the global CC frameworks and agreements is an issue of ongoing concern within the literature. The complex nature of CC, the difficulty to bring on board aviation and shipping, the focus on carbon production (rather than consumption), the voluntary nature of agreements, the free-rider problem, the lack of willingness by governments to compromise national interests (or by markets to solve the problem), the increased participation of non-state actors under a consensus-based system, the doubtful UNFCCC's ability to deliver a truly inclusive and deliberative

space, and high future discounting have been said to be important policy failure's contributors (Bailey, 2017; Gupta, 2010; Helm, 2008; Kuyper et al., 2018). With a focus on the Paris Agreement, potential reasons for a lack of action go beyond the fact NDCs are not legally binding (Kuyper et al., 2018) and include i) the non-existence of any control, monitoring and penalization system; ii) the low quality and scarce clarity of the provided information; iii) the need of a high amount of external funding for low developed countries to comply with NDCs; and iv) the fact all funding has to be channelled through individual projects, carbon markets and the private initiative (Nieto, Carpintero, & Miguel, 2018).

More critically, some works have referred to the economic and political dimensions shaping the architecture of climate policy as drivers of its failure, thus calling for a change of the current socioeconomic system to ensure action's effectiveness. This system has been said to be governed by "an elite minority that has a stranglehold over the economy, the political process and most of the major media outlets" (Klein, 2014), consequently, allowing it to define the rules of the world economy. As stated by Cipler and Roberts (2017), the contemporary UNFCCC regime has institutionalized neoliberal reforms in climate governance. Changing the current socioeconomic order would involve changing these rules as they grant privileges to the wealthiest, as long stated by critical researchers, independent organisations and individuals and social movements (Arrighi, 2009; Malm, 2016; Newell, 2012). Accordingly, many authors claim there is a need to replace the dominant societal objectives and to shift the balance of political-cultural power in society to ensure a real path toward sustainability (Bailey, 2017; Foster & Clark, 2012; Klein, 2020; O'Brien, 2017; Pelling, 2011). This raises an interesting question: *are the rules driving the world economy shaping the actual climate policy?* In other words, *are the weaknesses of the actual climate policy architecture responding to the interest of the powerful to keep the status quo?* The difficulties to effectively reach the committed emission targets due to the flexible architecture of a climate policy subject to the Global North's plans seem to insinuate an affirmative response.

To shed some light on the ongoing GCA, this paper examines its growth roots under the umbrella of sustainable development (SD) or green growth. The rules driving the world economy build on the economic growth ideology which feeds a socioeconomic metabolism (or the sum total of material and energy flows between nature and society) being highly dependent on accelerated, intense extractive activities and hence responsible for the actual planetary socioecological crisis (Boulding, 1966; Haberl et al., 2019; Krausmann, Lauk, Haas, & Wiedenhofer, 2018; Pauliuk & Hertwich, 2015; Schandl et al., 2018). In a context of climate emergency where evidence shows a clear positive correlation between global GDP and emissions (Kallis et al., 2018), this paper pursues to critically analyze climate policy due to its promotion of a green economy (Moreno et al., 2016). To this end, the paper has been structured as follows. In the next section, we describe the methodology used to examine the vision of the main climate-focused events on the relationship between growth and CC. We make a critical historical analysis of such events from a political ecology perspective rather than a physical one. In section 3, we present the results of such analysis and discuss them in section 4, where we explore the defining elements of a growth-oriented climate policy and reflect on why pursuing growth becomes a non-sensical and reckless strategy to fight against CC. A Conclusions section ends the paper.

2. Methodology

To draw conclusions about whether the rules driving the world economy are shaping the GCA, we proceeded as follows. At a first stage, we made use of all of the available sources in order to familiarize ourselves with the construction of the GCA. Among others, this task involved reviewing literature on both climate science/policy and environmental/sustainability issues; consulting reports and proceedings of climate/environmental conferences held post II World War; reading up on the world central governance institutions (e.g. mission, objectives, publications, policy recommendations) as well as finding out about the potential role played by major political leaders in the GCA construction. Secondly, we selected the climate-focused events we considered to be more representative to explain the development of climate politics. Table 1 reports a chronology of such events together with the international events focusing on economic/ecological issues characterizing the political-historical context where the climate-focused events took place which we considered have played a role in the GCA construction. Finally, we analyzed the vision of the selected climate-focused events on the relationship between growth and CC. Specifically, we examined the way they understand CC and their accordingly derived climate policy recommendations, as outlined in the following sections.

Table 1. Chronology of the main international events involved in the construction of climate governance since the II World War

YEAR	MAIN INTERNATIONAL EVENTS	CLIMATE-FOCUSED
1955	1. "Man's Role in Changing the Face of the Earth" Symposium (MRCFE)	
1965	2. Causes on Climate Change Conference (Boulder conference)	X
1970	3. Study of Critical Environmental Problems Conference (SCEP)	X
1971	4. Study of Man's Impact on Climate Conference (SMIC)	X
1972	5. "Limits to Growth" Report (Meadows Report) 6. UN Conference on the Human Environment (Stockholm Conference)	
1974	7. Cocoyoc Symposium	
1979	8. First World Climate Conference (WCC-1) 9. Election victory of Thatcher (1979), who played a determined stand on CC, marking the beginning of the global "neoliberal" era.	X X
1983	10. Creation of the World Commission on Environment and Development (WCED)	
1986	11. Beginning of Uruguay Round of Multilateral Trade Negotiations	
1987	12. "Our Common Future" Report (Brundtland Report) 13. "Earth as Transformed by Human Action" Symposium	
1988	14. World Conference on the Changing Atmosphere (Toronto Conference) 15. Intergovernmental Panel on Climate Change (IPCC)	X X
1990	16. First IPCC Assessment Report 17. Second World Climate Conference (WCC-2)	X X
1992	18. UN World Conference on Sustainable Development (Rio/ Earth Summit) 19. UN Framework Convention on Climate Change (UNFCCC)	X
1994	20. Signature of Marrakesh Agreement 21. End of Uruguay Round of Multilateral Trade Negotiations	
1995	22. Creation of the World Trade Organization (WTO) 23. Beginning of UNFCCC Conferences of the Parties with the Berlin Conference (COP-1) - Berlin Mandate	X
1996	24. Second IPCC Assessment Report	X
1997	25. UNFCCC Kyoto Conference (COP-3) - Kyoto Protocol	X
2001	26. Third IPCC Assessment Report	X
2002	27. UN World Summit on Sustainable Development (Johannesburg Summit)	
2005	28. Coming into force of the Kyoto Protocol with Russia's ratification. 29. Commemoration of the 50 th anniversary of the "Man's Role in Changing the Face of the Earth" Symposium	X
2007	30. Fourth IPCC Assessment Report	X
2009	31. Third World Climate Conference (WCC-3) 32. UNFCCC Copenhagen Conference (COP-15) – Copenhagen Accord	X X
2011	33. UNFCCC Durban Conference (COP-17)	X
2012	34. UN Conference on Sustainable Development (Rio 2012/Rio+20/2012 Earth Summit) 35. UNFCCC Doha Conference (COP-18) - Doha Amendment	X
2014	36. Fifth IPCC Assessment Report	X
2015	37. Adoption of the 2030 Agenda at the UN Sustainable Development Summit and hence its 17 SDGs including Climate Action (13 SDG) 38. UNFCCC Paris Conference (COP-21) - Paris Agreement	X X
2019	39. IPCC "Global Warming of 1.5°C" Special Report 40. IPCC "Refinement to the 2006 IPCC Guidelines for National GHG Inventories" Special Report	X X
2020	41. US withdrawal from the Paris Agreement 42. First European Climate Change Law 43. European Climate Pact as part of the European Green Deal	X X X
2021	44. US return to the Paris Agreement 45. UNFCCC Glasgow Conference (COP-26) (postponed in 2020 due to COVID-19) 46. Working Group I Contribution to the Sixth IPCC Assessment Report (for the first global stocktake in 2023): The Physical Science	X X X
2022	47. Rest of Working Group Contributions to the Sixth IPCC Assessment Report*	X

* Expected events.

Own elaboration

2.1. Causes of Climate Change (The Boulder Conference)

Held in 1965, the Boulder conference was the first scientific conference on the causes of CC. It took place at the time of a social public debate on the ecological impacts of economic growth. However, the high level of uncertainty regarding the anthropogenic influence on the atmosphere composition led scientists to consider the need for further research rather than calling for a reduction in the expansion of human activities. Indeed, the alteration of the atmosphere was considered a minor problem which did not justify reducing the exponential economic growth. Despite research highlighting the atmosphere's limited capacity, uncertainty around this capacity served to keep things equal (MacDonald, 1966).

2.2. Study of Critical Environmental Problems (The SCEP Conference) and Study of Man's Impact on Climate (The SMIC Conference)

The SCEP and SMIC conferences played a significant role in visualizing the CC problem. These conferences drew attention to CC as a global environmental conflict, thus fuelling concerns about the ecological consequences of the growth-driven expansion of human activities. The discovery of the oceans' limited capacity of carbon absorption (thought to explain the Keeling (1960)'s measured annual rise in anthropogenic CO₂ concentration in the atmosphere), led for the first time US researchers to consider CC as a critical problem at the SCEP held in Massachusetts in 1970. Postponing policies due to scientific uncertainty was viewed unfeasible. Despite the low probability of CO₂-induced CC in the 20th century, long-term potential consequences of CO₂ effects on the climate and of social reaction to such threats were considered serious, thus calling not only for further research but also for action (SCEP, 1970).

To assist the SCEP requests on climate, the SMIC was held in Stockholm in 1971 bringing together scientists from all over the world. It advocated the interrelated nature of atmospheric processes and presented CC as a critical problem in an international context of increased concern about the growth-derived ecological effects. The SMIC discussed the many ways human activities including the addition of fossil fuel burning-derived CO₂ might affect global atmospheric processes (SMIC, 1971). That conference recognized that climate could change dangerously and stated special attention should be paid to emissions of particle pollutants and GHGs (Wilson & Matthews, 1971). Though the expected magnitude of CC impacts was still uncertain (Hammond, 1972), the SMIC concluded CC was a real threat and acknowledged mankind's power to change the global climate (Kellogg, 1987).

2.3. First World Climate Conference (WCC-1)

Held in Geneva in 1979 under the theme "A Conference of Experts on Climate and Mankind", the WCC-1 also emphasized the interrelated nature of atmospheric processes and expressed increased concerns about the growth-derived ecological effects. It recommended preserving soil fertility, promoting the efficient use of water resources, forests and rangelands, ceasing desertification, and reducing atmospheric and ocean pollution to reverse ecological degradation (WMO, 1979). It pointed out that the continued expansion of human activities could cause important regional and global climate changes which could become significant before the middle of the 21st century. It opened the door to redirect the world economy to ensure the coevolution of nature and society and hence mankind's long-term survival (WMO, 1979).

The WCC-1 also called for a World Climate Programme (WCP). This would act as an authoritative international scientific scheme to improve understanding of the climate system so that societies could better cope with climate variability and change. WCP specifically pursued strategies to assist countries in making better use of climate information in planning for social and economic development (WMO, 1979).

2.4. World Conference on the Changing Atmosphere: Implications for Global Security (The Toronto Conference)

The Toronto Conference was held in 1988 and focused on the changing atmosphere due to the continued growth in fossil fuel burning-derived atmospheric concentrations of CO₂ and other gases (WMO, 1988). Driven by Brundtland-based SD principles⁴, it viewed CC as a problem of pollutants, burning of fossil

⁴ Gro Harlem Brundtland gave the Keynote Address of the conference, which strongly supported the proposal for a 1992 World Conference on Sustainable Development under the UN auspices (WMO, 1988).

fuels and poverty and for the first time called on the world's governments to set strict, specific targets for reducing GHG emissions (Weart, 2008). It also called for using conventional economic tools for internalizing energy external costs and providing incentives to developing countries to sustainably manage their tropical forest resources. Energy options for development and the environment were recommended. Setting targets for energy efficiency improvements and energy supply, as well as switching to lower CO₂ emitting fuels and implementing renewable energy were emphasized. Revisiting the nuclear power option was also suggested under the belief that better engineering designs and institutional arrangements could solve problems related to nuclear safety, radioactive wastes, and nuclear weapons proliferation (WMO, 1988).

The conference also called for increased research funding and monitoring efforts within the WCP, support for the IPCC creation and development of a comprehensive global convention as a framework for protocols on the atmosphere protection (Zillman, 2009).

2.5. “Climate activism” of Margaret Thatcher

The interest in defeating the UK coal mining trade unions (Fontana, 2018; Milne, 2014) led Margaret Thatcher to opportunistically hoist the climate activism's sign. While closing coal mines and weakening miners' unions in the country, she was initiating intensive oil and gas drilling projects in the North Sea, trying to reactivate the nuclear power and arms sectors and started to import coal from the rest of the world (Fernández-Durán, 2010). At the time she initiated a “Thatcherism” process fed by radical capitalist free trade ideas (Edgerton, 2018), she became the first major political leader to take a determined stand on CC and invest new funds in related research (Weart, 2008). She played an active role in establishing a GCA built on the Brundtland report-based SD principles which she defended at the Toronto conference (WMO, 1988), her 1988 foreword to “Our Common Future” and her speeches to both the Royal Society in 1988 and the UN General Assembly in 1989⁵.

Accordingly, she promoted the creation of the IPCC in 1988 which also received support by the conservatives and CC sceptics in the US administration which aimed to tame climate politics. They thought it would be easier to control an IPCC created under the UN scheme, which would lead to more moderate statements, than independent scientists and their structures (Weart, 2008). Besides, they considered having a UN body for assessing CC related science would convert the work of IPCC into the official and soundest CC knowledge this serving as a way of silencing critical voices of environmental NGOs and scholars (Hulme, 2020). By continuously stressing the need for further scientific research, climate action could be easily postponed this ensuring the expansion of global capitalism.

Thatcher was also one of the few political leaders attending the 1990 II World Climate Conference. However, concerned about the anti-capitalist arguments which the campaigners against global warming were deploying, she later abandoned the CC cause and then her arguments that growth had to be environmentally sustainable (Thatcher, 2002).

2.6. Intergovernmental Panel on Climate Change (IPCC)

As the UN body for assessing CC science, the IPCC provides governments with information about CC, its impacts and future risks, as well as socioeconomic advice about adaptation and mitigation. Since its creation, it has delivered five Assessment Reports representing the most comprehensive scientific CC reports produced worldwide and a range of Methodology Reports, Special Reports and Technical Papers in response to requests for information on specific scientific and technical matters from the UNFCCC, governments and international organizations.

Despite being the authoritative source of CC knowledge (Zillman, 2009), the hybrid nature of the members of the IPCC (consisting of government representatives and scientists) has led to some controversies around its work. Disputes have been said to normally involve its economic and policy aspects rather than its scientific results which although having to be negotiated are considered quite robust (Helm, 2008). However, some authors state the IPCC's consensus approach leads to the underexposure not only of political but also of scientific dissent, this leading to the politicization of climate science (van der Sluijs, van Est, & Riphagen, 2010).

5 Documents 107302, 107306 and 107817, respectively, available on <https://www.margaretthatcher.org/document/>.

2.7. Second World Climate Conference (WCC-2)

Held in Geneva in 1990, the first purpose of WCC-2 was to review the WCP including major achievements in the application of climate information to food, water, energy and urban and building design challenges. Its second purpose was to undertake a review of the IPCC First Assessment Report as a leading to the UNFCCC negotiations (Zillman, 2009). It stressed the need for further scientific research mainly by supporting the WCP and recommended the urgent development of a Global Climate Observing System, thus being a relevant call for international cooperation (Zillman, 2009). The historical emissions growth was viewed as a direct consequence of fossil fuel burning by advanced capitalist societies together with an increase of human population, rising incomes, and the expansion of agriculture. The conference concluded improving energy use efficiency and employing alternative fuels/energy sources was technically feasible and cost-effective to reduce CO₂ emissions, which would allow many capitalist regions to stabilize their emissions from the energy sector (WMO, 1990).

Climate information was considered as a relevant tool to assist SD which was recognized to be threatened by CC. Research, development, co-development and technology transfer regarding energy efficiency and non-fossil fuel energy technologies were viewed as important not only to reduce emissions but also to move to more SD pathways (WMO, 1990).

2.8. The United Nations Framework Convention on Climate Change (UNFCCC)

Supported by the IPCC work (Le Treut et al., 2007), the UNFCCC is the key international treaty to reduce global warming and cope with CC impacts. New agreements of overall targets and GHG emission allocation are negotiated in the annual two-week Conference of the Parties (COP) (Dryzek et al., 2013). It was signed at the 1992 UN Conference on Environment and Development which was a milestone for environmental sustainability and SD. It entered into force in 1994, a period of international trade liberalization driving both the “neoliberal” globalization process and the increase of global GHG emissions (Dorninger et al., 2021). It became operational before the signature of the Marrakesh Agreement which both marked the end of the Uruguay Round of Multilateral Trade Negotiations (1986-1994) and established the World Trade Organization (WTO). Responding to an international context which enshrined economic growth as necessary for development, all the UNFCCC-derived global agreements are growth-oriented. Indeed, the UNFCCC ultimate goal (Art. 2) is to stabilize GHG concentrations in the atmosphere to prevent dangerous anthropogenic CC in such a way that enables sustainable economic development. The fact countries are forced to comply with the WTO decisions while they can voluntarily decide if complying or not with those taken by the UNFCCC shows the priority given to growth by the current central climate governance institutions (Zelli & van Asselt, 2010).

The Berlin Mandate resulting from the first 1995 COP pointed to the responsibility of advanced capitalist countries to reduce GHGs and formed the starting point for the negotiations toward the Kyoto Protocol.

2.9. Kyoto Protocol (COP-3)

To make operational the UNFCCC, the Kyoto Protocol was adopted in 1997. With a focus on countries roles in emitting fossil fuel burning-derived GHGs to the atmosphere, the protocol placed a heavier burden on Annex I countries under the principle of “common but differentiated responsibility and respective capabilities”. Annex I countries were some capitalist countries (mostly from the Global North), economies in transition and the EU. The protocol aimed to reduce Annex I country emissions by an average of 5% from 1990 levels over the 2008-2012 first commitment period (UNFCCC, 1997). Inspired by the SD narrative, it emphasized the need to correct for the CC market failure and invest in technological solutions. It recommended using market-based environmental policy tools (emissions trading, Clean Development Mechanism, Joint Implementation), enhancing energy efficiency and investing in renewable energy sources as well as in advanced and innovative technologies such as carbon sequestration (UNFCCC, 1997).

However, its architecture generated distributional conflicts at domestic and international levels leading among others to the US no ratification, thus coming into force in 2005⁶, the failure of the 2009 Copenhagen conference and the advanced capitalist countries’ lower willingness to sign up to the Protocol’s 2013-2020 second commitment period (Kuyper et al., 2018).

6 It was only operational when Europeans bargained the WTO membership and other concessions with Russia (Helm, 2008).

2.10. Third World Climate Conference (WCC-3)

The WCC-3 was held in Geneva in 2009 under the theme “Climate Prediction and Information for Decision Making”. It emphasised the need for both the best possible climate science and information, as well as their effective application through climate services and tools to better adapt to climate-related risks thus ensuring SD (WMO, 2009a). The WCC-3 cited the need for comprehensive climate information supporting national and international strategies to reduce emissions and adapting to unavoidable CC (Zillman 2009). This was influenced by the IPCC Third Assessment Report (2001), the Johannesburg World Summit on SD (2002) and the growing recognition that the global CC challenge should be addressed through a mitigation/adaptation balance. The development and implementation of the Global Framework for Climate Services was also supported (WMO, 2009b).

At the WCC-3, information was assigned an economically and socially important role in developing new climate commodification and financial mechanisms to function as socioecological fixes to the 2008 financial crash (McCarthy, 2015). Information was said to be relevant to achieve sustainable energy based on more efficient production and use of traditional non-renewable energy forms, as well as on designing and operating renewable energy infrastructures and facilities (WMO, 2009a). Accurate carbon flows measurement was considered key to creating carbon markets. The WCC-3 recognized decoupling emission growth from development advances as possible, starting the basis for its contribution to the Millennium Development Goals (MDGs) for 2015 (WMO, 2009a) and the Paris Agreement (Kuyper et al., 2018).

2.11. Paris Agreement (COP-21)

The problems associated to the Kyoto Protocol led the 2011 Durban Conference to claim for the need to renegotiate a universal legal agreement no later than 2015, this resulting in the Paris Agreement entering into force in 2016. In the context of SD, the Agreement’s objective is to strengthen the global response to the CC threat by keeping a planetary temperature rise well below 2°C in the 21st century and pursue efforts both to limit it to 1.5°C and to eradicate poverty (UNFCCC, 2015).

The shift from Kyoto’s targeting advanced capitalist country emissions to the requirement of intended NDCs by the Paris Agreement’s signatories implicitly shows a watering down of the emissions reductions responsibility of rich countries. According to Kuyper et al. (2018), the interest in raising global ambition has led to a more flexible climate policy built on pledges of commitments and contributions with the participation of more nonstate and substate actors converting the UNFCCC into a coordinator rather than an implementer⁷. As a result of such a flexibilization process, adaptation and finance have become additional goals to mitigation (UNFCCC 2015), thus emphasizing the role of technological solutions to CC⁸.

3. Results

Through the previous analysis we observe that the main climate-focused events involved in the construction of climate politics post II World War can be divided into two groups according to their vision on the relationship between growth and CC. Indeed, the reviewed events taking place before the 1980’s view CC as another global environmental problem derived from the expansion of human activities motivated by the growth imperative. In contrast, the events being hold from the 1980’s onwards advocate for a growth-based SD to solve for CC which is understood as the result of fossil fuel burning-derived GHGs in the atmosphere. In other words, we find out that climate politics before the 1980’s understood growth as a driver of the planetary socioecological conflicts, while it considered growth as the solution to environmental problems and poverty from the 1980’s onwards (Table 2). In line with Gómez-Baggethun & Naredo (2015), we document a shift in the guiding principles of climate politics from 1980s onwards when economic growth became a global political objective at the international governance level.

⁷ Despite such a flexibilization, CC denial by Donald Trump led him to announce the USA withdrawal from the Paris Agreement in June 2017, which was formalized in November 2020. However, the election victory by Joe Biden at the end of 2020 has led the USA to return to the Agreement in February 2021.

⁸ Ignored in early Kyoto Protocol negotiations, adaptation gained gradually importance especially since the publication of the Third Assessment Report (Kuyper et al., 2018).

Table 2. Overview of the construction of a growth-oriented global climate agenda*

VISION ON GROWTH		MAIN INTERNATIONAL EVENTS		VISION ON CLIMATE CHANGE (CC)
International context	Vision	Focused on economic/ecological issues	Focused on climate	
Global public debate on limits to growth	Growth as a driver of planet's ecological unbalance	Years: 1955-1981		CC as another growth-derived global environmental problem
		1, 5, 6, 7	2, 3, 4, 8, 9	
Growth-based sustainable development or green growth as a global political goal	Growth as the solution to environmental problems	Years: 1983-2019		CC as the result of fossil fuel burning-derived greenhouse gases in the atmosphere
		10, 11, 12, 13, 18, 20, 21, 22, 27, 29, 34	14, 15, 16, 17, 19, 23, 24, 25, 26,, 28, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47	

*Numbers from 1 to 47 correspond to the events reported in Table 1.

Own elaboration

These two identified visions on the relationship between growth and CC have been strongly influenced by the political-historical context where the reviewed events took place. For a better understanding of the two ways in which CC has been accordingly defined, a brief discussion of the features characterizing such political-historical contexts are discussed below.

3.1. Dealing with climate change before the 1980s: growth as a driver

The first calculation of global warming from human CO₂ emissions was done at the end of the 19th century (Arrhenius, 1896)⁹. However, research on the anthropogenic influence on climate only gained strength after World War II in a context of unprecedented, continuous exponential economic growth. By this time, a social debate was emerging on the global environmental effects from the expansion of human activities and their consequences on the ecological balance. This debate was furthered by increased awareness about the ecological limits to growth in a finite planet motivated by the multidimensional crisis of the 1970s linked to energy, economic, monetary, fiscal and sociopolitical issues as well as North-South and West-East disparities (Fernández-Durán, 2010; Fernández-Durán & González-Reyes, 2018; Fontana, 2011). As highlighted in the Meadows report, concerns about absolute resource scarcity and ecological impacts as constraints to economic growth raised the need to alter growth trends and to establish a sustainable condition of ecological and economic stability (Meadows, Meadows, Randers, & III, 1972). Although “no-growth” was considered an unviable policy (UNCHE, 1972) by the central global governance institutions¹⁰, rethinking the purposes of growth was viewed as necessary.

Thus research on anthropogenic CC was developed in a context where the public environmental debate revolved around the structural causes of ecological disruption and the purposes of growth. It nourished a broader scientific approach concerned with the disturbance of the planetary ecological balance by the industrial civilization metabolism. Such an approach built on Verdnasky (1926) which considered both the interrelated nature of atmospheric processes and that the volume of materials produced by human industry was approaching the scale of geological forces (Weart, 2008). Concerns about the ecological disruption by human activities were expressed at the 1955 monumental “Man’s Role in Changing the Face of the Earth” Symposium organized by the influential historical and institutional geography ‘school’ of the University of Berkeley (Naredo & Gutiérrez, 2005). Held in Princeton, it brought together scholars from all over the world working in a wide range of fields. Accordingly, climate researchers viewed the large scale of such a human-induced geophysical transformation as the mechanism through which concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years was released into

9 Nevertheless, the discovery of both the ability of CO₂ and water vapor to absorb heat and their direct link with CC dates back to the middle of the 19th century (Foote, 1856; Tyndall, 1861).

10 One exception was the 1974 Cocoyoc Symposium which openly challenged mainstream theories of growth and development (UNEP/UNCTAD, 1974).

the atmosphere and oceans (Revelle and Suess, 1957). They expected that the continuous exponential rise in fuel combustion derived from such a growth-oriented metabolism would have a significant impact on the radiation balance thus raising the average global temperature (Plass, 1956). Scientists agreed that the pursuit of economic growth was the main driver of global warming. The industrial metabolism fed by fossil fuel combustion was considered the major source of GHGs. Gradually, other CC determinants were also considered such as CFCs, methane or nitrates, among others. Since the beginning, climate science has followed an evolutionary process subject to many uncertainties leading to the gradual recognition that CC is a very complex phenomenon (Weart, 2008)¹¹. CC was then viewed as another global environmental effect from the expansion of human technology and activities (Steffen, Crutzen, & McNeill, 2007), as set out in the top climate conferences held before the 1980's.

3.2. *Shaping the global climate agenda from the 1980's onwards: growth as the solution*

The effects of the 1970s crisis allowed the election victories of Margaret Thatcher in the UK (1979) and Ronald Reagan in USA (1981). This gave way to an important world political and cultural change which weakened the labour movement and reduced the strength of the social mobilizations that had emerged from the 1968 protests (Fontana, 2018; Hobsbawm, 1994). It led to a series of privatizations, commodification and financialization processes (Fernández-Durán & González-Reyes, 2018) which have come to be labelled as “neoliberalism” (Harvey, 2005). The privatization of public enterprises and services and the lower taxation of corporations, in addition to their tax evasion, alongside the cuts to public spending, marked the beginning of an era characterized by a gradual dismantling of the welfare state and rising inequality (Piketty, 2014; Saez & Zucman, 2019). Since then, the “ethics” of the market exchange became dominant in both thought and practice throughout much of the world (Harvey, 2005), thus resulting in a further exacerbation of the planetary socioecological conflicts (Newell, 2011).

Accordingly, economic growth was enshrined as a global political objective by the advanced capitalist countries which believed it was a major ingredient for development (Redclift, 1987). Growth mystification was reinforced by the low prices of raw materials and oil and a stronger bargaining position of the wealthy countries at the global level (Naredo, 2006). As a result, absolute resource scarcity as a constraint to growth was no longer considered a concern in the sustainability governance sphere. Furthermore, the growth-fuelled intensive resource consumption led the rich nations to significantly increase their waste and emissions which contributed to convert pollution and CC into their main environmental concerns. The attention moved from resources to waste and from land to climate¹², so the urgency of making structural analyses about the planetary ecological disruption disappeared (Fernández-Durán, 2010). However, as the risks of an ecological breakdown were increasing the statu quo defenders made efforts to “green” the concept of growth (Brand, 2012; Naredo, 2020). This led to the formation of the World Commission on Environment and Development (WCED) in 1983 which published the Brundtland report in 1987. Under the title “Our Common Future”, this report presented the term of sustainable development (SD) assuming growth was a key component for development and protection of nature, thus supporting growth over the long-term (WCED, 1987). Therefore, growth was no longer viewed as a driver of ecological decline but as the solution to social and environmental problems (Gómez-Baggethun & Naredo, 2015).

Following conventional economics reasoning, the Brundtland report considered poverty and the unintended growth-derived externalities as the main environmental challenges (WCED, 1987). So CC was viewed as a market failure to be corrected through the monetary valuation of fossil fuel burning-generated emissions and market-based environmental policy tools. Voices claiming the growth-based expansion of human activities as the main CC driver (emphasizing the interrelated nature of atmospheric processes) were silenced at the international governance level. Energy transition through efficiency improvement measures and investment in low carbon/renewable energy by corporations became the pillars of mitigation. The report presented solutions to CC in the form of energy choices for the environment and (growth-based) development. Though the WCED recognized the reduction of energy consumption

11 This explains why some of the causes initially thought to explain CC (like the ozone layer depletion) are not considered today determinants of it.

12 This shift was evidenced at the 1987 “The Earth as Transformed by Human Action” Symposium, as denounced at the 2005 “Man’s Role in Changing the Face of the Earth” Symposium held in Lanzarote to commemorate the 50th anniversary of that held in Princeton (Naredo & Gutiérrez, 2005).

as crucial to achieving a sustainable future, it considered improvements in energy efficiency and transforming the energy mix towards a major share of renewables was more urgent (WCED, 1987). This not only showed optimism towards technological solutions but also presented investment in technology as a new path for growth. The valuation of energy's external damage costs and carbon markets have since become essential mitigation mechanisms (Bryant, 2018) as stated in the main international climate-focused events taking place after 1987.

4. Discussion of results

A historical analysis of the main international climate-focused events shows a growth-oriented discursive shift in the 1980's which moved the attention from mankind's impacts on climate to GHG emissions to the atmosphere. As we critically discuss in the following sections, as a result of this shift a carbon agenda highly reliant on technological solutions dominates today the global climate policy leading to believe GHG emissions can be decoupled from GDP.

4.1. The carbon agenda

In an era of corporate globalisation enshrining economic growth and shaping accordingly a growth-oriented GCA, CC needed to be redefined. A new narrative was required to shift attention from the planetary ecological impacts of the growth-driven expansion of human activities to the fossil fuel burning-derived gases "unintendedly" put into the atmosphere. Redefining CC as a negative externality from certain forms of growth was useful to the multinational corporations as it stimulated an emerging green capitalism which viewed nature as a new frontier of capital accumulation (Smith, 2007). The Brundtland report-based SD concept served as a wake-up call to initiate a climate agenda serving an elite minority eagerly searching for new profit-making opportunities. Focusing on the need to "decarbonize" the economy has contributed to developing a climate commodification and financialization process (Bailey, 2017; Lohmann, 2006; Paterson, 2001) where carbon emissions can be added, subtracted, moved or compensated through projects supported by green finance (Castree & Christophers, 2015). A carbon agenda in the form of carbon budgets, carbon goals, carbon prices and carbon markets dominates today the international climate policy driven by an excessive reliance on technological solutions. The faith in technology such a carboncentric perspective builds on leads to believe unlimited growth is possible (Bailey, Gouldson, & Newell, 2011; Cavagnaro & Curiel, 2012) through investments in technologies around renewable energy, energy efficiency, low carbon/non-carbon transport and emission compensation mechanisms (Paterson, 2001). On the basis of an ecological modernization discourse, it leads to believe green growth is possible and the solution to CC.

However, this converts carbon metrics into a key tool to assess climate policies which are consequently considered as "good" if providing a reduction or net reduction of CO₂ emissions, thus leading to short process analyses overlooking the rest of realities and their links (Moreno et al., 2016). It restricts the policy debate to discussions about end-of-pipe technological solutions (O'Brien, 2018) and demand reduction options involving changes in logistics and lifestyle (Sharmina et al., 2020). The conventional economics approach treats GHG emissions only as a technical question of correcting market failures ignoring the social and political aspects involving mitigation and adaptation (Bailey, 2017). As Moreno et al. (2016) state, proposing solutions based on low carbon/renewable technologies and market-based instruments do not question the current socioeconomic order but reassert it. Even more, the existing optimism towards technological solutions has led to view adaptation as a priority policy (IPCC, 2001), thus further moving the attention away from the debate on the need to change the rules driving the world economy (Mussetta, 2020). However, this debate is essential especially in a context where supply risks for some of the raw materials required to develop green technologies are high (Valero, Valero, Calvo, & Ortegoa, 2018).

4.2. The illusion of growth-based sustainable development or green growth

The SD concept which the current GCA builds on considers growth as a key ingredient for development, this converting SD into an oxymoron. The concept's wide acceptance by conservationists and conventional economists can be explained by the ambiguity of a term trying to conciliate two notions referring to different abstraction and reasoning systems levels: growth-based development

and sustainability. As Naredo (2015) states, such development involves the growth of the aggregated production which represents today only a monetary magnitude. As production is not linked to the physical world, it is assumed it can grow unlimitedly. In contrast, sustainability concerns heterogeneous physical processes considering the second thermodynamics law. The social progress virtues which have been usually attributed to growth helps to explain why the SD advocated for by the central sustainability governance institutions is viewed not only as possible but also as desirable (Valladares, Magro, & Martín-Forés, 2019).

However, the SD-induced idea that continued economic expansion is compatible with planet's ecology, which was formalized at the Rio+20 Summit (Hickel & Kallis, 2020) through the new oxymoron of green growth (Brand, 2012)¹³, lacks empirical support. The belief technology and substitution can improve resource efficiency with the help of market-based environmental policy tools have been refuted by empirical data. Evidence shows GDP growth cannot be decoupled from growth in material and energy use (Haberl et al., 2020; Vadén et al., 2020; Ward et al., 2016; Wiedenhofer et al., 2020) as it requires the appropriation of physical resources (Cavagnaro & Curiel, 2012). Besides, physical limits governing efficiency gains make permanent decoupling (absolute or relative) impossible for essential, non-substitutable resources (Ward et al., 2016). Although global historical trends show some relative decoupling, no evidence exists of absolute decoupling, the beginning of the 21st century showing worse efficiency and re-coupling occurring (Hickel & Kallis, 2020). The Kuznets Kurve-inspired hypothesis of dematerialization with GDP growth has only happened in developed countries via outsourcing industrial activity to developing ones with cheaper labour force and softer environmental regulation standards (Gómez-Baggethun & Naredo, 2015; Özokcu & Özdemir, 2017).

Consequently, empirical data also shows a positive correlation between global GDP and emissions (Tapia, Ionides, & Carpintero, 2012). Given CC derives from the growth-oriented metabolism of the current socioeconomic system (Schandl et al., 2018), emissions cannot be decoupled from resource use and hence from growth at a planetary scale. This also applies to the Global North despite some recent examples of absolute GDP decoupling from emissions. Energy transition also has resource requirements which will lead to rising energy demand in a context of technical limitations and rebound effects (Wiedmann, Lenzen, Keyßer, & Steinberger, 2020). Hickel and Kallis (2020) argue that, while absolute decoupling is happening in some regions, it is unlikely to happen fast enough to reach the 1.5°C/2°C Paris goals if growth continues as it stimulates energy demand. Emission reduction efforts will have to be not only maintained but strengthened to support a global peak in emissions followed by global emissions falls (Le Quéré et al., 2019).

5. Conclusions

This paper has examined the GCA growth roots to shed some light on whether the rules driving the world economy are shaping it. These rules build on the growth ideology fuelling the current extractivist socioeconomic metabolism lying behind the actual planetary socioecological crisis. The fact that global emissions have kept growing since such an agenda took off thirty years ago proves the international climate policy is growth-oriented, thus responding to the interest of the powerful to maintain the status quo. Such an orientation appears as the main driver of climate policy failure. A SD notion assuming growth is essential for development leads to frame the policy debate within the discussion about the need for both “decarbonizing” the economy through energy transition and CC adaptation. Then it results in a policy architecture highly reliant on technological solutions and market-based instruments, which views emissions as easy to handle “LEGO pieces” which can be added, subtracted, moved or compensated. It results in a policy architecture subject to the Global North's plans and consequently to the goodwill of both the signatory governments and the “major pollution players”. As their emissions remain outside the bounds of the national jurisdiction (Ivanovich, Ocko, Piris-Cabezas, & Petsonk, 2019), aviation and shipping have not been directly included in the Paris Agreement. This further exacerbates the ineffectiveness of the climate

13 At the Rio+20 Summit, the UN Member States decided to launch a process to develop a set of Sustainable Development Goals (SDG) to build upon the MDGs which led to adopt the [2030 Agenda for Sustainable Development](https://sdgs.un.org/es/goals) at the 2015 [UN Sustainable Development Summit](https://sdgs.un.org/es/goals) (accessed 15 April 2021). Considering “Decent Work and Economic Growth” and “Climate Action” as 2 of the 17 SDGs being at the core of the 2030 Agenda (8 SDG and 13 SDG, respectively) further demonstrates the general assumed idea that (growth-based) SD is needed to fight against CC.

policy especially in a context where aviation emissions have been recently found to warm the climate at approximately three times the rate of that associated with aviation CO₂ emissions alone (Lee et al., 2021).

Combined, this has led us to believe green growth is possible and the solution to CC. However, under continued GDP growth evidence shows no absolute decoupling from resource use on a global scale and the impossibility to achieve absolute decoupling from carbon emissions at the rate required by the Paris Agreement (Hickel & Kallis, 2020). The green growth objective pursued by the central climate governance institutions is undoubtedly misguided. Despite this, the European Green Deal (EGD), which includes the European Climate Pact, considers a new growth strategy is needed for the EU to overcome all environmental challenges. Even more so, the European Commission's proposal for the first European Climate Law aims to write into law the EGD goal. The 2030 Agenda-related 17 SDG express the belief that growth is not only needed for development (8 SDG), but also compatible with climate action (13 SDG). The contradictions between growth and sustainable resource use (Eisenmenger et al., 2020) do not seem to be reasons enough for the UN Member States to understand why action to meet the goals is not advancing at the speed or scale required. Power dynamics and interactions between injustices underlying the SDGs are not questioned (Wiedmann et al., 2020). Even worse, the International Energy Agency satisfactorily forecasts GDP will return to pre-crisis levels in 2021 assuming the pandemic is brought under control (IEA, 2020).

By the end of 2019 more than 11,000 scientists from around the world declared planet Earth is facing a climate emergency and called for urgent action (Ripple et al., 2020). In recent years, new youth-led global movements such as Fridays for Future, Extinction Rebellion and By2020WeRiseUp have emerged claiming for an immediate and convincing climate action to avoid the 1.5°C temperature increase. Other social movements, such as the Degrowth Movement, the Green New Deal for Europe or the International Progressive are also gaining strength in the actual context of socioecological crisis. Many researchers from all over the world working in a wide range of fields have long been denouncing the world economy functioning. The role of geographers in emphasizing the need to understand CC from a holistic perspective has especially been prominent as already shown by the Princeton symposium almost three quarters of century ago. Indeed, geographers associations, such as the International Geographical Union or the Spanish Geographical Association, keep reminding us of the role of geography as a major science in global debates on climate change. Together with all these scholars, social movements claim for scaling down aggregate energy use to move to a different socioeconomic system respecting the planetary boundaries. They have put again on the table the public debate on the limits to growth. The European Environment Agency recently warned Europe will not live well with the planet's limits by continuing to promote growth (EEA, 2019).

In the Anthropocene era of human activities shaping the face of Earth (Elhacham, Ben-Uri, Grozovski, Bar-On, & Milo, 2020), where CC acts as a synecdoche for their derived ecological impacts (Hulme, 2017), the GCA needs a 180-degree turn. Urgent, transformative action is required (Dryzek, 2016; Mastini, Kallis, & Hickel, 2021; Wamsler et al., 2020). CC must be repoliticized (Liverman, 2015). Considering the role of politics and power in perpetuating business as usual is essential to ensure coherent transformative responses which question existing thought paradigms and patterns (O'Brien, 2017). The COVID-19 pandemic should serve as a wake-up call to tackle the climate crisis even more urgently and move toward a better future (Perkins, Munguia, Ellenbecker, Moure-Eraso, & Velazquez, 2020). Acting on the direct drivers of nature decline is not sufficient to prevent further planetary ecological deterioration, as it also requires addressing the root economic, sociocultural, demographic, political, institutional and technological causes behind them (Díaz et al., 2019). Moving beyond GDP growth then becomes an urgent need (Kuhnhenh, Costa, Mahnke, Schneider, & Lange, 2020).

The mechanisms ruling the world economy have to be challenged. This challenge is however large (Capellán-Pérez, Mediavilla, de Castro, Carpintero, & Miguel, 2015; Millward-Hopkins, Steinberger, Rao, & Oswald, 2020). The structural imperative for growth in the current socioeconomic order will make societal change difficult (Wiedmann et al., 2020) as growth is equated with human progress, power and welfare (Kallis et al., 2018; Naredo, 2015). As an ideology, growth dangerously filters the messages sent by climate scientists on urgent action leading to keep things unchanged (Dryzek et al., 2013). In the meantime, planet Earth keeps warming. 2019 was the second warmest year in the 140-year record with the temperature for 2020 October being the fourth-highest for October behind that of 2015, 2018 and 2019 Octobers (NOAA, 2020, 2019). If CC continues, future projections point to a potentially

catastrophic global biodiversity loss (Trisos, Merow, & Pigot, 2020). So, no matter how big the challenge of going beyond growth is, the CC challenge is much bigger. The global climate policy will have to go beyond growth sooner or later. A finite planet with limited resources does not allow for other policy options. Social pressure on the institutions is needed to force them to develop a new climate agenda. Let's not make more mistakes to avoid losing the Earth (Rich, 2020). Let's act now before it is too late.

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Visión panorámica del “Montblanc de España”: apropiación y reinterpretación del referente alpino en el relato geográfico de Sierra Nevada (1800-1930)

*Panoramic view on the ‘Montblanc de España’: appropriation
and reinterpretation of the Alpine model in the geographic narrative
on the Sierra Nevada (1800-1930)*

Carlos Cornejo Nieto¹ 

Resumen

La historia del conocimiento geográfico de Sierra Nevada no ha sido rigurosamente abordada desde una perspectiva relacional dentro del contexto del fenómeno global europeo de la interpretación de la montaña. Desde ahí, el artículo propone como hipótesis que el discurso geográfico decimonónico sobre la Sierra estuvo determinado por la apropiación del referente alpino a través de unos determinados recursos convencionales. Mediante el análisis hermenéutico comparativo de documentación narrativa y gráfica sobre ambos sistemas montañosos, se analiza la relevancia que tuvieron la transmisión, apropiación y reinterpretación de métodos, modelos de representación y estrategias narrativas foráneas, conformados a partir de la aplicación de la visión panorámica al estudio de los Alpes, en la legitimación del relato geográfico moderno de Sierra Nevada a través de la obra de Simón de Rojas Clemente y Rubio y Juan Carandell. Recurriendo al marco teórico de las geografías de recepción, se discuten las implicancias epistemológicas de la aplicación y extrapolación de dichos métodos y estrategias en la montaña nevadense. Se concluye que la Sierra constituyó un complejo espacio epistemológico periférico de reinterpretación hermenéutica del paradigma de la alta montaña alpina. De este modo, se infiere que la interpretación geográfica del macizo osciló entre la pretendida universalidad del discurso canónico importado de la alta montaña europea y el reconocimiento de una identidad geográfica diferente que se correspondiera con los particularismos del macizo.

Palabras clave: Sierra Nevada; Alpes; geografías de recepción; modelos de representación; visión panorámica; estrategias narrativas; Juan Carandell; Simón de Rojas Clemente y Rubio.

Abstract

The history of geographical knowledge of the Sierra Nevada has not been thoroughly addressed from a relational perspective within the context of the global phenomenon of European mountain interpretation. The article hypothesises that the nineteenth-century geographic discourse on the Sierra represented an appropriation of the Alpine model by several conventional resources. Through the comparative hermeneutic analysis of narrative and graphic materials on both mountain chains, the paper investigates the relevance of the transmission, appropriation, and reinterpretation of foreign methods, representational patterns, and narrative strategies, all shaped by a panoramic view in the study of the Alps in the legitimisation of the modern geographical narration on the Sierra Nevada. Moreover, by

1 Departamento de Geografía, Universidad de Concepción (Chile). carlcornejo@udec.cl

using a theoretical framework of geographies of reading, the epistemological implications of the application and situatedness of using such methods and strategies in the Betic mountains are discussed. The article concludes that the Sierra was a complex peripheral epistemological space for a hermeneutic reinterpretation of the Alpine paradigm of high mountains. Thereby, it is inferred that the geographical interpretation of the massif varied between the alleged universality of the imported canonical discourse on European high mountains, and the recognition of a different geographic identity, corresponding to the particularisms of the Sierra's specificities.

Keywords: Sierra Nevada; Alps; geographies of reading; rendering models; panoramic view; narrative strategies; Juan Carandell; Simón de Rojas Clemente y Rubio.

1. Introducción

1.1. *La montaña europea en la historia del conocimiento geográfico*

Las montañas han ocupado un lugar protagónico en la historicidad del discurso geográfico occidental, ya sea desde perspectivas geofísicas y medioambientales como desde dimensiones de naturaleza cultural, política y simbólica. En la historia de la ciencia, la geografía histórica y la historia cultural europeas, la mayoría de los estudios sobre el tópico han estado (y, en gran medida, siguen estando) centrados en los sectores central y occidental de los Alpes y en los Pirineos centrales. Generalmente, esta literatura ha abordado el denominado “descubrimiento” cultural y científico del espacio de la alta montaña, atendiendo, por un lado, a sus correspondientes expresiones estéticas, filosóficas y literarias en el marco temporal de la modernidad (Beattie, 2006; Colley, 2010; Reichler, 2002) o en el de épocas anteriores (Korenjak, 2017; Nicolson, 1963); y, por otro, a sus relatos y representaciones geográficas en el contexto de la construcción del conocimiento científico, la cultura visual y las transformaciones epistemológicas al amparo de la modernidad (Berdoulay y Saule-Sorbé, 1998; Bigg, Aubin y Felsch, 2009; Billing, 2019; Briffaud, 1994; Broc, 1991; Klonek, 2003; Speich, 2009; Stafford, 1984). Asimismo, se han investigado las proyecciones políticas y patrimoniales de unos determinados paisajes montañosos icónicos en el marco de ciertas políticas de memoria y sus correlatos identitarios de la nación (Armiero, 2011; Mathieu, 2009), así como las implicaciones sociales, ideológicas e institucionales de las actividades montañistas insertas en las empresas coloniales e imperialistas europeas (Hansen, 2013; Moraldo, 2013; Ring, 2000).

La Geografía histórica española también ha mostrado interés académico por los paisajes montañosos nacionales. Los estudios más significativos han tratado el encuentro con la montaña desde aproximaciones culturalistas similares a los de la geografía francófona, proponiendo una lectura simbólica de la cumbre a la luz de ciertos relatos dominantes de la cultura europea moderna (Martínez de Pisón, 2000, 2004; Ortega Cantero, 2012). Se han abordado también las proyecciones políticas de paisajes de montaña emblemáticos dentro de los discursos sobre la memoria y las distintas identidades nacionales o regionales peninsulares de territorios como Castilla, Asturias, Aragón y Cataluña (entre otros), este último al alero de análisis similares desarrollados en Francia (Acín Fanlo y Lampre Vitaller, 2002; Nogué, 2005; Nogué y Vicente, 2004; Ortega Cantero, 2005; Ortega Cantero y García Álvarez, 2009; Roma i Casanovas, 2004). Finalmente, se ha puesto de relevancia el papel de las cordilleras peninsulares en la consolidación de la cultura científica y el pensamiento geográfico nacionales en los contextos de la Ilustración, el regeneracionismo y el krausismo (Mateu Bellés, 2008; Ortega Cantero, 2001). Respecto de Sierra Nevada (caso de estudio de este artículo), el relato histórico de su conocimiento se ha articulado, por un lado, en torno a los personajes célebres que participaron en la sistematización tanto de su aproximación científica como de su valoración cultural, y, por otro, a varios aspectos de la Sierra relacionados con las iniciativas económicas y sociales locales, como han sido, por ejemplo, las actividades del turismo, los deportes de invierno y otras formas de montañismo (Titos Martínez, 1997, 2014). Por otra parte, se ha abordado la genealogía del conocimiento geográfico del macizo a través del estudio historiográfico de la abundante documentación acerca de la montaña nevadense (Gómez Ortiz y Plana Castellví, 2006; Gómez Ortiz, Milheiro Santos y Serrano Giné, 2008; Gómez-Ortiz, Palacios, Schulte, Salvador-Franch y Plana-Castellví, 2009), sin apenas dotar a este corpus documental de una contextualización cultural y epistemológica relacional que lo situara en el contexto europeo de los avances de las ciencias de la tierra.

Gran parte de la literatura internacional referida ha evidenciado unos abordajes poco relacionales y a menudo autorreferenciales, apuntalados sobre una supuesta singularidad emanada de cada caso de estudio, sin prestar una rigurosa atención a los posibles diálogos transnacionales que se hayan podido dar

entre formas de interpretación, sistemas de conocimiento y modelos de representación de las distintas geografías de montaña continentales. Por su parte, los diversos enfoques de la geografía española han sido también poco proclives a explorar con profundidad los orígenes y las connotaciones de dichos sistemas y modelos discursivos dentro de unos determinados contextos científicos, culturales y epistemológicos en una escala europea y de manera relacional. Como contraparte a esta desatención generalizada, han aparecido recientemente otras investigaciones que proponen enfoques dialógicos entre lo universal del fenómeno de la interpretación científico-cultural de la montaña y lo particular de sus respuestas localizadas, problematizando así los sistemas montañosos como nodos de transmisiones intelectuales transnacionales a la luz de la movilidad de los discursos, las tecnologías y los modelos de interacción con las geografías verticales (Cornejo Nieto, 2015, 2018; Della Dora, 2011, 2016; Kakalis y Goetsch, 2018), y planteando miradas comparativas que permitan relevar aspectos comunes y diferencias particularizadas en la construcción discursiva de diversos sistemas de montaña (Anderson, 2020; Cosgrove y Della Dora, 2008; Debarbieux y Rudaz, 2015; Frolova, 2001, 2006).

1.2. Referentes: métodos, recursos narrativos y modelos de representación en Alpes y Pirineos

Paradójicamente, y a pesar de las limitaciones que presenta la literatura mencionada referente a Sierra Nevada, el macizo andaluz se consolidó como objeto de estudio significativo dentro del circuito europeo del conocimiento geográfico de la alta montaña desde los primeros años del siglo XIX, debido, en gran medida, a las continuas relaciones —certeras en mayor o menor grado— que se establecieron entre él y la alta montaña europea. No en vano, a lo largo de toda la centuria, la relevancia del macizo se vio mediada por las constantes analogías con los sectores central y occidental de los Alpes y, en menor medida, con los Pirineos, ambas cordilleras exploradas y estudiadas con anterioridad. Las comparaciones entre estas grandes cadenas montañosas del continente (especialmente Alpes) y la Sierra fueron frecuentes en las interpretaciones de los autores foráneos y nacionales que visitaron Granada. Ya fuera desde dimensiones estéticas o científicas, sus representaciones y aproximaciones acerca de los “los majestuosos Alpes de Granada” (Capell Brooke, 1831, p. 214), los “Alpes andaluces” (Boissier, 1839), el “Montblanc de España” (Carandell Pericay, 1920) o la “hermana de los Alpes” (Bernaldo de Quirós, 1923, p. 10), estuvieron condicionadas por el referente científico-cultural alpino, que se presenta a continuación. Lejos de ser un mero recurso analógico para conceptualizar el macizo andaluz, este recurrente parangón deja entrever la jerarquía que alcanzó la cordillera centroeuropea como referente hegemónico ineludible para entender las claves del conocimiento normativo de la época en torno a las geografías de montaña del continente.

A partir del siglo XVIII, los científicos de la tierra experimentaron un notable interés por la explicación del orden estructural de la superficie terrestre. Para abordar tal desafío, aplicaron el método de la visualización panorámica desde las cumbres, el cual no solo se reveló como un nuevo procedimiento metodológico, sino que también se convirtió en un “tópico explícito de reflexión”, especialmente entre aquellos naturalistas pertenecientes al círculo científico de Ginebra, como Charles Bonnet, Jean Senebier, Horace-Bénédict de Saussure, Jean-André Deluc y Benjamin Carrard (Bigg, 2007, p. 76; Billing, 2019, p. 65). De importantes repercusiones para las ciencias geográficas, dicha operación visual, ejercida desde las cumbres de la cordillera de los Alpes y de naturaleza móvil, global e integradora, generó unos determinados modelos de representación gráficos y unas estrategias narrativas en la literatura científica de la época, que aún seguirían empleándose a lo largo de la centuria siguiente. Dichos recursos estuvieron conformados por las vistas panorámicas, ya fuera bajo los formatos de dibujos, croquis o écfrasis descriptivas, y los *tours d'horizon* o panoramas circulares, dibujados a mano alzada sobre el terreno y, a veces, pintados posteriormente.

Los panoramas fueron uno de los formatos de representación más determinantes para la transformación de la cultura visual y científica modernas desde el siglo XVIII, abriendo paso a un acceso nuevo al conocimiento que se traduciría en nuevas formas de control del territorio y desciframiento racional del paisaje (Charlesworth, 2010), estandarización de un tipo concreto de producción de verdad y de “visión normativa” (Crary, 1990, p. 20; Oettermann, 1997, p. 7), y representación pública espectacularizada de paisajes de difícil acceso (Della Dora, 2007). El formato panorámico funcionó como una tipología tanto de representación visual como de técnica descriptiva que organizaba los componentes geográficos del territorio que la operación móvil de la mirada del sujeto recogía desde un punto elevado (Naranjo Ramírez y López Ontiveros, 2011). Una modalidad circular de este formato fueron los llamados *tours d'horizon*, representaciones anamórficas de vistas panorámicas completas de 360° obtenidas desde las cimas de las

montañas que reproducían el alzado del relieve mediante la aplicación de una “mirada circular y envolvente” (Naranjo Ramírez y López Ontiveros, 2011), funcionando como “una respuesta a la noción de totalidad” contemplada activamente desde un punto de observación (Comment, 2002, p. 166).

Los miembros del círculo científico de Ginebra fueron conscientes de los desafíos que presentaba la aplicación de este tipo de visión como metodología complementaria a la ascensión a la cumbre. Horace-Bénédict de Saussure fue uno de los pioneros tanto en aplicar este método como en reflexionar acerca de su pertinencia, manifestando su interés personal por “ascender las cimas elevadas donde el ojo pueda abarcar a la vez una multitud de objetos” (Saussure, 1779, p. III) a fin de obtener una “visión total, panorámica, que ofrecería un dominio completo del espacio” (Reichler, 2002, p. 59). Convencido de que el estudio de las montañas era la única forma en que se “puede acelerar el progreso de la teoría del globo” (Saussure, 1787, p. VI), y consciente de la novedad que implicaba el uso de la mirada exploratoria sobre la estructura del sector occidental de los Alpes, el ginebrino vio la necesidad de traducir este método en nuevas tipologías de representación, tanto textuales como gráficas, que pudieran vehicular con precisión esta nueva aproximación al paisaje. Así, los fragmentos de escritura descriptiva panorámica se reiteraron en toda su obra. En una sección del relato, Saussure (1779, pp. 102-103) ofrecía un “vistazo general (*coup-d’oeil*)” sobre una parte de la cordillera, procedimiento a través del cual fraccionó la cordillera en imágenes parciales con el objetivo de presentar distintas secciones panorámicas para analizar la formación geológica de la montaña. Los resultados fueron mostrados en varios *coup-d’oeil* narrativos de distintos sectores cordilleranos, que le sirvieron al autor para reconstruir visualmente, primero de manera segmentada, su orden geográfico, para después abordar la interrelación de dichas partes como una totalidad.

Además de las écfrasis panorámicas, Saussure creó un innovador modelo de representación gráfica del paisaje: la primera vista circular anamórfica de la alta montaña publicada hasta entonces, levantada entre 1766 y 1770 por el escritor y dibujante Marc-Théodore Bourrit (1739-1819) para su libro *Description des glacières et glaciers de Savoie*, publicado en 1773 (Figura 1).

Figura 1. Marc-Théodore Bourrit: *Vue circulaire des Montagnes qu'on découvre du sommet du Glacier de Buet*



Fuente: Saussure (1787)

Según Saussure (1779), el célebre *tour d'horizon* pretendía sustituir las “vistas ordinarias” (p. 496) e ineficaces empleadas hasta entonces a fin de plasmar el ordenamiento sistemático de los “objetos infinitamente variados” que se apreciaban desde la cumbre (p. 495), de manera que se vieran “todos los objetos relacionados entre ellos y absolutamente tal como se presentan a un observador situado sobre la cima de

la montaña” (p. 496). El formato panorámico iba acompañado de su correspondiente explicación, en la que Saussure subrayó tres aspectos fundamentales: el papel dominante del sujeto que ejercía la mirada racional sobre la naturaleza, la cualidad móvil de tal mirada panorámica y la transcripción al papel de su aplicación en base a leyes de perspectiva:

Hay que poner en el dibujante un singular esfuerzo de atención, y una aplicación difícil de las reglas de la perspectiva para proyectar sobre los planos verticales y las líneas derechas de los objetos que él ve realmente sobre las circunferencias y en el interior de un número de círculos cuyo ojo suyo sea el centro. (...) siguiendo el método que he empleado, el dibujante pinta los objetos exactamente como los ve girando su papel a medida que él mismo gira. Y aquellos que (...) quieran formarse una idea de los objetos que ha dibujado, sólo tienen que imaginar que están colocados en el centro del dibujo, (...) y, girando el dibujo, hacer la revisión de todas sus partes. (Saussure, 1779, pp. 496-497).

Todos los elementos del espacio geográfico, desplegados en derredor, aparecían ilustrados en perspectiva en torno al punto central, “como si se presentaran a un ojo situado en el mismo punto, y que sucesivamente da la vuelta a todo su horizonte” (Saussure, 1787, p. 326). Extendida sobre el papel, la imagen se complementaba con su correspondiente leyenda, una nomenclatura alfabética que indicaba el nombre y la ubicación de las cumbres extendidas en la silueta del horizonte circular, traduciendo la doble estrategia de Saussure de conjugar la más exacta descripción topográfica posible con la expresión singular de su plasmación gráfica (Billing, 2019, p. 71; Klonk, 2003). El resultado fue un ingenioso y sofisticado dispositivo icónico-textual que pronto se convirtió en epítome de la proyección gráfica de la exploración moderna de la montaña y de la sistematización geográfica de su relieve.

El dominio de este método visual y la calidad de ejecución de su modelo perspectivístico favoreció la producción gráfica de formatos panorámicos en la cultura geográfica francófona a lo largo de la modernidad, dotando a la montaña de una legibilidad verosímil, racional e inédita hasta entonces². Entre los ejemplos más notables, ya en el primer cuarto del siglo XX, destacaron los panoramas levantados y pintados a la acuarela por el geodesta y alpinista Paul Helbronner, quien cartografió la parte francesa de la cordillera con mapas a gran escala, publicados en su obra en doce volúmenes *Description géométrique des Alpes Françaises* entre 1910 y 1938. En ella, el autor reunía los relatos de sus ascensiones, los cálculos detallados de sus mediciones geodésicas y las ilustraciones y *tours d’horizon* fotográficos —más tarde transformados en panoramas acuarelados— (Guilhot, 2005, p. 24), que reafirmaban, sobre el soporte bidimensional del papel, la complementariedad metodológica entre el desplazamiento físico a las cumbres y la aplicación de las técnicas de visualización panorámica desde distintas estaciones geodésicas. Las triangulaciones de Helbronner generaron 270 panoramas circulares, si bien entre su producción gráfica destacaron una serie de acuarelas sobre fotograbados de grandes vistas panorámicas de la montaña, las cuales, como se verá más tarde, tuvieron una importancia fundamental en los estudios de Juan Carandell sobre Sierra Nevada.

Entre sus acuarelas, destacaron dos, tanto por la calidad geográfica y estética de su ejecución como por el gran formato empleado: el *Tour d’horizon depuis le sommet du Mont Blanc*, impreso en 12 planchas con una longitud de algo más de 7 metros, y la *Représentation panoramique du sommet du Pelvoux*, organizada en 10 planchas y de una longitud de 6 metros, dibujadas y pintadas a la acuarela en 1899 y 1902 respectivamente (<http://www.helbronner.org/>) (véanse las imágenes en <http://bibliotheque-dauphinoise.blogspot.com/2010/11/paul-helbronner-1871-1938.html>). Las dos técnicas artísticas utilizadas en cada panorama (dibujo y acuarela) recogían distintos componentes geográficos del sistema montañoso. Por un lado, la parte inferior de cada plancha estaba ocupada por el perfil de montañas dibujado a plumilla con utilización de sombreados, mostrando la orientación de los cordales de la cordillera, las altitudes y toponimia de cimas y valles, la ubicación de las masas glaciares y la articulación entre macizos, cumbres y collados; todo ello desplegado horizontalmente como un gran sistema. Por otro lado, las tres cuartas partes restantes de cada plancha estaban reservadas al horizonte panorámico del perfil inferior pintado con acuarela, técnica que le permitió a Helbronner destacar con detalle la geomorfología de los macizos, el estado de los glaciares, la disposición granítica de las paredes verticales y los roquedos, la apariencia

2 Otros científicos montañistas suizos, como Augustin Schmid y F. L. Pfyffer von Wyher, con su *Panorama circular dibujada desde la montaña Rigi al Kulm*, de 1815; Elias Emanuel Schaffner, con su *Panorama des Alpes Rhétiennes du Haut-Engadin*, realizado desde la cumbre del Mont Rosatsch en 1836, constituyeron algunos ejemplos elocuentes de la celebridad que alcanzó este formato (Comment, 2002, p. 166; Saule-Sorbé, 2004, p. 214; Della Dora, 2016).

de los canchales, las condiciones nivológicas de la montaña y, sobre todo, el despliegue de todo el orden geográfico de los cordales. Las dos técnicas quedaban integradas en el resultado final de la impresión, revelando, tanto en la representación pictórica en sí como en el soporte impreso utilizado para su publicación, las nociones de totalidad y globalidad a las que aspiraba la mirada panorámica.

Las técnicas de observación móvil y los modelos de representación panorámicos no tardaron en circular desde el mundo alpino hasta los Pirineos. Louis-François Ramond de Carbonnières (1755-1827) aplicó el mismo procedimiento desde las cumbres del Monte Perdido desde la década de 1780, declarando, como buen conocedor de la obra de Saussure, que “cuando se ha visto la primera de las montañas graníticas [el Mont-Blanc], falta por ver la primera de las montañas calcáreas [el Mont-Perdu]” (Ramond de Carbonnières, 1801, p. 115). Acompañado de su instrumentalización científica, aunque persuadido del uso maestro del ojo humano como herramienta fundamental, afirmó que desde lo alto de la cumbre “una mirada era suficiente; el caos estaba desenredado” (Ramond de Carbonnières, 1789, p. 45). En su obra, la mirada panorámica ejercida sobre el paisaje geográfico fue también trasladada a las representaciones de los perfiles del sector central de la cordillera mediante dibujos-diagrama realizados por él mismo (Cornejo Nieto, 2015). La composición de estas imágenes permitía integrar “todos los objetos que había examinado de forma aislada”, mostrando el macizo del Monte Perdido como un sistema global de partes conectadas y “relaciones generales que mediante las observaciones detalladas solo estaban entregadas a conjeturas” (Ramond de Carbonnières, 1801, pp. 283-284). El uso de este método en Pirineos alcanzaría cotas más elevadas con la contribución del pintor y geógrafo Franz Schrader, quien perfeccionó, a finales de siglo, esta forma de sistematizar los componentes de la montaña a través de sus vistas circulares panorámicas u orografías (Berdoulay y Saule-Sorbé, 1998; Saule-Sorbé, 2004).

1.3. Objetivos

Atendiendo a estos referentes europeos, el presente artículo postula la siguiente hipótesis: el conocimiento geográfico moderno y la consecuente producción científica en torno a “los Alpes andaluces” (Sierra Nevada) estuvieron determinados por un régimen discursivo geográfico, surgido previamente en el entorno del sector francófono de la cordillera alpina, y, algo más tarde, en Pirineos, que fue el resultado de la implementación de las estrategias metodológicas, los formatos tipológicos de representación y los recursos narrativos novedosos —basados en la aplicación de la visión panorámica— comentados en el epígrafe anterior; una discursividad de la montaña importada que conllevó importantes efectos en la creación y legitimación de un determinado relato geográfico sobre el macizo nevadense a lo largo de todo el siglo XIX y principios de la centuria siguiente.

Para atender a esta hipótesis, el artículo se sitúa en la dimensión interrelacional del fenómeno europeo del conocimiento geográfico de las cumbres, mencionado anteriormente. Desde ahí, se plantean dos objetivos: primero, analizar la movilidad, asimilación y reinterpretación de unos marcos epistémicos, procedimientos metodológicos, recursos narrativos y modelos de representación específicos, surgidos en el seno de la geografía alpina de la Ilustración, que participaron en la construcción del relato geográfico de Sierra Nevada a lo largo de la modernidad; y, segundo, discutir las consecuencias que tuvo, en el plano epistemológico, esta circulación de estrategias y recursos en la elaboración del discurso geográfico en torno a un macizo con particularismos muy marcados, como es Sierra Nevada, aún estudiado por entonces a través del referente alpino. Para abordar tales objetivos, el artículo se enfoca en las aportaciones del naturalista Simón de Rojas Clemente y Rubio (1777-1827) y el geógrafo Juan Carandell Pericay (1893-1937), dos autores españoles fundamentales para el conocimiento geográfico nevadense en dos momentos históricos y contextos científicos distintos de la modernidad, aunque ambos atravesados por la impronta de las geografías alpinas de montaña. Con ello, el artículo contribuye a los debates en torno a la historia del conocimiento geográfico de la montaña peninsular como fenómeno global de la cultura científica europea a partir de un contexto epistemológico y una cultura visual compartidos.

Tras la revisión de la literatura, la presentación de los referentes europeos a tener en cuenta para el análisis particular de Sierra Nevada y la formulación de la hipótesis y los objetivos, el artículo expone a continuación las características esenciales del área de estudio, las fuentes analizadas, el abordaje metodológico empleado en dicho análisis, y el marco teórico utilizado para la interpretación y posterior discusión de dichos materiales, centrado este último en las geografías de recepción del conocimiento. Seguidamente, el apartado de resultados realiza un análisis interpretativo de las fuentes textuales y gráficas de Clemente y Rubio y Carandell sobre Sierra Nevada, poniéndolas a dialogar con los referentes

presentados de la montaña europea. Finalmente, el artículo cierra con una discusión acerca de las implicancias epistemológicas que tuvo la recepción discursiva del conocimiento de la montaña europea en la realidad geográfica de Sierra Nevada.

2. Metodología

2.1. Área de estudio

El artículo tiene como caso de estudio el macizo de Sierra Nevada (Granada), atendiendo especialmente a las altas cumbres de su cordal principal. El macizo se encuentra ubicado en la Zona Interna Bética de los Sistemas Béticos, formando, junto con el Rif, el arco Bético-Rifeño que se eleva junto al Mediterráneo, y alcanzando una altitud máxima de 3.482 metros sobre el nivel del mar en la cumbre del Mulhacén. Como es sabido, entre algunos de los particularismos más destacables del macizo se encuentran sus paisajes de alta montaña de tipo alpino por encima de los 2.500 metros de altitud, a pesar de distar tan solo 35 kilómetros del mar Mediterráneo; la amplia biodiversidad que albergan sus distintos ecosistemas debido a la relación entre la altitud de sus cumbres y su ubicación en una zona macroclimática de influencia mediterránea; y la variabilidad de la morfología de su relieve, marcada por la diferencia entre el agreste modelado glaciario de la vertiente norte y los paisajes culturales de las lomas de la vertiente meridional, con una notable presencia antrópica (Jiménez Olivencia, Porcel Rodríguez y Caballero Calvo, 2015; Platt, Behr, Johanesen y Williams, 2013).

2.2. Fuentes y abordaje metodológico

Abordar la dimensión relacional de la historia del fenómeno europeo del conocimiento geográfico de la montaña ha requerido una aproximación dialogada e interpretativa a las fuentes documentales sobre cordilleras y macizos continentales distintos —en este caso, los referentes de los Alpes y, en menor medida, Pirineos, y Sierra Nevada—. La complejidad de este enfoque ameritó adoptar dos abordajes metodológicos complementarios: por un lado, se trabajó con el método histórico de naturaleza comparativa, centrado en las fuentes primarias pertinentes, tanto textos como imágenes, sobre dichos sistemas montañosos; y, por otro, se empleó un método de análisis de dichos materiales de naturaleza hermenéutica.

Respecto del método histórico, se llevó a cabo un trabajo de archivo en el que se identificaron y seleccionaron algunos de los escritos e ilustraciones de naturaleza geográfica más significativos que participaron tanto en la formulación del discurso geográfico en torno a los Alpes y Pirineos como cordilleras referenciales, como en la construcción del relato geográfico en torno a Sierra Nevada. En este sentido, se han seleccionado aquellas fuentes que fueron configuradas a partir de la aplicación metodológica de la observación panorámica como vector articulador de las mismas y con distinta cronología dentro del arco temporal de la modernidad —desde la Ilustración hasta el primer cuarto del siglo XX—. Según este criterio de selección, el artículo hace una revisión de las aportaciones fundamentales de Horace-Bénédict de Saussure y Paul Helbronner en el ámbito alpino, y, en menor medida, en la de Louis-François Ramond de Carbonnières en la cordillera pirenaica. Sobre estos materiales, se realizó la debida contextualización histórica, epistemológica y cultural, atendiendo a sus circunstancias originales de producción, al valor de su contenido y a relaciones convenientes con otras imágenes y textos coetáneos que pudieran aportar información sobre la consolidación de la alta montaña como objeto de un nuevo conocimiento geográfico moderno. Respecto de Sierra Nevada, la investigación gira en torno a las aportaciones de Rojas Clemente y Rubio y Juan Carandell, ya que sus textos y representaciones de carácter científico se vieron asimismo atravesados, de una manera fundamental, por la operación de la mirada panorámica sobre el conjunto de las cumbres. Desde el punto de vista comparativo, se han cotejado los contenidos y formatos de los materiales mencionados, referentes a la montaña europea (Alpes y Pirineos), con los de las producciones narrativas y gráficas de estos dos últimos autores que trabajaron en Sierra Nevada.

Respecto del segundo método, se ha efectuado un análisis interpretativo de los contenidos y significados de los textos y las imágenes a partir del diálogo con literatura secundaria específica. En este sentido, se han empleado los procedimientos metodológicos planteados por Gillian Rose en su tratado sobre la interpretación de las imágenes en geografía (Rose, 2001), abordando las representaciones y, por extensión, las narrativas a partir de la distinción del “lugar de la producción”, “el lugar de la imagen” (o del texto), y “el lugar de la recepción” (Rose, 2001). Siguiendo a Rose, se han tenido en cuenta dos aspectos en el análisis de los materiales: a) respecto a la contextualización científica: se ha situado la imagen o el texto

dentro de los esquemas discursivos convencionales que vehiculizaron el conocimiento geográfico de las cumbres; y b) respecto a la contextualización cultural: se ha abordado la representación dentro de una cultura visual específica, definida por las técnicas de observación y el formato panorámicos, determinantes para la creación de los modelos gráficos del paisaje de montaña.

2.3. Marco teórico: geografías de recepción del conocimiento

Los materiales se interpretan recurriendo al marco teórico de las geografías del conocimiento, de muy escasa acogida en la academia española, inspirada por la “teoría nómada” o “itinerante” (*travelling theory*) del teórico palestino Edward Said. Said (1991) señaló que “las ideas y las teorías viajan”, cuyas manifestaciones y resultados se ven “alimentados” y “sostenidos” por una constante movilidad de circulación de conocimientos, ya sea a través de una “influencia reconocida” o “inconsciente”, que “posibilita la actividad intelectual” (p. 226). La historia de la ciencia también ha tratado la cuestión de la itinerancia de ideas y saberes científicos en la tradición moderna occidental. Bruno Latour (2001) ha planteado que el conocimiento, lejos de ser solo transferido desde lo que él denomina “centros de cálculo establecidos”, es asimismo transformado mediante “operaciones de traducción” y “operaciones de persuasión” (Latour, 2001, pp. 90, 120). Asimismo, James Secord (2004) ha indicado que la circulación del conocimiento significa considerar cada texto, imagen, acción y objeto científico como el “indicio de un acto de comunicación, con receptores, productores y modos y convenciones de transmisión” (Secord, 2004, p. 661). Se trata, por tanto, de un “circuito” de comunicación que opera en múltiples direcciones (Secord, A., 2011, p. 285), una red de intercambios y un proceso hermenéutico de traducción y resituación del conocimiento científico, al mismo tiempo incluyente y excluyente (Secord, J., 2004, p. 662), que son puestos en práctica en unos determinados espacios y mediatizados a través de formas impresas itinerantes (Curry, Jardine, Secord y Spary, 2018; Jardine, Spary y Secord, 1996).

La geografía anglosajona ha incorporado estos debates a la historia de la disciplina en la medida que ha asumido que la formulación de teorías y la producción de significados están condicionados espacialmente. En este sentido, autores como David Livingstone y Charles Withers, entre otros, han propuesto unas “geografías del conocimiento”, o “de la interpretación” de las ideas (*geographies of reading*), del mundo moderno europeo a partir de la producción, recepción, extrapolación (o “traducción”) y reinterpretación de los dispositivos de representación, las estrategias narrativas y los espacios físicos de textualidad que forman parte del discurso geográfico, analizando la relevancia que adquieren las particularidades geográficas locales en la transmisión y reformulación situada del conocimiento y las formas impresas en las que circulan (Della Dora, 2007; Livingstone, 2003, 2005; Withers y Livingstone, 2011). Como han indicado otros autores (Duncan y Gregory, 2010; Keighren y Withers, 2012), en este préstamo de ideas y formatos en continua circulación, la narratividad implícita en el relato científico se ha visto envuelta en estrategias autorales y procesos de traslación de teorías y procedimientos convencionales ya legitimados, establecidos en un centro y extendidos a otras geografías periféricas, dando como resultado espacios que, con frecuencia, son dimensionados por criterios ajenos a las cualidades geográficas locales.

3. Resultados: interpretación geográfica de Sierra Nevada: asimilación de procedimientos metodológicos, formas de representación y recursos narrativos de origen alpino

3.1. Rojas Clemente: visión panorámica desde las cumbres nevadenses

Las cumbres de Alpes y Pirineos se consolidaron como atalayas de observación del orden geográfico del paisaje. La normalización, en el plano epistemológico, de los métodos referidos hasta ahora, así como la movilidad, en el tiempo y el espacio, de sus correspondientes manifestaciones mediante recursos gráficos y/o narrativos impresos, favorecieron la circulación transnacional de teorías geológicas, prácticas geográficas y estrategias procedimentales. En dicha circulación, como se analizará a continuación, Sierra Nevada ocuparía un lugar privilegiado, cuyo conocimiento geográfico con rigurosidad científica asimilaría esta normalización del método del desplazamiento de la mirada desde la cumbre a lo largo de todo el siglo XIX y el primer cuarto de la centuria siguiente.

Simón de Rojas Clemente y Rubio fue el primer naturalista que subió a Sierra Nevada para llevar a cabo, entre 1804 y 1809, un trabajo sistemático de medición y nivelación de las cumbres, entre otras investigaciones. Su viaje a la Sierra formó parte del proyecto estatal para estudiar la vegetación silvestre y

cultivada del país en el marco de los nuevos proyectos científicos promovidos por el Real Jardín Botánico de Madrid. Clemente y Rubio conocía muy bien las contribuciones científicas foráneas de su tiempo, concretamente las investigaciones en geología llevadas a cabo en Europa a finales del siglo XVIII. Se refirió a algunos fenómenos de la alta montaña observados por Ramond en el Pirineo, citó las teorías de científicos como Abraham Gottlob Werner y Déodat Gratet de Dolomieu, estuvo en contacto con Carlos de Gimbernat (quien investigaría en los Alpes), y fue también conocedor de las exploraciones de Saussure en la cordillera alpina (Capel Sáez, 2002; Clemente y Rubio, 2002)³. A través de la lectura de la obra del naturalista ginebrino —a quien citó con frecuencia en su obra—, se familiarizó con el método de la visión global panorámica, con las reflexiones sobre su relevancia y aplicación en terreno, y con su traslación a modelos de representación geográfica del paisaje. Además del referente de Saussure, Clemente y Rubio conoció los nuevos formatos perspectívos foráneos, ya que estaba integrado en un ambiente científico nacional que había incorporado distintos modelos de representación de la montaña relacionados con estudios de carácter geográfico y geológico, como, por ejemplo, el formato del *tour d'horizon*, introducido unos años antes en las propuestas científicas españolas, con ejemplos como el de Cavanilles de 1793 (Mateu Bellés, 2008).

El conocimiento de estos antecedentes le permitió a Clemente y Rubio asimilar la visión panorámica como método a partir del encuentro físico con las cumbres nevadenses con el fin de revelar el orden topográfico y las alineaciones de los cordales de la Sierra. Haciéndose eco de las convicciones de sus pares europeos, como Saussure y Ramond, según los cuales una mirada integral a los componentes del conjunto paisajístico bastaba para desentrañar el caos que el trabajo de gabinete no elucidaba, Clemente y Rubio (2002) “[e]speraba que en la cumbre de Veleta satisfaría mi curiosidad impaciente” (p. 648). Así, recogió la hipótesis de Saussure, según la cual, como se indicó anteriormente, el estudio de las montañas era la única manera de acelerar el conocimiento de la teoría de la tierra, y declaró su objetivo de llevar a cabo la “clasificación y descripciones” de lo que él consideraba la “osamenta o el esqueleto del globo” (es decir, “las sierras”) mediante la ascensión sistemática a las cumbres nevadenses para examinar su cordal principal (Clemente y Rubio, 2002, p. 95). De este modo, el científico español planteó una explicación de la naturaleza como conjunto sistemático de elementos relacionables al considerar los distintos componentes “como nexos del mismo cuerpo geográfico” en sus observaciones geognósticas desde lo alto del Veleta (Clemente y Rubio, 2002, p. 95). Asimismo, tomó como modelo narrativo de sus investigaciones la estructura del relato científico de Saussure —quien había presentado sus ascensiones a las cumbres alpinas en clave de expedición—, y organizó sus textos en “Itinerarios”, acuñando información exacta sobre las estaciones, paradas, fechas y horarios de su itinerario en terreno por la montaña bética (Clemente y Rubio, 1863, p. 3; Clemente y Rubio, 2002).

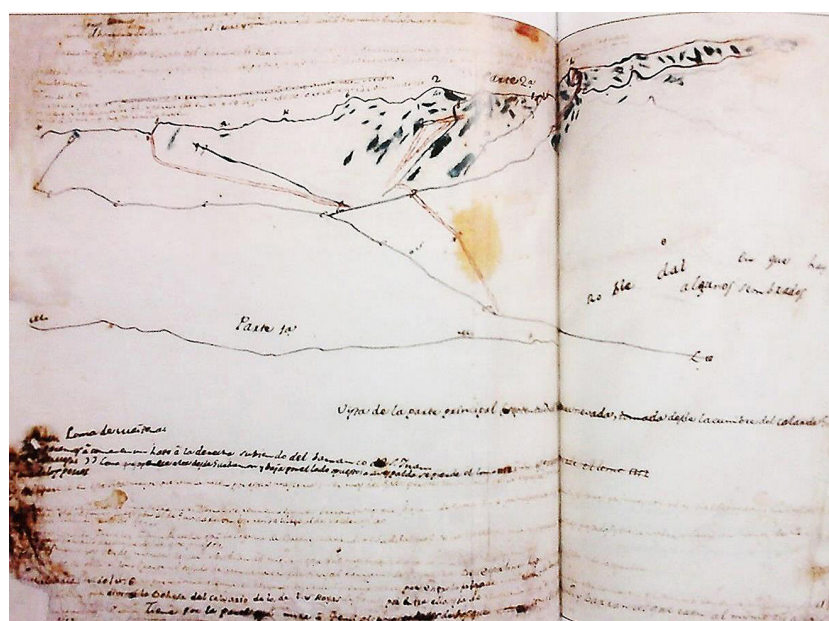
Clemente y Rubio fue consciente de que el abordaje de tales objetivos ameritaba la aplicación de procedimientos metodológicos novedosos, importados de las últimas contribuciones geográficas foráneas. De esta forma, adoptó la utilización de la visión móvil y su traslado correspondiente a formas impresas a través de varios recursos de representación panorámica, como la écfrasis, los dibujos y los croquis, para cuya realización empleó instrumentos como la cámara oscura y el telescopio, ya utilizados en las investigaciones alpinas (Broc, 1991, p. 73; Capel Sáez, 2002, p. 45). Desde el Veleta y el Mulhacén, ofreció varias descripciones panorámicas del cordal de las altas cumbres serranas, aportando información sobre su orientación y la caracterización de su relieve, variables que solo pudo sistematizar mediante la aplicación de la mirada envolvente al conjunto de la montaña:

Desde el Puerto de Bacares se veían correr de N.O. 1/4 al Oeste a S.E. 1/4 al Este los Cerros con este orden: Veleta, los Machos, el de la Laguna de la Caldera, la Alcazaba, Mulhacén, Tajo Negro, sobre la Laguna de Bacares. (...) El Cerro de Mulhacén tiene su corte o tajo al N.N.O., como todos los demás, excepto el de los Machos y Veleta, que están cortados desde el punto de Sur hasta el de N.E., siendo el corte mucho más profundo desde el punto del Este al N.E. (Clemente y Rubio, 2002, p. 212).

3 Las dos obras de Rojas Clemente y Rubio citadas en este artículo datan de 1863 y 2002. Conviene aclarar que no son reediciones, sino obras que fueron publicadas una vez que su autor hubo fallecido en 1827. La obra de 1863, como se indica en la bibliografía, se trata de un “Trabajo ordenado conforme a los manuscritos del autor, por D. Miguel Colmeiro”; mientras que la obra de 2002, editada por Gil Albarracín, es una compilación de un gran conjunto de notas de trabajo del botánico (manuscritos que forman ocho volúmenes independientes y que se encuentran depositados en el Archivo del Real Jardín Botánico de Madrid), que vieron la luz, por vez primera, en dicho año.

Durante sus trabajos de nivelación del Mulhacén, Clemente y Rubio realizó algunos perfiles panorámicos parciales de las cumbres de la Sierra (Figura 2). Estas ilustraciones informaban, en clave toponímica, de los elementos geográficos principales, y las notas del científico ofrecían una descripción topográfica para la comprensión del relieve, haciendo evidente su interés por la organización del cordal que su ojo en movimiento alcanzaba a discernir desde la posición privilegiada de la cumbre: “Vista de Mulhacén (...) desde la cumbre de Veleta. De c está perfectamente tajada la cumbre. Lo rojizo es nieve. a. Mulhacén. b. La Alcazaba. c. A su Oriente está la Caldera. nnn. Cuerda central que desde Mulhacén corre a Veleta” (Clemente y Rubio, 2002, p. 1095). Si en el caso de la célebre panorámica circular de Saussure era la línea del dibujo la que traducía la mirada integral móvil al conjunto del paisaje de la montaña, aquí la descripción sintética se convertía en el vehículo expresivo de comunicación de la visión racional científica sobre el esqueleto geográfico de la montaña.

Figura 2. Simón de Rojas Clemente y Rubio: Vista de la parte principal (septentrional) de Sierra Nevada, tomada desde la cumbre del Calar de Güéjar



Fuente: Clemente y Rubio (2002)

3.2. Juan Carandell: panoramas, retóricas y tours d'horizon en el estudio del “Montblanc de España”

Más de un siglo después de la aportación de Clemente y Rubio al conocimiento geográfico de Sierra Nevada —además de otras importantes contribuciones de científicos de renombre internacional de la época, como Edmund Boissier y Moritz Willkomm—, el macizo siguió acaparando una notable atención en las ciencias geográficas españolas. Su orogenia, geomorfología y estructura tectónica marcaron las investigaciones sobre la montaña nevadense y el conjunto de los Sistemas Béticos llevadas a cabo por el geólogo y catedrático de Historia Natural Juan Carandell Pericay en el primer cuarto del siglo XX, dando como resultado un total de dieciséis obras sobre Sierra Nevada (López Ontiveros, 2006; López Ontiveros y Naranjo Ramírez, 2000; López Ontiveros, Naranjo Ramírez y García García, 2007). También en este caso, la transmisión del conocimiento previo acerca de los Alpes se hizo muy evidente. La aportación de Carandell a la geografía de su tiempo, como se verá, estuvo determinada por su amplio conocimiento de los métodos y las formas narrativas y de representación que habían sido (y aún estaban siendo) empleados en el discurso geográfico europeo sobre la alta montaña.

En sus estudios geomorfológicos, Carandell no dudó en tomar el referente alpino como modelo para su explicación de Sierra Nevada, patrón que se había normalizado en las distintas interpretaciones de los viajeros foráneos del siglo anterior (Cornejo Nieto, 2018). El geólogo trazó una serie de relaciones y analogías entre los Alpes y lo que, según él, debía llamarse “los Béticos”, conceptualizando la Sierra como el “núcleo del Sistema Bético, de los Alpes andaluces” (cit. en López Ontiveros y Naranjo Ramírez, 2000, p. 288), y

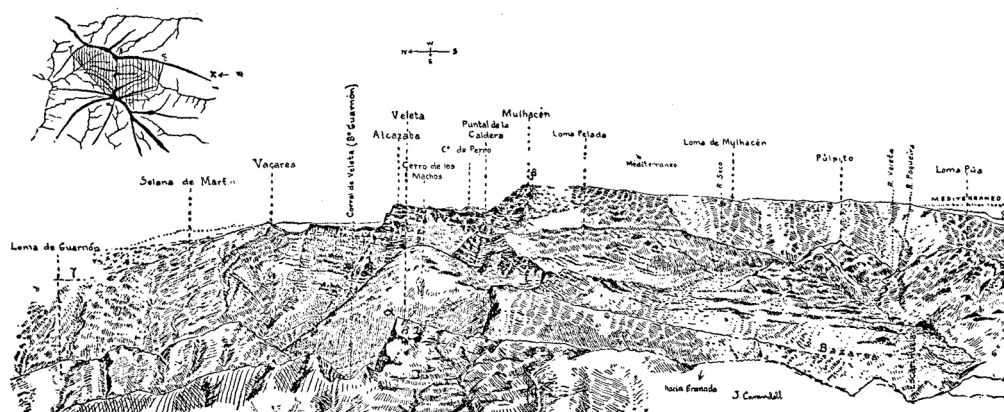
afirmando que “la gigantesca cúpula de la Sierra Nevada” constituía la masa más importante del relieve andaluz (Carandell Pericay, 1930, pp. 122, 124). En sus frecuentes comparaciones entre ambos sistemas montañosos, Carandell (1920) se lamentaba, sin embargo, del contraste entre la desigual y atípica morfología de la Sierra, con su “casi carencia de facies alpinas”, y el “carácter grandioso de los Pirineos y los Alpes” (p. 47), ponderando las agrestes formas del relieve de estos últimos con la mayor suavidad del modelado de la Sierra (véase también Carandell Pericay, 1930, pp. 127-128). El razonamiento analógico de Carandell se completaba con un curioso apéndice al final de su escrito “La morfología de la Sierra Nevada; ensayo de su interpretación tectónica”, en el que el autor, con el fin de evidenciar otras similitudes entre Sierra Nevada y los Alpes, presentó un “paralelo morfológico” entre el macizo y los “Alpes Transilvanos” (Cárpatos) apoyado en las tesis del geógrafo francés Emmanuel de Martonne, manifestando así su interés por poner sus trabajos en diálogo con el conocimiento geográfico europeo de su tiempo (Carandell Pericay, 1920, pp. 75-76).

En el XIV Congreso Geológico Internacional, celebrado en Granada en 1926, Carandell estableció definitivamente, según su criterio, la analogía de carácter geográfico y geológico entre las altas cumbres de Sierra Nevada, epítome de “los Béticos”, y el macizo del Mont Blanc, paradigma de los Alpes. En su artículo “Sierra Nevada, Montblanc de España”, publicado con motivo de la conferencia ofrecida en dicho evento, constató que “hablar de Sierra Nevada” equivalía a tratar el macizo “cual si fuera el Montblanc de España” (Carandell Pericay, 1926a, p. 66). Con ello, no solo reafirmó las comparaciones que ya había planteado en anteriores publicaciones, sino que propuso la identificación directa de los Béticos con los Alpes, utilizando como estrategia la extrapolación, en términos geomorfológicos, de la región montañosa de Andalucía oriental al centro del continente:

Mediante el uso del discurso analógico, “[v]an a ser esos Alpes majestuosos; ese Valle del Ródano; aquellas montañas que, constituyendo la que pudiéramos llamar Sierra Morena de la vecina Francia, toman los nombres de Cevennes; Morvan, Plangres, Cuesta de Oro; serán finalmente, el Lago de Ginebra y los ríos Ródano y Saona”. (Carandell Pericay, 1926a, p. 68).

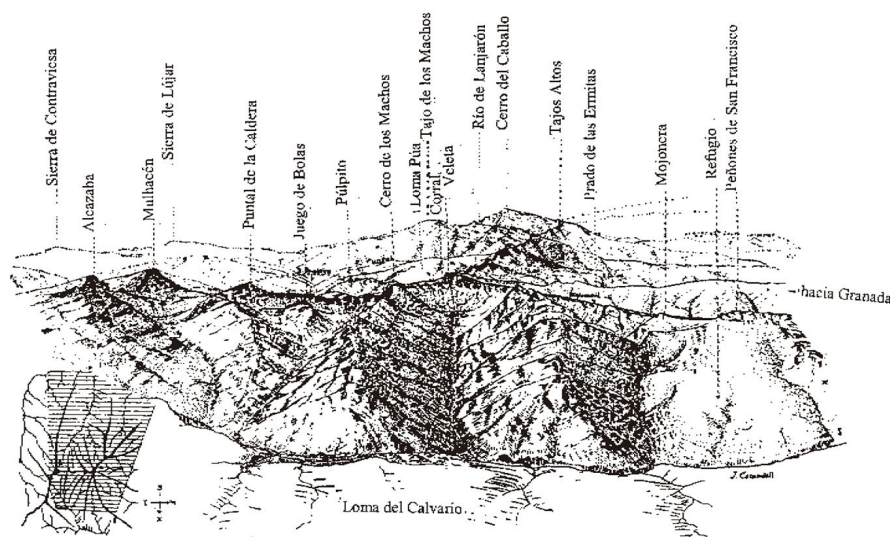
Seguidamente, mostró los paralelismos orogénicos y tectónicos de las dos cadenas montañosas y sus sierras adyacentes, llevando así “la comparación entre Andalucía Oriental y el centro de Europa a los rasgos estructurales” (Carandell Pericay, 1926a, p. 68), y presentando los materiales de las distintas fases orogénicas del macizo nevadense a fin de elaborar su analogía con los de la cordillera centroeuropea. Su ejercicio comparativo, además de comprender la formación rocosa de ambos sistemas, se extendió a todo el territorio que quedaba configurado por sus respectivos plegamientos. De esta manera, Carandell Pericay (1926a, p. 69) confrontó la vertiente sur de la Sierra, las Alpujarras, con la depresión meridional de los Alpes, encarnada por el Piamonte italiano, y señaló el paralelismo de las cortezas terrestres de ambas cordilleras, que se hunden hasta el Mediterráneo.

Además de adoptar el modelo explicativo alpino para el estudio de la Sierra, Carandell también se hizo eco del método de observación panorámica desde la cumbre, aplicando sus correspondientes tipologías de representación (panoramas y vistas circulares) para comunicar sus investigaciones. Fruto de esta importación metodológica, compuso varios dibujos panorámicos de la Sierra. Su artículo “La morfología de la Sierra Nevada; ensayo de su interpretación tectónica” incorporó dos láminas de este tipo: el *Panorama total de la Sierra Nevada* y el *Panorama desde el Veleta*. Esta última (Figura 3) le sirvió para mostrar uno de los argumentos del texto: el marcado contraste de las formas del relieve que modelan lo que él denominaba el macizo central metamórfico o “la sierra por excelencia” (Carandell Pericay, 1920, p. 47). Dentro de ese contraste, contemplado desde el tajo del Corral del Veleta, Carandell Pericay (1920) destacaba la “imponente y majestuosa” (p. 47) presencia de los “enormes escarpes verticales” (p. 56) que definen las caras norte de las mayores cumbres del cordal principal. Tras reconocer la “pesada monotonía” que presentaba la ascensión al Corral, la mirada envolvente y esclarecedora de Carandell, como Ramond en Pirineos o Saussure en los Alpes, le fue suficiente para desvelar el “gigantesco braquianticinal” del pliegue-falla Mulhacén-Veleta, permitiéndole reconducir su relato: “la faz del relieve se transmuta por completo” (Carandell Pericay, 1920, p. 56). La estrategia discursiva del artículo se mostraba con claridad: basada en la explicación de la morfología del macizo a partir de la contraposición de sus dos formas principales del relieve —la suavidad de las lomas *versus* la verticalidad de los tajos—, Carandell Pericay (1920) presentaba el dibujo como modelo de representación complementario a tal explicación, mostrando los “dos tipos morfológicos que se dan en la Sierra Nevada: tipo *vosgiense*, relieve propio de montaña media; y tipo *alpino*, escarpado y ceñudo” (p. 57). Por tanto, mediante el recurso icónico-textual, el objetivo de Carandell parecía esclarecerse: otorgar relevancia al aspecto propiamente cordillerano, y, con ello, alpino, del macizo nevadense.

Figura 3. Juan Carandell: *Panorama desde el Veleta*

Fuente: Carandell Pericay (1920)

El *Panorama total* (Figura 4), tomado desde la Loma del Calvario, mostraba dos aspectos importantes. Por un lado, exponía gráficamente el cordal principal de las altas cumbres del macizo (hasta la Alcazaba en su parte oriental), enfatizadas por el sombreado de la técnica del dibujo, y, por otro, revelaba con claridad los profundos barrancos de la vertiente norte, fruto de la erosión glaciaria, con la cuenca del Genil en primer término. De este modo, Carandell Pericay (1920) ratificaba gráficamente el carácter abrupto del relieve de la cara septentrional del macizo, subrayando, incluso, su singularidad, ya que, como afirmó en el texto, “no ya en España, quizá ni en los Alpes hay ejemplos más patentes” de la profundidad de las “recientes fracturas” desde aquel punto privilegiado que el geólogo supo relevar para la aplicación de la visión panorámica sobre la faz más alpina de la Sierra (p. 53).

Figura 4. Juan Carandell: *Panorama total de la Sierra Nevada*

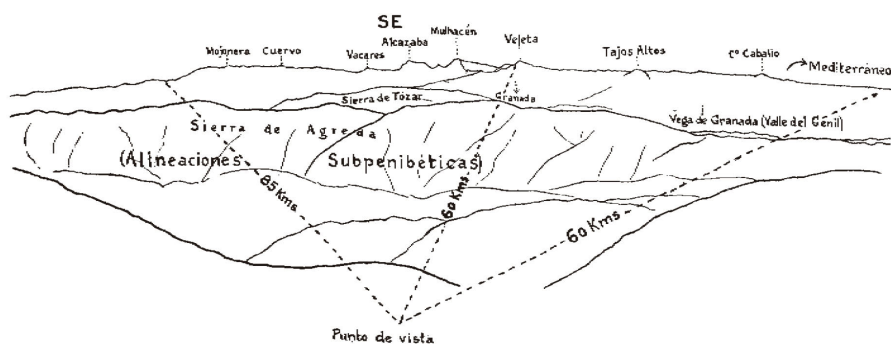
Fuente: Carandell Pericay (1920)

Entre el conjunto de sus panoramas, Carandell destacó la *Panorámica de Sierra Nevada desde la Sierra de Cabra* (Figura 5), una representación de la vertiente norte del cordal principal de Sierra Nevada desde las Sierras de Córdoba, dibujada y pintada a la acuarela.

La panorámica iba acompañada de un croquis en la parte inferior de la representación, que le sirvió a Carandell como recurso gráfico para señalar las distancias desde el punto de vista tomado hasta el Cerro del Caballo, en el extremo occidental del macizo, el Pico del Cuervo, en el extremo oriental (entre los

cuales quedaba comprendido el cordal principal más elevado de Sierra Nevada), y el Picacho del Veleta, centrado en la imagen junto con el Mulhacén y la Alcazaba, como las tres cotas máximas del macizo. El croquis dejaba entrever la autoridad de la representación, indicando el foco de origen del observador soberano —el científico— y el control racional de la ejecución de su mirada panorámica sobre el territorio. En el punto de fuga de la composición, el marcado modelado glaciar de la cara norte contrastaba con la “serenidad de perfiles [del resto del macizo] verdaderamente inaudita” (Carandell Pericay, 1930, p. 123). Carandell utilizaba la autoridad de su mirada, situada estratégicamente en la Sierra de Cabra, para destacar la verticalidad del relieve, de reminiscencias alpinas, de las caras norte de las tres grandes cumbres nevadenses, la Alcazaba, el Mulhacén y el Veleta, que le servía al científico para demostrar su frecuente (y deseada) analogía con la cordillera centroeuropea. De este modo, sobre cualquier otra peculiaridad geográfica, acentuaba las concomitancias más evidentes con la alta montaña europea, subrayando, mediante la retórica, el aspecto más agreste de la Sierra (Carandell Pericay, 1920, pp. 53-54): “¿Quién sospechará que aquellos picos, de redondeado perfil, (...) se nos presentarán con una bravura inaudita cuando nos dispongamos a remontar la Sierra por otros puntos, o cuando se nos aparezcan, desconocidos, desde las distintas estaciones de nuestro itinerario?”.

Figura 5. Juan Carandell: *Panorámica de Sierra Nevada desde la Sierra de Cabra*.



PANORÁMICA DE SIERRA NEVADA, DESDE LA SIERRA DE CABRA

(Aquarela de J. Carandell)

Fuente: Bernaldo de Quirós (1923)

En su conferencia pública del congreso mencionado, Carandell no solo reforzó el razonamiento análogo en su explicación, sino que también utilizó el recurso del *tour d'horizon*, manifestando su profundo conocimiento acerca de los formatos geográficos de representación utilizados en los estudios de los Alpes. Al igual que hiciera Saussure en sus *Voyages*, comunicó de manera explícita su preocupación por “fijar gráficamente la amplitud de los horizontes que desde el Veleta se divisan” (Carandell Pericay, 1926a, p. 66), como ya había quedado patente en sus publicaciones anteriores. En esta ocasión, sin embargo, en lugar de utilizarlo como imagen impresa, empleó la vuelta de horizonte desde el Picacho como recurso retórico comunicativo en el espacio de la presentación pública, al tiempo que proyectaba las imágenes ante la audiencia. Para la presentación de sus planteamientos visuales, Carandell (1926a) propuso “algo así como la cinematografía de un viaje desde Granada al Picacho” (p. 69) a fin de trasladar a los asistentes a la misma cumbre del Veleta. Así, mediante la herramienta del desplazamiento virtual a la cima de la montaña, acompañado de la proyección de unas vistas de la Sierra, Carandell invitaba a reflexionar, en un acto público de auténtica transmisión y comunicación del conocimiento geográfico, sobre las concomitancias entre los dos macizos.

Una vez que hubo llevado al público a la cumbre del Veleta, Carandell (1926a) expuso el paralelismo entre el Montblanc y el Picacho utilizando el panorama circular y el método comparativo, para lo cual exhibió “el amplísimo horizonte copiado por mí”, que proyectó “comparándolo con la vuelta de horizonte trazada por Helbronner desde el Montblanc francés” (p. 69). De este modo, el paralelismo entre un sistema y otro fue articulado y presentado visualmente al público a través de la captación visual comparada de los relieves de ambas cordilleras. Para ello, se sirvió primero del célebre *tour d'horizon* levantado por el geodesta francés. Situado visual (y virtualmente) sobre la cumbre de los Alpes, Carandell trasladó a los oyentes el relieve de Andalucía, identificando así un paisaje con otro:

Vais a ver la línea recta, suave, del borde de la Meseta francesa, homólogos de la Sierra Morena y Meseta españolas; veréis el lago de Ginebra, homólogo de la vega de Granada o de la llanura de Guadix; veréis los Alpes Marítimos, homólogos de la Contraviesa y la sierra de Lújar; veréis el Jura franco suizo, homólogo de nuestras sierras de Jaén, de Luque, de Alcalá y Priego. (Carandell Pericay, 1926b, p. 52).

Tras la proyección del panorama alpino de Helbronner, Carandell presentó al público su propio *tour d'horizon* desde el picacho del Veleta, en el que alternó la descripción pormenorizada del paisaje circular con sus propias impresiones subjetivas, referencias a acontecimientos históricos y textos literarios sobre las cumbres nevadenses. Si con la imagen del horizonte desde el Montblanc el geólogo evocaba los Sistemas Béticos y sus depresiones, ahora el proceso se invertía, recurriendo a la analogía presentada anteriormente:

¿No recordáis cómo desde el Montblanc veíamos la Cevennes, el Morvan, el Beaujolais, al Cuesta de Oro? Pues traducid por Sierra de Córdoba, de Adamuz, de Montoro, de Andújar, de Bailén, esos nombres franceses, y el paisaje justificará por sí mismo el por qué título esta conferencia: Sierra Nevada, Montblanc de España. (Carandell Pericay, 1926b, pp. 55-56).

A pesar de la marcada referencia alpina en toda su explicación, Carandell se mostró consciente de los particularismos de Sierra Nevada y, por tanto, de sus diferencias fundamentales con su pretendido homólogo continental. En este sentido, recurrió a tres aspectos específicos del macizo en su argumentación. En primer lugar, subrayó su ubicación geográfica, estrategia que utilizó para otorgar a la montaña bética un elemento valorativo de unicidad, basado en su extraordinaria proximidad al mar, factor que evidenciaría su condición de alta montaña mediterránea distinta a la alta montaña centroeuropea. Carandell recogía así parte del conocimiento científico que se había generado en torno a Sierra Nevada a lo largo del siglo XIX, el cual ya había puesto de manifiesto, especialmente a través de la obra de Moritz Willkomm, las especificidades de la alta montaña nevadense en función de ciertos factores implicados en su geolocalización, y que escapaban del canon alpino.⁴ En sintonía con Willkomm, Carandell recalca, al hablar del Mulhacén y a pesar de la falta de uniformidad en las formas del relieve propiamente alpinas, no su excepcionalidad geomorfológica completa (salvo su cara norte), sino su ubicación en relación al espacio geográfico circundante: “a unos 45 [kilómetros] de la costa mediterránea, yérguese hasta cerca de tres kilómetros y medio el Mulhacén, pico culminante de la Sierra Nevada y máxima altura de la Península ibérica” (Carandell Pericay, 1920, p. 47). De este modo, según Carandell (1920) “[c]ompensa la casi carencia de facies alpina (...) la estrecha asociación del elemento terrestre con el marino (...) [ya que] agiganta aún más el relieve del ingente monolito andaluz” (p. 47); una relación de contraste que le otorgaba al macizo una singularidad geográfica y paisajística distinta del referente alpino.

En segundo lugar, Carandell recurrió a la evocación de la historia local como elemento diferenciador de Sierra Nevada, refiriéndose al macizo como parte integrante del relato histórico y geopolítico de la Granada islámica. En la conferencia, presentó el corredor del Genil como “el punto vulnerable de la región granadina en la historia política”, ya que, según su interpretación, “por ahí debía venir, fatalmente, la contestación que las huestes cristianas dieron al reto de Muley Hacén, acabando por derrotar a Boabdil” (Carandell Pericay, 1926b, p. 54). Y, en tercer lugar, Carandell diferenció a la Sierra del modelo alpino a través de las visuales panorámicas del paisaje obtenidas desde la cumbre, una dimensión que, no en vano, también había sido señalada por Willkomm.⁵ Haciéndose eco de esta particularidad, al final de la

4 Según la idea de Willkomm, no había en la península Ibérica ni en todo el continente europeo otra zona geográfica que se pudiera parangonar con la de Granada en altitud, formación ni “respecto a la ubicación geográfica y el clima” (Willkomm, 1993, p. 53).

5 El botánico alemán ya había sido consciente de que, si bien “Sierra Nevada carece de grandiosos glaciares, de cimas cubiertas de nieve perpetua, de maravillosas cataratas, de umbrosos pinares y de lagos encantadores, (...) de los que presumen los Alpes”, superaba, sin embargo “a todas las sierras europeas”, no solo en la ubicación —como se indicó anteriormente—, sino también en “el panorama sobre el mar Mediterráneo a la costa y montañas africanas” (Willkomm, 1993, p. 265).

conferencia Carandell Pericay (1926b) afirmó que “la vuelta del grandioso horizonte del Veleta, de ese horizonte cuyo radio es de más de doscientos setenta kilómetros”, constituía no solo “el mayor de Europa después del Montblanc”, sino también “el mayor de Europa en absoluto, porque Sierra Nevada tiene el Mediterráneo a treinta y cinco kilómetros, lo que no le sucede al Montblanc” (p. 57). Finalmente, si bien Carandell aprovechó su mirada global al macizo para explicar y comunicar algunos de los particularismos específicos de Sierra Nevada, su deseo por asimilar en su totalidad el referente alpino en su interpretación geográfica de la Sierra le hizo decantarse por su caracterización exógena al concluir que, “recordando que [la Sierra] fue árabe, parece querer ocultar dentro del níveo jaique que la envuelve, los tesoros de sus encantos alpinos” (Carandell Pericay, 1926a, p. 71).

4. Discusión de resultados

Para los naturalistas suizos del círculo de Ginebra, el método de la aplicación visual panorámica sobre la ordenación geográfica de la montaña implicó una nueva forma de examinar el paisaje a través de un “ojo exploratorio” en movimiento (Della Dora, 2007, p. 294) que, además, debía ir acompañado de la experiencia física y corpórea de la ascensión a la cumbre. Este método, al tiempo visual y fenomenológico, permitió llevar a cabo los primeros análisis empíricos rigurosos de la orografía de los conjuntos montañosos mediante la visión móvil integral, vehiculada por la razón y complementada con la precisión instrumental; una mirada que privilegiaba las interrelaciones de los componentes geográficos a fin de aprehender y ordenar la naturaleza “en términos de sistema” (Briffaud, 1994, p. 187).

La implementación de dicha metodología desencadenó la invención de modelos gráficos y recursos narrativos que dieran cuenta del sistema que se pretendía descifrar. Aunque no estuvieron exentos de importantes connotaciones subjetivas, estéticas y filosóficas (Billing, 2019; Klöckner, 2003; Reichler, 2002; Stafford, 1984, p. 54), estos modelos y recursos, presentados en formatos panorámicos de representación y descripción del paisaje, aparecieron como una declaración metodológica y epistemológica de intenciones al poner de manifiesto la función cardinal, reveladora y legítima de la mirada autónoma del naturalista como una “expresión máxima de autoridad racional”, epítome del “sujeto soberano” cartesiano frente al estudio controlado de la naturaleza (Della Dora, 2018, pp. 190, 204; véase también Hansen, 2013, pp. 58-60). Las imágenes y éfrasis panorámicas, deudoras de esta autonomía de la mirada, contribuyeron a legitimar un nuevo régimen de verdad geográfico articulado en torno a un modelo explicativo icónico-textual que integró dichos recursos en el relato científico. Se configuró así el paradigma referencial discursivo del estudio sistemático de la montaña en el contexto de la génesis del pensamiento geográfico de la modernidad.

Por tanto, las cumbres alpinas constituyeron, empleando la terminología de Latour (2001), auténticos “archivos” de altitud o bases de datos naturales del geógrafo, establecidos como “centros de cálculo” (p. 362) desde donde se difundieron sus postulados teóricos y metodológicos a otras investigaciones en curso en ámbitos montañosos periféricos. De este modo, la visión panorámica y sus modelos de representación circularon desde el “conjunto de circunstancias iniciales” del mundo científico ginebrino, donde la idea se incorporó al discurso y apareció en formas impresas (Said, 1991, pp. 226-227), hasta los Pirineos. El lenguaje de representación adoptado por Ramond, deudor de las aportaciones de Saussure, presentaba igualmente la montaña como materia “legible” y “penetrable” (Stafford, 1984, p. 285) gracias a la aplicación de este nuevo método. La visión panorámica y sus correspondientes expresiones, siguiendo a J. Secord (2004), demostraron su eficacia como herramientas y “convenciones de transmisión” (p. 661) de los avances del conocimiento geográfico sobre las cordilleras europeas, teniendo, por tanto, un papel protagónico en la “concepción normativa de la montaña” (Frolova, 2001, p. 166). En el contexto de esta normativización discursiva de la montaña y a la luz del análisis de las fuentes, es preciso discutir, desde el marco teórico presentado, las implicancias de la circulación del conocimiento geográfico de las cordilleras continentales hasta Sierra Nevada, cuya evidente transmisión encontró en el macizo, según los términos de Said (1991) y J. Secord (2004, p. 669), un espacio periférico de recepción de procedimientos metodológicos, formatos de representación y estrategias narrativas de origen foráneo, basados en la aplicación de la mirada panorámica en movimiento.

Las teorías de Clemente y Rubio sobre Sierra Nevada se sustentaron en dicha transferencia del conocimiento mediante la adopción de los métodos analizados de procedencia europea, basados en la aplicación operativa de la mirada panorámica sobre los cordales de Alpes y Pirineos tras la ascensión a las cumbres.

Como Saussure desde la cima del Buet o Ramond en Monte Perdido, la perspectiva que se le abrió al botánico español desde la cumbre del Veleta le reveló su orden topográfico, reconociendo, visual y, sobre todo, epistemológicamente, la existencia de la alta montaña nevadense dentro del sistema normativo de conocimiento geográfico de las cumbres continentales en el horizonte cognoscitivo de la Ilustración. Con ello, otorgó a la Sierra un orden legible a través de unos recursos y estrategias icónico-textuales de origen foráneo, articulados en torno a la organización del relato bajo una estructura expedicionaria de encuentro inmersivo con la montaña y a las representaciones gráficas. Estas últimas, elaboradas como croquis con anotaciones añadidas, fueron el resultado de lo que Latour (2001) ha denominado una “operación de traducción” (p. 120) de teorías y métodos exógenos a la realidad de la montaña nevadense, los cuales, desde el centro epistemológico ginebrino, se difundieron a las ciencias geográficas españolas.

Estos préstamos se vieron enriquecidos por el diálogo que Clemente y Rubio estableció conscientemente con las producciones científicas europeas de su tiempo, contribuyendo a la consolidación de “circuitos” de transmisión del conocimiento a través de estos “encuentros hermenéuticos” entre hipótesis, teorías y herramientas metodológicas propuestas por diferentes autores de la época (Secord, A., 2011, p. 285; Livingstone, 2005, p. 392). En consecuencia, a razón de lo que Said (1991) llama un “conjunto de condiciones de aceptación” y “procesos de institucionalización” locales (p. 226), que fueron posibilitados en este caso por el Real Jardín Botánico de Madrid, Clemente y Rubio protagonizó un proceso de construcción y legitimación de un nuevo discurso geográfico en el espacio de Sierra Nevada y en el contexto de la reciente institucionalización de las ciencias naturales en la España de su tiempo. El naturalista mostró así una montaña inteligible en términos geográficos, hasta entonces carente de representación científica, conceptualizando el macizo como un sistema articulado por la interrelación lógica de sus elementos, y consolidándolo como un espacio de recepción, producción y, desde entonces, transmisión del conocimiento geográfico europeo de la alta montaña.

Clemente y Rubio inauguró la genealogía de interpretaciones geográficas de la Sierra que sería completada por científicos como Boissier, Willkomm y, más tarde, Carandell, iniciando un proceso histórico de asimilación y extrapolación del referente alpino al análisis del macizo y la correspondiente construcción de su relato geográfico. Carandell llevó esta extrapolación a sus máximas consecuencias al proponer la “traducción de un lugar [Alpes] a otro [Sierra Nevada]” (Duncan y Gregory, 2010, p. 4), traducción que en su caso tendría un sentido bidireccional al optar por la identificación entre ambos sistemas y trasladar, en una operación analógica, el ordenamiento geográfico de una montaña a la otra. Si, según Duncan y Gregory (2010), los procesos de traducción, lejos de ser neutrales, están “atravesados por relaciones de poder y de deseo” (p. 5), se desprende que la traducción acometida por Carandell estuvo impregnada de su propio afán por conceptualizar el macizo en términos estrictamente alpinos, para lo cual utilizó un conjunto bien elaborado de herramientas retóricas e icónico-textuales, resultado de la observación panorámica, como estrategia de representación de aquellos elementos geográficos del macizo que se ajustaban a la idea normativa y hegemónica de la alta montaña, encarnada por el canon alpino.

En este sentido, los recursos gráficos, las técnicas narrativas y las herramientas retóricas empleadas por Carandell formaron parte de su propia “estrategia interpretativa” (Keighren y Withers, 2012, p. 12) de la geografía bética con el objetivo, por un lado, de “demostrar la credibilidad autoral” de su propio discurso (Keighren y Withers, 2012, p. 13), y, por otro, de dotar de legitimación al macizo nevadense como objeto de análisis geográfico en el contexto del sistema de conocimiento normalizado de la alta montaña continental. En esta estrategia de legitimación, Carandell estudió, representó y comunicó la geografía de la Sierra recurriendo a términos y procedimientos exógenos, regulados y autorizados por las ciencias geográficas internacionales y sustentados en la soberanía racional de la visión panorámica. Por tanto, este proceso de traducción del conocimiento y esta estrategia de interpretación geográfica le permitió a Carandell sistematizar un régimen de verdad geográfico sobre la Sierra, validado por los preceptos normativos emanados del conocimiento científico de origen alpino, y consolidando así la contribución anterior de Clemente y Rubio.

Por consiguiente, se infiere que el canon de la alta montaña alpina actuó como mediador en las interpretaciones geográficas de Sierra Nevada a lo largo del siglo XIX y el primer cuarto del siglo XX, constatando que se produjeron continuos y cada vez más elaborados “actos de traducción” (Livingstone, 2003, p. 11; Duncan y Gregory, 2010, p. 4) de teorías y procedimientos importados desde el centro alpino a la periferia nevadense. Se trataron, por tanto, de procesos de traducción epistemológica que cristalizaron en la sistematización científica de una montaña “otra” a partir de criterios, categorizaciones y

representaciones previamente legitimados en geografías foráneas, ajenos, por tanto, a las particularidades geográficas locales. Como resultado, se desprende que Sierra Nevada, en la medida que constituyó lo que se podría denominar una montaña periférica de recepción del conocimiento geográfico normativo de la alta montaña europea, fue producto de una operación interpretativa de dimensiones científico-culturales en función de modelos exógenos, hecho que derivó en la frecuente omisión de, o falta rigurosa de atención a las singularidades del macizo y, por ello, en la desnaturalización de su propia geograficidad.

Sin embargo, dicha recepción y extrapolación del conocimiento, lejos de constituir una mera importación, implicó, en el caso particular de Carandell, una voluntad de “reconstrucción” de las ideas y el discurso originales (Cosgrove y Della Dora, 2008, p. 4). En este sentido, como indica Livingstone (2003), las condiciones locales del espacio geográfico de recepción —en este caso los particularismos del macizo— “limitaron el discurso” (p. 7) importado, afectando en esta transmisión y reapropiación del relato hegemónico de la montaña. A partir de estas limitaciones, surgieron “apropiaciones creativas” distintas de la teoría original (Said, 1991, p. 226) en el seno de la interpretación científica carandelliana de la montaña nevadense. Del análisis de las fuentes, se desprende que el proceso de traducción del conocimiento llevado a cabo por Carandell se vio interferido por una “compleja dialéctica entre el reconocimiento y la recuperación de la diferencia” (Duncan y Gregory, 2010, p. 4), representada por las características específicas de Sierra Nevada y puestas de relevancia en interpretaciones científicas anteriores (especialmente la de Willkomm), que Carandell supo recoger en sus publicaciones y conferencias. Estas singularidades, ya indicadas, funcionaron como aspectos distintivos de la geografía bética que, más allá de marcar la diferencia con las cordilleras continentales de referencia, provocaron una cierta reformulación de las teorías exógenas. Se produjo, por tanto, una reinterpretación situada del discurso, tanto geográficamente, en la medida que visibilizó las características propias del macizo, como epistemológicamente, en tanto que estuvo determinada por el “encuentro hermenéutico” (Livingstone, 2005, p. 392) entre las aportaciones de Carandell y los textos científicos nevadenses. Carandell integró así las anteriores contribuciones de la genealogía del conocimiento acerca de Sierra Nevada en el relato canónico alpino de la alta montaña a través de un diálogo situado que hizo de la montaña bética un espacio de “hibridación textual” en el que diversos textos, interpretaciones y contenidos se trabaron de forma indiscriminada (Livingstone, 2005, p. 393; Withers y Livingstone, 2011, p. 11).

Se concluye que Sierra Nevada, conceptualizada en gran medida como una montaña de recepción, se alzó también, paulatinamente, como un espacio geográfico y epistemológico complejo de reinterpretación hermenéutica del discurso hegemónico de la alta montaña continental. Por consiguiente, se infiere que el relato geográfico moderno de Sierra Nevada —al cual contribuyeron Rojas Clemente y Rubio y Carandell en diferentes momentos de la modernidad— ha oscilado entre la pretendida universalidad de un régimen de verdad canónico en torno a la alta montaña europea y el progresivo reconocimiento de una identidad geográfica diferente que se correspondiera con las marcadas singularidades del macizo. Esta identidad propia iría ocupando una relevancia cada vez más significativa a lo largo de las décadas siguientes en la construcción de un conocimiento geográfico situado que diera cuenta de la complejidad de Sierra Nevada como un macizo de alta montaña singular, condicionado por su ubicación en un sector de influencia climática mediterránea y subtropical, su pasado histórico, la mutabilidad de su morfología y, finalmente, el vasto y luminoso panorama apreciable desde sus cumbres.

5. Conclusiones

La conceptualización geográfica de las cordilleras occidentales del continente europeo tuvo una dimensión relacional, tratándose de un conocimiento global construido en base al diálogo entre teorías, métodos, narrativas y formas de representación, todos ellos componentes de una cultura científica y visual comunes que circularon en el tiempo y en el espacio a lo largo de la modernidad. La transmisión y las imbricaciones de estas ideas y representaciones fueron fundamentales para pensar en el discurso geográfico moderno de Sierra Nevada como resultado del fenómeno de la circulación del conocimiento. En este sentido, las obras de Rojas Clemente y Carandell han de verse, por un lado, como parte de estos intercambios de naturaleza científica y cultural, y, por otro, como integrantes de una genealogía del saber geográfico nevadense y europeo acerca de la alta montaña, participando en la consolidación del estudio de las cordilleras continentales y contribuyendo al reconocimiento y la transmisión del discurso a través de su producción impresa.

Considerando esta movilidad intelectual, el artículo ha abordado la historia del conocimiento de Sierra Nevada desde una perspectiva interrelacional dentro del contexto de la interpretación geográfica de la alta montaña en Europa occidental. De este modo, ha mostrado cómo la producción geográfica moderna en torno al macizo se ha ido conformando a partir de las continuas interacciones entre las ideas, vertidas en textos e imágenes tanto importados como producidos en el espacio local del macizo. Lejos de presentar un enfoque histórico aislado o autorreferencial de la montaña basado en distintas excepcionalidades, el presente trabajo ha problematizado la Sierra como un macizo cuya historia geográfica fue configurada a partir de continuos diálogos transnacionales con otras geografías de montaña continentales. Así, ha dado cuenta de la tensión entre lo global del fenómeno del encuentro científico con la montaña y lo local de sus respuestas situadas en un macizo cuya singularidad geográfica no fue debidamente apreciada hasta bien entrado el siglo XX. Asimismo, ha propuesto una lectura interpretativa de la Sierra como una montaña compleja, dotada de una discursividad e historicidad heterogéneas, idónea para el estudio de las geografías de recepción e interpretación de las ciencias geográficas europeas, reivindicándola así como un nexo importante de transmisión internacional de las ciencias geográficas.

En suma, el presente trabajo pretende constituir una contribución al estudio de la interpretación científica y cultural del macizo de Sierra Nevada como parte fundamental de la construcción discursiva de las geografías de montaña del continente europeo. Privilegiando una perspectiva histórico-hermenéutica, el artículo se inscribe así en aquellas investigaciones internacionales que han planteado enfoques complejos, dialogantes y multidireccionales entre los distintos aspectos (globales y locales) que forman parte del fenómeno de la interpretación de la montaña, y, con ello, abre la vía para el fortalecimiento de una mirada novedosa en el análisis de los sistemas montañosos peninsulares como importantes centros de intercambio de conocimiento. Conscientes de las limitaciones que supone el estudio de las zonas de alta montaña de Europa occidental en la medida en que la investigación queda circunscrita a unos métodos, discursos y representaciones propias del pensamiento moderno eurocéntrico, se trabaja actualmente en un tipo de cordillera extracontinental —concretamente en el centro-sur de Chile— a fin de explorar saberes, cosmovisiones e interpretaciones otras que permitan extender el tópico en el ámbito académico de una manera más plural, atendiendo así a la heterogeneidad, las diferencias y la pluriversalidad que ofrecen las geografías histórico-culturales de la montaña.

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Tropical cyclone effects on vegetation resilience in the Yucatan Peninsula, México, between 2000-2012

Efectos de los ciclones tropicales en la resiliencia de la vegetación en la península de Yucatán, México, entre 2000-2012

Gabriel Sánchez-Rivera^{1*} 
Leticia Gómez-Mendoza² 

Abstract

The resilience capacity of vegetation in the Yucatan Peninsula is influenced by the winds and rains of tropical cyclones. There are no recent long-term studies on cyclonic impacts on natural vegetation in the region despite their significant effects on infrastructure and biodiversity. The objective of this study was to identify the area impacted by 21 tropical cyclones between 2000 and 2012 and to quantify the recovery capacity of the vegetation by using standardized anomalies of the normalized vegetation index (aNDVI). MODIS images from NASA's "Terra and Aqua" satellites were used to calculate the damaged areas by analyzing the frequency of pixels corresponding to each type of vegetation per impact zone. The results showed that in 67% of the tropical cyclones, the impacts on vegetation were negative—a decrease in aNDVI—but in 33% of the cyclones, positive effects were recorded—an increase in aNDVI—. The lapse rate of vegetation recovery varied in 52% of the cases; vegetation recovered between two and three weeks after each cyclonic event, while 38% of the cases recovered within four to five weeks of the cyclone landfall. Tropical forests suffered the most significant effects, followed by hydrophilic vegetation. The most destructive hurricanes were *Emily*, *Wilma*, and *Dean*. The rate of recovery laps ranged from 4 to 10 weeks after the hurricane hit. The results could improve assessments of vegetation vulnerability against severe hydrometeorological events and establish priority zones for prompt inspection.

Keywords: ecological resilience; tropical cyclones; NDVI anomalies; Yucatán Peninsula.

Resumen

La capacidad de resiliencia de la vegetación en la Península de Yucatán está influenciada por los vientos y las lluvias de ciclones tropicales. No existen estudios recientes a largo plazo relacionados con los impactos ciclónicos sobre la vegetación natural de la región a pesar de sus grandes efectos en la infraestructura y la biodiversidad. El objetivo de este estudio fue identificar el área impactada por 21 ciclones tropicales entre 2000-2012 y cuantificar la capacidad de recuperación de la vegetación mediante el uso de anomalías estandarizadas del índice de vegetación normalizado (aNDVI). Se utilizaron imágenes MODIS de los satélites "Terra y Aqua" de la NASA para calcular las áreas dañadas considerando la frecuencia del número de píxeles correspondientes a cada tipo de vegetación por zona de impacto. Los resultados mostraron que en el 67% de los ciclones tropicales los impactos en la vegetación fueron negativos—disminución en aNDVI— pero en el 33% de los ciclones tropicales se encontraron impactos positivos—aumento en

1 Division of Sustainable Development, University of Quintana Roo, Mexico. grivera@uqroo.edu.mx. Corresponding author

2 College of Geography, School of Philosophy and Literature, National Autonomous University of Mexico, Mexico. gomez.leticia852@gmail.com

aNDVI—. El lapso de recuperación de la vegetación varió. En el 52% de los casos, la vegetación mostró recuperación entre dos o tres semanas después de cada evento ciclónico, mientras que en el 38% de los casos se produjo dentro de las cuatro a cinco semanas posteriores a la llegada del ciclón. Los bosques tropicales sufrieron los efectos más significativos seguidos de la vegetación hidrófila. Los huracanes más destructivos fueron *Emily*, *Wilma* y *Dean*. El período de recuperación varió de 4 a 10 semanas después del cada huracán. Los resultados podrían mejorar las evaluaciones de la vulnerabilidad de la vegetación frente a eventos hidrometeorológicos severos y establecer zonas prioritarias para su pronta inspección.

Palabras clave: resiliencia ecológica; ciclones tropicales; anomalías del NDVI; península de Yucatán.

1. Introduction

Resilience and recovery are two crucial concepts in the ecological service literature. Holling (1996) defines ecological resilience as the magnitude of the disturbance that a system can absorb before changing its structure by modifying the variables and processes that control its behavior. Oliver et al. (2016) argued that the concept of ecological resilience recognized the existence of multiple stable states and their ability to resist “regime changes” between alternate states. Tropical cyclones are considered regime changes in ecosystems. Vegetation recovery after the strike of a hurricane is essential to maintaining ecological protection services. To understand resistance and resilience, it is necessary to perform studies from different spatiotemporal and dimensional scales to grasp the significance of the processes that lead to an ecosystem suffering the impairment of its dynamics and functional performance (Ghazoul & Chazdon, 2017).

Mexico receives direct impacts from tropical cyclones because it is located between two cyclogenetic zones: the Northeast Pacific and the Northern Atlantic (Rosengaus-Moshinsky, 2010). The National Oceanic and Atmospheric Administration (NOAA) estimated an annual average of 12.1 tropical storms and 6.4 hurricanes in the Atlantic basin and 16.6 tropical storms and 8.9 hurricanes in the northeast and central Pacific (NOAA, 2014). During the second half of the 20th century, the most intense hurricanes, categories 4 or 5 according to the Saffir-Simpson scale, occurred in the Yucatan Peninsula region, mainly in Quintana Roo state, since it is on the track of Atlantic cyclonic systems (Ihl & Frausto-Martínez, 2014).

High-intensity winds and heavy rains associated with cyclones can cause disasters in regions with human settlements, such as damage to infrastructure, cultivation areas, and human losses and injuries (Rosengaus-Moshinsky, Jiménez-Espinosa, & Vázquez-Conde, 2002). In addition, these extreme weather systems also affect the natural environment by altering biodiversity patterns and ecosystem services (Solow, 2017; Van de Pol, Jenouvrier, Cornelissen, & Visser, 2017). In contrast, hurricanes can create favorable conditions for the regeneration of certain species capable of withstanding hurricane-force winds (Snook, 1993; Vink & Ahsan, 2018).

Ecosystem services depend directly on the conservation status of the vegetation cover. In the Yucatan Peninsula case, vegetation is mainly represented by tropical rainforests; medium and low deciduous forests are located predominantly in Yucatan state, while tall and medium subevergreen primarily occur in Campeche and Quintana Roo states (Sánchez Aguilar & Rebollar Domínguez, 2016). However, this type of forest suffers from deforestation and illegal logging (Rebollar, De la Paz-Pérez Olvera, & Quintanar, 1993) and land-use change to urban areas or cattle (Rosengaus-Moshinsky, 2010). Additionally, vulnerability to tropical cyclones is increased due to low relief, which does not decrease wind flow (Boose, Foster, & Hall, 2003).

The multitemporal analysis of the impacts of cyclones on vegetation is relevant. According to Buma and Wessman (2011), much of the knowledge about vegetation resilience comes from the investigation of disturbances caused by singular events. Various studies on the Pacific coast of Mexico consider tropical cyclones to be one of the prime causes of disturbances in ecosystems (Bhaskar et al., 2018; Tapia-Palacios et al., 2018). Some studies, such as those of Parker, Martínez-Yrizar, Álvarez-Yépiz, Maass, & Araiza (2018), quantified the change in vegetation by applying the normalized vegetation index (NDVI) and LIDAR images (laser imaging detection and ranging) after the passage of hurricanes *Jova* (2011) and *Patricia* (2016). Examples of large-scale studies applying sampling techniques are those of Jimenez-Rodríguez et al. (2018), who identified the relationship between the structure and composition of the forest, recovery capacity, and damage magnitude.

Another example is provided Martínez-Yrizar et al. (2018), who compared two hurricanes of distinct categories to estimate the Chamela dry forest litter production by analyzing the ecosystem's short-term

response. However, most of the research has focused on the evaluation a single cyclone's effects on vegetation or the comparison of just a few cyclonic events. Long-term analysis of hurricane impact on vegetation in the Yucatan Peninsula is still scarce.

To understand the dynamics of the ecosystem recovery processes, it is necessary to have data before and after each extreme event. However, the field samples and measurements may be restricted due to damage and restricted access to sites (Holm et al., 2017). Therefore, indirect methods, such as satellite-derived images, present an alternative to estimating the impacts' spatiotemporal scope. Remote sensing techniques with products designed to record different electromagnetic spectrum ranges have allowed the algebraic combination of spectral bands to detect vegetation cover variations (called "green indexes"). Yengoh et al. (2016) argued that the NVDI is the most widely used technique in detecting spatiotemporal vegetation changes. As Ghazoul & Chazdon (2017) indicated, the implementation of the NDVI on a smaller scale allows the identification of the landscape's degradation and recovery through indirect measures of treetop or forest cover densities.

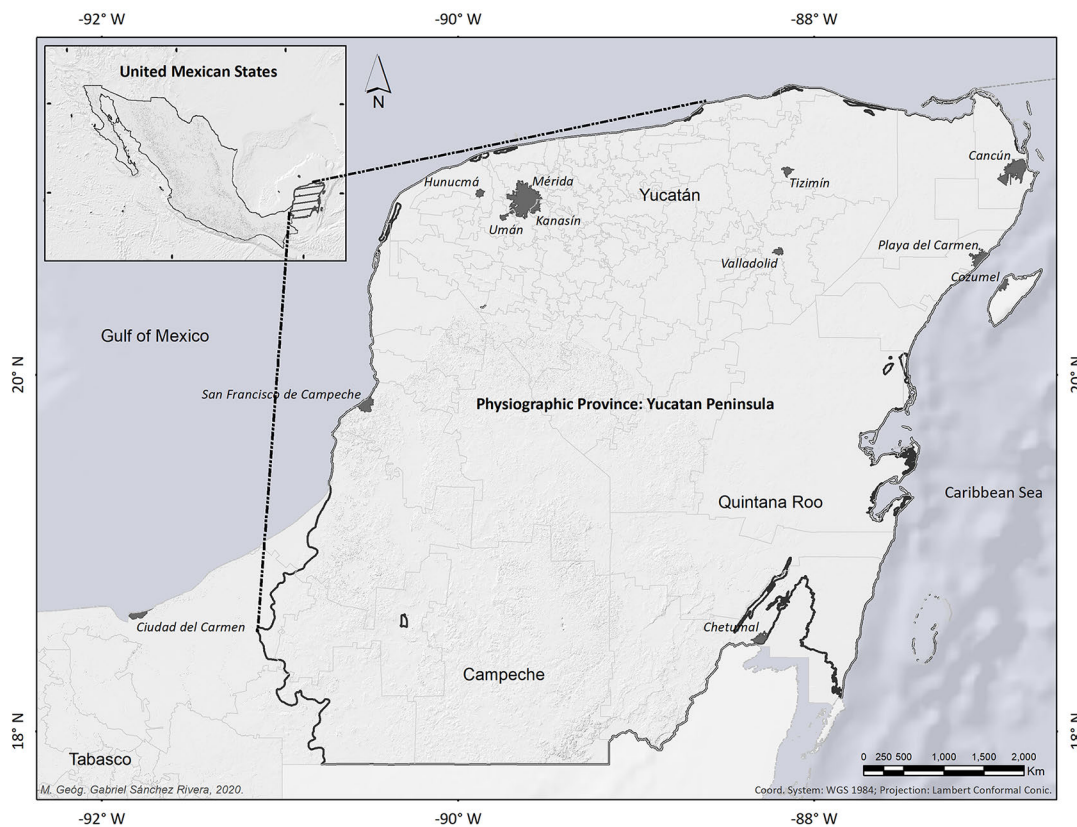
The objectives of this work are a) to estimate the impact area of 21 tropical cyclones that hit the Yucatan Peninsula between 2000-2012; b) to estimate the vegetation recovery capacity after the landfall of each cyclone through the NDVI anomaly value; and c) to identify whether the effects of cyclones on ecosystems are related to their trajectory, their category, or their landfall.

2. Methodology

2.1. Study area

This study considers the Yucatan Peninsula physiographic province (INEGI, National Institute of Geography and Statistics, 2001). The Yucatan Peninsula is located between 17.8° and 21.6° north latitude and 86.7° and 92.4° west longitude (Figure 1) and has an extension of 126,547.38 km² and a vegetation cover of 98%. It is characterized by a large karst platform and low altitude (0-300 m).

Figure 1. Study area



Own elaboration

The region largely consists of two climates: a warm wet climate with an average temperature between 24 and 26°C distributed from north to south, and a very warm climate with temperatures between 26 and 28°C toward the state of Campeche. The hurricane season occurs from June to November. May to October is the rainy season, with the highest rainfall (> 200 mm) in September due to the presence of tropical cyclones.

2.2. Data

Data and supplies for the research development came from the following free remote sensing databases and cartographic repositories: a) Cyclone trajectory from the library of the Best Track Archive for Climate Stewardship (IBTrACS, 2016) version “v03r09” by NOAA for the period 2000-2012, b) Vegetation types from the National Continuum of Land Use and Vegetation (LUV), scale 1: 250,000 series IV (INEGI, 2009), c) NDVI time series from the data library of the Research Institute for Climate and Society (IRI, 2017) of the USGS LandDAAC MODIS version_005 Southern North America series, with a temporal resolution of “16-day composites”, at a spatial resolution of 250 m/pixel (Huete et al., 2002). Both cartographic products and satellite images were processed using map algebra functions integrated with the geographic information system (GIS) ArcGIS 10.3.

An intersection geoprocess was used on a map overlapping the vector layers of the cyclone tracks formed into the North Atlantic basin and the peninsula polygon to identify the 21 cyclones that made landfall on the Yucatan Peninsula between 2000 and 2012. To simplify vegetation types, we performed cartographic reclassification from LUV to eliminate the polygons corresponding to the following categories: human settlements, bodies of water, other vegetation, and without vegetation. The remaining polygons were merged to create a new classification integrated only by tropical forest, grassland, farming, and hydrophilic vegetation.

The condition of vegetation is characterized at any given time by the historical mean of the period, in such a way that positive values represent an increase in photosynthetic activity —surplus—, while negative values are stated lower than expected by the mean —deficit—, where the “normal condition” is given by amounts between -1 and +1. NDVI time series integrated by 16-day composites overlapped with the Yucatan Peninsula polygon. The annual NDVI cycle was made up of twenty-three 16-day composites, resulting in 299 images for the 2000-2012 periods. For identification, each composite was chronologically numbered from 1 to 23 per year —composite number-year—. Data were available from 4-2003 (18 Feb - 4 Mar) to 23-2012 (18-31 Dec), and composites 13-2003 (12 - 27 Jul), 13-2008 (11 - 26 Jul), and 20-2010 (1 - 16 Sept) were reported as missing by IRI (2017).

The NDVI was calculated as the normalized difference of two spectral bands —red and near-infrared—, whose standardized variation was within the range of -1 to +1; the mathematical function for the computation is shown in Equation 1:

Equation 1. NDVI determination

$$NDVI = \frac{(NIR - R)}{(NIR + R)} \quad \text{Where: } NDVI = \text{Normalized vegetation index;} \\ NIR = \text{Near infrared, and } R = \text{Red.}$$

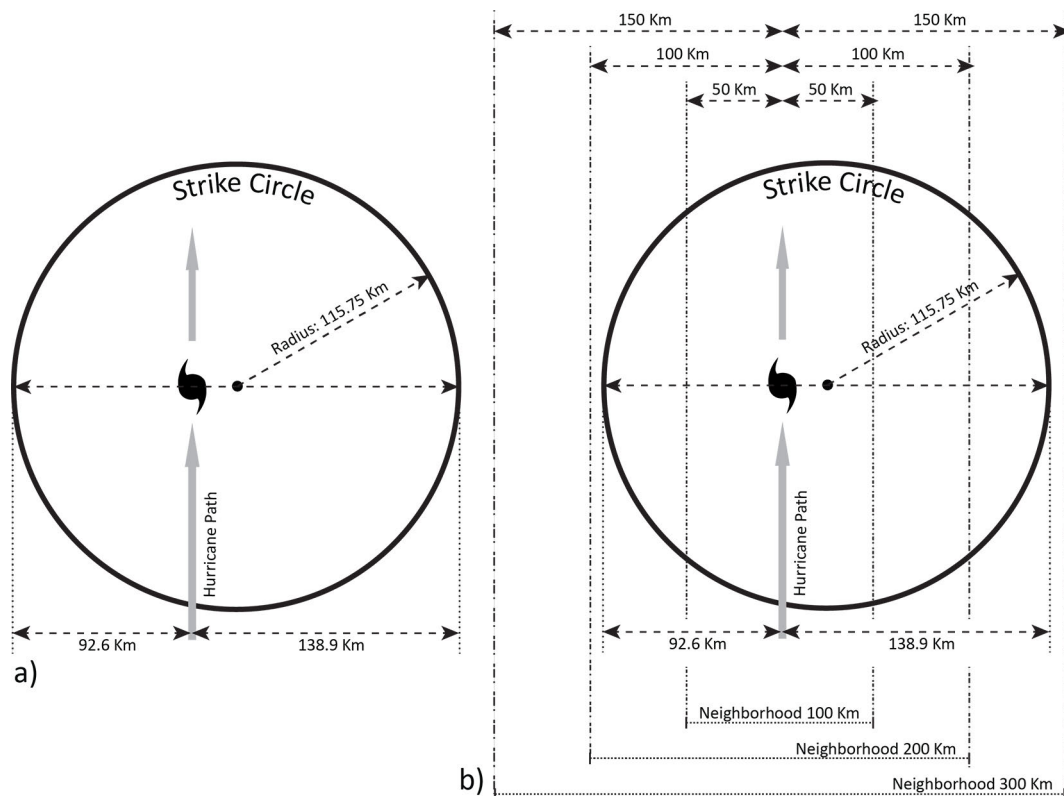
2.3. Methods

The study had two analysis stages: a) estimation of the cyclone impact area and b) estimation of the vegetation resilience after every cyclone.

2.3.1. Estimation of the cyclone impact area

To distinguish between seasonal phenological changes in vegetation and those associated with a tropical cyclone passage, we defined three “neighborhoods (Nh)” (buffer areas) for each cyclone track: Nh-100 km, Nh-200 km, and Nh-300 km. For the neighborhoods for each cyclonic trajectory, we considered the impact zone (strike zone), described by the National Hurricane Center (NHC, 2019). According to the track, the strike zone represents the typical extension of the hurricane winds category, centered on the hurricane’s eye (Figure 2).

Figure 2. a) Impact zone (strike zone), b) Delimitation of neighborhoods



Source: a) NHC (2019); b) Own elaboration

2.3.2. NDVI anomalies (aNDVI)

To determine the annual variation of vegetation phenology in the NDVI values from the sudden changes associated with a cyclonic path, we calculated the NDVI anomalies (aNDVI), where aNDVI is the difference between a sample value of a 16-day NDVI composite and the average NDVI value for the study period. The concept of climatic anomalies proposed by Wilks (2011) was adapted to calculate the aNDVI. The aNDVI is used widely for different purposes in agriculture, pests, forest management, water deficit, and drought assessment, allowing measuring changes in terms of the photosynthetic activity of vegetation —greenery— in its interannual shift (Aboud, Bias, Brites, & Santos, 2018; Meroni, Fasbender, Rembold, Atzberger, & Klisch, 2019; Nanzad et al., 2019; Zewdie & Csaplovics, 2015). The average and extreme values of aNDVI were quantified under the assumption that, due to the seasonal variation in events, anomalies provide more information about the magnitude of data series values by removing the influences of dispersion (Wilks, 2011). The adjusted mathematical expression to compute the aNDVI values is as follows (Equation 2):

Equation 2. aNDVI determination

$$aNDVI = \frac{(NDVI_x - NDVI_{xp})}{NDVI_{xs}}$$

where: *aNDVI* = anomaly normalized NDVI; *NDVI_x* = NDVI date *x*; *NDVI_{xp}* = NDVI sample average; and *NDVI_{xs}* = NDVI sample standard deviation.

To calculate the aNDVI, we applied Equation 2 at the pixel level for each annual set of images. The operation was performed using the ArcGIS “Cell Statistics” function. The NDVI and aNDVI were plotted to compare the landfalling cyclones with the time series to highlight observed phenological variations associated with cyclonic events, given that the interannual variation in NDVI is an indicator of vegetation phenology (Gómez-Mendoza, 2007).

2.3.3. Resilience estimation








The estimation of ecological resilience capacity (Holling, 1996) was obtained by calculating the recovery rates of photosynthetic activity measured as a function of the aNDVI in periods of 4 weeks after each tropical cyclone had landfall (Rouse, Haas, Schell, & Deering, 1973). The damaged area for each composite was calculated through the frequency of pixels concerning each neighborhood's vegetation type. We defined the impacts caused by each cyclone in five stages:

- a. For each cyclone, six composites were selected: one prior —16 days before—, one during the event, and four after landfalling —84 days later—.
- b. We recalculated the aNDVI values for each of the three cyclone-neighborhood combinations for each of the six composites selected per event. This operation was replicated for every one of the 21 cyclones. Subsequently, the results of each composite were subclassified by each vegetation type.
- c. The areas damaged by cyclones were estimated in percentages divided into two classes: moderate and extreme deficits.
- d. The estimation of the aNDVI per vegetation type was processed from the earlier step's images using the ArcGIS “Zonal Histogram” function.
- e. The weekly recovery rates were obtained, calculating the differences in aNDVI values between the previous composite concerning cyclone landfall and the subsequent composites.

Map algebra processing and operations were performed with Python programming language at a pixel resolution.

The impacts of each cyclone were classified using the IRI, UNESCO, FAO, and Ministry of Agriculture of Chile & Center Water for Arid Lands (2021) scale of interpretation of aNDVI values. This scale classifies the data dispersion around the mean value, measured in terms of the standard deviation, where values between -1 and 1 represent normal conditions, values greater than 2 represent moderate and extreme surplus, and less than -2 represent moderate deficit and extreme (Table 1).

Table 1. aNDVI classification

Scale	Class	Rank
	Extreme deficit	< -3
	Moderate deficit	-3 to -2
	Slight deficit	-2 to -1
	Normal	-1 to 1
	Slight surplus	1 to 2
	Moderate surplus	2 to 3
	Extreme surplus	> 3

Source: Adapted from IRI, UNESCO, FAO, Ministry of Agriculture of Chile & Center Water for Arid Lands (2021). Own elaboration

2.3.4. Statistical analysis

We applied a multiple-correlation model and a linear regression analysis to identify the impact of cyclonic events on the aNDVI. The variables considered to carry out the multiple correlations were cyclone category —Saffir-Simpson scale—, maximum sustained winds [km/h], distance traveled on land [km], maximum damaged area [%], a maximum difference of aNDVI [%], and recovery rate [number of composites]. We analyzed data through a linear regression method. Three pairs of variables were selected: a) maximum damaged area [%] vs. maximum increase or decrease [%] in aNDVI; b) maximum sustained winds [km/h] vs. maximum increase or decrease [%] in aNDVI; and c) distance traveled [km] vs. maximum increase or decrease [%] in aNDVI. The earlier three cases included the cyclone category as an additional reference variable.

3. Results

3.1. Tropical cyclones

Thirteen of the twenty-one cyclones studied in the period 2000-2012 reached the Saffir-Simpson hurricane category, and only five of them maintained that category when landing: *Isidore* (2002), *Emily* (2005), *Wilma* (2005), *Dean* (2007), and *Ernesto* (2012). Hurricane *Dean* (2007) stands out for being the only cyclone to maintain the H5 category in contact with Quintana Roo's coast (Table 2).

Table 2. Cyclones that landfall the Yucatan Peninsula (2000-2012)

Cyclone	General					Landfall			
	Max. S.S.	Start Time (UTC)	End Time (UTC)	Max. Winds [Km/h]	Track length [km]	Max. S.S. on Land	Landfall Time (UTC)	Max. Winds [Km/h]	Track length [km]
<i>Gordon</i>	H1	14/09/2000 12:00	21/09/2000 00:00	130	3,884.12	TD	17/09/2000 06:00	46	275.15
<i>Keith</i>	H4	28/09/2000 18:00	06/10/2000 06:00	222	2,179.30	TS	01/10/2000 06:00	83	249.26
<i>Chantal</i>	TS	14/08/2001 18:00	22/08/2001 06:00	111	6,103.02	TS	19/08/2001 06:00	102	276.27
<i>Isidore</i>	H3	14/09/2002 18:00	27/09/2002 12:00	204	6,491.49	H3	21/09/2002 18:00	204	301.87
<i>Bill</i>	TS	28/06/2003 06:00	02/07/2003 18:00	93	2,568.58	TD	30/06/2003 12:00	37	210.71
<i>Claudette</i>	H1	07/07/2003 00:00	17/07/2003 06:00	139	6,369.85	TS	15/07/2003 12:00	93	126.48
<i>Larry</i>	TS	27/09/2003 18:00	07/10/2003 12:00	102	1,804.30	TD	03/10/2003 00:00	37	303.85
<i>Cindy</i>	H1	03/07/2005 18:00	11/07/2005 00:00	120	4,948.72	TD	06/07/2005 00:00	56	296.82
<i>Emily</i>	H5	11/07/2005 00:00	21/07/2005 06:00	259	6,594.79	H4	17/07/2005 00:00	278	209.40
<i>Stan</i>	H1	01/10/2005 12:00	05/10/2005 00:00	130	1,358.86	TS	04/10/2005 12:00	74	323.03
<i>Wilma</i>	H5	15/10/2005 18:00	26/10/2005 12:00	296	5,668.83	H4	19/10/2005 12:00	222	99.99
<i>Dean</i>	H5	13/08/2007 06:00	22/08/2007 18:00	278	7,659.14	H5	21/08/2007 06:00	278	315.40
<i>Olga</i>	TS	10/12/2007 12:00	16/12/2007 00:00	93	3,469.79	TD	11/12/2007 18:00	56	63.49
<i>Arthur</i>	TS	31/05/2008 00:00	01/06/2008 18:00	74	419.81	TS	31/05/2008 06:00	65	231.52
<i>Dolly</i>	H2	20/07/2008 12:00	26/07/2008 18:00	157	3,026.07	TS	23/07/2008 12:00	83	175.76
<i>Alex</i>	H2	24/06/2010 18:00	01/07/2010 18:00	167	2,485.80	TS	01/07/2010 00:00	102	212.34
<i>Karl</i>	H3	13/09/2010 18:00	18/09/2010 00:00	204	2,082.27	TS	17/09/2010 12:00	102	303.62
<i>Richard</i>	H2	19/10/2010 18:00	26/10/2010 06:00	157	1,928.58	TS	25/10/2010 00:00	74	57.57
<i>Rina</i>	TS	22/10/2011 00:00	29/10/2011 18:00	185	1,633.80	TS	28/10/2011 02:00	102	98.92
<i>Ernesto</i>	H2	01/08/2012 12:00	10/08/2012 01:00	157	5,585.08	H2	08/08/2012 00:00	157	342.30
<i>Helene</i>	TS	09/08/2012 18:00	18/08/2012 18:00	74	6,420.32	TD	16/08/2012 00:00	46	79.28

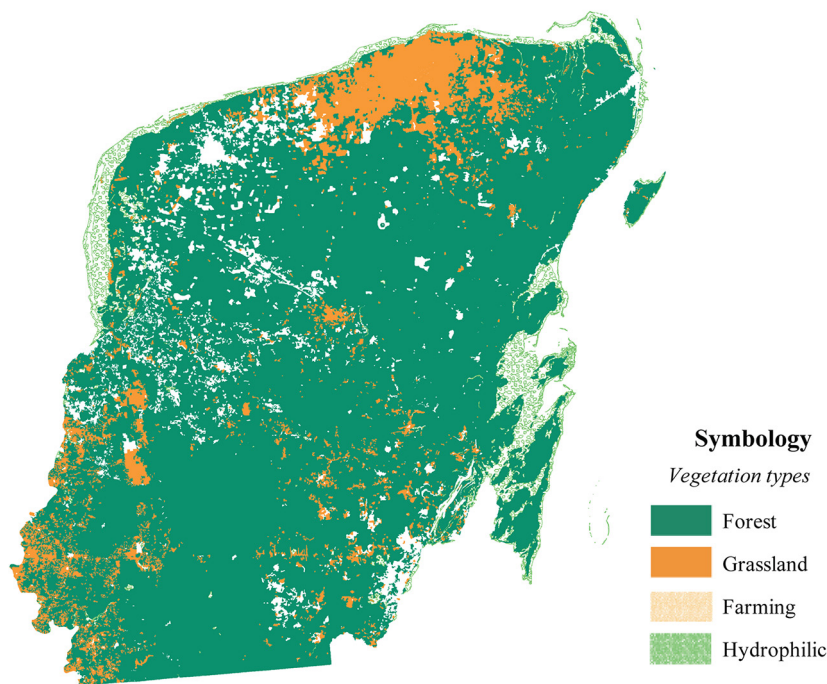
where: Max. SS: Maximum Saffir-Simpson Hurricane Scale; UTC: Coordinated Universal Time; Max. Winds: Maximum sustained wind speed; and colors represent category on the Saffir-Simpson scale; TD: tropical depression, TS: tropical storm, H1-H5: Hurricane's category

Own elaboration

3.2. Vegetation type classification

Tropical forests are the predominant vegetation type in the entire region, covering more than three-quarters of the peninsula (78%), followed by 9.6% grasslands, concentrated mainly in northern Yucatan State and some small areas in Campeche and southern Quintana Roo (Figure 3). Farming (cropland) land use accounts for 5% of land cover, mainly near Yucatan and Campeche states and small areas in Quintana Roo's southern zone. Finally, hydrophilic vegetation covers 5.2% of the region, where it is distributed throughout the peninsula's coastal zone, from south of Quintana Roo in the Caribbean Sea, through northern Yucatan to south of Campeche.

Figure 3. Vegetation types in the Yucatan Peninsula

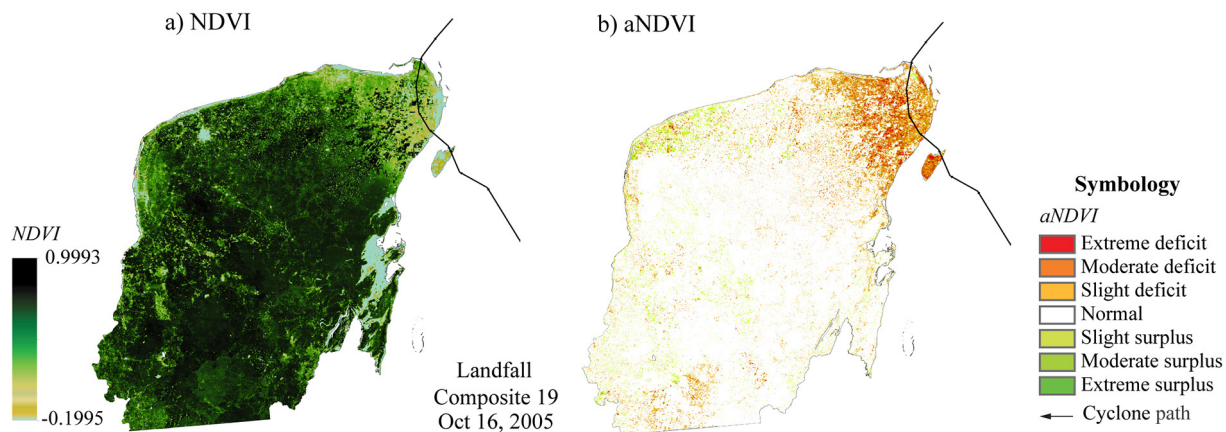


Own elaboration

3.3. Impact zone

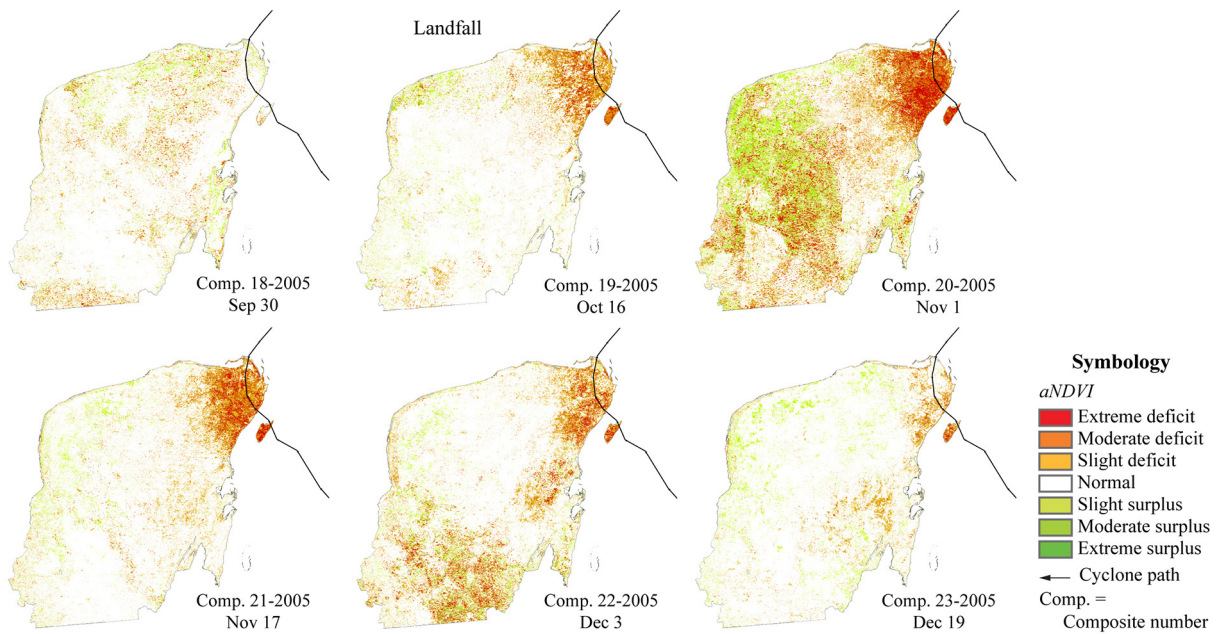
The aNDVI values were statistically diluted, given the territorial extension of the areas directly impacted against the peninsula's surface not damaged by the winds and rains associated with the cyclones. Figure 4 shows an example of the NDVI and aNDVI values for hurricane *Wilma* (2005) during its track through the peninsula. Figure 5 shows the hurricane *Wilma* (2005) time series, wherein for the first composite (18-2005) before the presence of the hurricane, the aNDVI values were in the range of -1 to +1—considered as a condition of normality—. The second image (19-2005), depicts the cyclone's landfall, during which the aNDVI increased dramatically toward the light and moderate deficit classes but only in a small area adjacent to its trajectory. It was approximately the fifth and sixth weeks (20-2005), after the cyclone had dissipated, that the most significant adverse effects on vegetation occurred with increases to a negative aNDVI, mainly toward the extreme deficit class.

Figure 4. Distribution of the mean values of a) NDVI and b) aNDVI for the composite corresponding to the passage of Hurricane *Wilma* (2005)



Own elaboration

Figure 5. Distribution of mean aNDVI values by composite during Hurricane Wilma (2005)

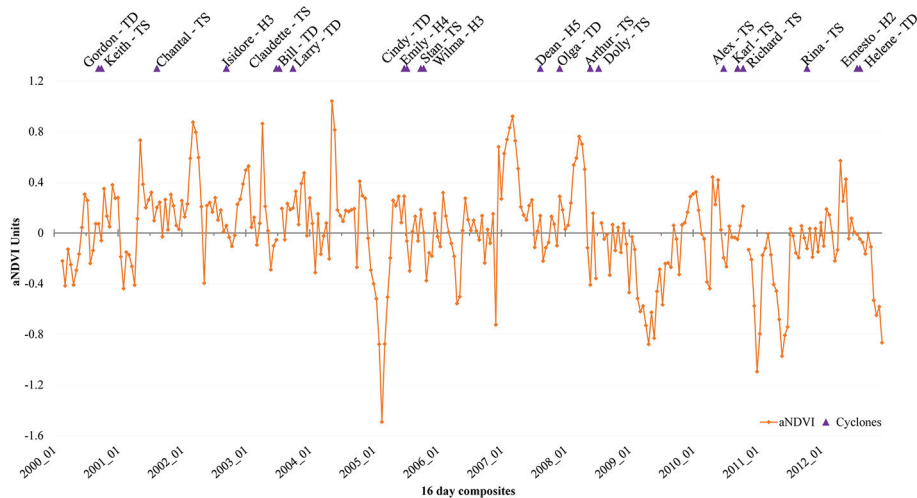


Own elaboration

Subsequently, the anomaly decreased remarkably close to the values before the cyclone track. Signs of recovery appeared between weeks 7 and 8 (23-2005). However, six weeks after the hurricane made landfall (22-2005), there was a slight uptick in the aNDVI values toward the moderate and extreme deficit classes on the south-southwest portion of the peninsula not directly associated with the passage of the cyclone. When calculated on a peninsular scale, such differences prevent the ability to accurately quantify the recovery rates of vegetation that suffered direct damage from cyclonic impacts.

In cases of very intense hurricanes such as *Emily* (2005, H4), *Wilma* (2005, H4), and *Dean* (2007, H5), the values did not decrease below 0.5 units (Figure 6). Furthermore, the existence of ascending and descending peaks in some aNDVI that did not correspond to the arrival of any cyclone could be the result of other types of extreme disturbances, such as drought, forest fires, El Niño-Southern Oscillation (ENSO), or land-use changes. Such is the case for composites 2-2005, 6-2009, and 8-2011. However, the explanation of such phenomena is outside the scope of this study.

Figure 6. Time series of aNDVI by 16-day composites on the Yucatan Peninsula



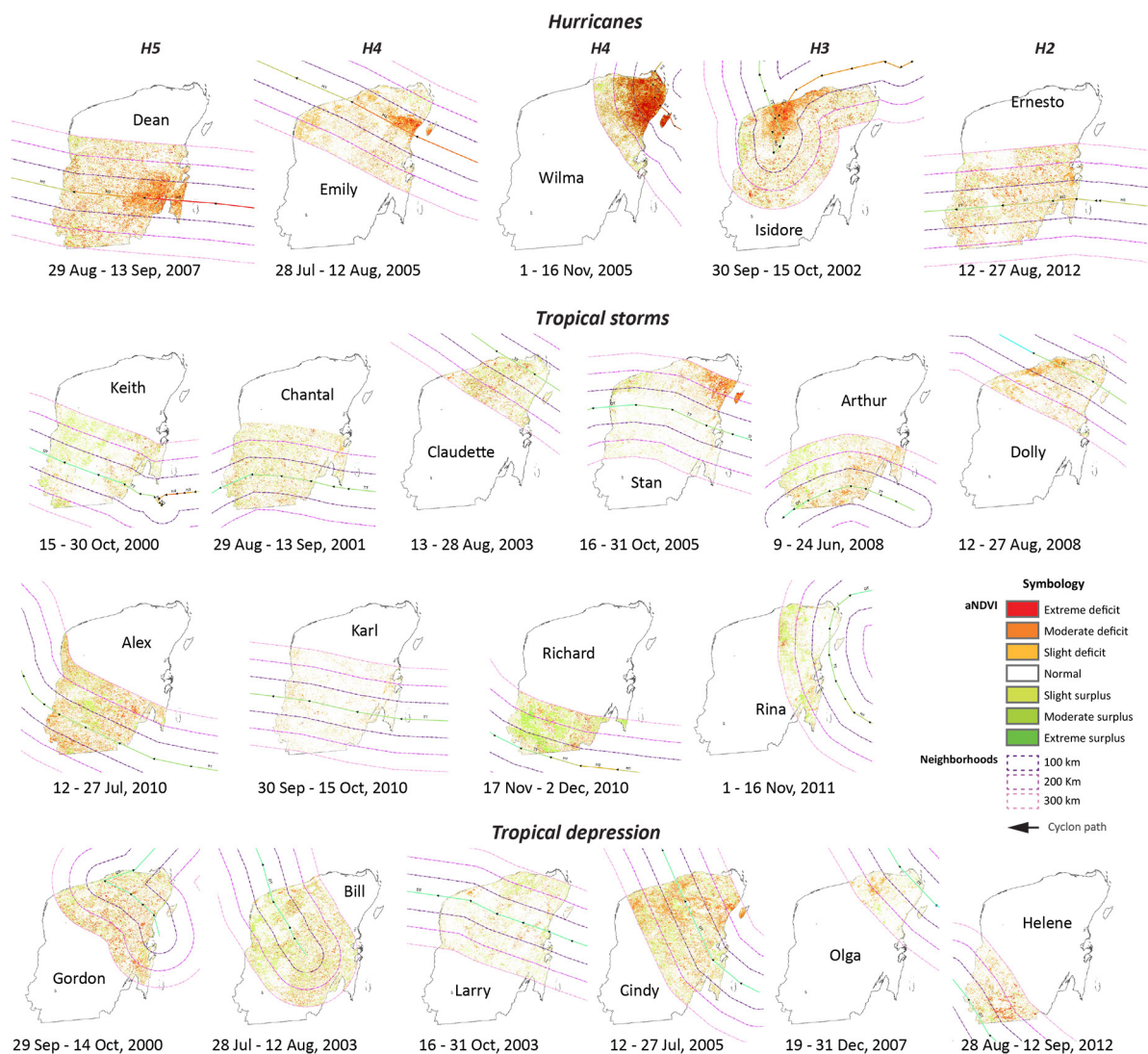
Own elaboration

The effects of cyclonic tracks on vegetation greenery loss could not be determined using aNDVI values at the peninsula level. Based on the earlier results, the neighborhoods were delimited by each cyclonic event to isolate the areas damaged by precipitation and associated winds, which allowed the quantitative estimation of the vegetation's resilience in the face of such phenomena.

3.4. Impact zones

Cyclonic systems typically cross the peninsula in an east-west direction, either through the north or south, without showing a particular trend (Figure 7). That is, the number of cyclones that passed through the south was 9 in each case, except for three tropical depressions that crossed the peninsula diagonally, from southeast to northwest (*Gordon*, 2000; *Bill*, 2003 and *Cindy*, 2005). The distances traveled overland varied; the smallest corresponded to tropical storm *Richard* (2010), with 57.5 km, and the maximum corresponded to hurricane *Ernesto* (2012, H2), with 342 km.

Figure 7. Distribution of aNDVI values, neighborhoods, and composites for hurricanes, tropical storms, and tropical depressions in the Yucatan Peninsula



Own elaboration

Of the five cyclones that made landfall in the Yucatan Peninsula in the hurricane category, three entered through the northeast (*Isidore*, 2002; *Emily* and *Wilma*, 2005), and two entered through the southeast (*Dean*, 2007 and *Ernesto*, 2012; Figure 7). Concerning the track length (total), *Dean* (2007) stands

out with a maximum distance of 7,700 km, and *Ernesto* (2012) stands out with a minimum distance of 5,500 km (Table 2). Thus, Quintana Roo's state suffered the most considerable cyclonic disturbances, according to the aNDVI changes observed.

3.5. Vegetation resilience to cyclonic impacts

We classified the maximum damaged area and the recovery rates —resilience— into two groups (Table 3): a) those which had deficit values —loss of greenness— and b) those which favored photosynthetic activity —surplus—.

Table 3. Maximum coverage with extreme aNDVI values for each cyclone that made landfall in the Yucatan Peninsula (2000-2012): a) maximum aNDVI changes and maximum aNDVI increase rate (negative impact), b) minimum damaged areas, and maximum decrease rate recorded (positive impact)

a) Impact Type: Negative

Cyclone	Year	Landfall			Neighborhood (Nh) with max. Impact	Maximum damaged area of Nh		Maximum aNDVI increase ¹ [%]	Recovery ²	
		Max. Saffir-Simpson Scale	Max. Winds [Km/h]	Track length on land [km]		%	Km ²		Interval [composites]	Approximate weeks
<i>Gordon</i>	2000	TD	46	275.15	Nh-300	9.70	5,900.86	5.24	1	2 - 3
<i>Keith</i>	2000	TS	83	249.26	Nh-100	11.84	7,587.57	1.82	1	2 - 3
<i>Isidore</i>	2002	H3	204	301.87	Nh-100	21.31	9,322.54	14.66	1	2 - 3
<i>Bill</i>	2003	TD	37	210.71	Nh-200	5.48	4,640.93	1.84	2	4 - 5
<i>Claudette</i>	2003	TS	93	126.48	Nh-200	6.63	2,230.85	1.34	> 6	> 13
<i>Cindy</i>	2005	TD	56	296.82	Nh-100	11.22	8,260.82	8.84	1	2 - 3
<i>Emily</i>	2005	H4	278	209.40	Nh-100	15.50	7,766.06	12.80	4	9 - 10
<i>Wilma</i>	2005	H4	222	99.99	Nh-100	72.54	9,368.73	69.07	1	2 - 3
<i>Dean</i>	2007	H5	278	315.40	Nh-100	21.29	12,363.62	16.17	1	2 - 3
<i>Arthur</i>	2008	TS	65	231.52	Nh-300	11.63	6,313.37	9.39	1	2 - 3
<i>Alex</i>	2010	TS	102	212.34	Nh-100	14.13	6,905.24	6.59	2	4 - 5
<i>Richard</i>	2010	TS	74	57.57	Nh-100	5.56	1,782.54	4.88	2	4 - 5
<i>Ernesto</i>	2012	H2	157	342.30	Nh-200	7.75	5,631.27	2.20	1	2 - 3
<i>Helene</i>	2012	TD	46	79.28	Nh-100	9.15	2,223.45	4.58	2	4 - 5

b) Impact Type: Positive

Cyclone	Year	Landfall			Neighborhood (Nh) with max. Impact	Maximum damaged area of Nh		Maximum aNDVI decrease ³ [%]	Recovery ⁴	
		Max. Saffir-Simpson Scale	Max. Winds [Km/h]	Track length on land [km]		%	Km ²		Interval [composites]	Approximate weeks
<i>Chantal</i>	2001	TS	102	276.27	Nh-100	5.33	3,362.42	-2.98	2	4 - 5
<i>Larry</i>	2003	TD	37	303.85	Nh-100	7.94	5,576.64	-0.30	2	4 - 5
<i>Stan</i>	2005	TS	74	323.03	Nh-300	3.78	3,364.85	-4.73	2	4 - 5
<i>Olga</i>	2007	TD	56	63.49	Nh-200	2.73	570.45	-6.28	2	4 - 5
<i>Dolly</i>	2008	TS	83	175.76	Nh-300	4.31	1,867.79	-2.80	2	4 - 5
<i>Karl</i>	2010	TS	102	303.62	Nh-300	8.29	6,740.53	-0.18	2	4 - 5
<i>Rina</i>	2011	TS	102	98.92	Nh-100	4.16	1,127.46	-1.17	2	4 - 5

1. Maximum percentage increase in aNDVI by composite before cyclone landfall.

2. Return to aNDVI before the cyclone makes landfall.

3. Maximum decline of aNDVI before the cyclone landfall.

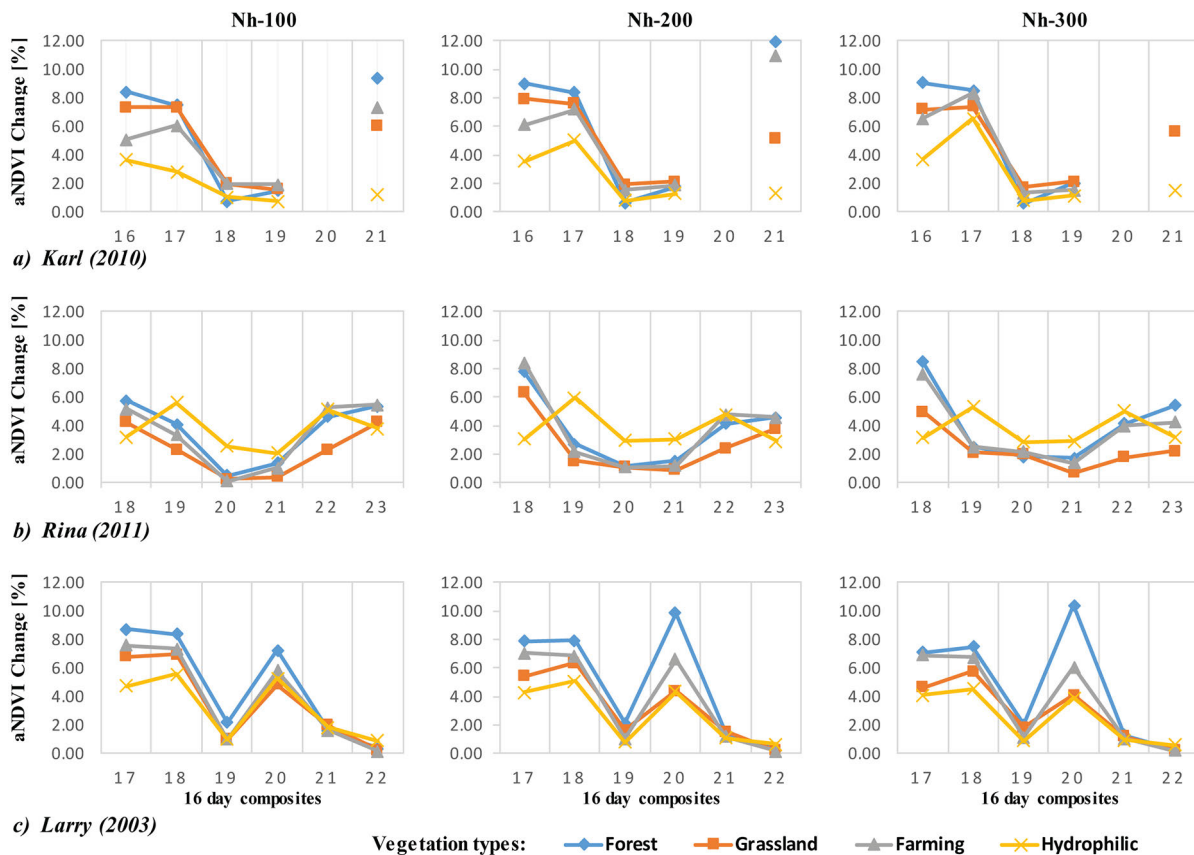
4. Time-lapse to get the minimum aNDVI.

Where colors represent categories on the Saffir-Simpson scale; TD: tropical depression, TS: tropical storm, H1-H5: Hurricane's category.

Own elaboration

Seven cyclones (33.3%) that reached the tropical depression or tropical storm categories caused an immediate increase in photosynthetic activity. Such were the cases of *Karl* (2010), *Rina* (2011), and *Larry* (2003), when after 2 or 4 weeks, the aNDVI reached levels higher than those before the cyclones had landfall (Figure 8).

Figure 8. Temporal variations in the mean values of the aNDVI by type of vegetation and neighborhood: a) *Karl* (2010), b) *Rina* (2011), and c) *Larry* (2003). The aNDVI changes were calculated from the earlier composite, up to four subsequent composites. The second composite in each time series graph represents the crossing of the cyclone. Composite 20-2010 were reported as missing



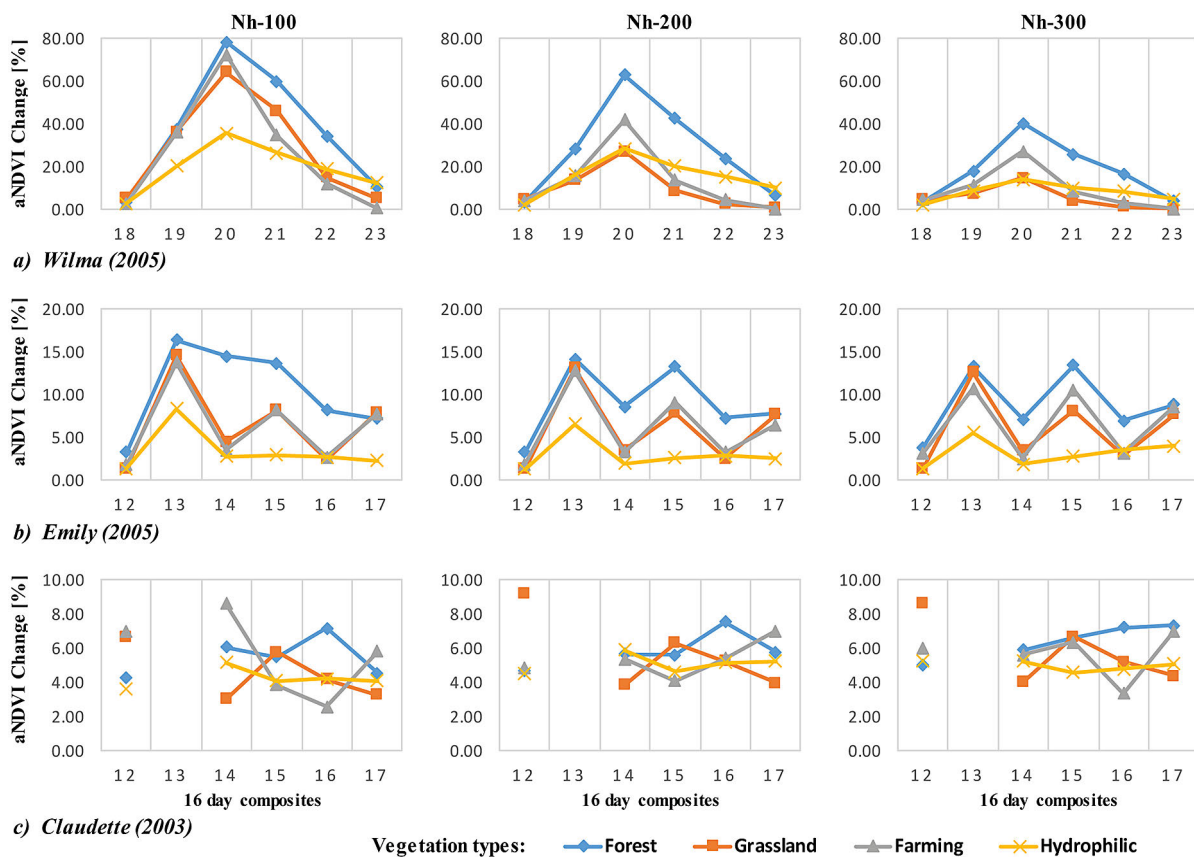
Tropical forests suffered the most significant damage from cyclones. In nine of the 14 cases (64%), negative aNDVI was observed. Hydrophilic vegetation was also damaged negatively in five cases (36%). In 11 cases (52%), recovery needed four to five weeks; that is, the aNDVI values returned to extremely close levels before the cyclone landfall at a lapse rate. In 38% of the cases, the recovery lapses were 2 or 3 weeks. The case of hurricane *Wilma* (2005) stands out; its damages were the most extreme, with 70% negative impacts. The most prolonged recovery corresponded to Hurricane *Emily* (2005) and tropical storm *Claudette* (2003). It took more than ten weeks in the case of Hurricane *Emily*, while after *Claudette*, it took more than thirteen weeks (Figure 9).

The impact of cyclones on vegetation was classified based on the maximum differences in aNDVI values, and as time passed, the aNDVI returned to precyclone levels. The results by category are as follows:

- Negative impacts: 67% (14 cyclones)
 - Little significant impact: in ten cases, the differences in the aNDVI did not stand for an increase of more than 10%, most of them corresponding to depressions and tropical storms, except for hurricane *Ernesto* (2012, H2).
 - Moderate impact: three of the hurricanes had an aNDVI increase on the order of 10 to 20%: *Isidore* (2002, H3), *Emily* (2005, H4), and *Dean* (2007, H5).

- Extreme impact: *Wilma* (2005, H4) was the only hurricane with differences in aNDVI values of close to 70%.
- Positive impacts: 33% (7 cyclones).
 - No one event in this class reached the hurricane category on the Saffir-Simpson scale.
 - The maximum difference in the aNDVI was close to 6% in the case of tropical depression *Olga* (2007).

Figure 9. Temporal behavior of the mean values of the aNDVI based on a type of vegetation and neighborhood: a) *Wilma* (2005), b) *Emily* (2005), and c) *Claudette* (2003). The changes in aNDVI were calculated from the earlier up to four subsequent composites after the cyclone's landfall. The second composite in each time series graph marks the passage of the cyclone. Composite 13-2003 was reported as missing

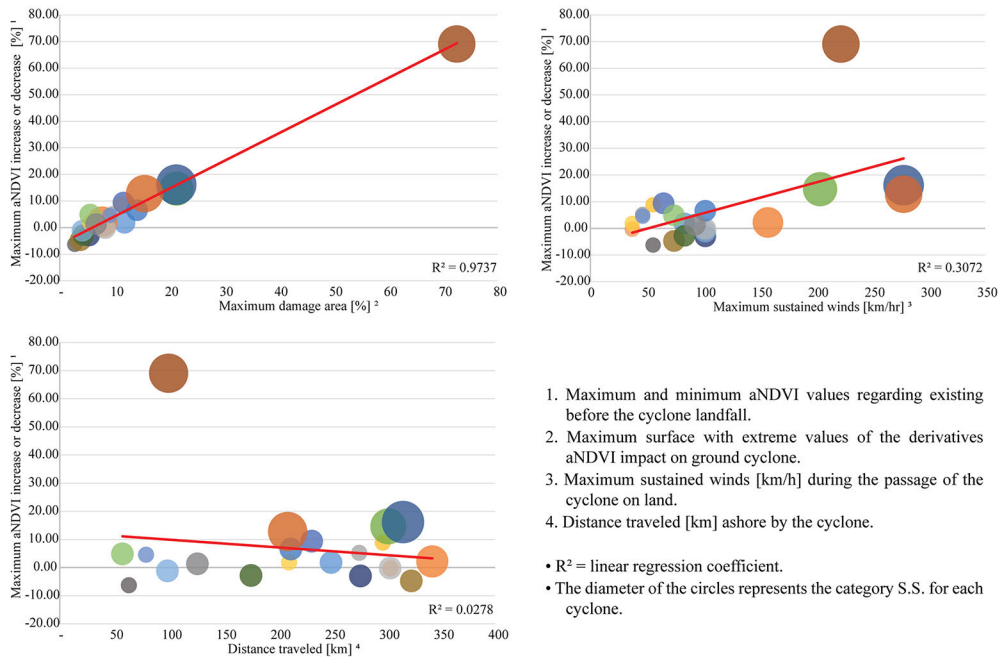


Own elaboration

3.6. Comparative statistical analysis

The multiple correlations showed a highly significant relationship between the impacted area and aNDVI ($R^2 = 0.99$); the greater the area impacted, the more significant the decrease in NDVI values. A moderately significant relationship between the cyclonic categories and the aNDVI was obtained ($R^2 = 0.63$). A higher intensity of sustained winds was found in 60% of cases; the damaged area was higher, and the aNDVI differences were more significant. In contrast, there was not a correlation between the cyclone categories and the length of their tracks overland ($R^2 = 0.16$) and with the recovery interval of the aNDVI ($R^2 = -0.07$), and between the distance traveled and the maximum damaged area ($R^2 = -0.12$) and the difference in the aNDVI ($R^2 = -0.17$). This pattern is likely due to the fact that the cyclone tracks crossed the mainland very near the coast but did not make landfall. The results of the correlations between the maximum damaged area and the difference in the aNDVI are consistent with those obtained through linear regression (Pearson $R^2 = 0.97$), which indicates a directly proportional relationship between the maximum impacted area and the difference in the aNDVI (Figure 10).

Figure 10. Linear correlations between the maximum damaged area, maximum sustained winds, and distance traveled by cyclone vs. aNDVI values before the cyclone's landfall



1. Maximum and minimum aNDVI values regarding existing before the cyclone landfall.
 2. Maximum surface with extreme values of the derivatives aNDVI impact on ground cyclone.
 3. Maximum sustained winds [km/h] during the passage of the cyclone on land.
 4. Distance traveled [km] ashore by the cyclone.
- R^2 = linear regression coefficient.
 - The diameter of the circles represents the category S.S. for each cyclone.

Own elaboration

4. Discussion

Resilience is a recurrent concept in different fields and disciplines, which has led to the formulation of various definitions of the term (Hosseini, Barker, & Ramirez-Marquez, 2016). To study the resilience and adaptation of natural systems, the ecological resilience definition proposed by Holling (1996) is still valid. Resilience estimations can be quantitative or qualitative (Wang, Nistor, & Pickl, 2017). For the present study, the change in photosynthetic activity, measured through aNDVI, was assumed to be a quantitative indicator of vegetation recovery capacity. We found that vegetation recovery rates—resilience—after a cyclone crossing took an average of 8 to 9 weeks for the Yucatan Peninsula. Tropical forest covers approximately 78% of the peninsula's surface and shows greenery recovery in periods less than 8 to 9 weeks after high-intensity hurricanes cross the region. In contrast, low-intensity hurricanes presented decreases in the values of the aNDVI in percentages of less than 10% of the surface with recovery rates between 2 and 4 weeks. Seven of the cyclones identified as tropical depression and tropical storm categories damaged the vegetation but also allowed for rapid regeneration.

The two most intense cyclones in the Yucatan Peninsula from 2000 to 2012 were *Wilma* (2005) and *Dean* (2007). The first reached the peninsula near Quintana Roo state, in an area known as the “Riviera Maya.” Some of the most significant land-use changes have occurred in this area due to tourist activities and urbanization. *Wilma* wreaked havoc in the cities of Cozumel, Playa del Carmen, and Cancun. Among the damages are the destruction of plant communities and urban systems, which means significant economic losses for the region (Zenteno Casas, Avelar Frausto, & Reinoso Angulo, 2006 and Rivera-Monroy et al., 2020). The second case was hurricane *Dean* (2007), which made landfall in the southwestern part of Quintana Roo and led to the highest number of uprooted and broken trees (Navarro-Martínez, Durán-García, & Méndez-González, 2012). Mangrove and medium-stature forests in Mahahual were defoliated to varying degrees; however, within a month, the medium-stature forest had recovered—foliation—by nearly 80% (Islebe, Torrescano-Valle, Valdez-Hernández, Tuz-Novelo, & Weissenberger, 2009). In previous work, Sánchez & Islebe (1999) emphasized that mangroves begin to recover after five to seven months. Although our findings were based on remote sensing products, the vegetation types damaged by cyclonic activity coincide with those reported in the literature.

Some studies on resilience to cyclones have covered the Mexican Pacific coast. Bhaskar et al. (2018) researched the resilience of the dry forest to the impact of Hurricane *Jova* (2011, H2) in the Chamela-

Cuixmala Biosphere Reserve in the state of Jalisco, Mexico. Their results revealed a decrease in the total basal area. The most frequent damage is uprooted trees and the loss of small branches. This is why the most dense vegetation, such as mangroves and tropical forests, must be conserved and protected against illegal logging.

As in the case of the dry forest of the Chamela-Cuixmala Biosphere Reserve, along the coast of the Mexican Pacific and the Gulf of Mexico, different types of forest ecosystems exposed to the impact of tropical cyclones exist (Rosengaus-Moshinsky, Jiménez-Espinosa, & Vázquez-Conde, 2002; INEGI, 2017), where the resistance and resilience capacities could be estimated by implementing the methodology presented in this study.

5. Conclusions

A methodology based on remote sensing products and techniques, combined with vegetation indexes, such as the NDVI and the aNDVI, allowed us to estimate the impacted areas and vegetation resilience capacity between a period of less than 8 and 9 weeks after each of 21 registered tropical cyclones that hit the Yucatan Peninsula between 2000 and 2012.

This study shows that satellite images and the green index are helpful for detecting areas where the vegetation status or conditions after the cyclone impact require priority attention and fieldwork and studies to identify the exact causes of the minimum recovery rates. The techniques used made it possible to identify relationships between each cyclone's impacts given their trajectory, category, and permanence by neighborhood.

The rapid recovery of photosynthetic activity following the passage of tropical cyclones suggests that the vegetation on the peninsula is well adapted to the interaction with such hydrometeorological phenomena. However, of the 21 cyclones analyzed only in those cases considered extreme events in terms of their wind intensity and inland permanency, the vegetation suffered severe damage that required long periods for their recovery.

Although the effects of high-intensity tropical cyclone landfall on vegetation have already been reported in the scientific literature, the study results allow us to compare the resilience capacity differences between four types of vegetation against the impact of cyclones of varying intensities. Our findings could contribute to assessing the vulnerability of the peninsula's vegetation to severe hydrometeorological events and establishing priority areas for their prompt inspection and, where appropriate, designing and carrying out more detailed and higher-scale studies in specific areas.

These research findings can also help to estimate recovery costs, apply conservation measures, and sustainably manage farming and ecotouristic locations in the region. Likewise, they allow the ranking of the areas with the most significant impacts, easing the establishment and delimitation of regions or priority areas for their attention.

To advance the understanding and knowledge of the processes of adaptation and recovery of the peninsula's forest ecosystems, investigations must be conducted that consider the effects caused not only by a single phenomenon and in isolation but also by the integration of multiple natural and extreme anthropogenic events at different spatiotemporal scales. This could also be considered to design different uses and management schemes that identify the effects and responses based on the four types of vegetation present in the region.

Finally, we propose to consider other resilience models, such as those based on a bivariate approach of resistance and resilience applied under a framework of spatial analysis techniques. Adding additional analysis variables, such as precipitation volumes and the flood zones associated with each cyclone studied, would allow future studies to better estimate the intrinsic attributes and extrinsic environmental factors for an ecological unit from observing long-term state changes.

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Assessment of climate change and prospective analysis on shallow lakes. Las Encadenadas del Oeste watershed, Buenos Aires - Argentina

Influencia del cambio climático y análisis prospectivo en lagos poco profundos. Las Encadenadas del Oeste, Buenos Aires – Argentina

Caroline Tengroth¹ 
Alejandra Mabel Geraldi^{2*} 

Abstract

The earth's ecosystem is fragile, and sometimes even small changes in the climate can have impacts on the environment and society. Changes in temperature and precipitation can cause numerous feedbacks that effect the ecosystem of the whole Earth. Many studies hold that the temperature will rise in some places, while other areas will experience a cooling in annual mean temperatures. The study area is famous for its many ponds. These ecosystems will be both physically, biologically, and chemically affected by climate change and its feedbacks. Las Encadenadas del Oeste consists of seven shallow lakes (Epecuen, La Paraguaya, Venado, Del Monte, Cochico, Alsina, and Inchauspe) of various depths and sizes is a closed river basin system aligned in an east-west direction. The objectives of this work are to demonstrate the change in shallow lake size over a period of 20 years and to relate these changes to temperature and precipitation over the basin area for the same period. It is also intended to examine future temperature and precipitation scenarios in the study area. Maximum and minimum temperature data and precipitation data was retrieved from a climate station in Carhue. A multiple regression analysis was performed and five models and the shallow lake area were compared. The water levels in the shallow lakes will continue to fluctuate in the future as precipitation and temperature varies. Temperatures will increase quickly in the area; and around a 3 °C change is expected before 2099. Only small variations in the temperatures have previously caused the lake to change in size. Precipitation patterns show a high variation, but the change is very small. Minimum temperature, which is already the most significant factor according to the statistical analysis, will in the future be an even more important factor if changes occur.

Keywords: ponds; climate change; Argentina; models; precipitation; temperature.

Resumen

La tierra es un ecosistema frágil, donde pequeños cambios en el clima producen impactos en el medio ambiente y en la sociedad. Muchos estudios sostienen que la temperatura aumentará en algunos lugares, mientras que otras áreas experimentarán un descenso en las temperaturas medias anuales. El área de estudio es importante por sus numerosas lagunas. Estos ecosistemas podrían ser afectados física, biológica y químicamente por el cambio climático y sus reacciones. Las Encadenadas del Oeste consta de 7 lagunas poco profundas (Epecuen, La Paraguaya, Venado, Del Monte, Cochico, Alsina e Inchauspe) de diferente profundidad y tamaño y es un sistema de cuencas fluviales cerradas alineadas en dirección este-oeste. Los objetivos de este trabajo son demostrar el cambio en el tamaño de las lagunas durante un período de 20 años y relacionarlo con la temperatura y la precipitación en el área de la cuenca durante el mismo período de tiempo. También, se pretende examinar los escenarios futuros de temperatura y precipitación. Los datos de temperatura máxima y mínima y los datos de precipitación se obtuvieron de una estación

1 University of Gothenburg, Renströmsgatan 641255 Göteborg, Sweden. caroline.tengroth@gu.se

2 Universidad Nacional del Sur – CONICET. Departamento de Geografía y Turismo 12 de Octubre and San Juan, Bahía Blanca, B8000BFW Buenos Aires, Argentina. ageraldi@criba.edu.ar. * Corresponding author

meteorológica en Carhue. Se realizó un análisis de regresión múltiple y se compararon 5 modelos y con el área de las lagunas. Los niveles de agua en las lagunas continuarán fluctuando en el futuro a medida que varíen las precipitaciones y la temperatura. Las temperaturas aumentarán rápidamente en la zona. Se espera un cambio de alrededor de 3 °C hasta 2099. Hasta el momento, pequeñas variaciones en las temperaturas han causado cambios en las superficies de los cuerpos de agua. Los patrones de precipitación muestran una gran variación, pero el cambio es muy pequeño. La temperatura mínima, que ya es el factor más significativo según el análisis estadístico, será en el futuro un factor aún más importante si se producen cambios.

Palabras clave: lagunas; cambio climático; Argentina; modelos; precipitación; temperatura.

1. Introduction

A climate change poses many risks to humans and to the global ecosystem. Changes likely to occur in the future are higher temperatures and an increased number of temperature extremes. There will also be a change in precipitation, with both increases and decreases in different parts of the world. A change in rainfall will in turn have an effect on run off patterns and sea level rise. Indirectly this will pose changes on water quality, air and food quality, and changes in ecosystems, industry, agriculture and infrastructure (Rosenzweig, et al., 2007); (Yang and Lu, 2014).

The average global temperature on the surface of the earth has risen by 0.74 °C ± 0.18 °C when estimated from 1906 to 2005, and the warming over the last 50 years is almost the double of that over the last 100 years (Trenberth et al., 2007). Thus, in the period 2003-2012 it was 0.78 °C (Hartmann et al., 2013) According to IPCC's SRES scenarios for global average surface temperature change, temperature is expected to increase 2 to 4 °C by the end of the 21st century compared to the levels in the end of the 20th century (Meehl, Stocker, Collins, and Friedlingstein, 2007).

Leemans and Eickhout (2004) stated that if an increase in 2 °C occurs over a 1,000 year period (+0.02 °C per decade) most affected ecosystems will have time to adapt. If however, such a change in temperature increase would happen over a 50 year period many ecosystems would rapidly deteriorate. Therefore, the rate of change is important for predictions of total impacts. Evidence of climate-change impacts is strongest and most comprehensive for natural systems (Intergovernmental Panel on Climate Change [IPCC], 2014). Freshwater resources as a part of the ecosystem would also change with future climate changes. For example, changes in surface and ground water, floods and droughts, the water quality, erosion and sediment transport in the low-lying areas can occur (IPCC, 2012; Barragan & Geraldi, 2018). Some physical and biological systems in many parts of the world have already changed due to past regional changes in climate (Tezcan et al., 2019).

The shallow lakes are highly sensitive to precipitation and temperature variability, and they also influence in the and drainage basin characteristics (Monti and Escofet, 2008; Schröter et al., 2005; Milly, Dunne, and Vecchia, 2005; Adrian, Wilhelm, and Gerten, 2006; Palmer et al., 2008; Erler et al., 2019). Studies of lakes are good early indications of the effects of current climate change on ecosystem structure and function (Adrian et al., 2009; Magnuson et al., 2000; Verburg, Hecky, and Kling, 2003; Jeppesen, Søndergaard, and Liu, 2017). Few studies have been able to quantify lake- climate relationships with precision for individual lake (Barley et al., 2006; Coats, Perez-Losada, Schladow, Richards, and Goldman, 2006; Sun, Lu, Lin, and Wang, 2016; Fee, Hecky, Kasian, and Cruikshank, 1996; Geraldi, Piccolo, and Perillo, 2010; Jeppesen et al., 2009; Jones, McMahon, and Bowler, 2001; Peeters, Livingstone, Goudsmit, Kipfer, and Forster, 2002; Plumb and Blanchfield, 2009; Shi et al., 2007).

Changes in lake levels are determined primarily by changes in river inflows and outflows, type and total amount of precipitation on to the lake, and evaporation from the lake (Kundzewicz, Mata, Arnell, Doll, and Kabat, 2007; Vincent, 2009). The percentage of the surface water and the groundwater however are controlled mainly by precipitation and evapo-transpiration. Water resources which have a shorter residence time are more vulnerable to climate changes than those with a longer residence time (Ekmekci & Tezcan, 2006; Jeppesen et al., 2009).

Floods and droughts are another important factor to consider when climate changes and climate variability increases. Floods depend on precipitation intensity, volume, timing, past conditions of rivers and their drainage basins. Anthropogenic activities on the flood plains and lack of flood response plans increase the damage potential (Londoño, Martinez, and Massone, 2012; Salvia, Karszenbaum, Kandus, and Grings, 2009). Most model projections show that higher precipitation extremes in warmer climates are very likely to occur. Precipitation intensity increases almost everywhere, but particularly at mid- and

high latitudes where mean precipitation also increases, which will have a direct effect on the floods in the areas. Conversely, mid- and low latitude continental interiors are likely to experience droughts during summer months (Kundzewicz et al., 2007).

One-sixth of the earth's population is dependent on the melt water from glaciers and seasonal snow packs for their water supply. Many small glaciers will disappear in the next few decades and drought problems are therefore projected for regions that depend heavily on this melt water (Shi et al., 2007). At the same time rapid glacial retreat can lead to flooding of rivers and formation of glacial melt water lakes posing a threat to the population in the area (Kundzewicz et al., 2007). The Andean inter-tropical glaciers are very likely to disappear over the next decades, affecting water availability and hydropower (Magrin et al., 2007).

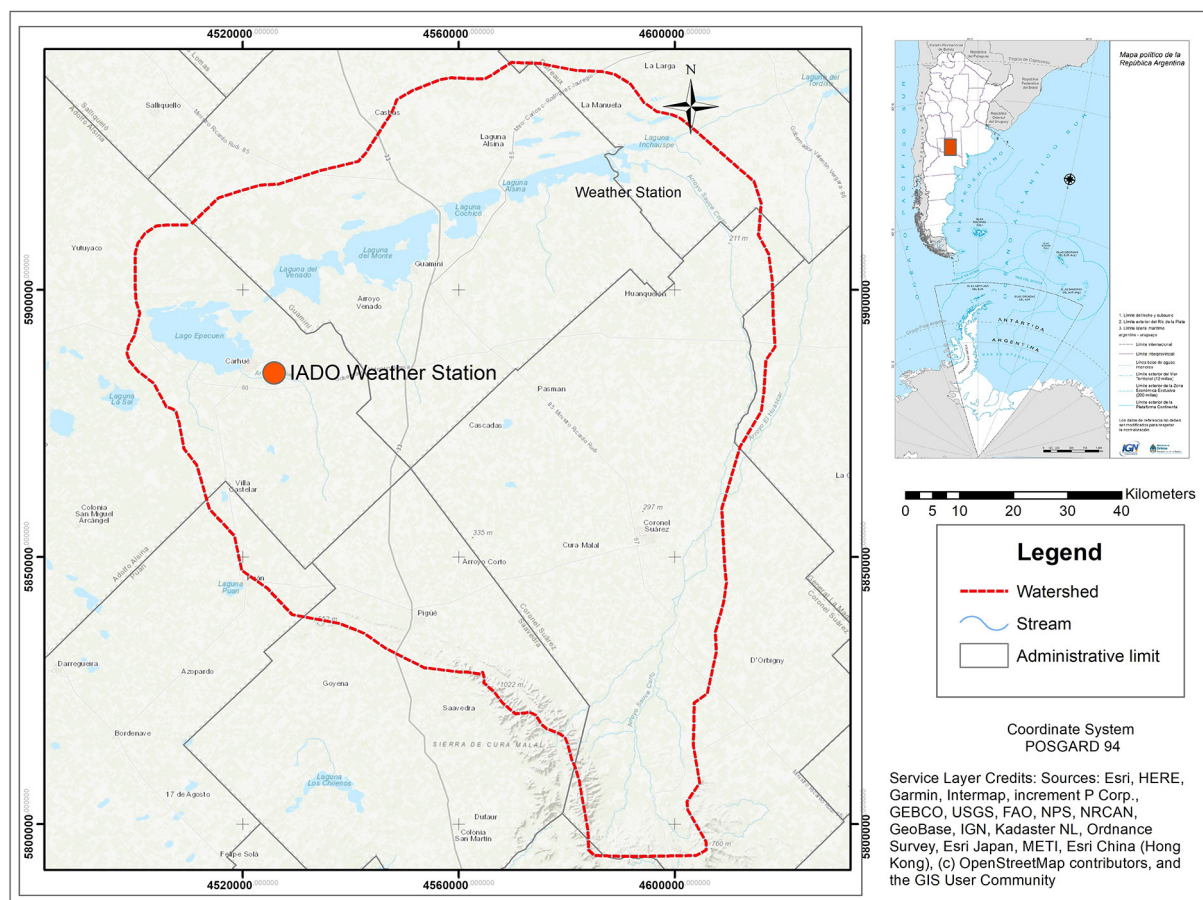
The objectives at this work is to demonstrate the change shallow lake size over a period of 20 years and to relate it to temperature and precipitation over de basin area for the same time period. It is also intended to examine future temperature and precipitation scenarios over study area, and determine the risk of flood or drought within a 100 year period, from 2000 to 2099. Finally to connect and compare different climate sources and model simulations for the region.

2. Methodology

2.1. Study area

Las Encadenadas del Oeste consists of 5 shallow lakes (Epecuén, Venado, Del Monte, Cochicó and Alsina) of various depth and size, and is a closed river basin system lined up in an east-west direction. The system is located in the Buenos Aires province (37°10'S, 62°50'W) which occupies an area of 302,650 km² (Figure 1). The drainage basin of Las Encadenadas del Oeste has an area of 1,115,248 hectares and lies on a mean altitude of 100 meters above sea level (Geraldí, 2009).

Figure 1. Study area



Own Elaboration

The ponds are shallow and have no thermal stratification (Geraldi, 2009). Anthropogenic activities such as farming, cattle rearing and industrial activities are present in the area, and the ecosystem withstands strong impacts from these activities (Geraldi, 2009). Previous studies (Quirós, 2000; Bauer, Del Genio, and Lanzante, 2002) have shown that Las Encadenadas del Oeste are eutrophic. The levels of nitrogen, phosphorous and chlorophyll A are high, which helps both biomass and phytoplankton production to reach substantial levels. Epecuén shallow, which also is considered to be a salt lake, has extremely high levels of phosphorous and is therefore hypereutrophic (Geraldi, 2009).

The shallow lake were created during long periods of droughts millions of years ago, and the lowest part of the depression system is occupied by Epecuén ponds in the west which is the largest one and which drains all the excess water. It lies on a mean altitude of 90 meters above sea level. The shallowest lake is Alsina with only 3 meters depth in the east and then the depth increase towards the west. Alsina lies on a mean altitude of 110 meters above sea level. Del Monte has a maximum depth of 5 meters, and towards the centre of the ponds is an island which has an area of 400 hectares and which is used for tourism and agriculture. Epecuén, the largest shallow lake, has a maximum depth of 8.5 meters in the centre, but a medium depth of 7 meters. The smallest ponds in the area is Cochicó (Figure 3). The area and perimeter of the shallow lakes vary with precipitation and evaporation changes. The occurrence of floods and droughts are frequent and varies with climate variation in the area (Geraldi, 2009).

2.2. Climate datasets

Maximum and minimum temperature data and precipitation data from 1994 to 2017 was retrieved from a climate station in Carhué (station 4992 from IADO), which is a village southwest of Epecuén (Figure 3). Annual mean temperature and precipitation was calculated. Monthly mean temperature and precipitation for the period 1994 to 2017 was created from the station data to see how much it varies within a year.

Historical temperature and precipitation data was downloaded from Climate Explorer on Koninklijk Nederlands Meteorologisch Instituut (KNMI) (KNMI, 2008). First temperature and precipitation data from CRU TS 2.1 from 1901 to 2002 was downloaded. The CRU TS 2.1 Global Climate Dataset is comprised of 1224 monthly time-series of climate variables, for the period 1901-2002, covering the global land surface, excluding Antarctica, at 0.5 degrees resolution (CGIAR-CSI). The temperature CRU TS 2.1 data was extracted for the region 37°S 37.5°S and 62°W - 62.5°W. Since precipitation data varies more in this area than the temperature data, a larger area was selected to get a better picture of the total precipitation over the drainage basin. The area covered by CRU TS 2.1 dataset for precipitation is 36°S - 38°S and 61°W - 63°W which is representative of the whole drainage basin.

Since the CRU TS 2.1 dataset only contains data until 2002, data from an additional source was collected as well. The “CPC GHCN/CAMS t2m analysis” was used for temperature, and it contains data for all months from 1948 until 2005. It extracts the same region as the CRU TS 2.1 temperature dataset. CPC GHCN/CAMS is the combined analysis of the Global Historical Climatology Network dataset and the Anomaly Monitoring System. The CHCN was released in 1997 and has more than 30 diverse data sources and up to 7,280 stations globally. The CAMS was designed to monitor the initiation and evolution of significant land surface parameter anomalies with high quality, near real time observations and sufficient long historical records. The CAMS dataset has up to 6,158 stations globally with station observations based on two data sources, one from NCAR (National Center for Atmospheric Research) for the period before 1981 and another from GTS (Global Telecommunication System) for the period after 1981 (Fan & van den Dool, 2008).

Precipitation data was also downloaded from the CPC Merged Analysis field. This field cuts out a larger region (35°S – 37.5°S and 60°W – 62.5°W) than the CRU TS 2.1 data set and might not be as representative for the area. The CPC Merged Analysis of Precipitation (“CMAP”) is a technique which produces pentad and monthly analyses of global precipitation where observations from rain gauges are combined with precipitation estimates from several satellite-based algorithms (infrared and microwave) (NOAACPC). A comparison between the two downloaded models and the station data was performed to establish how well they correlate.

2.3. Satellite images

15 satellite images from Landsat 5 TM; Landsat 7 EMT and Landsat 8 OLI of the shallow lake were retrieved from CONAE (Comisión Espacial de Actividades Espaciales) from 1997 to 2017. The satellite

images were atmospherically corrected with the image analysis extension. Flash model was used for atmospheric correction. The FLAASH model includes a method for retrieving an estimated aerosol/haze amount from selected dark land pixels in the scene. The method is based on observations by Kaufman, Wald, Remer, Gao, Li, and Flynn (1997) of a nearly fixed ratio between the reflectance for such pixels at 660 nm and 2100 nm.

FLAASH calculates the spectral radiance at a sensor pixel, L , that applies to the solar wavelength range (thermal emission is neglected) and flat, Lambertian materials or their equivalents (Equation 1):

$$L = (Ap/(1 - p_e S)) + [(Bp_e)/(1 - p_e S)] + L_a \quad \text{Equation 1}$$

where:

p is the pixel surface reflectance; p_e is an average surface reflectance for the pixel and a surrounding region;

S is the spherical albedo of the atmosphere; L_a is the radiance back scattered by the atmosphere; A and B are coefficients that depend on atmospheric and geometric conditions but not on the surface.

The values of A , B , S and L_a are determined from MODTRAN4 calculations that use the viewing and solar angles and the mean surface elevation of the measurement, and they assume a certain model atmosphere and aerosol type. The reflectance was calculated with the equation 2:

$$L_e = ((A + B)p_e | 1 - p_e S) + L_a \quad \text{Equation 2}$$

L_e spatially averaged radiance image;

The images were imported to Arc GIS 10.1, and the shallow lakes were digitalized. The shallow lake area was estimated by Arc GIS for each pond, and the change in area from year to year calculated. Water that after dry years created ponds separated from the shallow lake were not included in the calculation of the total pond area.

Rainfall patterns in the area vary considerably between summer and winter. Therefore, to be able to compare the shallow lakes area to relevant precipitation and temperature data, a mean of the climate variables was created for periods of 6 and 12 months before the image was taken. Station precipitation and temperature data was used to calculate these mean values. Nicholson (1999) found that water levels in Lake Tanganyika and Lake Rukwa, Tanzania, rose as precipitation in the catchment area increased, with a time lag of 1 to 3 years. Since these lake basins are larger than the basin for Las Encadenadas a shorter time period was adopted.

2.4. Statistical analysis

Statistical analysis was done using the ordinary least squares (OLS) method (Burnham, and Anderson, 1998), multiple regression analysis was conducted using SPSS v.12 to estimate the relationship between lake area and the climate variables for each of the shallow lakes. The regression model (Equation 3) used was:

$$\text{Area} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon \quad \text{Equation 3}$$

$$\text{Area} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon$$

where Area is the pond area estimated by ArcGIS (dependent variable)

β_0 is a constant

$\beta_1, \beta_2, \dots, \beta_n$ are regression coefficients

x_1, x_2, \dots, x_n are explanatory variables

ϵ , is an error term

The independent explanatory variables were maximum, minimum and mean temperatures 6 and 12 months before images were recorded; and precipitation 6 and 12 months before.

Five OLS models were estimated by separately regressing pond area against the explanatory variables for each of the shallow lake. The sample size for each model was 14. Data for November 2004 was excluded from the analysis since it was considered an outlier. Tukey's method was used to calculate outliers.

The best-fitting OLS model was established using the stepwise method in SPSS. The first regression run for each model found that the most significant explanatory factor in influencing shallow lake area

was one of the temperature variables. On the second regression run, only the most significant temperature variable and the two precipitation variables were included.

2.4. Future scenarios and Model comparison

The IPCC has in the "Special Report on Emission Scenarios" listed 4 different emission scenarios (A1, A2, B1 and B2) depending on different outlooks for the future. Two of them (A2 and B2) were used (IPCC, 2000).

The A2 storyline and scenario family describe a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines.

The B2 storyline and scenario family describe a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.

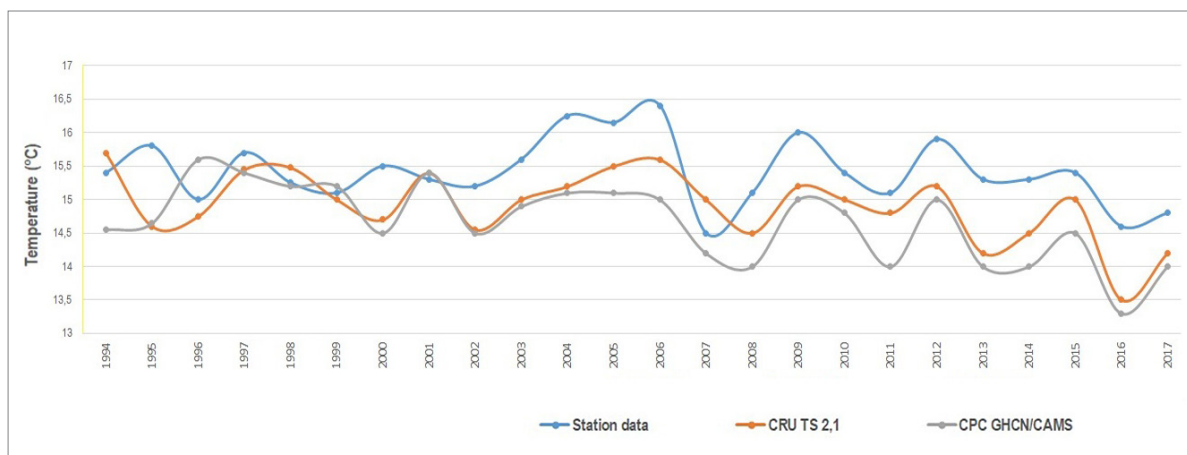
Future monthly precipitation and temperature anomalies for the A2 and B2 scenarios for the HadCM3 model were downloaded from Climate Explore on KNMI. The model extracts region has data from 1950 to 2099. The downloaded data included corrected anomalies from 1950 and 1990. Annual means were calculated from 2000 to 2099 from precipitation and maximum and minimum temperature, and change was then calculated for the 100 year period from 2000 to 2099.

A model comparison was made to see how the data downloaded for the HadCM3 model is explained by other models. Future estimated precipitation in the area for scenario A2 from IPCC's SRES scenarios was downloaded from Climate Explorer. Total annual precipitation for four models; ECHAM4/OPYC, GFDL, HadCM3 and NCAR-CSM was calculated to see the differences among different models. The four models have different time spans. The ECHAM4/OPYC model data was available from 1990 to 2100; the GFDL 1961 to 2100; HadCM3 model 1950 to 2099 and the last model used NCAR-CSM data available from 2000 to 2099 (KNMI, 2018).

3. Results

Station temperature data showed generally higher temperatures than the model data. Station data and model data were moderate correlated in the temperature data ($r=0.41$). Station data showed variations of 1 °C from 15 – 16 °C in the mean temperature data over the 12 year period. The two model datasets show a better correlation ($r=0.66$) and have a temperature variation between 14.4 and 15.5 °C (Figure 2).

Figure 2. Comparison between station temperature data in Carhué and models temperature data

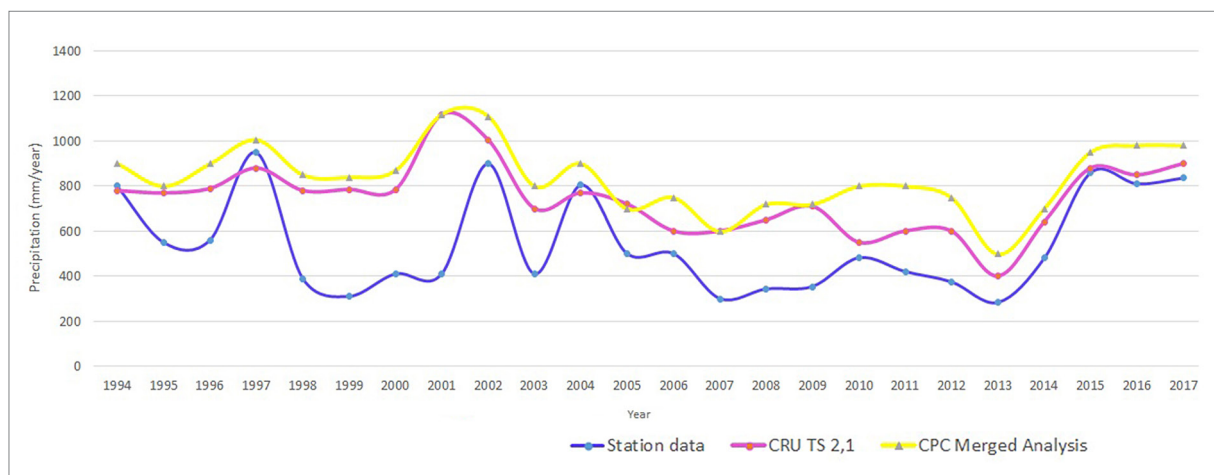


Own elaboration

Precipitation data shows a clearer link between station data and downloaded historical observations than the temperature data. Even though the station data has larger variations in amount of precipitation, all twelve years are quite well correlated with the downloaded data. The station dataset however shows a lot less precipitation than the downloaded dataset. Precipitation range from the station data is between 285 – 955 mm, and the downloaded data showed a variation between 722 – 1,235 mm. Even though it illustrated more precipitation, the CPC Merged Analysis data has more similarities to the station data than the CRU TS 2.1 dataset in terms change in rainfall (Figure 3).

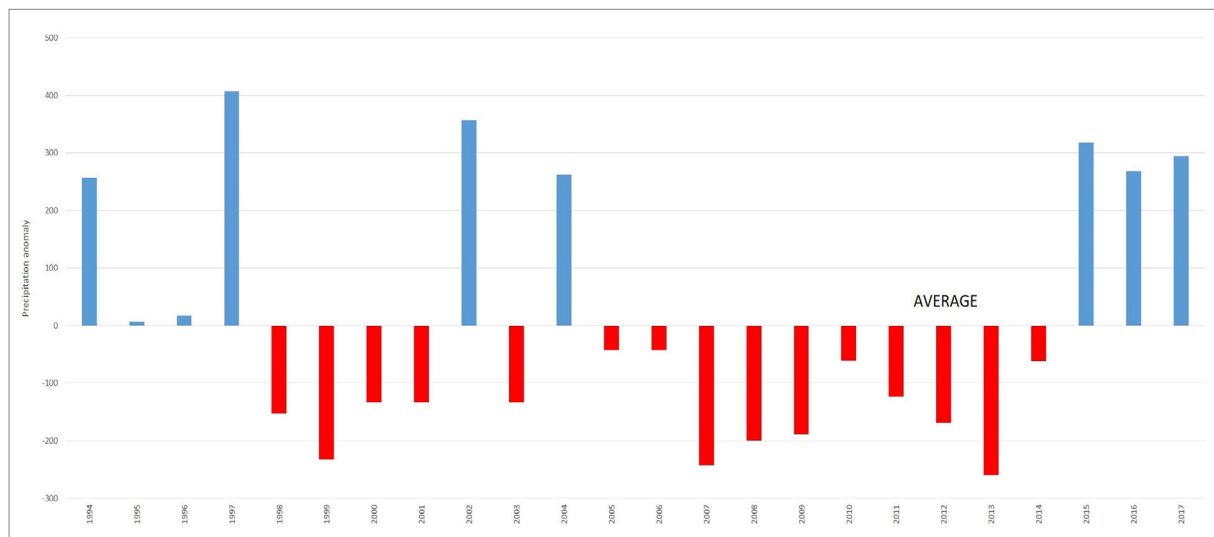
Precipitation anomalies from 1994 to 2017 from the station data in Carhué show that precipitation varies considerably between year; and even though the period is a dry decade within a humid period, some peaks in the precipitation data can explain the high precipitation when calculated annually (Figure 4).

Figure 3. Comparison in mean annual precipitation between station data in Carhué and models data



Own elaboration

Figure 4. Precipitation anomalies from 1994 to 2017. Data from station in Carhué



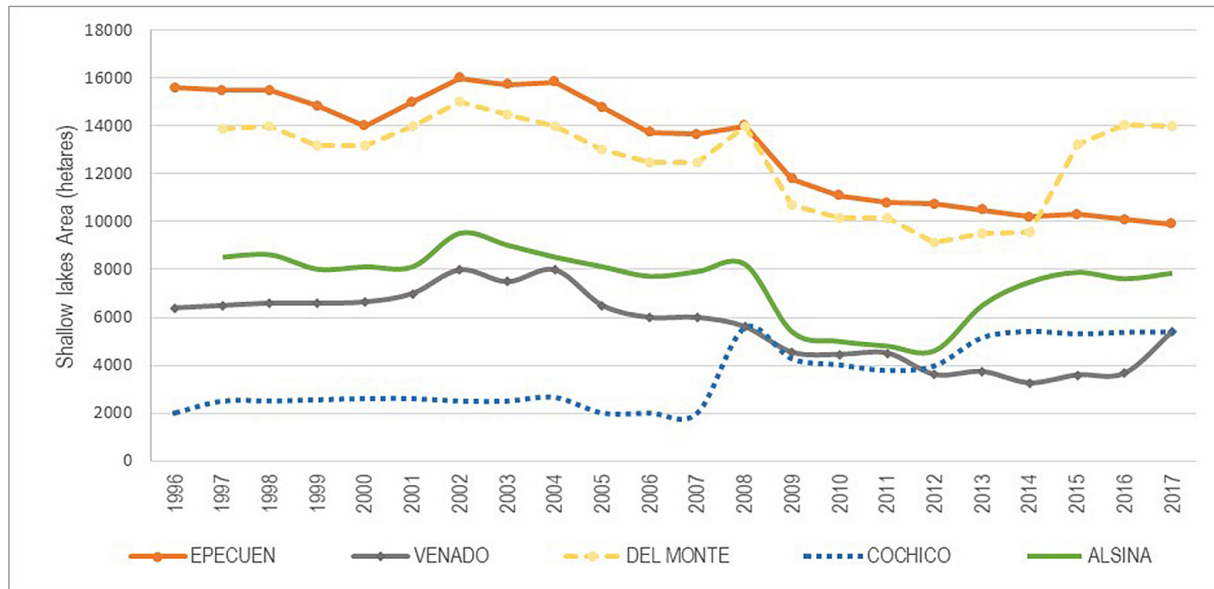
Own elaboration

Whith regard to satellite images the shallow lake area was calculated. It can be seen in Figure 5 that the fluctuation between the areas in the five shallow lake is consistent throughout the entire study period. The greatest fluctuation in area is observed in the larger shallow lake (Epecuén, Del Monte and Alsina).

Precipitation and temperature patterns over the 12 month period before capture of the satellite images were analyzed to see the actual response from the climatic variables. Generally, there is a good correlation

(between mean precipitation calculated for the 12month period before images were recorded and shallow lake area. When precipitation increases, the pond area increases as well. This pattern is however not seen in 1998, 2001, 2003 and 2005 (Figure 6).

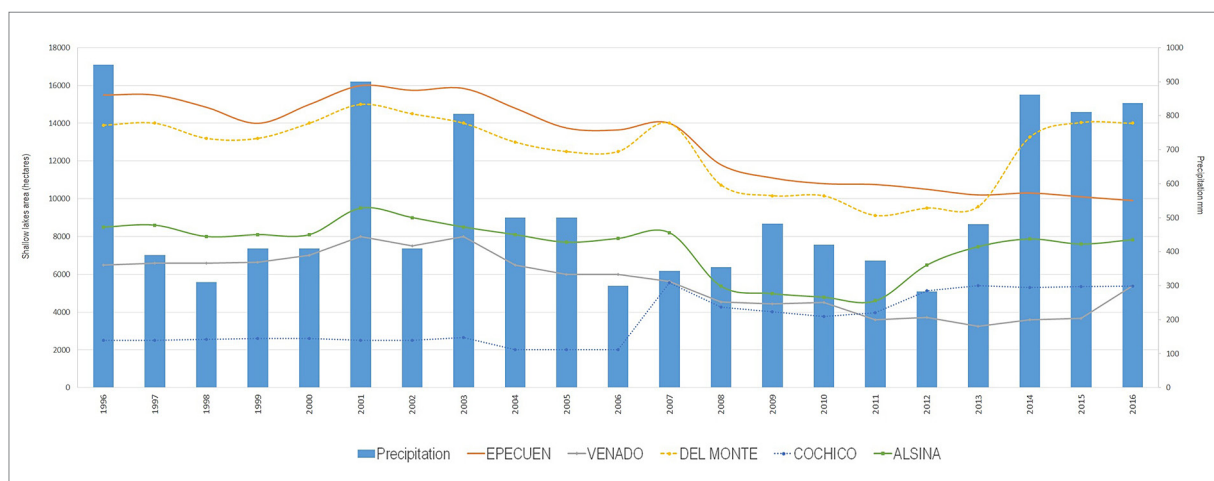
Figure 5. Area of Epecuén, Venado, Del Monte, Cochicó and Alsina calculated from the Landsat images from 1997 to 2017



Own elaboration

According to the diagram with maximum and minimum temperature calculated over the 12 months before images were recorded, there is generally an inverse relationship between pond area and temperature. These trends are however not very clear. In many occasions maximum temperature decreases when the minimum temperature increases (Figure 7).

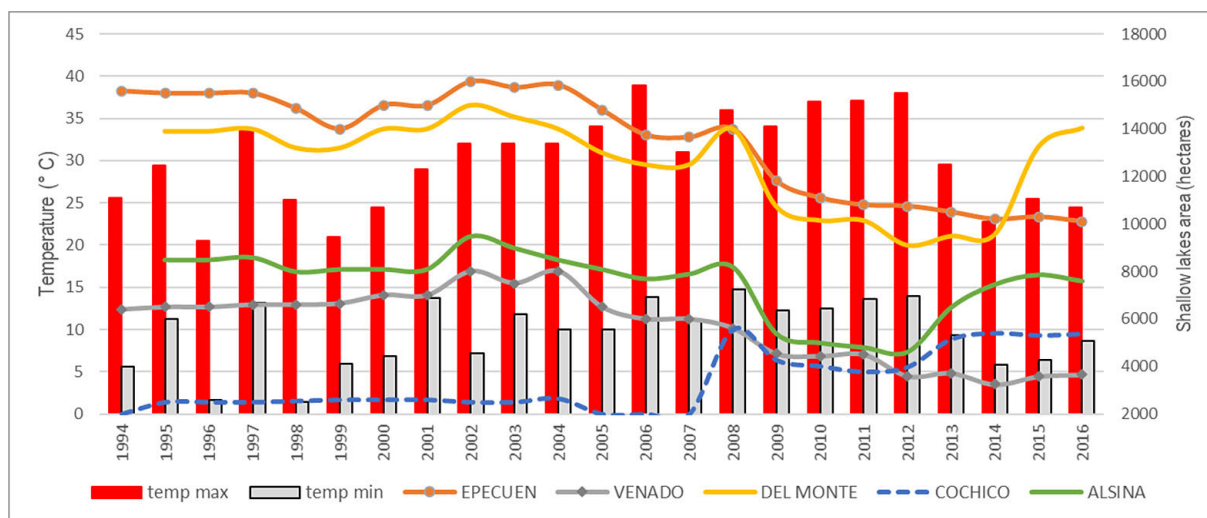
Figure 6. Shallow lake area and mean precipitation calculated 12 months before the images were taken



Own elaboration

In the OLS multiple regression analysis the samples consisted of data recorded from 14 different periods. November 2004 was considered an outlier and was therefore removed from the regression analysis. Figure 8 describes how ponds area increases as mean temperature increases. If, however the outlier in November 2004 is removed the results show different and more expected results, since shallow lake area was anticipated to decrease as temperature rises.

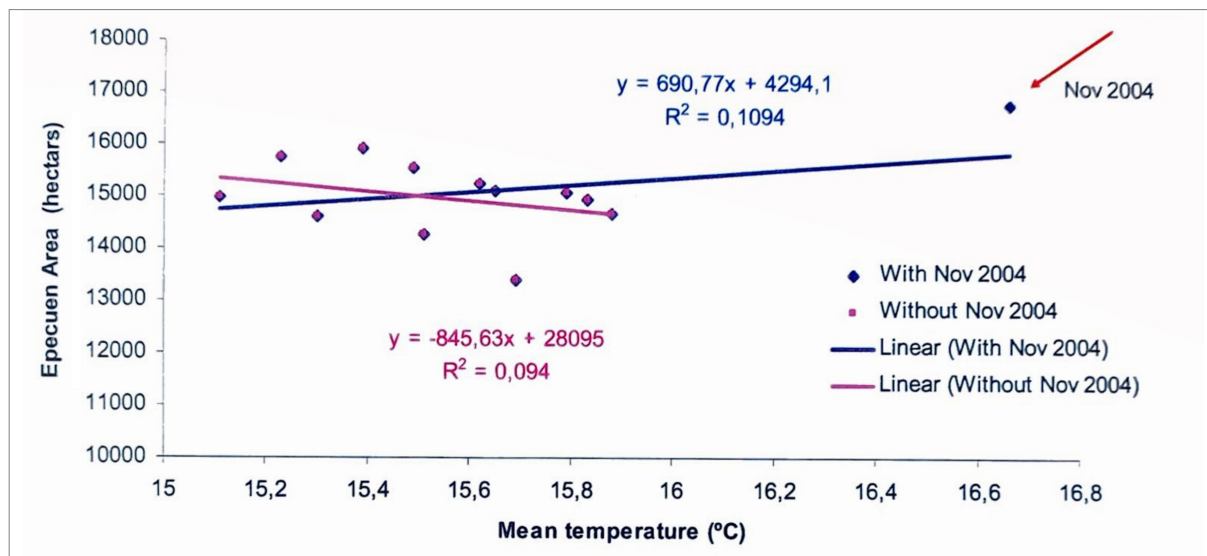
Figure 7. Shallow lake area and maximum and minimum temperature calculated 12 months before the images were taken



Own elaboration

A scatter plot with the area of Epecuén and mean temperature was done. Only Epecuén area was chosen here but the other four shallow lakes showed the same trend in an increase in area during November 2004 (Figure 8).

Figure 8. Scatter plot with the area of Epecuén and mean temperature from 1997 to 2006 showing the outlier in November 2004. If the outlier is removed from the plot a declining trend in area is seen as temperature rise



Own elaboration

The best- fitting OLS models for five shallow lake are described in table 1. The results of the regression analysis showed that:

- Temperature is a more significant explanatory factor than precipitation.
- Temperature was significant with a p value less than 0,1 for four models (Epecuén, Del Monte, Alsina y Venado).
- Precipitation was significant with a p value less than 0,1 for Alsina only.
- Precipitation was not significant for Venado and Cochico.
- In the case of Epecuén, Del Monte and Alsina, temperature is less significant when describing area on it own than when combined with precipitation.
- Maximum temperature was not significant for any of five models.

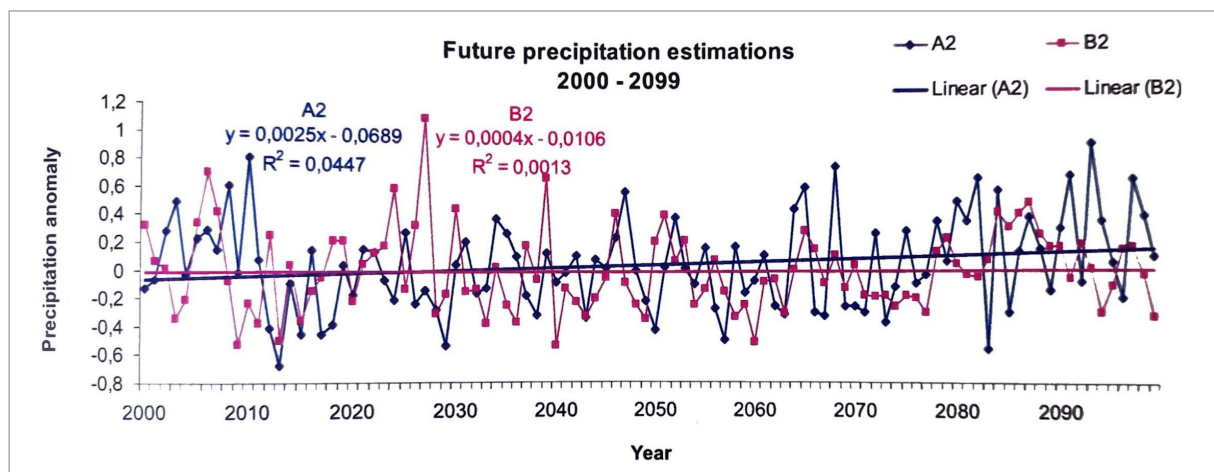
Table 1. The OLS model for Epecuen, Venado, Del Monte Cochicó and Alsina

	Regression coefficient	Std. Error	Significance	
Epecuen				
Constant	23233,11	4160,82	0	
T min	-914,48	435,62	0,065	
P	14,22	8,24	0,11	R ² =0,41
Venado				
Constant	19726,02	6279,78	0,01	
T mean	-820,81	404,04	0,07	R ² =0,30
Del Monte				
Constant	23057,12	4932,23	0,001	
T min	-1002,38	516,38	0,084	
P	13,17	9,77	0,211	R ² =0,32
Cochico				
Constant	7684,9	1643,57	0,001	
T min	-260,81	166,59	0,149	R ² =0,20
Alsina				
Constant	29910,19	11860,45	0,033	
T mean	-1440,56	774,76	0,096	
P	15,22	8,2	0,096	R ² =0,35

Own elaboration

Both A2 and B2 scenarios showed an increase in precipitation within a 100 year period from 2000 to 2099 using the HadCM3 model, although the variation is very high. The change in precipitation in the A2 scenario is 0.25 mm and in the B2 scenario only 0.04 mm. The variation is larger than the change and stretches between -0.6 to 1 mm in the A2 scenario. In the B2 scenario the variation stretches between -0.5 to 1.1 mm. The total mean variation shows in other words a span of 1.6 mm precipitation anomaly. In other words, the variation in the data can be up to about 600 mm (Figure 9).

Figure 9. Future precipitation anomalies from 2000 to 2099 with scenarios A2 and B2 from IPCCs TAR

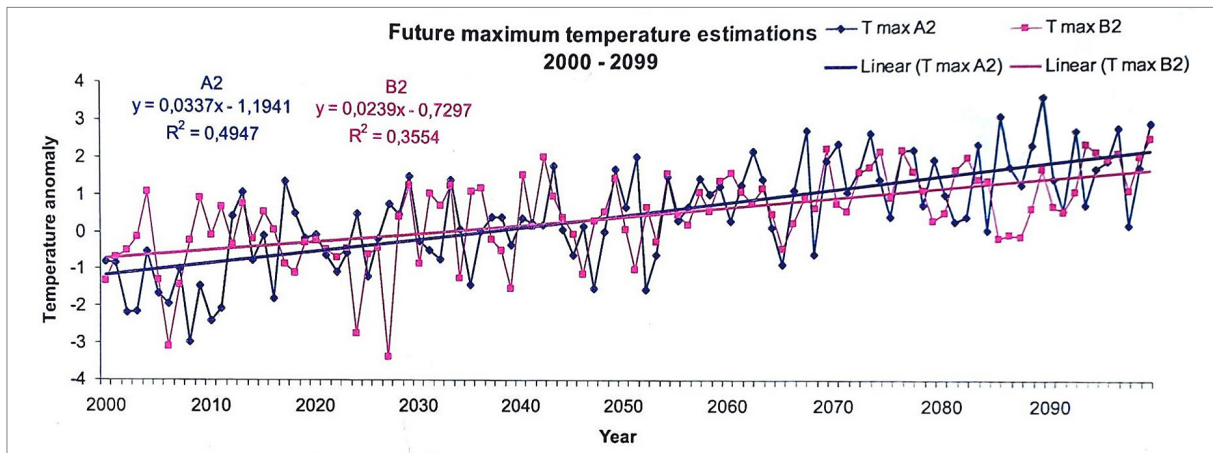


Own elaboration

In the future maximum temperature estimations, the increase from 2000 to 2099 was 3.37 °C in the A2 scenario and 2.37 °C in the B2 scenario. The variation in the data is however quite high (Figure 10).

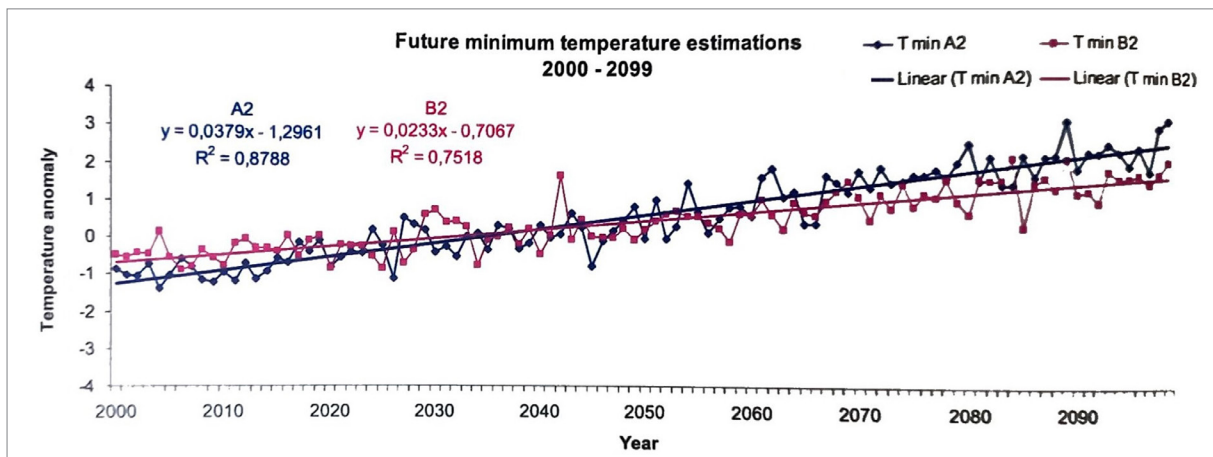
In the future minimum temperature estimations, the increase from 2000 to 2099 was 3.75 °C in the A2 scenario and 2.31 °C in the B2 scenario. The A2 scenario therefore shows a higher increase in both maximum and minimum temperatures. Variation in the data is less than in the estimations for maximum temperature (Figure 11).

Figure 10. Future maximum temperature anomalies from 2000 to 2099 with scenarios A2 and B2 from IPCCs TAR



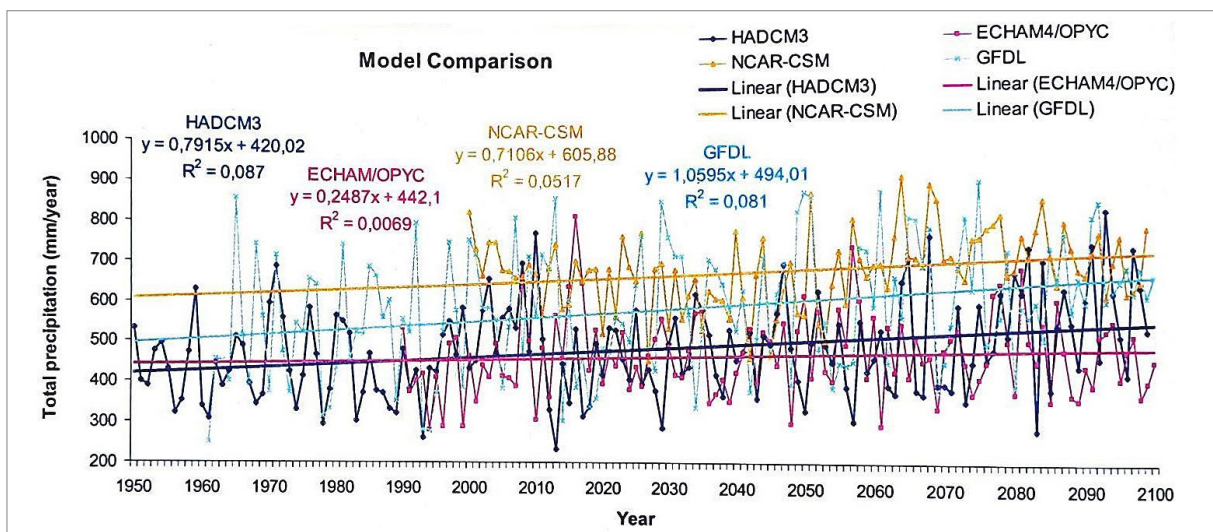
Own elaboration

Figure 11. Future minimum temperature anomalies from 2000 to 2099 with scenarios A2 and B2 from IPCCs TAR



Own elaboration

Figure 12. Comparison between the model HadCM3 used in the analysis above and three other models; ECHAM4/OPYC, NCAR-CSM and GFDL.3.1. Subsection



Own elaboration

To see more or less how well the HadCM3 model explains future change, a comparison was made with 3 other models which also use the A2 scenario. As can be seen in figure 12 the HadCM3 model shows lower precipitation from the beginning than all the other models, and the net change from 1950 to 2099 was estimated to be 119 mm. The lowest increase in temperature is seen in the ECHAM/OPYC model with a change of only 37.3 mm. The NCAR-CSM model begins with higher temperatures than the other models, and the change in the 150 year period is 106.6 mm. The GFDL model have values between the others and shows the highest change in precipitation with an increase of 158.9 mm (Figure 12).

4. Discussion

Temperature data from the meteorological station and downloaded temperature data are not very good correlated from year to year, and they differ in around 0.5 °C to 1 °C throughout the whole period from 1994 to 2006. When mean was calculated from 1994 to 2002 for all three data sources the change between station data and the downloaded data was 0.5 °C, with station data showing higher temperatures. The station data and downloaded data are in the case of precipitation quite good correlated from year to year, which is good since precipitation varies a lot from east to west in the study area. Station data however shows 200 to 400 mm less precipitation per year than the downloaded data, which probably is because the downloaded data covers a region which is bigger than the basin for the study area. Station data shows a mean of 600 mm per year when calculated from 1994 to 2002, while the CRU dataset has a mean of 850 mm per year and the CPC dataset has a mean of 1000 mm per year. Station data shows 40 % less precipitation than the CPC data and 30 % less precipitation than the CRU data. These differences observed between the two datasets are important to keep in mind when using models to predict climate scenarios for the future.

The mean monthly precipitation in summer (DJF) is a lot higher than during the winter months (JJA). Temperature is also higher during the summer and more water will evaporate even though it rains more. There could however be a delay in response of ponds water levels from precipitation. The shallow lake will respond to these changes in precipitation and temperature with a fluctuating water level.

The study area presented a significant rainfall variability with alternating dry and wet period (Barragan and Geraldi, 2018; Casado y Campo, 2019; Aliaga, 2020). In the end of 2001 and 2002 it rained a lot in the area, and the shallow lake started to increase early (Geraldi, 2009). The decrease in ponds area from 2002 to 2003, even though precipitation increases, can be due to the early rise in area from the heavy rains and then an early response from the less precipitation in the latter half on 2002.

Apart from this, by looking at the size of the shallow lake with both temperature and precipitation data available there seems to be a connection between all three of them. Where shallow lake area can not be explained solely by precipitation patterns, the temperature data can explain what happens, and vice versa. It is therefore important to take into account not only one variable but both temperature and precipitation at the same time.

The reason why the water levels in the shallow lake do not correlate very well with precipitation data 6 months before the calculation of ponds area can be due to the time it takes for the water to reach the shallow lake from streams from the basin area. The lag time is longer than 6 months. The temperature data taken 6 months before the shallow lake area calculation showed correlation from 2003 to 2006. The response from temperatures does not have the same lag time as precipitation and this might be reflected here.

Dangavs (2005), Torremorel, Bustigorry, Escaray, and Zagarese (2007), Allende et al. (2009); Bohn (2009) and Aliaga, Ferrelli, Alberdi-Algarañaz, Bohn, and Piccolo, (2016) showed that shallow lake dynamic depends mainly on precipitation. However, the statistical analysis does not take into consideration the behavior of a shallow lake basin in terms of lag times, openings and closings of dams, the geomorphology of the basins etc. The results however show that there is consistency in the data and that the shallow lakes behave in the same way. Why maximum temperature was never significant can be because the system answers more rapidly to evaporation already in small temperatures. The results also showed that the climate data calculated 12 months before the date that the images were taken were more significant than the 6 months data. This shows that the response time from the shallow lake is longer than 6 months.

Nicholson (1999) and Baigún, and Delfino (2003) showed that lakes and shallow lake have a response time of around 1 to 3 years. The reason why temperature is more significant than precipitation

could be due to the time it takes for the shallow lake to respond to variations in precipitation. Precipitation and temperature were in this analysis calculated up to a year before the images were taken which can be a good estimation in response time for temperature. Precipitation might however have a more delayed response time. The reason why temperature is more significant than precipitation could be that the area has a continental climate and the study period from 1997 to 2006 is a dry period. From the 11 years in the study period, only 3 years had a lot of precipitation. Temperature turns therefore out to be more significant than precipitation.

Venado and Cochicó are the smallest lakes in area, and the level of significance for precipitation is a lot higher in these ponds than in the larger ones. They also do not have the same fluctuation in area as the larger shallow lake, and the reason for this is that they have a more vertical beach contour than the rest of them. The volume increases therefore but in the area calculation in the digitalizing process this can not be seen to the same extent due to the beach profile. Other studies have reached similar conclusions for example, Zunini, Ferrelli, and Piccolo, (2018); Alfonso, Brendel, Vitale, and Piccolo, 2020.

The variation in the data shows larger differences than the change in a 100 year period. Precipitation changes in the future are not as important as the variations from year to year. Climate models have before predicted an increase in precipitation over the area, but as shallow lake area is responding faster to the variation in the data, this is more important to consider. From 2001 to 2002 the precipitation increased almost 400 mm/year, and the water levels in the shallow lake increased a lot.

From future scenarios calculation it can be seen that the variation in the future will continue to vary in the same quantity. The A2 scenario shows a faster increase in precipitation than the B2 scenario due to the faster growing population and economic development in the A2 scenario and the more environmental friendly B2 scenario.

Even though temperatures are fluctuating quite a lot from year to year as well, they show a more rapid increase than the precipitation estimations for the future. The fast increase in temperature will affect the shallow lake more than the precipitation change. An increase in temperature will cause the evaporation from the shallow lake to increase as well and the area to decrease.

The water levels in the shallow lake will continue to fluctuate in the future as precipitation and temperature varies. Temperatures will increase fast in the area; around 3 °C change is expected until 2099. Only small variations in the temperatures have before caused shallow lake areas to change. Similar results were found for Quirós (2000) and Li et al. (2017). Precipitation patterns show a high variation, but the change is very small. Minimum temperature, which is already the most significant factor according to the statistical analysis, will in the future be an even stronger factor if changes occur.

The model comparison showed that the changes in precipitation explained by the HadCM3 model are intermediate in comparison to the others. The amount of precipitation is however lower in the HadCM3 model than as estimated by the other three models. Compared to the station data of precipitation the HadCM3 model has a good estimation of precipitation. The ECHAM4/OPYC model also shows precipitations in the same range. The other two models, NCAR-CSM and GFDL, show generally a higher precipitation range than the station data.

5. Conclusions

The precipitation data shows differences in 30 – 40 % between station data and CRU TS 2.1 and CPC Merged Analysis data sets. Temperature shows differences of 3% between the station data and the CRU TS 2.1 and CPC GHCN/CAMS data sets, with higher temperatures from the station data. All five shallow lakes respond together to the variations in temperature and precipitation. When precipitation increase and temperature decrease, shallow lakes areas generally tend to increase. With a higher increase in precipitation than normal, response can be seen in shallow lake area earlier than the time period required for normal conditions. This is very significant for flat regions with an abundance of ponds.

In the multiple regression analysis minimum temperature, mean temperature and precipitation when it was calculated 12 months before the images were taken were the most significant parameters for variations in shallow lake areas. And temperature was always more significant than precipitation. This constitutes the basis for future research in relation to the evapotranspiration of the shallow lake with different scenarios.

Precipitation and temperature are together more significant than only temperature. Both precipitation and temperature will change in the future. For the case of precipitation in a 100 year period the variations are larger than the change, and might therefore be more important since the response in shallow lake area is relatively short.

The HadCM3 model predicts changes in precipitation which lies in between the other three models (ECHAM4/OPYC, NCAR-CSM and GFDL) and the precipitation range matches the precipitation collected from the station Carhue. The use of temperature and precipitation models and also future scenarios are useful tools for water resource management..

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Susceptibilidad deafección por enjambres de medusas (*Pelagia noctiluca*) en las playas del litoral occidental de la provincia de Málaga

*Susceptibility of affection by jellyfish swarms (*Pelagia noctiluca*) on the beaches of the western coast of the province of Malaga*

Ana de la Fuente Roselló^{1*} 
Juan Francisco Sortino Barrionuevo² 
Sergio Jesús Reyes Corredera³ 
María Jesús Perles Roselló⁴ 

Resumen

En el artículo se analiza y cartografía la susceptibilidad deafección por enjambres de medusas (*Pelagia noctiluca*) en las playas del litoral occidental de la provincia de Málaga. Los indicadores de peligrosidad de aparición de enjambres se elaboran a partir de un inventario de datos empíricos de avistamientos de medusas, registrados a través de la aplicación InfoMedusa (datos diarios para los meses estivales del periodo 2015-2020). Se proponen distintos indicadores de peligrosidad (frecuencia y severidad), y se calculan parámetros específicos que corrijan el problema del número desigual de observaciones en las playas. Los resultados cartográficos muestran que el patrón de distribución espacial no es aleatorio. Se observa una mayor frecuencia de episodios en las playas más occidentales del tramo estudiado, y el análisis preliminar de los factores condicionantes en cada playa permiten deducir una asociación de las playas con más propensión a recibir enjambres con la amplitud del ángulo de apertura de la misma, así como con la orientación al suroeste del tramo de costa en el que se sitúan las playas. Estas condiciones facilitan la entrada de las corrientes de levante procedentes del mar de Alborán, origen predominante de los enjambres.

Palabras clave: Costa del Sol; Infomedusa; cartografía de susceptibilidad; playas.

Abstract

The article analyses and maps the hazard of jellyfish swarms (*Pelagia Noctiluca*) on the western coast of Malaga province. Hazard indicators are based on empirical data from jellyfish sightings recorded with 'InfoMedusa' (daily observations for the summer months of the 2015-2020 period). Various hazard indicators are proposed (frequency and severity) and specific parameters are calculated to correct the problem of unequal numbers of beach observations and its repercussions on the representativeness of the results. The cartographic results show that the spatial distribution pattern is not random. A higher frequency of episodes is observed on the westernmost beaches of the area under study and a preliminary analysis of the conditioning factors in each beach allows us to associate the beaches with the greatest propensity to receive swarms with the width of the opening angle of these beaches – as well as the southwest orientation of the stretch of coast where the beaches are located. These conditions facilitate the entry of eastern currents from the Alboran sea (the main origin of the swarms).

Keywords: Costa del Sol; Infomedusa; susceptibility mapping; beaches.

1 Departamento de Geografía, Universidad de Málaga, España. anadelafuente@uma.es. * Autora para correspondencia

2 Departamento de Geografía, Universidad de Málaga, España. francis.sortino@uma.es

3 Departamento de Geografía, Universidad de Málaga, España. sergioreyes@uma.es

4 Departamento de Geografía, Universidad de Málaga, España. mjperles@uma.es

1. Introducción

Las costas y playas son elementos de indiscutible importancia para el desarrollo económico del territorio en el que se localizan, constituyendo un pilar básico en actividades como el turismo de sol y playa, cuyo atractivo resulta muy sensible a la degradación de estos espacios y a cualquier cambio que genere incertidumbre en su uso (Enríquez y Bujosa, 2020). En las últimas décadas, probablemente motivado por la influencia del ser humano en el funcionamiento del clima y sus consecuencias sobre de los mares y océanos, se han incrementado de una forma alarmante la presencia de floraciones de medusas que acaban por llegar hasta la costa (Dong, 2019; Mills, 2001; Purcell, 2011). En el entorno mediterráneo, estos problemas están especialmente motivados por la medusa clavel (*Pelagia noctiluca*), que supone la especie potencialmente más dañina de esta área (Bellido *et al.*, 2020). Se trata de una de las especies de medusas más importantes en el Mediterráneo debido a su amplia distribución, abundancia, función ecológica y también especialmente motivado por su interacción negativa con la población (Canepa, Fuentes, Sabatés, Piraino y Boero, 2014), siendo además una de las especies más usuales en los enjambres de medusas en la provincia de Málaga.

El incremento de la frecuencia de aparición de floraciones es analizado por distintos autores. Brotz, Cheung, Keisner, Pakhomov y Pauly (2012) constatan cambios en las poblaciones de medusas y analizan la tendencia al aumento de la presencia de éstas en las costas a partir del año 1950. Asimismo, Purcell, Uye y Lo (2007) pronostica un progresivo incremento de poblaciones de medusas en áreas costeras asociado a la presión antropogénica sobre el mar. Kogovsek, Bogunovic y Malej (2010) analizan las ocurrencias históricas en el mar Adriático en los últimos 200 años combinadas con variables ambientales (temperatura, salinidad, pH, clorofila, peso seco de zooplancton y descargas principales en los ríos), concluyendo que la periodicidad de aparición en forma de plaga se ha acortado en las últimas décadas, aumentando así la recurrencia de las floraciones de esta especie. Los archivos de la Station Zoologique, en el Observatorio Oceanográfico Villefranche-sur-Mer, contienen registros de años con presencia de *Pelagia noctiluca* y años sin visitas de ésta, indicando que en el periodo de 200 años que va desde 1785 a 1985, se produjeron apariciones masivas de esta especie, con una periodicidad aproximada de doce años. En el caso concreto de la Costa del Sol, el Aula del Mar observa un incremento de frecuencia y magnitud de apariciones de medusas en el litoral malagueño, que parece indicar un cambio de tendencia. En la última década, ha registrado proliferaciones en periodos cíclicos de 2-4 años, cuando con anterioridad los ciclos esperados se estimaban en 10-20 años (Aula del Mar, 2021).

La llegada de enjambres de medusas a las playas de un determinado litoral en cantidad y frecuencia extraordinaria constituye una anomalía con consecuencias negativas sobre la sociedad, que permite clasificarlo, según la Oficina de las Naciones Unidas para la Reducción del Riesgo de Desastres (UNISDR), como un riesgo ambiental de tipo biológico. Estos enjambres acarrearán una gran problemática para las costas que lo sufren puesto que, aparte de la pérdida de biodiversidad que conllevan, traen consigo importantes efectos negativos en sectores como la pesca (Sabatés *et al.*, 2010) pero sobre todo en el sector turístico (Ghermandi, Galil, Gowdy y Nunes, 2015; Nunes *et al.*, 2015; Rubio y Gutiérrez, 2020).

El enfoque territorial de análisis del riesgo (Cutter, 1994; Calvo, 2001; Olcina, 2008; Perles y Mérida, 2010; Veyret, Beucher y Bonnard, 2005) destaca la importancia de la posición de los elementos causantes y receptores del daño a la hora de evaluar el riesgo. Perles y Cantarero (2010), de forma más concreta, insisten en la importancia de conocer el patrón espacial con el que se comporta el evento peligroso. Proponen articular el patrón espacial de peligrosidad en áreas causantes de la peligrosidad, líneas o superficies transmisoras de los flujos, y áreas receptoras de los impactos del proceso. Para que un peligro incida sobre un área receptora tiene que existir algún vector de transferencia de materia y energía que los una, y además, el área causante ha de estar situada en una posición topológica que permita esta transferencia. Este enfoque es idóneo para analizar la peligrosidad de llegada de los enjambres de medusas a los distintos puntos del litoral.

Existen investigaciones que se centran en el análisis y predicción del comportamiento espacial y/o temporal de los enjambres, y en la búsqueda de factores condicionantes del proceso. En este sentido, Bellido *et al.* (2020) indagan en la relación entre los índices atmosféricos y la incidencia de enjambres costeros y encuentran una conexión entre años de incidencia alta de proliferación de enjambres de medusas y lluvias copiosas durante invierno y primavera. (Bellido *et al.*, 2020; Gutiérrez-Estrada *et al.*, 2021). Kogovsek *et al.* (2010) analizan las ocurrencias históricas en el mar Adriático en los últimos 200 años, combinadas con variables ambientales (temperatura, salinidad, pH, clorofila, peso seco de zooplancton y descargas principales en los ríos), concluyendo que la periodicidad de aparición en forma de plaga se ha acortado en las últimas décadas, aumentando así la recurrencia de las floraciones de esta especie. Asimismo, Goy, Morand y Etienne (1988) manifiestan que, usando un modelo de pronóstico (variables climáticas, temperatura, lluvia y presión atmosférica), se pueden predecir periodos con *Pelagia noctiluca*.

Los estudios orientados a conocer y cartografiar el comportamiento espacial de la especie con un sentido más aplicado, puede citarse el Proyecto Medusa, que se crea en 2007, por la Agencia Catalana del Agua en colaboración con el Instituto de Ciencias del Mar de Barcelona (ICM-CSIC), con el objeto de controlar la presencia de medusas y entender su funcionamiento en el espacio y en el tiempo a lo largo de la costa catalana. Este proyecto ha realizado sondeos diarios en época estival en diferentes playas, donde se mapean las mayores concentraciones de medusas varadas. Asimismo, se incorporan en las conclusiones de su estudio la importancia de factores como la producción de medusas en alta mar, así como las estructuras artificiales que propician las condiciones idóneas para su crecimiento y reproducción. También se incluyen los factores que propician su debilitamiento, como son los vientos del sureste (Canepa *et al.*, 2014).

Con respecto a los antecedentes más próximos al área de estudio, cabe señalar el análisis realizado en este ámbito (Rubio y Gutiérrez, 2020) que, para analizar la distribución del fenómeno, utiliza como fuente la recurrencia de búsquedas de información sobre medusas en internet, la publicación de noticias relacionadas de los principales periódicos de Andalucía y encuestas a usuarios de playas en la Costa del Sol. Con este material concluye un patrón de distribución en el que destacan los avistamientos estivales, espacialmente concentrados entre la Costa del Sol Oriental (Málaga) y la Costa Tropical (Granada). La escala de trabajo del citado informe, a diferencia del desarrollado en la presente investigación, no se acerca de forma expresa al litoral, ni desciende al nivel de detalle de la playa, sino se desarrolla a escala regional. Gutiérrez-Estrada *et al.* (2021) enfocan su estudio al desarrollo de un sistema predictivo de la llegada de medusas a tierra en la Costa del Sol. A una escala más detallada, el trabajo de Olmedo (2019) constituye un referente del comportamiento y peligrosidad de los enjambres de medusas en las playas del sector oriental de la provincia de Málaga.

A nivel de la Costa del Sol (Málaga), un antecedente directo de este trabajo es el informe presentado por el Aula del Mar basado en la aplicación móvil InfoMedusa (<https://infomedusa.es>). Esta aplicación fue creada por la Diputación Provincial en colaboración con el Aula del Mar para el seguimiento de la aparición masiva de *Pelagia noctiluca* en las distintas playas que componen este litoral. Suministra datos informativos sobre el comportamiento, evolución, trayectoria e intensidad de la plaga, suponiendo por ello una importante base para la elaboración de modelos predictivos (Bellido, Souviron, Báez, Ferri-Yañez y Salas, 2018). En el ámbito español existen otras plataformas de recopilación de datos tales como MedusApp, Grumering o iMedJelly, con diferentes periodos temporales y escalas espaciales en el fenómeno de avistamiento de medusas, aunque ninguna de ellas tan abundante ni extensa en el área de estudio como InfoMedusa.

A partir de la problemática causada por la llegada de enjambres a la costa, en la realización de esta investigación, se ha considerado de interés analizar cuáles son los patrones espaciales de comportamiento de las medusas a nivel litoral. Se pretende identificar las playas más proclives a recibir medusas como paso previo para la identificación de factores relacionados con esta distribución, y poder proponer, en última instancia, medidas de mitigación idóneas para estas zonas.

De forma específica, se abordan los siguientes objetivos:

- 1) Explotar la base de datos proporcionada por el programa InfoMedusa, para generar un inventario básico de avistamientos de medusas en las playas del litoral occidental de la provincia de Málaga, para el periodo 2015-2020.
- 2) Analizar la frecuencia de aparición de medusas en cada playa de la zona de estudio (recurrencia diaria en periodo estival durante seis años), así como su severidad. Ajustar los indicadores de peligrosidad a las particularidades y sesgos de la fuente de datos y del inventario.
- 3) Elaborar una cartografía de peligrosidad por llegada de enjambres en las playas de la Costa del Sol occidental.
- 4) Comprobar que la distribución espacial de la peligrosidad de afección muestra un patrón aleatorio o, por el contrario, permite identificar tendencias estructurales en la mayor susceptibilidad de algunas playas.
- 5) Proponer hipótesis preliminares sobre los factores que pueden estar condicionando la mayor predisposición a recibir medusas manifestada en algunas playas.

2. Metodología

Para la elaboración de la cartografía de peligrosidad se han desarrollado las siguientes fases de trabajo:

- 1) Delimitación espacial y cartografía de las playas del litoral occidental de la provincia de Málaga. Identificación de sus principales características fisiográficas y otros factores que puedan relacionarse como posibles factores condicionantes de la mayor o menor presencia de medusas.
- 2) Volcado y tratamiento inicial de depuración de la base de datos proporcionada por el programa InfoMedusa. Tránsito de la información cualitativa (comentarios) hacia cuantitativa (dato numérico) y asignación del número de registros a cada playa.

- 3) Selección para el estudio de las playas con un número de registros válidos que garanticen la fiabilidad de los datos.
- 4) Análisis de la frecuencia y severidad de aparición de medusas en cada playa de la zona de estudio (recurrencia diaria durante los meses estivales durante un periodo de seis años).
- 5) Elaboración de la cartografía de susceptibilidad mediante el software de procesamiento geoespacial ArcGis.
- 6) Análisis de posibles factores explicativos del patrón espacial de peligrosidad observado.

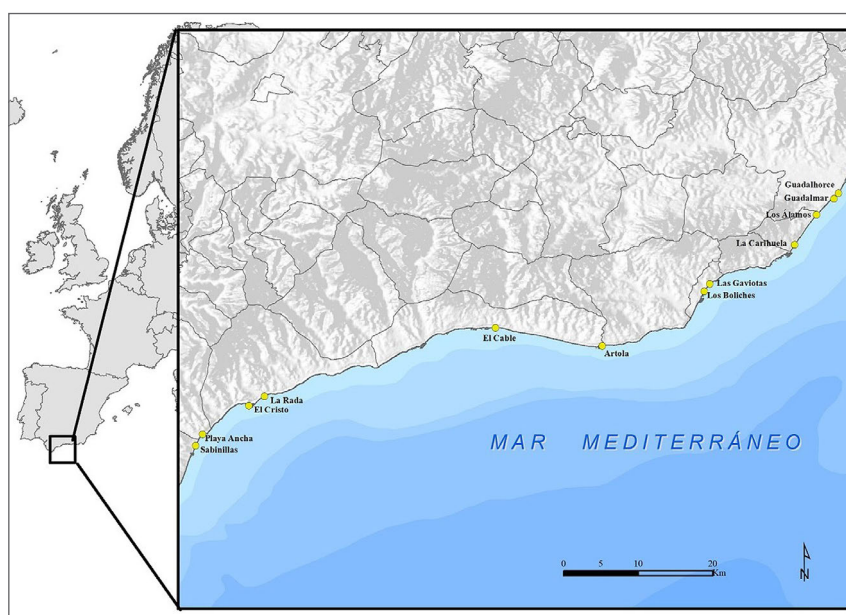
2.1. Selección del área de estudio

El análisis de la frecuencia y severidad de la aparición de medusas se ha aplicado al conjunto de playas del litoral occidental malagueño. Tras una primera fase de revisión y depuración de los datos en todas las playas, se han seleccionado, para una segunda fase de estudio, las 12 playas que reúnen una totalidad de registros suficiente como para ser consideradas fiables, además de una casuística variada en lo que se refiere a factores que puedan resultar explicativos de una mayor o menor propensión a recibir enjambres. (playas de Guadalhorce, Guadalmar, Los Álamos, La Carihuela, Las Gaviotas, Los Boliches, Dunas de Artola, El Cable, La Rada, El Cristo, Playa Ancha y Sabinillas, recogidas en la Figura 1).

Se han seleccionado playas de extensión diversa, que se distribuyen a lo largo de unos 90 km del litoral (Tabla 1). Se ha procurado que en la muestra exista una casuística variada en función de los criterios recogidos en la guía de playas del Ministerio para la Transición Ecológica y el Reto Demográfico (MITECO). Se ha atendido principalmente a características como el carácter, clasificando las playas en urbana, cuando esta se encuentra integrada en el entramado urbano, semiaislada, si tiene acceso a alguna urbanización de baja densidad edificativa y aislada, cuando no existen urbanizaciones en el frente costero. También se han tenido en cuenta las condiciones de baño (oleaje moderado y aguas tranquilas), el tipo y composición de la arena el cual, aunque muy similar en la totalidad del tramo de costa analizado, puede distinguir entre arena y grava, y si se localizan en zonas protegidas. Además, en la selección, se ha procurado que las playas abarquen la práctica totalidad de los términos municipales que componen el tramo de costa. En la Figura 2 se muestran imágenes en las que se observa las mencionadas características. De forma añadida, la alta dependencia de este sector del territorio respecto a la actividad turística justifica sobradamente el interés del análisis en la zona.

Se ha determinado que la unidad de análisis y representación de la peligrosidad en esta investigación sea la playa, frente a otras opciones utilizadas en otras investigaciones similares, como por ejemplo el municipio. La playa es la delimitación fisiográfica mínima en las que las características morfológicas y los procesos funcionales costeros se comportan de forma sistémica, y constituyen una unidad. Por este motivo, la playa constituye la unidad especial idónea a la hora de interpretar la mayor susceptibilidad a recibir medusas de algunos sectores del litoral, y las causas que pueden explicar esta mayor afección.

Figura 1. Playas seleccionadas como área de estudio



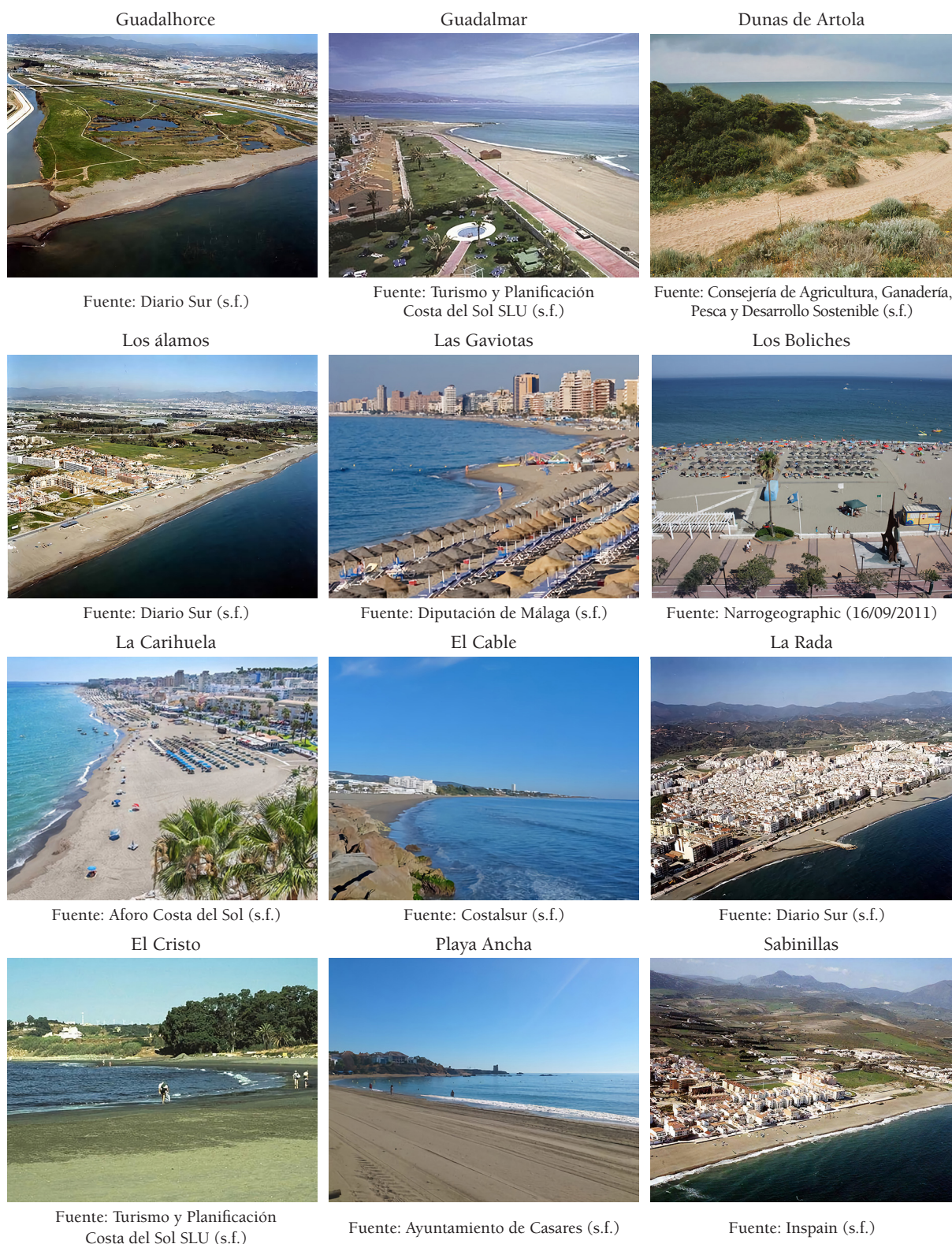
Elaboración propia

Tabla 1. Características de las playas objeto de estudio

Playa	Término municipal	Longitud (metros)	Anchura (metros)	Grado de urbanización	Paseo marítimo	Condiciones de baño	Fachada litoral	Tipo de arena	Composición	Zona protegida	Descripción
Guadalhorce	Málaga	950	60	Aislada	No	Oleaje moderado	Dunas / Humedal	Oscura	Arena	RENPA Paraje natural	Playa junto a la desembocadura del río Guadalhorce, con escasa afluencia de público.
Guadalmar	Málaga	400	30	Semiurbana	No	Oleaje moderado	Urbana / Dunas	Oscura	Arena	No	Forma parte de la zona conocida como playa de San Julian, cerca de la desembocadura del río Guadalhorce. Presenta un alto grado de urbanización
La Carihuela	Torremolinos	2100	30	Urbana	Sí	Oleaje moderado	Urbana	Oscura	Arena	No	Playa con un alto nivel de servicios, ambiente familiar y muy frecuentada.
Los Álamos	Torremolinos	1500	60	Semiurbana	No	Oleaje moderado	Semiurbana	Dorada	Arena	No	Playa familiar. La más alejada del centro de Torremolinos.
Las Gaviotas	Fuengirola	1200	40	Urbana	Sí	Aguas tranquilas	Urbana	Oscura	Arena	No	Buen nivel de servicios y alta ocupación.
Los Boliches	Fuengirola	1100	40	Urbana	Sí	Aguas tranquilas	Urbana	Oscura	Arena	No	Playa muy popular, bien equipada, en el centro urbano de Fuengirola.
Dunas de Artola	Marbella	1200	30	Aislada	No	Oleaje moderado	Semiurbana	Dorada	Arena	RENPA Parque Natural	Playa situada en una zona protegida denominada Dunas de Artola.
El Cable	Marbella	400	40	Semiurbana	No	Oleaje moderado	Dunas / Semiurbana	Oscura	Arena	No	Playa formada por una franja de arena estrecha, con poca afluencia de público.
El Cristo	Estepona	700	25 a 10	Semiurbana	No	Aguas tranquilas	Semiurbana / Humedal	Oscura	Arena	Zona protegida de interés ornitológico	Playa del casco urbano, aunque algo retirada del centro, junto al Puerto Deportivo de Estepona. Forma una bonita cala, regenerada recientemente, configurando una zona abrigada y resguardada de los vientos.
La Rada	Estepona	2300	80 a 50	Urbana	Sí	Aguas tranquilas	Urbana	Oscura	Arena	No	Playa situada frente al casco urbano, ha sido recientemente regenerada. Muy extensa y concurrida, cuenta con gran número de servicios.
Playa Ancha	Casares	1300	50	Urbana	Sí	Aguas tranquilas	Urbana	Oscura	Grava	Zona protegida de interés ornitológico	Aguas tranquilas y gran afluencia de público. Dotada con un buen número de servicios.
Sabinillas	Manilva	1700	50	Urbana	Sí	Aguas tranquilas	Urbana	Oscura	Arena	No	Se extiende entre el Puerto Deportivo y el río Manilva. El frente litoral está ocupado por el núcleo de San Luis de Sabinillas.

Fuente: MITECO, 2021. Elaboración propia

Figura 2. Imágenes de playas seleccionadas



2.2. Características de la base de datos InfoMedusa y tratamiento y depuración de los datos

La investigación se fundamenta en los datos ofrecidos por la aplicación informática InfoMedusa (<https://infomedusa.es>), activada en 2013 por parte de la Diputación Provincial en colaboración con

el Aula del Mar. La aplicación tiene como objetivo informar sobre la actividad de las medusas en las playas del litoral malagueño y es realizada gracias a la colaboración ciudadana, que participa mediante la introducción de comentarios acerca de la presencia o no de medusas clasificadas por playas. La base de datos asociada constituye una importante fuente a tratar y explotar, pero requiere una labor previa de transformación de los registros, expresados en forma de comentarios generales sobre el estado de la mar, en datos fehacientes y concretos sobre ausencia o presencia de enjambres.

Para la utilización de la base de datos en cuestión, ha sido necesario tomar una serie de decisiones iniciales, y aplicar una serie de procesos de depuración:

- 1) Interpretación y filtrado de comentarios, con la eliminación de errores y clasificación de los comentarios relevantes o útiles para el estudio. Hay que señalar que los comentarios son expresados de forma libre por los usuarios, por lo que existe un variado patrón de observaciones.
- 2) Delimitación del periodo de información en el que los datos poseen la suficiente calidad como para poder ser utilizados para un propósito científico, que se concreta en la serie temporal que transcurre desde el año 2015 al 2020 durante los meses de junio a septiembre.
- 3) Selección de las playas a analizar en el tramo de estudio seleccionado en razón de la totalidad de registros de datos de cada playa. Se han eliminado del análisis las playas del tramo occidental de la Costa del Sol con menos de 500 registros. Este valor de exclusión se ha obtenido tomando como referencia el total de anotaciones del año 2018, el cual supone, con diferencia, el que posee un mayor número total de comentarios. A partir del registro total de datos del año de referencia sobre el total de playas de la costa occidental de Málaga presentes en la aplicación (170), se ha obtenido el valor medio de 576, 4, que se ha redondeado a la baja para facilitar el análisis.

Total comentarios año 2018: 98.004.

Total playas: 170.

Promedio: 576, 49.

- 4) Diseño de matriz de volcado de datos diarios depurados por playas, que contiene la serie temporal comentada, las playas objeto de análisis y las variables seleccionadas.

Para sistematizar los datos obtenidos de los comentarios de los usuarios de la aplicación, la información se ha clasificado en cuatro categorías (Tabla 2).

Tabla 2. Clasificación de los comentarios de InfoMedusa

Clasificación de medusas	Comentario
0	Comentario irrelevante
1	No presencia de medusas
2	Presencia de medusas dispersas
3	Presencia de enjambres

Elaboración propia

Se han consultado de forma directa y manual un total de 16.726 comentarios para las playas objeto de este estudio. Tras los procesos de filtrado y depuración de la base de datos han resultado un total de 1.885 registros útiles para el estudio.

2.3. Análisis de la frecuencia y severidad de aparición de medusas. Indicadores calculados

Para obtener datos diarios de la presencia o ausencia de medusas en cada playa en un formato binario (sí/no), los dos grados de severidad diferenciados en el inventario (Presencia de medusas dispersas/ presencia de enjambres) han sido unificados en uno sólo, ya que ambos indican la presencia de medusas. Se han calculado distintos parámetros indicadores de la frecuencia de medusas en la playa: por una parte, se ha procedido a ponderar el número de registro por la superficie útil de la playa, entendiendo que la superficie de la playa puede resultar un indicador aproximado de la afluencia o potencial de visitas de cada una de ellas. El indicador obtenido se ha denominado *Número de días con medusas ponderado por la superficie de la playa*. Asimismo, para evitar el problema de la diferente afluencia en función de la localización, se ha aplicado un coeficiente de minoración para las playas alejadas de los circuitos de acceso urbano, multiplicando por 0,5 la superficie de la playa.

Paralelamente, para el análisis comparativo de las anotaciones diarias de presencia/ausencia de medusas entre playas, se han calculado datos porcentuales relativos al total de registros en cada playa (número

de días con y sin medusas para cada playa en relación al total de registros de la misma). Se han obtenido dos indicadores: *Porcentaje de días con medusas respecto al total de registros de la playa* y *Porcentaje de días sin medusas respecto al total de registros de la playa*. A continuación, para clasificar en intervalos los distintos indicadores de peligrosidad calculados y asignar los correspondientes grados de gravedad, se han utilizados dos criterios: intervalos de naturaleza estadística (media y desviación estándar) en el caso de las variables *Número de días con y sin medusas ponderado por la superficie de la playa*, e intervalos regulares para el indicador *Porcentaje de días con y sin medusas*. En este último caso, se ha optado por estandarizar los intervalos para el conjunto de las playas a partir del valor máximo presente en la muestra, esto es, el porcentaje de días con medusas máximo en las playas del área de estudio, a fin de observar con mayor claridad las diferencias entre playas y afinar la comparación entre ellas. Las Tablas 3, 4 y 5 recogen los intervalos asignados.

Tabla 3. Media y desviación estándar de las variables número de días con y sin medusas ponderado por la superficie de la playa

Cálculos	Número de días con medusas	Número de días sin medusas
Σ superficie de la playa	248,54	366,91
\bar{x}	20,71	30,58
σ	24,38	38,47
$1/2 \sigma$	12,19	19,24

Elaboración propia

En razón de los estadísticos obtenidos, se han definido tres intervalos de gravedad del peligro (Tabla 4).

Tabla 4. Días con medusas ponderado por la superficie de la playa. Intervalos de peligrosidad

Intervalos en función de la superficie de la playa	Días con medusas	Días sin medusas
1	< 9	<12
2	10-31	12-50
3	>31	>50

Elaboración propia

Tabla 5. Porcentaje de días con y sin medusas. Intervalos asignados

Intervalos en función de datos relativos	Días con medusas	Días sin medusas
1	< 38	<52
2	38-47	52-61
3	>47	>61

Elaboración propia

La representación gráfica y cartográfica de estos indicadores y sus intervalos se ha realizado siguiendo la semiótica de color del semáforo. La representación cartográfica se ha ejecutado mediante el programa de procesamiento geoespacial ArcGis.

2.4. Asignación de intervalos de peligrosidad a los distintos indicadores

Como se ha citado anteriormente, el número de registros (comentarios en InfoMedusa, 2020) no es homogéneo entre las distintas playas. Para discriminar las playas que son más y menos fiables para este estudio en razón del número de anotaciones de usuarios disponible, se han calculado los valores medios de comentarios para el conjunto del área de estudio y su desviación estándar (Tabla 7). A partir de estos datos, se han considerado, por una parte, fiables aquellas playas que tienen un número de registros en

torno a la media menos $\frac{1}{2}$ desviación estándar y/o superiores a ella. Por otra parte, se consideran playas poco fiables las que disponen de un número inferior a la media menos $\frac{1}{2}$ desviación estándar (Tabla 6).

Tabla 6. Número de registros por playa. Media y desviación estándar

Cálculos	Registros de datos
Σ	594,90
\bar{x}	49,58
σ	57,37
$1/2 \sigma$	28,68

Elaboración propia

Tabla 7. Intervalos de fiabilidad de la playa en función del número de registros

Intervalos de fiabilidad de las playas	Días con medusas
Poco fiable	< 21
Fiable	21-78
Muy fiable	>78

Elaboración propia

En una fase posterior, para evaluar la fiabilidad de los datos ofrecidos por la playa, se ha utilizado una estrategia añadida. Se ha procedido a constatar que, si una playa presenta un elevado número de días con medusas, no coincida con la observación contraria, esto es, que tenga a la vez un número elevado de días sin medusas, lógica que invalidaría la consistencia de la afirmación primera. Se ha considerado que, si la playa ofrece un número elevado de días con medusas y a la vez un número elevado de días sin medusas, la contradicción hace perder fiabilidad a ambas observaciones. A partir de este análisis, la fiabilidad de los datos ofrecidos por cada playa se rige por el razonamiento que se muestra en la Tabla 8.

Tabla 8. Criterios aplicados para deducir la fiabilidad de los datos en cada playa

Playa fiable	Se considera que una playa es fiable cuándo tiene un más de 21 de registros (dato ponderado por la superficie de la playa) y una diferencia entre los días con y sin medusas mayor al 60%.
Playa fiable proclive a las medusas	Playa con un porcentaje de registro de días con medusas mayor al 60%.
Playa fiable no proclive a las medusas	Playa con un porcentaje de registro de días sin medusas mayor al 60%.
Playa no fiable	Se considera que una playa no es fiable cuándo tiene un número de registros por debajo de la media y/o una escasa diferencia entre los días con medusas y los días sin medusas (del 50 al 60%)

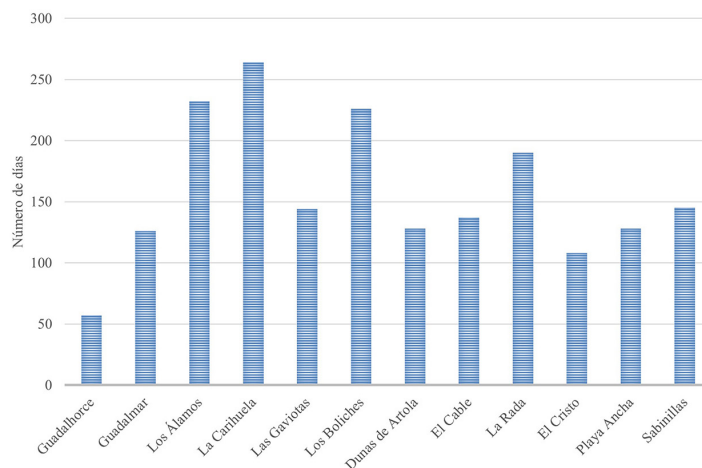
Elaboración propia

3. Resultados

Tras el proceso de consulta directa y manual de un total de 16.726 comentarios referentes a las playas seleccionadas, los comentarios han sido depurados y filtrados en razón de su calidad y representatividad estadística, ofreciendo como resultado un total de 1.885 registros útiles para el estudio, datos que centran el análisis en un total de 12 playas del litoral occidental. Como puede observarse en la Figura 3, los resultados muestran que existe una notable disparidad en el número de comentarios útiles (nº de registros) entre las distintas playas, que oscila entre 57 en Guadalhorce y 264 en La Carihuela.

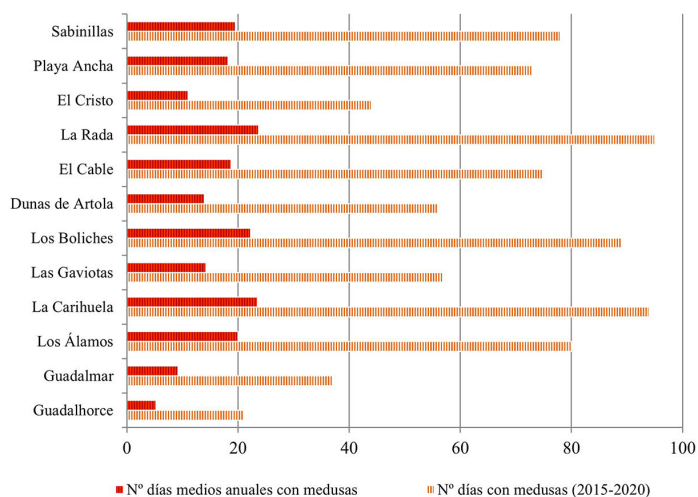
Los valores de frecuencia expresados en valores absolutos son más elevados en las playas con más registros, tanto para el indicador de días con medusas como para su contrario, días sin medusas (Figuras 4 y 5). Este hecho resta valor comparativo a los indicadores de peligrosidad expresados en valores absolutos, tales como el *Número absoluto de días con medusas* representado en la Figura 6, en la que, como puede observarse, las playas Los Álamos, La Carihuela, Los Boliches y La Rada presentan los valores más elevados de frecuencia de afección por medusas.

Figura 3. Número de días con registros de medusas



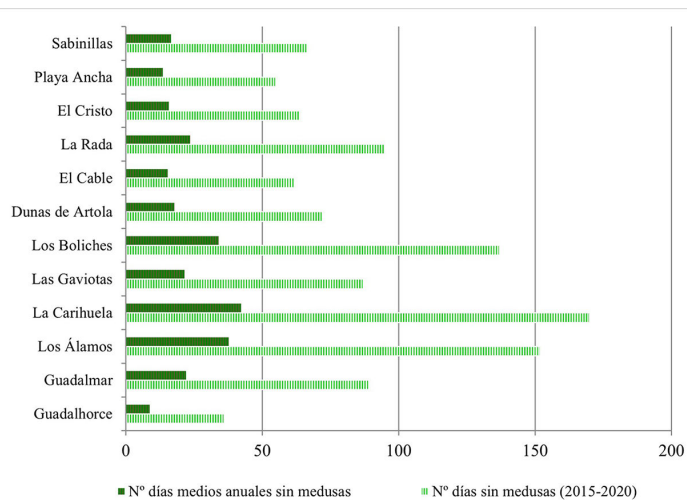
Fuente: InfoMedusa, 2020. Elaboración propia

Figura 4. Días con medusas por playas. Medias del periodo de análisis y datos absolutos



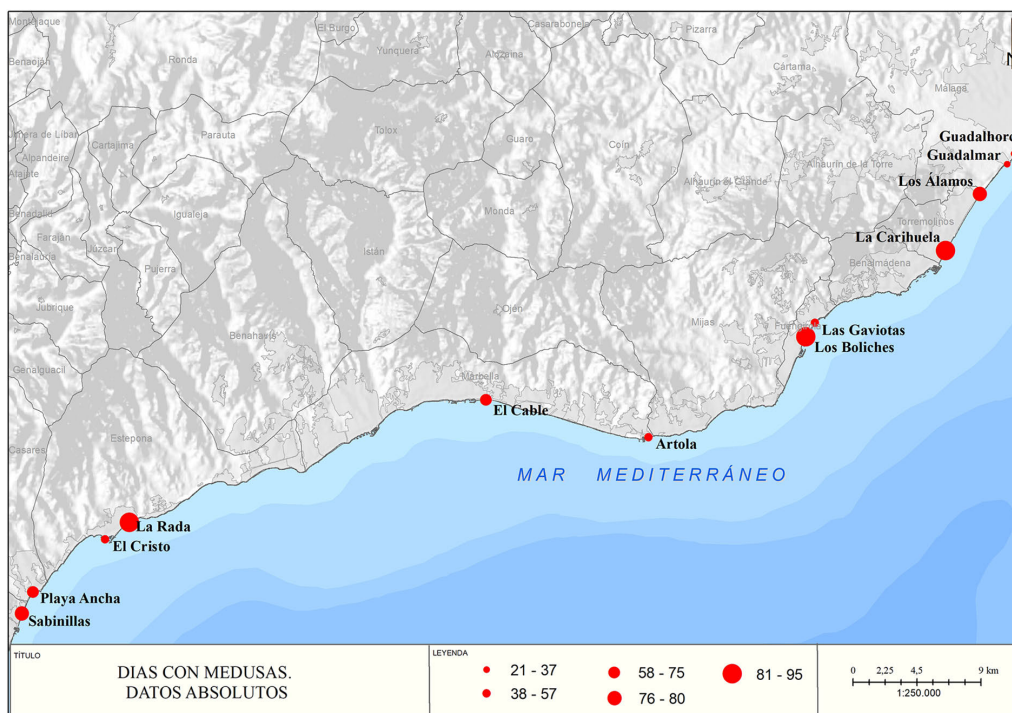
Fuente: InfoMedusa, 2020. Elaboración propia

Figura 5. Días sin medusas por playas. Medias del periodo de análisis y datos absolutos



Fuente: InfoMedusa, 2020. Elaboración propia

Figura 6. Días con medusas por playas. Datos absolutos



Fuente: InfoMedusa, 2020. Elaboración propia

Al objeto de matizar el problema que introduce en la interpretación el hecho de que las playas tengan un número de registro tan dispar, se ha calculado el indicador de frecuencia ponderado por la superficie de la playa. En la Tabla 9 se muestra el resultado de la ponderación de los días con medusas con respecto a la superficie total de la playa, así como los cálculos realizados para la obtención del valor medio y los intervalos de gravedad establecidos con relación al mismo. Los valores superiores a la media aparecen resaltados en la Tabla 9.

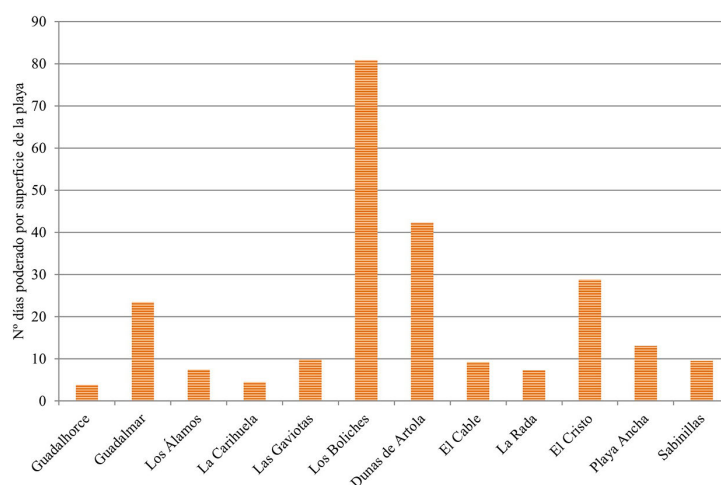
Tabla 9. Número de días con medusas ponderado por la superficie de la playa

Playa	Días con medusas
Guadalhorce	3,81
Guadalmar	23,49
Los Álamos	7,50
La Carihuela	4,52
Las Gaviotas	9,90
Los Boliches	81,00
Dunas de Artola	42,38
El Cable	9,31
La Rada	7,29
El Cristo	28,79
Playa Ancha	13,05
Sabinillas	9,51
Σ	248,54
\bar{x}	20,71
σ	24,38
$1/2 \sigma$	12,19

Elaboración propia

Como resultado de la aplicación de la ponderación por superficie se ha obtenido el resultado mostrado en la Figura 7.

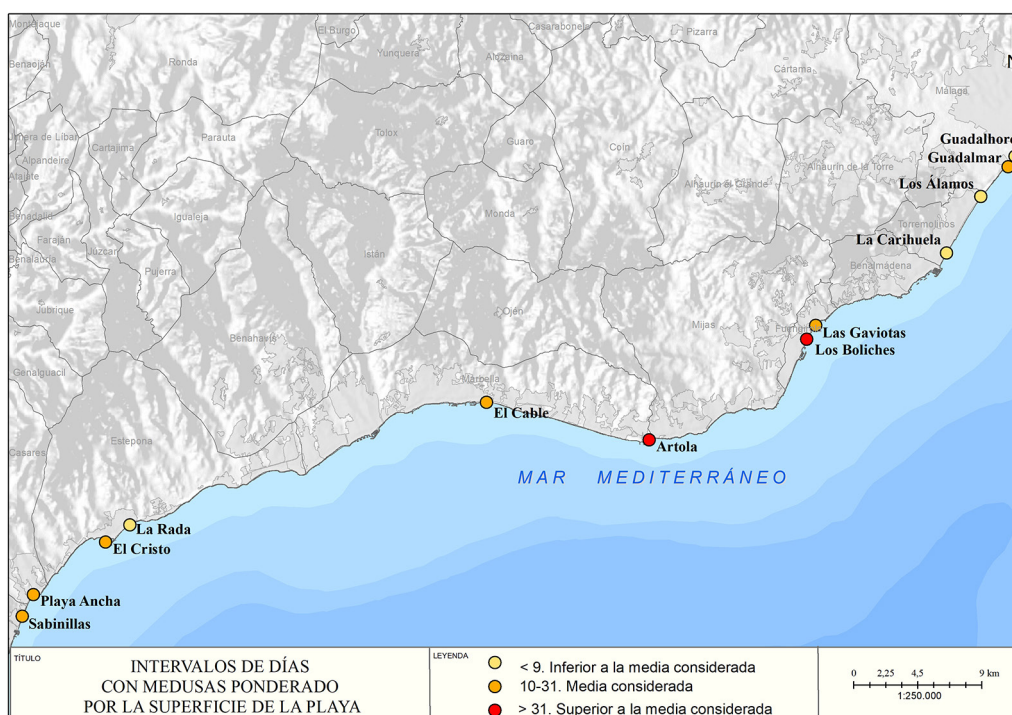
Figura 7. Número de días con medusas ponderado por la superficie total de la playa



Fuente: InfoMedusa, 2020. Elaboración propia

Considerando la superficie de cada playa, los datos varían notablemente, destacando sobre todo la playa de Los Boliches y, en menor medida, Dunas de Artola, como las que más porcentaje de medusas han registrado en función de su superficie, siendo éstas las únicas playas que se sitúan en el intervalo 3, por encima de la media considerada. El mapa resultante clasificado en intervalos se muestra en la Figura 8.

Figura 8 Intervalos de días con medusas ponderado por la superficie total de la playa

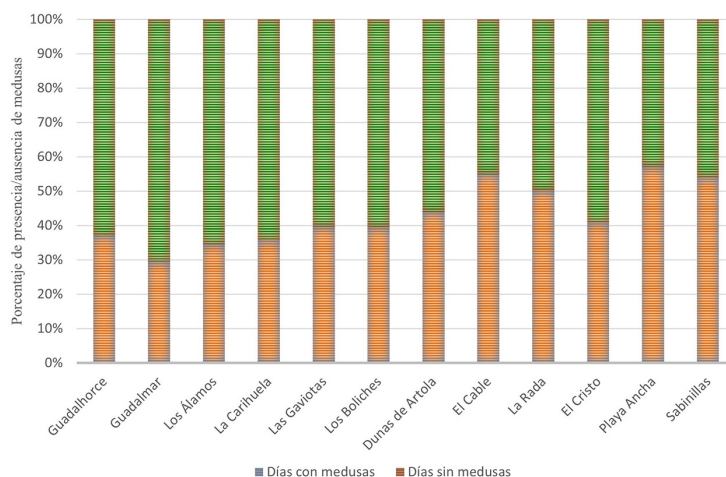


Fuente: InfoMedusa, 2020. Elaboración propia

Sin un patrón de continuidad, se pueden distinguir tres niveles de presencia de medusas: inferior a la media considerada (playas de Guadalhorce, Los Álamos, La Carihuela y La Rada), playas en la media considerada (Las Gaviotas, El Cable, El Cristo, Playa Ancha y Sabinillas) y playas con valores superiores a la media considerada (Los Boliches y Dunas de Artola).

Una vez comprobado que con el cálculo de intervalos regulares no se aprecia de manera conveniente las diferencias entre playas, para una mejor apreciación de las diferencias entre playas y en un intento de homogeneizar los datos de presencia de medusas, se ha optado por la realización de intervalos relativos al máximo y mínimo porcentaje de la muestra. El resultado del análisis previo comparativo entre datos registrados de presencia y ausencia de medusas en base 100 se puede ver en la Figura 9.

Figura 9. Porcentaje de presencia/ausencia de medusas por playas. Datos relativos



Fuente: InfoMedusa, 2020. Elaboración propia

Los resultados de los cálculos relativos de los días con medusas se presentan en la Tabla 10, en la cual se resaltan los valores superiores a la media.

Tabla 10. Porcentaje de días con medusas con intervalos relativos a la muestra de la zona de estudio

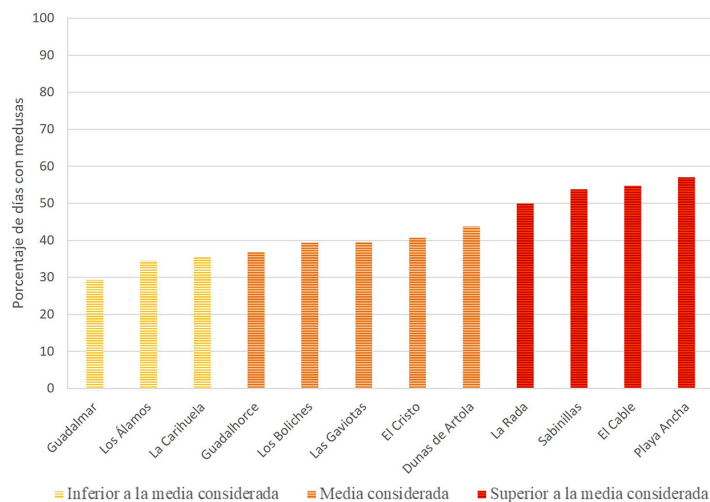
Playa	Presencia de medusas
Guadalhorce	36,84
Guadalmar	29,37
Los Álamos	34,48
La Carihuela	35,61
Las Gaviotas	39,58
Los Boliches	39,38
Dunas de Artola	43,75
El Cable	54,74
La Rada	50,00
El Cristo	40,74
Playa Ancha	57,03
Sabinillas	53,79
Σ	515,32
\bar{x}	42,94
σ	8,95
$1/2 \sigma$	4,48

Elaboración propia

En el análisis del porcentaje de días con medusas con intervalos relativos a la muestra de la zona de estudio se han definido tres intervalos. En la Figura 10 se representan los resultados ordenados de menor a mayor y por tonalidades de color. En este análisis se observan, a grandes rasgos, menos diferencias entre playas que en la ponderación por superficies. De entre los intervalos definidos, como playas con menos presencia de medusas, se encuentran Guadalmar, Los Álamos y La Carihuela. A continuación, en el intervalo intermedio se presentan cinco playas, estas son, Guadalhorce, Los Boliches, Las Gaviotas,

El Cristo y Dunas de Artola. En el último intervalo, con más días de medusas por playas, están La Rada, Sabinillas, El Cable y Playa Ancha.

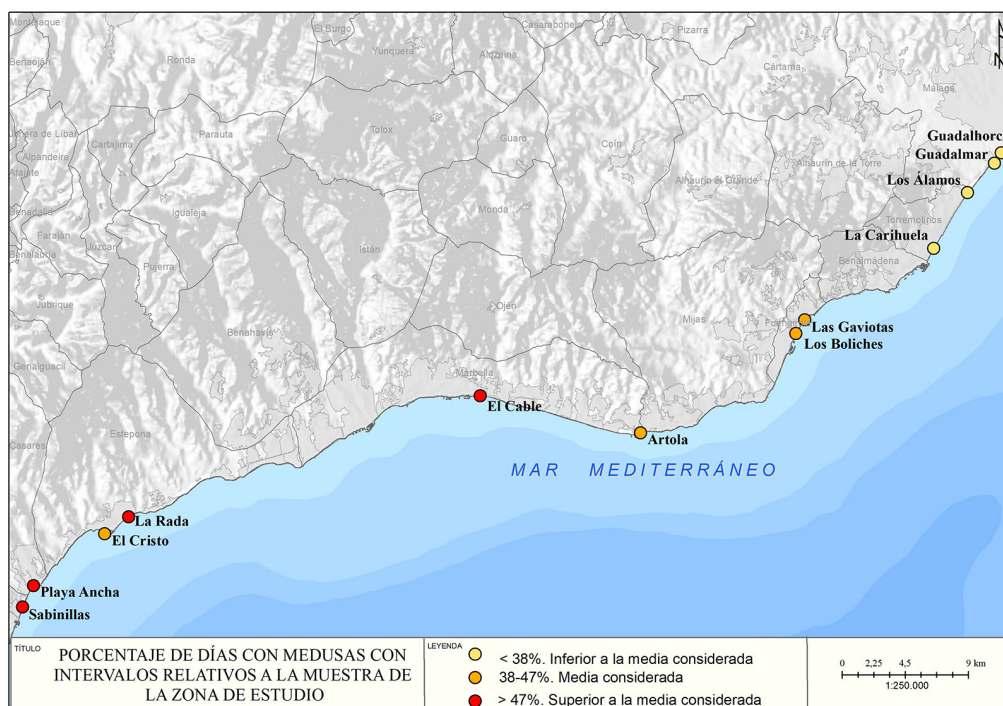
Figura 10. Porcentaje de días con medusas por playa con intervalos relativos a la muestra de la zona de estudio



Fuente: InfoMedusa, 2020. Elaboración propia

El análisis con datos porcentuales relativos permite observar, con mayor claridad, un patrón de distribución espacial de la peligrosidad bastante definido, con una disposición este-oeste en la que aumenta progresivamente la presencia de medusas (Figura 11).

Figura 11. Intervalos con datos relativos de presencia de días con medusas por playas



Fuente: InfoMedusa, 2020. Elaboración propia

4. Discusión

La bibliografía sobre los ciclos de aparición de floraciones de medusas en el mediterráneo y su llegada a la costa está poniendo de manifiesto un acortamiento progresivo de los ciclos. La mayoría de los autores, a la hora de buscar causas explicativas al incremento de la frecuencia en zonas costeras, han trabajado

a escala regional. Entre las causas aludidas para esta tendencia, se citan la presión antropogénica sobre las zonas litorales y su impacto directo en los mares y océanos (Condon *et al.*, 2013; Duarte *et al.*, 2013; Purcell, 2011). Otros autores apuntan como los efectos del cambio climático inciden directamente en este hecho (Purcell, 2011) con lo que podría entenderse que es un efecto global y común en todo el entorno Mediterráneo.

El motivo del presente estudio es observar si existen diferencias apreciables entre áreas, ante un hecho universal, en esta tendencia generalizada al aumento de frecuencia y severidad de las floraciones de medusas, en cuyo caso las razones de la variabilidad entre zonas habría que investigarlas en las características estructurales de la costa. Se considera fundamental entender el comportamiento de estas floraciones de medusas, ya que afectan negativamente a actividades relacionadas con estos espacios litorales como la pesca, la acuicultura o el turismo (Richardson, Bakun, Hays y Gibbons, 2009).

Para analizar la incidencia y severidad se ha utilizado una aplicación de registro de medusas, InfoMedusa, abordando el problema mediante la colaboración de la población, la cual aporta, en esta y otras materias, conocimiento con uso científico que puede ser incorporado en las políticas públicas y, en este caso particular, puede ayudar en la implantación de medidas preventivas y/o paliativas del riesgo. Además, la contribución de la ciudadanía, puede ser muy beneficiosa para la comunidad, ya que siente formar parte del proceso (Danielsen, Burgess, Jensen y Pirhofer-Walzl, 2010). Los resultados que aportan este tipo de metodologías se equiparan a otro tipo de técnicas, más tradicionales, en las que intervienen profesionales del tema en cuestión, lo que argumenta a favor de esta técnica en estudios científicos (Cohn, 2008; Irwin, 1995; Theobald *et al.*, 2015). Silvertown (2009) matiza la utilidad de esta técnica de investigación, indicando la necesidad de validar los datos que aporta el público participante y la necesidad de un buen diseño y estandarización para que los resultados no pierdan calidad.

En lo que se refiere a la calidad de la fuente utilizada en la investigación en relación a otras fuentes con similar aplicación, un análisis comparado de las prestaciones y limitaciones permite observar ventajas notables de InfoMedusa sobre otras opciones. Sus principales ventajas son la totalidad de observaciones por playa que aporta y la extensión temporal de los registros válidos (periodo 2015 a 2020). Como inconveniente puede mencionarse la detallada labor de interpretación de los datos que requiere, hecho que se relaciona con el carácter libre de las observaciones y comentarios que conforman la base de datos. Estas características exigen una labor extensa de traducción de los comentarios libres de la ciudadanía, para interpretarlos y obtener resultados útiles para el propósito del inventario.

Existen investigaciones, en el marco del litoral andaluz, que toman como referencia otras fuentes de información, cuya calidad y criterios de homogeneización es discutible (Rubio y Gutiérrez, 2020). Entre las otras aplicaciones y bases de datos de medusas disponibles en la Costa del Sol se encuentra la proporcionada por la Red de Información Ambiental de Andalucía (Rediam), que ofrece una disponibilidad temporal que abarca desde 1994 a 2017, para toda la costa andaluza. Esta base de datos podría, a priori, considerarse complementaria a InfoMedusa, ya que comienza con anterioridad a la serie 2015-2020 con la que se ha trabajado en este estudio. Un análisis de detalle de la fuente, sin embargo, descarta esta expectativa ya que Rediam, que se basa en la investigación de Prieto y Navarro (2013), no trabaja con datos en tiempo real proveniente de visitantes, lo que se traduce en un menor volumen de información. La aportación de tan sólo 12, 7 y 2 avistamientos en los años concurrentes de ambas bases de datos, esto es 2015, 2016 y 2017 respectivamente, se muestra como claramente insuficiente para la pretensión del presente estudio. Otra limitación de esta base de datos es que, además, carece de actualización, ya que está activa sólo hasta 2017.

Mayor similitud en prestaciones a InfoMedusa tiene la aplicación Medusapp, que aporta datos diarios y opera en el ámbito espacial requerido en este trabajo. Uno de los aspectos negativos de esta aplicación es el intervalo de años que comprende, que comienza en 2018, lo que la limita en este aspecto, además de que los registros u observaciones que muestra sean mucho menos abundantes. Si comparamos el año 2018, que constituye el que más avistamientos posee en ambas aplicaciones, la diferencia de datos es considerable, ya que Medusapp contiene 194 comentarios en comparación a los 98.004 de InfoMedusa, en ambos casos para el conjunto del tramo occidental de la Costa del Sol. Otras aplicaciones similares como MedJelly, Grumering u Oboradar operan fuera del ámbito de análisis, por lo que se descarta en un primer momento como fuentes de trabajo.

El análisis comparado de las prestaciones ofrecidas por la base de datos utilizada respecto a las otras fuentes mencionadas muestra con claridad que, a pesar de sus inconvenientes, las posibilidades que ofrecen los datos de InfoMedusa para el análisis de detalle de la frecuencia de avistamientos en la costa es incuestionablemente de mejor calidad. En este contexto, el inventario resultante de la presente investigación constituye una aportación especialmente valiosa, dada la inexistencia de una fuente de similar calidad y características en la zona de estudio.

Tanto InfoMedusa como Medusapp, registran los datos a nivel de playa. El desarrollo del trabajo ha mostrado que el uso de la playa como unidad de trabajo básica para la representación y cálculo estadístico de la peligrosidad presenta ventajas e inconvenientes. El principal inconveniente es la extensión variable de la misma, hecho que distorsiona la interpretación de la alta o baja frecuencia de avistamientos, dado que no se parte de un espacio potencial de frecuentación de usuarios similar. La base de datos de Rediam, por el contrario, al obtener los datos mediante recopilación de información y el procesado de imágenes de satélite, carece de este tipo de problemática. Sin embargo, como ventaja fundamental del uso de la playa como unidad de trabajo, puede señalarse que constituye un marco para la evaluación y cartografía de la susceptibilidad, coherente con la unidad fisiográfica, geomorfológica y funcional litoral básica, y facilita, por ello, la interpretación de las relaciones entre el patrón de comportamiento espacial de las medusas con las causas precisas que lo puedan estar generando.

En lo que se refiere a la periodicidad de la toma de datos y la duración del periodo disponible, la fuente de datos explotada e inventariada ofrece una secuencia más sistemática que Medusapp y Rediam, con un ritmo menos frecuente y un periodo de datos menor, en el caso de Medusapp y poco actualizado con respecto a Rediam.

Por último, con respecto al formato de información ofrecida por estas tres fuentes, la más operativa es, sin lugar a dudas, Rediam, que ofrece datos en formato *Shape* (.shp) de fácil manejo y tratamiento mediante Sistemas de Información Geográfica (SIG). Medusapp, por su parte, requiere la captura de datos procedente de la aplicación y su tratamiento para poder importarlos al SIG, tarea que se realizó para verificar su utilidad en el estudio y cuyo uso se descartó por la insuficiente suma de registros anteriormente comentada. Por último, la base de datos de InfoMedusa, si bien es la más amplia con diferencia, también es la más exigente en dedicación y necesidades de tratamiento de los datos brutos (comentarios cualitativos en formato libre).

Por consiguiente, aunque la escala de trabajo sea similar en estos tres casos analizados, tanto el intervalo temporal como la disponibilidad y calidad de los datos, descarta a Rediam y Medusapp como fuente sistemáticas para comprender el comportamiento espacial de las medusas. A partir de la observación comparada de las potencialidades y limitaciones de la fuente de datos, puede afirmarse que el inventario de datos obtenido a partir de su explotación constituye, por sus características, una aportación valiosa y excepcional en el contexto de trabajo, fiable para generar indicadores de distribución espacial del fenómeno.

Respecto a los indicadores calculados para evaluar la propensión de las distintas playas a recibir medusas, como se ha comentado, se ha constatado en los mismos una limitación relativa a la diferencia de tamaño de la unidad espacial de observación (la playa) y la posible diferencia asociada a su frecuentación por usuarios. Este hecho puede proporcionar una interpretación confusa de la alta o baja presencia de días con medusas, ya que el dato puede estar motivado por una alta o baja frecuentación de usuarios en la playa. Para aquilatar este problema, se ha propuesto el indicador *Número de días con medusas ponderado por la superficie de la playa y Número de días sin medusas ponderado por la superficie de la playa*. Mediante la ponderación por la superficie se ha intentado suavizar el hecho probable de que los valores altos de *días con medusas* de una playa estén motivados por la alta frecuentación de usuarios en la misma. Se ha considerado una relación directa entre la extensión de la playa y la frecuentación de usuarios. Este factor de ponderación se ha ajustado con un coeficiente de minoración (superficie de la playa* 0,5) en los casos en los que la playa esté muy alejada de los circuitos de acceso urbano. Se intenta discriminar, de esta forma, las playas de grandes dimensiones urbanas (alto potencial de frecuentación tanto por el espacio disponible como por la cercanía a la ciudad como punto emisor de usuarios), respecto a las grandes playas alejadas de la ciudad y poco frecuentadas. En cualquier caso, en avances futuros de la investigación, se están calculando indicadores empíricos de frecuentación de las playas para afinar la representación del dato estadístico. Otros estudios han intentado resolver el problema de la homogeneización de datos planteado a través de distintas soluciones. En este sentido, Rubio y Gutiérrez (2020) elaboran una cartografía de los avistamientos basada en una cuadrícula de 5x5 km sobre la que representan la cuantificación de las medusas. Este procedimiento puede ser apropiado para la escala de su investigación, ya que la unidad espacial de cálculo y representación es el municipio, pero no sería útil para el trabajo a nivel de playa. En otro estudio en la costa catalana, Benedetti-Cecchi *et al.* (2015) estudian los brotes de medusas por año, es decir, se analiza el patrón temporal, no el espacial, lo que hace innecesario calibrar los datos por áreas.

Los resultados estadísticos y cartográficos obtenidos permiten deducir que la distribución espacial de la llegada de medusas a la costa no presenta un patrón aleatorio en las playas del tramo estudiado. Al analizar los resultados en su conjunto, se aprecia una clara tendencia al aumento de los avistamientos de medusas conforme se avanza hacia las playas más occidentales, siendo éstas por lo tanto las que presentan una mayor peligrosidad de afección por medusas. En el lado opuesto, las playas más orientales disfrutaban de más registros de ausencia de medusas, siendo, por consiguiente, menos proclives a su presencia.

Algunos autores han avanzado en la búsqueda de un patrón espacial de la distribución de los enjambres. A una escala regional, de mucho menos detalle, Canepa *et al.* (2014) atribuyen los avistamientos costeros en el mar Adriático a la dirección y velocidad del viento y al efecto de las mareas, ya que se trata de aguas costeras poco profundas, lo que favorece grandes acumulaciones de medusas. Estos mismos autores, en un estudio del litoral de Cataluña, concluyen que, si bien las observaciones de presencia de medusas están extendidas a lo largo de toda la costa, tienen a concentrarse con mayor frecuencia en las playas cercanas a los cañones submarinos, que actúan como “superautopistas” desde las aguas más profundas. A escala de la Costa del Sol, Gutiérrez-Estrada *et al.* (2021) identifican, al igual que Canepa *et al.* (2014), la velocidad y la dirección del viento como factores clave que determinan el momento y la intensidad de la llegada de las medusas a las playas. En el mismo entorno geográfico, Rubio y Gutiérrez (2020), que analizan la totalidad de la costa andaluza, relacionan una posible causa de los avistamientos con accidentes geográficos como bahías, ensenadas y costas altas con presencia de calas. Estos autores identifican la localización hacia levante, en el tramo que se extiende desde el municipio malagueño de Torrox hasta Motril en Granada como el más proclive a recibir medusas. En nuestro estudio, sin embargo, no se percibe esta tendencia, sino la contraria, en la que la peligrosidad de las playas aumenta hacia el oeste. Posiblemente motivado por el mayor nivel de detalle de nuestro estudio, puede observarse una explicación coherente a estos hechos, en principio, contradictorios. Debido a la propia incurvación del litoral mediterráneo andaluz, las playas que muestran una mayor propensión en nuestro análisis se posicionan en las franjas de costa orientadas al flujo de levante, desde dónde los estudios más generales afirman que provienen los enjambres, que se trasladan hacia la orilla desde el mar de Alborán (Bellido *et al.*, 2020).

A nivel de detalle, un análisis preliminar de la distribución espacial observada en nuestro estudio, permite asociar la distribución la mayor frecuencia de avistamientos de medusas a una serie de factores que pueden estar actuando como condicionantes. Más que la localización hacia el sector oriental de la costa, se han identificado como posibles causas de la mayor peligrosidad de algunas playas aspectos como su orientación sureste, el mayor ángulo de apertura de la playa y la ausencia de una protección lateral de la playa respecto al flujo de levante. Según se ha constatado, las playas de ángulo más abierto y orientadas hacia el este y sudeste, presentan una mayor frecuencia de enjambres. Este hecho pone de manifiesto que, cuando el análisis se realiza a nivel de detalle, la orientación de la embocadura de la playa hacia la zona de procedencia predominante de los enjambres, puede determinar la susceptibilidad, en mayor medida, que la propia localización de la playa. De las playas muestreadas en este estudio, El Cristo, más cerrada y con una orientación suroeste, que además se encuentra resguardada del flujo de levante por una barra de protección lateral en su extremo este, presenta un menor grado de peligrosidad que las de su entorno.

La hipótesis que explica la distribución de la peligrosidad observada, como resultante de la orientación del tramo de costa en el que se ubica la playa y su apertura al flujo de levante, se comprueba, igualmente, al analizar el sector oriental del tramo analizado, que presenta playas menos proclives a la aparición de medusas. La protección frente al viento del este que le otorga la propia bahía de Málaga, abierta hacia el poniente, puede explicar esta menor propensión en las playas más orientales. Los valores más bajos de frecuencia de medusas en este sector costero también podrían relacionarse con la proximidad de las playas a fuentes de aporte de agua dulce, debido al río Guadalhorce. Autores como Bellido *et al.* (2020), citan la posible incidencia de este variable en la distribución espacial de las floraciones de medusas en el litoral y su llegada hasta las zonas de playa desde mar adentro.

5. Conclusiones

La base de datos ofrecida por InfoMedusa proporciona una información esencial en lo que se refiere al conocimiento y gestión del problema de la afección por medusas. Su uso con propósitos científicos, no obstante, requiere de un tratamiento detallado y profuso de la información bruta para, después de un proceso de depuración y filtrado, obtener datos fiables. Sus potencialidades como fuente para el análisis del patrón espacial de afección de medusas en el litoral se muestran superiores a las ofrecidas por otras bases de datos de propósito similar, que resultan muy insuficientes. En este contexto, el inventario de datos aportado en la investigación adquiere una especial relevancia, dado la inexistencia de inventarios de datos de similares prestaciones en el ámbito costero andaluz.

La variabilidad en los resultados de presencia o ausencia de medusas entre las distintas playas a lo largo del periodo analizado permite afirmar que existe un patrón de distribución de la peligrosidad no aleatorio. La pauta de distribución observada refleja una tendencia al aumento de la presencia de medusas conforme la playa se localiza en sectores más occidentales de la zona de estudio. Factores como la orientación abierta de las playas más proclives hacia las corrientes provenientes de levante, por la orientación general de la costa, puede relacionarse con el incremento de la susceptibilidad en las playas en el sector occidental de la zona de análisis. La orientación a sotavento respecto a los flujos de levante de las playas

más orientales puede explicar, de igual modo, la menor frecuencia de medusas en estas playas. Este patrón espacial no aleatorio y la coherencia general, entre el modelo de distribución espacial de la aparición de enjambres y factores explicativos asociados a la morfología y funcionamiento del litoral, permiten observar, a pesar de sus limitaciones, la potencialidad como fuente del inventario que se ha elaborado, así como la validez de los indicadores de peligrosidad.

El comportamiento diferenciado de las playas objeto de estudio, que se ha constatado en este trabajo, anima a plantear futuras hipótesis, más complejas, en lo que se refiere a otros posibles factores subyacentes al patrón de susceptibilidad observado, que puedan estar causando las diferencias de afección, para avanzar hacia la generación de un modelo predictivo. La explotación de los datos sobre presencia de medusas y la metodología de análisis aplicada en la investigación, han permitido concluir aportaciones de carácter inédito y de interés para el análisis de la afección de medusas en el litoral. Los resultados ofrecen una base de partida sólida para extender el área de estudio e indagar con mayor profundidad en la identificación de factores condicionantes, al objeto de realizar cartografías predictivas de la susceptibilidad en otras zonas costeras.

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Fuerzas centrífugas y centrípetas en el Pacífico Sur de Costa Rica: los impactos de la expansión agroindustrial

Centrifugal and centripetal forces in the South Pacific territory of Costa Rica: the impacts of agroindustrial expansion

Yazmín León Alfaro^{1*} 
Frank González Brenes² 
Nieves López Estébanez³ 

Resumen

Dentro del contexto Centroamericano, la región Pacífico Sur de Costa Rica destaca por su riqueza cultural y biológica; pero también por la manifestación de los impactos negativos de la expansión agroindustrial. Históricamente, esta región se ha visto marginada respecto al núcleo geo-histórico del país, y se ha caracterizado por el rezago socioeconómico y deterioro ambiental. En este sentido, en la presente investigación interesa abordar el caso de la región del Pacífico Sur como una región periférica y transfronteriza, que evidencia el impacto que han tenido las políticas y estrategias del Estado costarricense para el desarrollo nacional, en la configuración de los sistemas productivos regionales. A partir de un trabajo de campo que comprendió entrevistas en profundidad y observación directa, más la consulta de fuentes bibliográficas, estadísticas de agroproducción e indicadores socioeconómicos diversos, se analiza la incidencia de los agromodelos vigentes en la región. Como resultado, se sintetizan las principales fuerzas centrífugas y centrípetas que se asocian al rezago socioeconómico y a los desequilibrios territoriales manifestados en el territorio. Finalmente, se proponen posibles rutas de acción para superar los desequilibrios imperantes, destacando la agricultura familiar como un modelo productivo más sostenible y acorde a las características socio ecológicas regionales.

Palabras clave: Agromodelos; periferias; Pacífico Sur; Costa Rica.

Abstract

The South Pacific region of Costa Rica stands out for its cultural and biological richness in Central America. By contrast, this area is remarkable for the negative impacts of agroindustrial development. Throughout history this region has been marginalized with respect the geo-historical centre of the country. Socio-economic backwardness and environmental degradation are some of the region's main features. The research analyses the South Pacific region as a peripheral and cross-border region. This area is included within the policies and strategies of the Costa Rican state for national development and the configuration of regional production systems. The management and consequences of the current agri-models in the region are analysed by different methods. Fieldwork method includes in-depth interviews and direct observation. In addition, we have used bibliographic sources, statistics of agri-production, and socioeconomic indicators.

1 Centro de Investigaciones sobre Diversidad Cultural y Estudios Regionales (CIDICER), Sede de Occidente, Universidad de Costa Rica. (Costa Rica). yazmin.leonalfaro@ucr.ac.cr. * Autora para correspondencia

2 Laboratorio de Ecología Urbana, Universidad Estatal a Distancia (Costa Rica). fgonzalez@uned.ac.cr

3 Departamento de Geografía, Facultad de Filosofía y Letras, Universidad Autónoma de Madrid (España). nieves.lopez@uam.es

Information about the main centrifugal and centripetal forces and linkages with the socio-economic deficiencies and the territorial imbalances is summarised. Finally, the work proposes possible courses of action to overcome the prevailing imbalances and encourage a more sustainable production model for family farming and an agro-system better suited to the socio-ecological characteristics of the region.

Keywords: Agri-models; peripheral regions; South Pacific; Costa Rica; Central America.

1. Introducción

1.1. El contexto Centroamericano

Centroamérica es uno de los *hotspots* mundiales en biodiversidad, en la que se estima una extensión de la vegetación primaria de 231.000 km² con un 59,9% de ese territorio protegido (Myers, Mittermeier, Mittermeier, Da Fonseca y Kent, 2000). Sin embargo, entre 1990 y 2012, la deforestación aumentó un 9%, evidenciando la necesidad de esfuerzos para conservar este patrimonio natural de enorme interés (Salido, 2015). Uno de los cambios más importantes de los últimos años, concretamente en el ámbito Centroamericano, es la expansión de los cultivos industriales (Quesada, 2007; Valverde, Rodríguez y Mora, 2018); siendo para 2017 los más importantes por valor de exportación el café (US\$2.928 millones), la caña de azúcar (US\$722 millones), y la palma aceitera (US\$191 millones). Es preocupante la expansión de los cultivos comerciales en toda la región, principalmente el banano (US\$2.594 millones) (Central America Data, 2019); seguido de la piña, producto del que sólo Costa Rica exportó en 2019 US\$930 millones (CANAPEP, s.f.).

En contraste con los grandes cultivos comerciales como la piña, el banano y la palma, esta región es una de las más importantes en el desarrollo y mantenimiento de la agricultura familiar (Gómez, Le Cop y Samper, 2014). Según el informe de CEPAL/FAO/IICA (2013) la agricultura familiar en América Latina y el Caribe alcanzan cerca de 17 millones de unidades productivas e incluye a 60 millones de personas, siendo este sistema cercano al 75% del total agrícola. Estas cifras resultan aún más interesantes para el área de Centroamérica y México, donde el porcentaje de unidades familiares en proporción al número total de establecimientos es del 78,6% siendo el número de unidades familiares casi de 6 millones. Costa Rica es el tercer país, después de México y Guatemala en número de personas que mantienen este sistema (79.000) (Schneider, 2016). Estas cifras ponen de manifiesto el interés especial que tiene este tipo de agricultura, aunque constituye un grupo muy heterogéneo en América Latina y El Caribe, que en términos generales posee poca tierra y los más bajos ingresos en el ámbito laboral rural (Comisión Económica para América Latina y el Caribe [CEPAL], 2019). Industrial o familiar, la frontera agrícola en Centroamérica sigue siendo muy activa, experimentando un incremento de 2,5% de la producción las dos últimas décadas (OECD-FAO, 2019). Resulta particularmente preocupante el caso del avance de la agroindustria de monocultivos, dado que los frentes colonizadores están amenazando los Espacios Naturales Protegidos (ENP) y ecosistemas boscosos remanentes (Shaver *et al.*, 2015). Esta situación es paradójica en una región con tanta biodiversidad y recursos naturales, pues las prácticas poco sostenibles de aprovechamiento de recursos están erosionando su patrimonio natural (Algeet-Abarquero, Marchamalo, Bonatti, Fernández-Moya y Moussa, 2015; International Union for Conservation of Nature [IUCN], 2017).

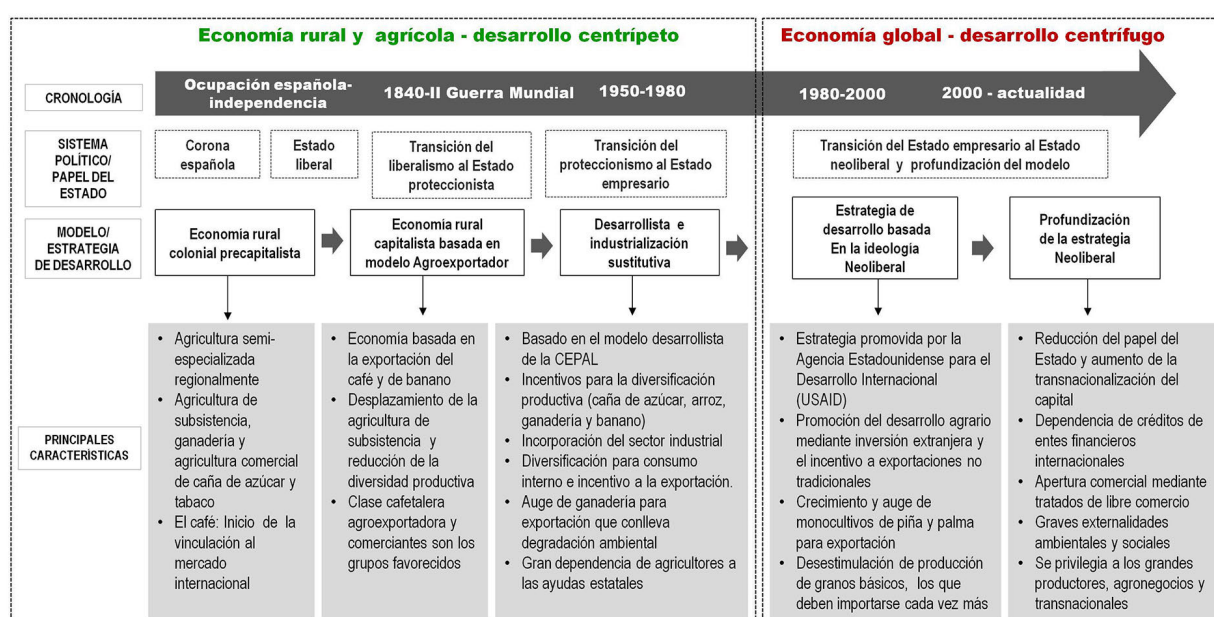
Por otra parte, estos procesos están llevándose a cabo en regiones periféricas y/o transfronterizas, alejadas de los centros de administración y gestión, en un contexto de escasas infraestructuras terrestres para la movilidad que afecta el acceso y la calidad de los servicios básicos y en general las condiciones socioeconómicas de la población (Bonilla, 2008; Medina, 2004). La deficiente comunicación terrestre con las capitales y centros administrativos (Durango *et al.*, 2019), ha favorecido un deficiente control nacional en la explotación de recursos naturales, mientras grandes multinacionales agroindustriales se instalan en las áreas periféricas, ocupando el lugar de dinamizadores de la economía local, dadas las condiciones de pobreza y desempleo de estas regiones (Rodríguez, 2014). La escasa preocupación por el establecimiento de políticas integrales de desarrollo rural en estas regiones periféricas y/o transfronterizas de los países del Istmo Centroamericano ha abierto la puerta a una serie de fuerzas centrifugas y centripetas que actúan en las regiones rurales de esta área, generando intensas incertidumbres socioambientales (Consejo Agropecuario Centroamericano [CAC], 2010; Durango *et al.*, 2019).

En Costa Rica, al agotarse la frontera agraria, inició un proceso de transición hacia un nuevo modelo agrícola (Bartels y Araya, 2010; Botella, 2010), donde la inversión transnacional asumió un rol protagonista en el desarrollo territorial, dada la carencia de un plan de desarrollo claro por parte del Estado, en

particular para las regiones periféricas y rurales, como la región del Pacífico Sur (Amador *et al.*, 2011; Carmack, 1994).

La evolución de los modelos de desarrollo en el país (Figura 1) ha tendido hacia una “economía hacia afuera”, regida por las reglas del comercio internacional en el ámbito agropecuario. Ello, ha implicado que las políticas internas concuerden con las regulaciones e intereses internacionales (Botella, 2010; GFA Consulting Group S. A., 2010). Bajo ese modelo, el país buscó posicionarse en la economía mundial por medio de cultivos como el café (Fernández, 2003; Hall, 1976; Vargas y Mora, 2017) y más adelante con el banano y la expansión ganadera (Arroyo y León, 2017; Molina, 2005). La dependencia excesiva de unos pocos cultivos de exportación sometió a la economía nacional a una gran inestabilidad, determinada principalmente por las fluctuaciones de los precios internacionales del café (Fernández Arias, 2003; Vargas, 2015) y se produjeron efectos ambientales adversos, convirtiendo una gran cantidad de tierras agrícolas a pastizales y provocando una disminución de la cobertura boscosa de forma muy significativa (De Camino, Villalobos y Morales, 2015; Sánchez-Azofeifa, 2015).

Figura 1. Estrategias y modelos de desarrollo en Costa Rica y su evolución temporal



Fuente: Basado en Vargas (2015); Molina (2005). Elaboración propia

Ante esta situación, el Estado procuró promover el desarrollo endógeno mediante una mayor diversificación productiva interna y la exportación (Bartels y Araya, 2010; León, 2012), ampliando la estructura económica a través de la industrialización, el desarrollo de infraestructuras, la nacionalización bancaria, la educación, la salud, los créditos, etc. (Arias y Muñoz, 2007; Bartels y Araya, 2010; Botella, 2010; González, 1993; Vargas, 2015). Todo esto en el marco de la estrategia desarrollista y de sustitución de importaciones de la región, y con la intención de integrar el Mercado Común Centroamericano (Abarca y Ramírez, 2016; Vargas, 2015). La integración Centroamericana no prosperó y se generó una alta dependencia de los pequeños agricultores a las ayudas del Estado, una baja vinculación con la agroindustria (Castillo, 2006; Sáenz, 2002) y el aumento de la importación de insumos agrícolas.

En la década de 1980, Centroamérica cae en una severa crisis fiscal y de estancamiento económico generalizado (Arias y Muñoz, 2007; Sáenz, 2002), ante la que el Fondo Monetario Internacional (FMI) y el Banco Mundial plantean una serie de medidas reestructurantes (Programas de Ajuste Estructural, Agencia Estadounidense para el Desarrollo Internacional) (Arias y Muñoz, 2007; González, 1993), atrayendo capital extranjero y la transnacionalización de la producción agraria. Entran ahora en escena productos nuevos como los cítricos, la piña y la palma aceitera (Botella, 2010) privilegiando la agroindustria, en buena parte financiada por capital extranjero (Arias y Muñoz, 2007). Bajo la ideología neoliberal, a partir de 1980, la economía nacional se ve cada vez más sujeta a las leyes del mercado internacional y de los

tratados de libre comercio. Además, se genera una expansión creciente de plantaciones de piña y palma aceitera, altamente dependientes de pesticidas, y con externalidades ambientales sumamente negativas (Echeverría-Sáenz *et al.*, 2012; Galt, 2020; Lawrence, 2010).

1.2. Modelos de desarrollo y su impacto en la agroproducción en el Pacífico Sur

Las estadísticas productivas evidencian los cambios ocurridos en la agricultura y unidades productivas, en relación con los sucesivos modelos y estrategias de desarrollo en el país, particularmente en la región del Pacífico Sur. Son los censos agropecuarios nacionales de 1973, 1984 y 2014 del Instituto Nacional de Estadística y Censos [INEC] los que permiten identificar el peso creciente que tienen los monocultivos de exportación de piña y palma aceitera (Tabla 1).

Tabla 1. Agroproductividad nacional y del Pacífico Sur, según censos agropecuarios nacionales de 1973, 1984 y 2014

Período censal	1973			1984			2014		
	Nacional (Ha)	Pacífico Sur (Ha)	Tasa de aporte	Nacional (Ha)	Pacífico Sur (Ha)	Tasa de aporte	Nacional (Ha)	Pacífico Sur (Ha)	Tasa de aporte
Palma aceitera	5.060,0	4.127,0	81,6%	16.830,0	8.021,0	47,7%	66.420,0	18.645,0	28,07%
Piña	736,0	259,0	35,2%	2.474,0	1.106,0	44,7%	37.659,6	7.144,0	18,97%
Banano	36.153,8	10.051,9	27,8%	32.319,2	5.061,0	15,7%	51.758,0	1.268,7	2,45%
Café	83.405,9	13.718,1	16,4%	89.880,4	14.567,1	16,2%	84.133,1	22.730,0	27,02%
Caña de azúcar	38.760,4	1.630,6	4,2%	47.280,0	2.253,0	4,8%	65.061,9	4.570,0	7,02%
Arroz	65.456,0	17.134,8	26,2%	86.439,0	11.892,0	13,8%	58.539,7	13.427,8	22,94%
Producción pecuaria (cabezas de ganado)									
Ganadería de Leche	130.930,0	n.d.	n.d.	383.188,0	120.089,0	31,3%	327.130,0	14.810,0	4,53%
Carne/leche y carne	1.693.942,0	n.d.	n.d.	2.035.535,0	260.077,0	12,8%	1.272.852,0	139.017,0	10,92%
Porcino	215.972,0	41.166,0	19,1%	282.527,0	43.741,0	15,5%	435.243,0	52.574,0	12,08%

n.d.= no disponible

Fuente: Arroyo y León (2017); Instituto Costarricense del Café (ICAFE) (2019). Elaboración propia

El cultivo de palma aceitera tuvo sus inicios en el Pacífico Sur en 1964, como respuesta a la crisis del banano en los cantones de Golfito y Corredores (Ministerio de Agricultura y Ganadería [MAG], 2007). En 1973, a escala nacional, se cultivaban 5.060 ha y aumentó a 16.830 ha en 1984, y a 18.645 ha en el 2014. Sin embargo, en 2018 la región Sur aumentó el área cultivada a 48.880 ha, el equivalente al 71,7% del total del área cultivada a escala nacional. Corredores, Osa y Golfito, en el área baja, presentaban las mayores extensiones de área cultivada de palma aceitera: 26.280 ha, 11.822 ha y 8.100 ha, respectivamente. En el sector alto, Buenos Aires y Coto Brus, tenían las menores áreas de cultivo: 2.378 ha y 300 ha, respectivamente (Arroyo y León, 2017). Comparativamente, entre 1973 y el 2014 el área cultivada de palma aceitera en la región casi se cuadruplicó (Tabla 1). De forma similar sucedió entre el 2014 y el 2018. Tal es el auge de este cultivo que, de enero a noviembre de 2019, Costa Rica fue el segundo exportador de aceite de palma en Centroamérica (US\$58 millones) (Central America Data, 2020). En cuanto a la producción de piña, los datos aportados por la Cámara Nacional de Productores y Exportadores de Piña (CANAPEP), indican una extensión de 44.500 ha cultivadas con piña en el país, de las que un 19% están en el Pacífico Sur. Sin embargo, los datos de extensión del cultivo a escala nacional son inferiores a los registrados por el Monitoreo de Cambio de Uso en Paisajes Productivos (MOCCUP) del PRIAS (Programa de Investigaciones Aero-transportadas y Sensores Remotos e *in situ* [PRIAS], 2019a), quienes estimaron 57.327 ha sembradas con piña en el período 2015-2016 y el registro correspondiente al año 2017 asciende a 66.266 ha, con lo que la cobertura de piña habría aumentado 15,7% en tan solo un año. Los datos de 2018 del MOCCUP indican un total de 65.670,68 ha cultivadas de piña en todo el país, lo que representa 1,29% del territorio nacional. En 2018 la región Pacífico Sur ocupaba el tercer lugar en producción, con el 13% del total del país.

Por otro lado, en cuanto a granos básicos entre 2008 y 2015 Leiva y Vargas (2017) determinaron un aumento del 4,71% en el área cultivada de frijol; en contraposición, una disminución del -2,27% y

-15,63% para los cultivos de arroz y maíz, respectivamente y cuya producción corresponde, principalmente a explotaciones en manos de pequeños productores. Respecto a la producción pecuaria, las tasas de aporte para ganadería de leche, carne y leche y porcina evidencian, en general, una disminución, al comparar los datos agropecuarios de los años 1984 y 2014 (Tabla 1).

1.3. Desigualdades y contrastes socioambientales en el territorio

El Pacífico Sur presenta fuertes desequilibrios en comparación con otras regiones del país (Bartels y Araya, 2010). Las desigualdades se relacionan, en buena parte, con las diferencias culturales y étnicas que, junto al aislamiento, generan condiciones de marginalidad (Solórzano, 1992). La región presenta las mayores desventajas en cuanto a condiciones socioeconómicas, lo cual motiva a muchos de sus habitantes a emigrar, principalmente hacia la región Central o a Estados Unidos (Comité Sectorial Regional Agropecuario [CSRA], 2007; Morales Gamboa *et al.*, 2011). Los datos de INEC (2012) (Tabla 2), muestran que el indicador de población de “pobreza extrema” regional duplica el valor nacional, y triplica el valor para la región Central. Además, la cantidad de “hogares pobres” de la región duplica el valor para la región Central, y supera en 14 puntos porcentuales el valor nacional.

Tabla 2. Situación de pobreza regional comparada (%)

Indicadores	Costa Rica	Región Central	Región Pacífico Sur
Población pobre	23,60	18,60	38,60
Población en pobreza extrema	7,20	4,90	14,60
Hogares pobres	20,60	16,30	34,60
Hogares en pobreza extrema	6,30	4,30	12,90

Fuente: INEC. Encuesta Nacional de Hogares (2012). Elaboración propia

Esta situación de pobreza ofrece las condiciones idóneas para que las redes del narcotráfico establezcan sus nodos en la región (Wrathall *et al.*, 2020). Si bien es cierto que el problema es generalizado en la región, los territorios indígenas y los grandes espacios protegidos, como los Parques Nacionales de Corcovado y La Amistad, y el humedal Térraba-Sierpe, que presentan condiciones topográficas complejas y que dificultan una vigilancia efectiva, se convierten en sitios para ocultar y transportar droga proveniente, principalmente, de Colombia. Corrales (2019), señala que el 25,5% de las plantaciones de marihuana erradicadas entre 2007 y 2018 en Costa Rica estaban ubicadas en el Pacífico Sur, siendo el Parque Internacional de la Amistad (PILA) el ENP con el mayor número de plantaciones a escala nacional (81%). Señala ese mismo autor que solamente en el territorio indígena de Rey-Curré se localizó el 13% del total de marihuana erradicada en territorios indígenas a escala nacional.

En congruencia con los datos anteriores, y según Ulate, Mayorga y Alfaro (2017), el Índice de Competitividad Cantonal (ICC) situaba a los municipios de la región en las categorías *Muy baja* o *Baja*. Buenos Aires ocupa el penúltimo lugar, de un total de 81 municipios, habiéndose mantenido en la categoría *Muy baja* de competitividad entre los años 2006 y 2016. Por su parte, Coto Brus, Corredores y Golfito presentan el mismo comportamiento que Buenos Aires, localizándose en la categoría *Muy baja* en estos dos años y ocupando los puestos 76, 74 y 71 del ICC, respectivamente. El municipio de Pérez Zeledón y el de Osa presentan cierta mejoría respecto al resto de la región, sin embargo, se encuentran en la categoría *Baja* del ICC, ocupando los lugares 61 y 47 respectivamente.

En contraste con las actividades extractivistas y los impactos socioambientales asociados, el esfuerzo estatal y privado para la conservación de los recursos naturales es considerable, si se tiene en cuenta que el país pasó de tener una cobertura forestal del 40,8% en 1986, a 51,4% en el 2010, como resultado de sus políticas conservacionistas (Sánchez-Azofeifa, 2015; Sánchez-Azofeifa *et al.*, 2002). Tal esfuerzo es evidente en la región Sur, donde existe una considerable biodiversidad, resguardada mediante numerosas figuras de protección (Tabla 3), que cubren un 23,4% del territorio analizado con más de 423 mil ha. Se han identificado 28 ENP, destacando la presencia de 6 Parques Nacionales, máxima categoría de protección en el país, que cubren un total de 104.402,97 ha y entre los que destaca Corcovado, Marino Ballena, Chirripó, y La Amistad. Entre los humedales sobresale Térraba-Sierpe, que ha recibido la denominación

de Sitio RAMSAR como humedal de importancia internacional (Ministerio de Planificación Nacional y Política Económica [MIDEPLAN], 2014; Sistema Nacional de Áreas de Conservación [SINAC], s.f.). Desde el punto de vista del tipo de gestión de las áreas protegidas presentes en el área, la mayor parte tiene una gestión estatal (223.008 ha), pero destaca la presencia de la gestión mixta (público-privada) en casi 199.000 ha. Este último tipo de gestión se desarrolla en los Refugios Nacionales de Vida Silvestre. Por último, la gestión privada es residual en el área con apenas 1.680 ha y utilizada en tres Refugio Nacional de Vida Silvestre (Tabla 3).

Tabla 3. Espacios Naturales Protegidos de la región Pacífico Sur

Categoría de manejo	Nombre del ENP	Ha	Gestión		
			Estatal	Privada	Mixta
Corredor Biológico	Perteneiente a Sistema Nacional de Conservación- Área de Conservación La Amistad Pacífico (SINAC-ACLAP)	114.930,54			•
	Perteneiente a Sistema Nacional de Conservación - Área de Conservación Osa (SINAC-ACOSA)	49.471,53			•
Humedal	San Vito	43,72	•		
	Lacustrino Laguna del Paraguas	49,58	•		
	Térraba-Sierpe	32.325,0	•		
Parque Nacional	Chirripó	17.160,7	•		
	Corcovado	42.226,3	•		
	Marino Ballena	5.546,01	•		
	Piedras Blancas	14.133,4	•		
	La Amistad	25.264	•		
	Tapantí	72,56	•		
Refugio Nacional de Vida Silvestre	Carate	140,37			•
	Finca Barú del Pacífico	326,62			•
	Golfito	2.868,47			•
	Longo Mai	928,43		•	
	Montana de El Tigre	282,81		•	
	Osa	1.749,44			•
	Pejeperro	2.748,01			•
	Preciosa Platanares	263,23			•
	Punta Río Claro	319,73			•
	Quillotro	66,49			•
	Rancho La Merced	410,15			•
	Río General	470,65		•	
Saimiri	106,9			•	
Reserva Biológica	Isla del Caño	5.527,42	•		
Reserva Forestal	Golfo Dulce	60.678,6	•		
	Los Santos	24.951,4			•
Zona Protectora	Las Tablas	19.981,1	•		
Total (Ha)		423.043,2	223.008,39	1.681,89	198.352,88

Fuente: SINAC-ACLAP y SINAC-ACOSA (2020). Elaboración propia

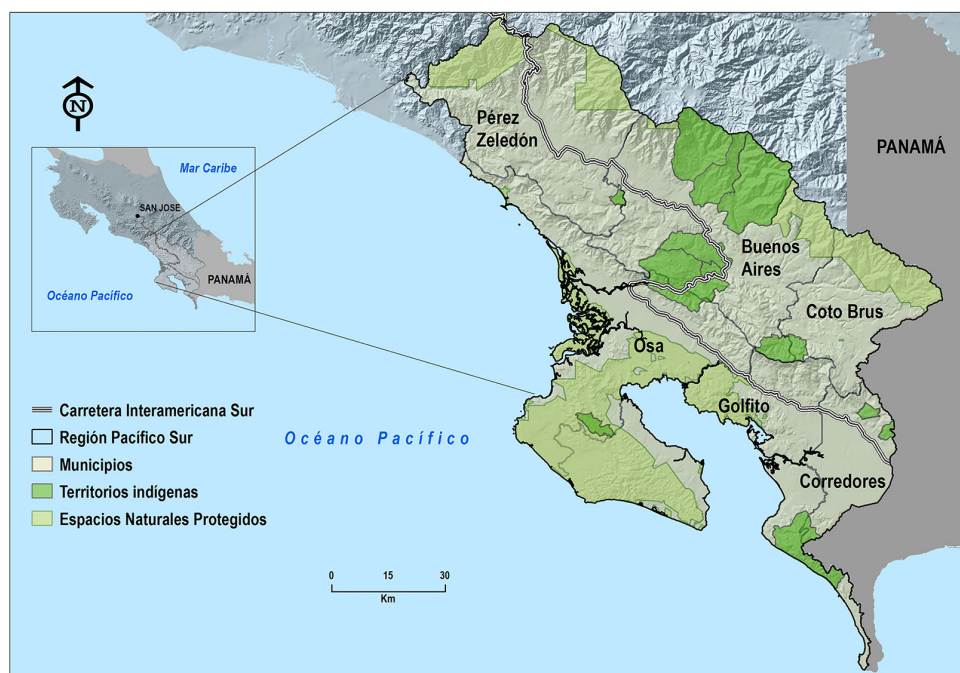
El Pacífico Sur de Costa Rica, es una región periférica y transfronteriza que evidencia el impacto que han tenido las políticas y estrategias del Estado costarricense para el desarrollo nacional, en la configuración de los sistemas productivos regionales y en los cambios socioambientales evidenciados en este territorio (Harvey, Alpizar, Chacón y Madrigal, 2004). Esta investigación trata de resolver los siguientes interrogantes: ¿cómo son los modelos agroproductivos actuales en el Pacífico Sur costarricense? ¿Cuáles son las dinámicas territoriales del agromodelo actual de la región? ¿Cuáles son los puntos débiles y las fortalezas de este sistema? y ¿qué oportunidades pueden ser la base de un desarrollo rural real en el contexto actual?

2. Metodología

2.1. Área de estudio: una periferia en el centro del Istmo

La región del Pacífico Sur tiene una extensión de 9.528,44 km², que corresponde al 18,6% del territorio costarricense (Bartels y Araya, 2010) (Figura 2). De acuerdo al último censo de población del año 2011, en este espacio habitan un total de 328.645 personas, de las cuales el 49,5% corresponde a hombres y el 50,5% a mujeres. Esta población equivale a 7,1% de la población del país. En contraste, la región Central (la más poblada de Costa Rica), contaba en el año 2011 con 2.688.664 habitantes, lo que equivale al 66% de la población total de Costa Rica en tan solo un 16% del territorio nacional (MIDEPLAN, 2014). De igual manera, la densidad de población en la región Sur es baja, ya que es de apenas 34,5 Hab/km², siendo menor a la media nacional (90 Hab/km²); y en el extremo opuesto en la región Central (315 Hab/km²) (MIDEPLAN, 2014). En términos económicos, el ingreso medio por hogar en 2018 se sitúa en US\$1.164 mensuales, disminuyendo un 3,3% respecto al 2017 (INEC, 2018). Todo ello la convierte en la segunda región más pobre del país, con índices de pobreza y pobreza extrema de 29,5%, y 10,4% respectivamente (INEC, 2018).

Figura 2. Ámbito de estudio



Fuente: Bases cartográficas del Atlas del Instituto Tecnológico de Costa Rica (2014). Elaboración propia

La región tiene una fuerte presencia indígena representada por cinco etnias (Bribris, Borucas, Cabécares, Ngâbes y Térrabas), distribuidas en 12 territorios⁴, con un total de 24.972 personas autodefinidas

⁴ Mediante la ratificación en 1993 del Convenio 169 de la Organización Internacional del Trabajo, Costa Rica adopta la denominación de territorio en términos jurídicos y formales, para designar a las tierras reconocidas por el Estado como lugares de asentamiento de los pueblos indígenas. El territorio contempla el derecho colectivo de los pueblos indígenas, no solo a la posesión de la tierra, sino también a los recursos, a la cultura y a la autodeterminación (Centro de Investigación en Cultura y Desarrollo [CICDE], 2014).

como indígenas, lo que corresponde a un 8,22% de la población total de la región (Centro Centroamericano de Población, 2011; INEC, 2011). Además, se suma la población no indígena de distintos orígenes, en su mayoría campesinos provenientes de otras regiones del país, de la región de Chiriquí en Panamá, y de Nicaragua (Amador *et al.*, 2011; Arce, 2014; Carmack, 1994); así como población de origen europeo representada, principalmente, por colonos italianos establecidos en San Vito de Coto Brus (Méndez, 2016; SINAC, 2012).

Administrativamente, la región Sur comprende seis municipios: Pérez Zeledón, Buenos Aires, Corredores, Coto Brus, Golfito y Osa (Figura 2). La principal vía que comunica la región con el centro histórico-geográfico del país (Valle Central), es la carretera Interamericana Sur, la cual se extiende por más de 350 km (6 horas 30 minutos de recorrido entre San José y la frontera con Panamá). Debido a las dificultades históricas de conectividad vial, el territorio de esta región fue uno de los últimos en ser colonizado (Amador *et al.*, 2011; Carmack, 1994; Méndez, 2016; Sandner, 1961). El sector alto de la región mantuvo el aislamiento hasta finales del siglo XIX, cuando el gobierno promovió la creación de una ruta de comunicación desde el Valle Central (Carmack, 1994; Méndez, 2016). Posteriormente, inicia un fuerte movimiento de pioneros provenientes de diversas comunidades de la región Central que se establecen en la región del actual municipio de Pérez Zeledón, para desarrollar actividades agrícolas, principalmente la producción de café (Amador *et al.*, 2011; Arce, 2014; Instituto de Desarrollo Rural [INDER], 2014; Méndez, 2016).

A partir de 1950 se inicia en Coto Brus un proceso planificado de colonización a través del cual se consolida el café como la principal actividad económica (Bartels y Araya, 2010; INDER, 2014; Méndez, 2016). En 1970, en Buenos Aires, comienza el monopolio de la esfera económica a través de la actividad agrícola extensiva para la producción de piña a pequeña escala por parte de la compañía Pineapple Development Corporation (PINDECO) (Amador *et al.*, 2011; Bonatti, Borge, Herrera y Paaby, 2005; Carazo y Aravena, 2016; León, González y López, 2019). El territorio bajo que corresponde a Osa, Golfito y Corredores (Figura 2), con una historia más reciente, se pobló y desarrolló con poca planificación por parte del Estado, con asentamientos que surgen a partir de la influencia que ejerció la Compañía Bananera de Costa Rica (CBCR) (Amador *et al.*, 2011; Bonatti *et al.*, 2005). En la segunda mitad del siglo XX se desarrollan actividades de minería y extracción de madera por la empresa Osa Productos Forestales, con importantes impactos ambientales y conflictos sociales (Amador *et al.*, 2011; Calvo, 2012; van den Hombergh, 1999).

2.2. Métodos

Para el desarrollo de esta investigación, se recopilaron los datos socioeconómicos referidos al Censo Nacional de Población de 2011, del INEC. Además, se utilizaron las bases cartográficas disponibles en el Atlas de Costa Rica del Instituto Tecnológico de Costa Rica (Ortiz-Malavasi, 2014); las bases cartográficas de cobertura de piña y palma aceitera del Laboratorio del PRÍAS (2019a, 2019b); así como capas de información propias, generadas a partir del trabajo de campo, desarrollado entre julio de 2017 y diciembre de 2019, para la toma de datos y para la realización de entrevistas a gestores de espacios protegidos, líderes locales y otros actores. Con todo ello, se elaboró un sistema de Información Geográfica, que dio lugar a una cartografía sintética de las dinámicas detectadas en el territorio.

Se diseñó una muestra de tipo no probabilística, compuesta por 24 informantes seleccionados bajo el criterio de nivel de experiencia en el tema de investigación (Tabla 4). A cada informante se le aplicó, de forma presencial, una entrevista semiestructurada que fue diseñada para tres grandes grupos de informantes: a) los de incidencia a nivel regional (técnicos, administrativos y académicos vinculados a instituciones y organizaciones no gubernamentales); b) los participantes en las dinámicas de gobernanza y desarrollo local (líderes comunales vinculados con asociaciones, plataformas comunitarias y gobiernos locales indígenas); y c) agroproductores indígenas y campesinos. El propósito de las entrevistas fue indagar de manera directa sobre el criterio técnico, percepción y experiencia vivencial de cada informante, respecto a los siguientes aspectos: las principales problemáticas socioambientales relacionadas con monocultivos extensivos, los aspectos de la organización comunal y sus aportaciones al desarrollo local, la permanencia de los sistemas tradicionales de producción familiar de pequeña escala y las problemáticas asociadas a narcotráfico y delitos contra el medioambiente. La información de carácter cualitativo obtenida mediante las entrevistas fue analizada y contrastada con los datos previamente localizados mediante la revisión bibliográfica de documentos técnicos y de tipo diagnóstico de carácter económico, socioambiental y

cultural para la región, de tal forma que fuera posible precisar, a una escala más local, los diversos factores que inciden en el modelo de desarrollo regional del Pacífico Sur.

Tabla 4. Tipo de actores entrevistados

Actores	Código	Tipo de Actor
Asociaciones y plataformas	Lc1	Líder comunal
	Lc2	Líder comunal
	Lc3	Líder comunal
	Lc4	Líder comunal
	Lc5	Líder comunal
Institucional	Ac1	Académico
	Aap1	Administrador de Área protegida
	Gap1	Gerente de Áreas protegidas
	Tag1	Técnico agropecuario
	Ta1	Técnico ambiental
	Ta2	Técnico ambiental
Organización No Gubernamental	Oc1	Conservacionista
	Oc2	Conservacionista
Población campesina	Pag1	Productor agrícola
	Pag2	Productor agrícola
	Pa1	Productor Apícola
	Pg1	Productor ganadero
	Pg2	Productor ganadero
Población indígena	Agpi	Agroproductores indígenas
	Lci1	Líder comunal indígena
	Lci2	Líder comunal indígena
	Lci3	Líder comunal indígena
	Lci4	Líder comunal indígena
Regional	Clg1	Comité local de gestión

Código: identificación anónima de los actores.

Elaboración propia

3. Resultados

Los datos aportados por diversos actores clave (Tabla 4: Lc1, Lc2, Gap1, Clg1, Oc1, Oc2, Ac1, Ta1, Tg1, Lci2, Lci3) sobre los procesos y dinámicas regionales permite considerarlos, a nivel de municipios, en términos de fortalezas y debilidades que contribuyen a la desigualdad socioambiental en la región (Tabla 5, Figuras 3 y 4).

Los procesos y dinámicas considerados como fortalezas están presentes, en general, en los cinco municipios (Tabla 5), destacando las *Actividades turísticas sostenibles*, las *Investigaciones vigentes* y la presencia de *Organizaciones de base comunal*, que se detectan en 5 de los 6 municipios. Sin embargo, parecen ser más propios de las comunidades aledañas a los ENP (Figura 3), que manifiestan una tendencia hacia el desarrollo de modelos productivos basados en el uso sostenible de la biodiversidad. Esto es producto quizá, de un modelo de gobernanza más autónomo, que se nutre de una base asociativa local (Tabla 4:

Lc1, Lci3), que apuesta por el desarrollo endógeno basado en el capital social y natural. Por otra parte, se han identificado 14 procesos, clasificados como debilidades, de los que 4 de ellos están presentes en todos los municipios analizados (*Inadecuado manejo de basura y residuos sólidos, Infraestructuras y equipamientos deficientes, Ocupación ilegal de tierras indígenas y Tráfico de drogas y actividades de crimen organizado*). Dichas debilidades regionales parecen estar relacionadas con el modelo económico existente, basado en la agroproducción industrial de monocultivos extensivos (Figura 4). Este modelo, además, aporta poco a la disminución de la pobreza (Tabla 4: *Pag1, Pa1, Lci2, Clg1*), la cual favorece la utilización de diversas prácticas productivas y económicas que son ambiental y socialmente insostenibles (Rodríguez *et al.*, 2018). A ello se suma la ineficacia de las autoridades locales para atender problemas esenciales del desarrollo regional (Tabla 4: *Ac1, Oc1*).

Tabla 5. Fortalezas y debilidades en los municipios de la región Pacífico Sur

F/D	PROCESOS Y DINÁMICAS	MUNICIPIOS						Nº
		PZ	BA	CB	O	G	C	
Fortalezas	Producción agraria sostenible ^{2, 8}	•	•	•				3
	Buenas prácticas productivas ^{2, 8}				•		•	2
	Iniciativas de conservación y producción sostenible ^{2, 8}		•	•				2
	Iniciativas conservacionistas ^{2, 8}		•		•	•	•	4
	Actividades de reforestación ²		•		•			2
	Actividades turísticas sostenibles ^{2, 8}	•	•	•	•	•		5
	Investigaciones en desarrollo ⁷	•	•	•	•	•		5
	Organizaciones de base comunal ^{2, 8}	•	•	•	•	•		5
Debilidades	Plantaciones de piña ^{1, 3, 8}	•	•					2
	Plantaciones de palma aceitera ^{1, 3, 8}				•	•	•	3
	Ganadería convencional ^{3, 8}	•	•	•		•	•	5
	Producción agraria insostenible ^{3, 8}	•	•		•			3
	Deforestación ilegal ⁴				•	•	•	3
	Incendios forestales recurrentes ^{4, 5}	•	•					2
	Caza ilegal ⁴				•	•		2
	Extracción ilegal de oro ⁴				•	•		2
	Uso intensivo de pesticidas ³	•	•		•			3
	Contaminación en aguas/Sedimentación ^{3, 8}				•			1
	Inadecuado manejo de basura y residuos sólidos ^{6, 8}	•	•	•	•	•	•	6
	Dificultades en vías de acceso ^{5, 6, 8}			•	•		•	3
	Infraestructuras y equipamientos deficientes ^{6, 8}	•	•	•	•	•	•	6
	Ocupación ilegal de tierras indígenas ^{4, 5}	•	•	•	•	•	•	6
Tráfico de drogas y actividades de crimen organizado ⁴	•	•	•	•	•	•	6	

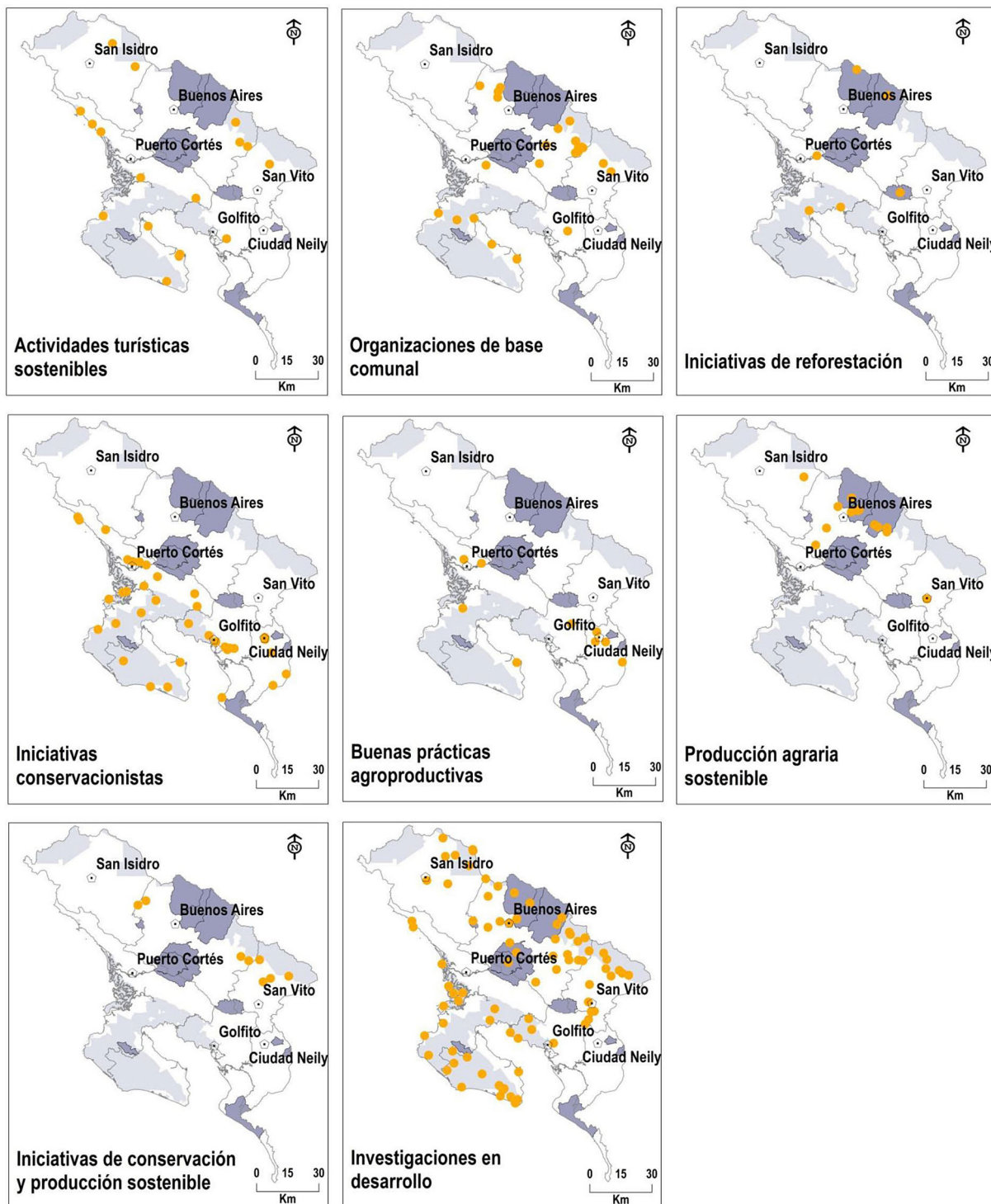
PZ: Pérez Zeledón; BA: Buenos Aires; CB: Coto Brus, O: Osa; G: Golfito; C: Corredores

Fuente: ¹ Bases cartográficas del PRIAS (2019a; 2019b); ² (Tabla 4: *Lc1, Lc2, Lc3, Ta1, Ta2, Oc1, Oc2*); ³ (Tabla 4: *Lc2, Lc4, Tag1, Pag1, Pag2, Pg1*); ⁴ (Tabla 4: *Aap1, Gap1, Ta1, Ta2, Oc2, Lc1, Lci1*); ⁵ (Tabla 4: *Gap1, Oc2, Ac1, Aap1, Lci1, Lci2, Lci3*); ⁶ (Tabla 4: *Ac1, Ta1, Clg1, Lc1, Lc4, Lc5, Aap1*); ⁷ SINAC-ACLAP y SINAC-ACOSA (2020); ⁸ Comprobación de campo (2020). Elaboración propia

Las iniciativas conservacionistas predominan en los municipios del Sur Bajo, particularmente en la Península de Osa, vinculadas a las actividades de corte ecoturístico, dada la gran riqueza biológica del área (Figura 3). No obstante, en este mismo territorio se producen una serie de delitos que atentan contra los espacios protegidos, como la caza ilegal y la extracción ilegal de oro dentro del Parque Nacional Corcovado (Figura 4). Por otra parte, las prácticas agroganaderas insostenibles se manifiestan tanto en

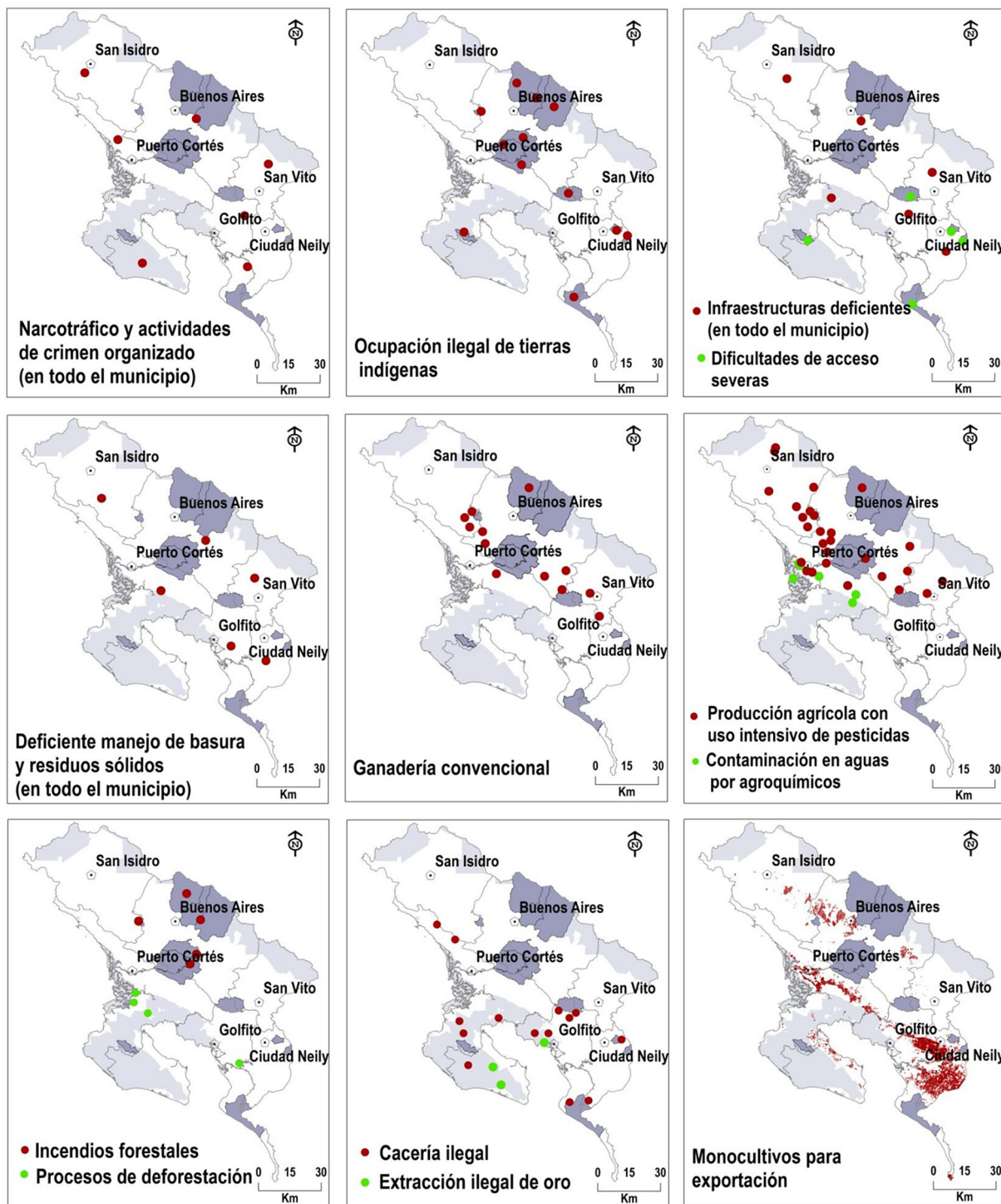
los territorios indígenas donde provocan incendios forestales, así como de forma extendida en la cuenca del río Grande de Térraba e inclusive en el Humedal Nacional Térraba-Sierpe, donde se ha identificado contaminación de aguas por uso intensivo de agroquímicos, particularmente asociado a los monocultivos (Tabla 4: *Aap1, Gap1, Ta1, Ta2, Oc2, Lc1, Lci1, Lci2*) (Figura 4).

Figura 3. Fortalezas en la región Pacífico Sur
(Gris oscuro: Territorios Indígenas; gris claro: Espacios Naturales Protegidos)



Fuente: Bases cartográficas del Atlas del Instituto Tecnológico de Costa Rica (2014); (Tabla 1: *Lc1, Lc2, Lc3, Ta1, Ta2, Oc1, Oc2*); SINAC-ACLAP y SINAC-ACOSA (2020); Comprobación de campo (2020). Elaboración propia

Figura 4. Debilidades en la región Pacífico Sur
(Gris oscuro: Territorios Indígenas; gris claro: Espacios Naturales Protegidos)



Fuente: Bases cartográficas del Atlas del Instituto Tecnológico de Costa Rica (2014) y del PRIAS (2019a; 2019b); (Tabla 4: *Ac1, Aap1, Gap1, Ta1, Ta2, Oc2, Lc1, Lc4, Lc5, Lci1, Lci2, Lci3*); Comprobación de campo (2020). Elaboración propia

4. Discusión

La región Sur se encuentra sometida al impacto de conflictos socioambientales de alta complejidad, en un territorio que manifiesta grandes desigualdades y rezago socioeconómico, produciéndose en los últimos decenios una transformación de la estructura productiva que ha pasado de la agricultura familiar

a la agroindustria de los monocultivos, favorecida por las políticas estatales (Rodríguez *et al.*, 2018), y a partir de la tendencia de la región Centroamericana (Gómez, 2018). En una escala más amplia, la presión sobre la agricultura familiar se enmarca en el contexto de subordinación de los sistemas agroalimentarios nacionales de América Latina y el Caribe a los patrones de consumo de los países centrales (Segrelles, 2001). Esto a su vez ha conllevado el cambio en la estructura social de la región, e inclusive de los patrones culturales, al evidenciarse el abandono de los sistemas productivos tradicionales indígenas (Arroyo y León, 2017; León *et al.*, 2019).

Las políticas neoliberales han impulsado la producción animal intensiva basada en piensos importados de bajo coste, cultivos como la piña y la palma aceitera altamente dependientes de insumos químicos de elevado costo, excluyendo así a los pequeños agricultores (Tabla 4: *Pag2, Lc2, Agp1, Lci4*). Estos cultivos, de acuerdo a los actores entrevistados (Tabla 4: *Lc1, Lc2, Lc3, Lc4, Lc5, Lci1, Lci4*), acaparan la mano de obra local, lo que provoca que se abandonen las parcelas agrícolas de autoconsumo. Mientras que cultivos como el maíz y los frijoles —de bajos insumos externos— llevados a cabo por pequeños productores han sido desfavorecidos (Galt, 2020). De esta forma se ha reducido el número de productores de granos básicos en todo el país y en general en el Istmo a partir de los años noventa (Baumeister, 2019). Este sistema productivo conlleva una homogeneización de la economía rural (Shaver *et al.*, 2015) y una modificación del mapa de actores de los sistemas agroalimentarios, donde se favorece el capital concentrado en detrimento de la agricultura familiar (Rodríguez *et al.*, 2018). Finalmente, la externalización de los impactos ecológicos y sociales de este sistema productivo son sufridos por las clases trabajadoras, los ecosistemas y las especies (Galt, 2020).

Si bien, los modelos y estrategias de desarrollo y de producción han cambiado su planteamiento a lo largo del tiempo, se evidencia como, la tendencia a centrar la economía en unos pocos productos de exportación, sujetos a los vaivenes del mercado, ha ocasionado problemas reiterativos (Picado y Botella, 2017). Tal es el antecedente de la expansión cafetalera, cuando ya a mitad del siglo XIX se registraron importaciones de arroz, frijoles, maíz, trigo y carne, debido al desplazamiento de estos recursos alimentarios básicos de la producción nacional (León, 2012), además del caso de la expansión ganadera en los años sesenta y setenta (Bozzoli de Wille, 1977; Kaimowitz, 1996).

Para Amador *et al.* (2011), la estructura y la dinámica productiva actual de la región, con sus grandes contrastes, es producto de los Programas de Ajuste Estructural implementados durante la década de los ochenta, que limitaron el desarrollo de actividades productivas de pequeña y mediana escala asociadas a la producción de granos y de hortalizas, en tanto que propiciaron el asentamiento y consolidación de grandes áreas de producción de monocultivos (piña, palma y, en menor medida, arroz), en manos de pocos productores o, en el mejor de los casos, dependientes de procesos de industrialización. Más que un modelo de desarrollo, como señala Vargas (2015) se trata de un “proyecto histórico neoliberal” que englobaría tanto lo político (relaciones de poder internas y externas), como lo económico (organización de los mercados y sectores de acumulación de capital, así como los aspectos ideológicos (visión de mundo coincidente con las estructuras de poder) e inclusive culturales, ya que como resultado se manifiestan formas de vida particulares que se articularían con las estructuras económicas y las político-ideológicas imperantes. Este proyecto explicaría estas estructuras, así como su evolución dinámica en el período de 1984-2015 en Costa Rica, cuando se gesta la “economía hacia afuera” (centrífuga).

En este contexto, es manifiesto el impulso del Estado a la agroindustria de monocultivos (Gómez, 2018; Maglianesi-Sandoz, 2013; Rodríguez *et al.*, 2018), de tipo empresarial y más rentable, mientras que se acentúa la vulnerabilidad de la agricultura familiar y del sistema productivo indígena, siendo elementos que ayudan a conservar diferentes tipos de patrimonio: paisajístico, rural, cultural, agrobiológico y natural; así como la seguridad social y alimentaria de los habitantes locales (Gómez, 2018; León *et al.*, 2019).

Los escasos recursos destinados a la conservación de la biodiversidad impiden una adecuada gestión de los espacios protegidos (Tabla 4: *Lc1, Ta1, Oc1, Pg1, Pg2*), lo cual aumenta su vulnerabilidad ante diversas presiones antrópicas relacionadas con la producción agraria insostenible (grandes extensiones de monocultivos y ganadería convencional); ilícitos ambientales (deforestación, cacería y minería ilegales); deficiente manejo de residuos y contaminación; así como el narcotráfico y la narcoproducción. Estos fenómenos se insertan dentro de las comunidades rurales y los ENP dando origen a intensas transformaciones en el paisaje y en la estructura social y económica (Bonatti *et al.*, 2005; Wrathall *et al.*, 2020).

Aguilar-González, Cerdán, Kocian y Aguilar-Umaña (2017) hablan de un fenómeno que denominan narco-deforestación, actividad que se manifiesta de formas diversas, incluyendo la compra de tierras,

adyacentes o dentro de las áreas protegidas, para el desarrollo de diversas actividades productivas y para el establecimiento de rutas de transporte; generando profundas alteraciones en las dinámicas de desarrollo rural, al infiltrarse dentro de los sistemas de comercio locales mediante la generación de latifundios para ganadería extensiva, la adquisición de sistemas de producción y comercio, entre otros. Se trata de territorios denominados como “tierra de nadie”, donde la escasa acción estatal los convierte en tierra fértil para la criminalidad (Foucher, 1991).

La falta de conectividad con el principal centro de desarrollo del país (el Valle Central), contribuye además a la sensación general de abandono que expresan usualmente los habitantes de territorios rurales o indígenas respecto del Estado (Tabla 4: *Lc1, Lc2, Lc5, Pag2, Pg1, Agpi, Lci1, Clg1*). No solamente es importante la accesibilidad de un territorio sino también la facilidad con la que los habitantes y la producción tienen para salir de éste y conectarse con el resto del territorio (Sieber, 1997). Pese a que el Índice de Acceso Rural (RAI) en Costa Rica es cercano al 80%, la red pavimentada supone solamente el 27%, siendo los caminos rurales (vías terciarias) un 70% del total de la red vial del país (Pérez, 2020). Por tanto, las áreas más alejadas, como el Pacífico Sur, requieren inversión estatal para mantener y mejorar la infraestructura vial, siendo este aspecto un elemento fundamental para el desarrollo rural y la forma de favorecer la comercialización y distribución de los productos obtenidos en una agricultura familiar coherente con los Objetivos de Desarrollo Sostenible que plantea la UNESCO.

La centralización del aparato estatal y de los procesos de decisión es otro desafío que debe superar la región, lo mismo que la debilidad estructural de los gobiernos territoriales y locales para atender las demandas de la población de los territorios rurales. Esta situación refleja el patrón centro-periferia, donde los municipios más pobres del país se encuentran subordinados al centro neurálgico, como ocurre con la región Sur, situada a 6 horas 30 minutos de distancia desde la capital (Pérez, 2020).

En definitiva, la región Pacífico Sur, como otros territorios rurales del país, evidencia una serie de dinámicas y procesos territoriales que dan cuenta del modelo de desarrollo endógeno imperante desde los años ochenta y de la carencia de políticas rurales y agrarias que propicien un verdadero desarrollo rural con enfoque territorial (Mora-Alfaro, 2005). Estas dinámicas y procesos se concretan en un modelo de territorio poco integrado con el resto del país, con limitada presencia y actuación estatal, donde las fuerzas del capital transnacional y la complicidad del Estado han promovido un modelo de desarrollo que perpetúa la pobreza y la acumulación de capital a partir del deterioro socioambiental (Harvey *et al.*, 2004). En la Figura 5 se presentan los rasgos más evidentes del territorio de la región Pacífico Sur, tanto aquellos que representan deficiencias, como los que constituyen recursos valiosos para superar los desequilibrios.

Figura 5. Síntesis de las dinámicas territoriales en la región Pacífico Sur



Elaboración propia

5. Conclusiones

El caso de la región del Pacífico Sur, dadas sus características de región periférica en un ámbito nacional, es de enorme interés para comprender la realidad Centroamericana. Se trata de territorios que han pasado de ser invisibilizados dentro de las economías nacionales a incorporarse a la economía global a través de rápidas transformaciones del sector agroganadero, como es la producción de carne bovina para exportación y el actual auge de los monocultivos, particularmente la piña en Costa Rica. El rol de estos territorios se ha orientado a la satisfacción de demandas de consumo de Estados Unidos, pero también de la Unión Europea. En ese sentido, resulta necesario profundizar en el futuro acerca del papel de la periferia estudiada en las dinámicas económicas globales.

La situación periférica del Pacífico Sur en Costa Rica y la falta de una política de desarrollo rural, específica y a largo plazo, son cuestiones clave en la búsqueda de un modelo de territorio ambiental y socialmente más sostenible y más equilibrado. Es necesaria la inversión estatal en el mantenimiento y mejora de la infraestructura vial en esta región para el desarrollo rural y el fomento de la distribución y comercialización de la producción local. Además, para compensar los efectos sociales, económicos y ambientales de la estructura económica imperante, altamente dependiente de la agroindustria transnacional, debería potenciarse una transición hacia una agricultura que sea capaz de conservar la biodiversidad y el patrimonio natural y cultural de los territorios periféricos que, según propone Vermunt, Negro, Van Laerhoven, Verweij y Hekkert (2020), permita la transformación del sector agroalimentario hacia un modelo más sostenible, con un ajuste específico a las condiciones socio ecológicas y al interés en la innovación.

Según este contexto, parece que el modelo económico imperante se sirve de un aprovechamiento sistemático de la pobreza local para fortalecer las actividades de tipo extractivista, en detrimento de las actividades y emprendimientos agroproductivos de la agricultura familiar, de lo cual también saca partido el narcotráfico para sus actividades ilícitas. A pesar de ello, se manifiestan las capacidades locales y se fortalecen los modelos de gobernanza que apuestan por el desarrollo socioeconómico enfocado en la conservación, particularmente en las comunidades aledañas a las áreas protegidas. Dicha agricultura familiar, en el contexto Centroamericano, tiene un rol estratégico en el desarrollo rural, debido a su incidencia en los procesos productivos y comerciales, así como para la erradicación de la pobreza y la adaptación al cambio climático (Gómez, 2018). Es imprescindible el desarrollo de políticas rurales que apoyen las explotaciones de agricultura familiar, los pequeños y medianos emprendimientos productivos y el turismo rural como modelos de negocio basados en el uso sostenible de la biodiversidad, como estrategia de conservación del capital natural y social de la región.

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Ordenación de usos agrarios en áreas protegidas de media montaña mediterránea. Estudio de la Sierra Morena andaluza

Agricultural uses management in middle Mediterranean protected mountainous areas. Study in the Andalusian Sierra Morena

Rafael Garzón-García^{1*} 
Rafael Vega-Pozuelo² 

Resumen

Se analiza la vinculación entre áreas protegidas y actividades de base agraria, en particular en entornos de media montaña mediterránea. En ellos dicha vinculación goza de una especial relevancia a tenor de factores como la variedad y riqueza de las formas de aprovechamiento agrario y su compatibilidad —en frágil equilibrio— con la conservación de elevadas cotas de cualificación ambiental y paisajística. El importante incremento durante las últimas décadas de las áreas protegidas de gran extensión y visión multifuncional —particularmente bajo la categoría de Parque— en tales entornos así lo muestra. Se estudia, con el apoyo de fuentes cartográficas, estadísticas y del trabajo de campo, la situación general registrada en los parques naturales de la Sierra Morena andaluza. Se constatará la dispar consideración de los agrosistemas entre parques, así como los logros y carencias en la ordenación y gestión de los principales usos agrarios y la incidencia en su evolución.

Palabras clave: actividad agraria; áreas protegidas; media montaña mediterránea; Parque Natural; multifuncionalidad; Sierra Morena andaluza.

Abstract

The connection between protected areas and agrarian-based activities – particularly in Mediterranean mountainous environments – is analysed. This connection has a special relevance according to factors such as the variety and richness of the forms of agricultural use and their compatibility – in a fragile balance – with the conservation of environments and landscapes. Evidence is the significant increase in recent decades of large and multifunctional protected areas – particularly under the category of Park. With the support of cartographic sources, statistics, and fieldwork, the general situation in the natural parks of the Andalusian Sierra Morena is studied. The various agrosystems in different parks are verified, as well as the achievements and shortcomings in the organisation and management of the main agricultural uses and the impact on their development.

Keywords: agricultural activity; protected areas; Mediterranean mid-mountain; Natural Park; multifunctionality; Andalusian Sierra Morena.

1 Departamento de Ciencias Sociales, Filosofía, Geografía y Traducción e Interpretación; Grupo de Investigación Estudios de Geografía; Universidad de Córdoba, España. rafael.garzon@uco.es. * Autor para correspondencia

2 Departamento de Ciencias Sociales, Filosofía, Geografía y Traducción e Interpretación; Grupo de Investigación Estudios de Geografía; Universidad de Córdoba, España. rvega@uco.es

1. Introducción

Según la definición más aceptada, la aportada por la Unión Internacional para la Conservación de la Naturaleza (UICN, en inglés IUCN), un *espacio natural protegido* o área protegida corresponde a “una superficie de tierra y/o mar especialmente dedicada a la protección y mantenimiento de la diversidad biológica y de los recursos naturales y culturales asociados, y gestionada a través de eficaces instrumentos legales o de otro tipo” (Corraliza, Valero y García, 2002, p. 62). De dicha definición se infiere que se trata de espacios geográficamente delimitados, que cuentan con un especial valor natural y, en no pocos casos, cultural, a los que se dota de un régimen de protección legal, lo que se acompaña de un manejo o *gestión* orientada a alcanzar los objetivos planteados.

Como se infiere de dicha definición, los *espacios naturales*, entendidos como aquellos donde los procesos y dinámicas naturales se hacen aún patentes con nitidez, tan solo en pocos casos resultan completamente ajenos a la intervención más o menos directa del hombre, que busca principalmente en tales espacios la obtención de recursos vivos de diversa índole, bajo la forma de variadas *actividades agrarias*; podría hablarse pues, con la sola excepción de aquellas áreas protegidas radicadas en entornos especialmente hostiles para la presencia humana por sus condiciones climáticas y de relieve, de una evidente correspondencia territorial entre áreas protegidas y espacios agrarios (de carácter tradicional y respetuosos —en un grado notable— de la base biofísica sustentadora).

En relación con ello, cabe remarcar el cambio conceptual operado en la visión de las áreas protegidas: desde una visión inicialmente aislacionista y restrictiva —centrada en el objetivo primordial de la conservación de espacios naturales muy valiosos o excepcionales— a una más reciente —un *nuevo paradigma*, en palabras de Phillips (2003) — de carácter más abierto e integrador, fundamentada en el entendimiento de tales áreas en tanto que piezas clave y de especial valor en el contexto de la matriz territorial y ecológica en que se enmarcan y con la que interactúan (Spellerberg, 1994; Naughton-Treves, Holland y Brandon, 2005; Chape, Spalding y Jenkins, 2008). Se ha apuntado que lo característico de las políticas más avanzadas de protección de espacios han sido los planteamientos *multifuncionales e integrados* (Naughton-Treves *et al.*, 2005; Chape *et al.*, 2008; Dudley, 2008; McDonald y Boucher, 2011). De este modo, las políticas de áreas protegidas, sin renunciar al tradicional objetivo conservacionista (aún predominante, o incluso exclusivo, en ciertos espacios de muy bajo grado de humanización), han incorporado o reforzado una diversidad de funciones con trasfondo social, tales como la educación ambiental, la investigación científica, el uso turístico-recreativo, además de los usos tradicionales de base agraria.

En todo caso, la disparidad territorial de los espacios dotados de relevantes valores naturales justifica la heterogeneidad en el diseño geográfico y formas de gestión de las áreas protegidas, en un contexto de proliferación de las mismas a escala global. Prueba de ello son las categorías de protección reconocidas por la UICN, referente básico para la definición de figuras protectoras en los diversos contextos nacionales (Tabla 1).

Tabla 1. Síntesis de los caracteres básicos de las categorías protectoras establecidas por la clasificación de la UICN (1994)

<i>Categoría</i>	<i>Definición</i>
I- Reserva Natural Estricta	Área protegida manejada principalmente con fines científicos o fines de protección de la naturaleza.
II- Parque Nacional	Área protegida manejada principalmente para la conservación de ecosistemas y con fines de recreación
III- Monumento Natural	Área protegida manejada principalmente para la conservación de sus características naturales específicas
IV- Área de Manejo de Hábitats/Especies	Espacio protegido cuyo manejo deberá dedicarse principalmente hacia la conservación, con intervención activa en el ámbito de la gestión.
V- Paisaje Terrestre y Marino Protegido	Área protegida manejada principalmente para la conservación de paisajes terrestres y marinos, y con fines recreativos. Se identifica con superficies en las que las interacciones del ser humano y la naturaleza han producido una zona de carácter definido con importantes valores estéticos, ecológicos y/o culturales, y que a menudo albergan una rica diversidad biológica.
VI- Área Protegida con Recursos Manejados	Áreas protegidas y manejadas principalmente para la utilización sostenible de los ecosistemas naturales.

Fuente: Corraliza *et al.* (2002)

Como puede advertirse, las categorías UICN aglutinan la totalidad de casuísticas posibles de protección de áreas naturales relevantes. Cabe destacar, a los efectos de este trabajo, aquellas categorías —como las V y VI— cuya conceptualización manifiesta con nitidez la flexibilidad y dimensión multifuncional en la gestión antes apuntadas.

Tales categorías resultan de especial aplicabilidad en aquellos contextos geográficos donde la presencia humana ha resultado históricamente más evidente en sus espacios naturales de mayor cualificación, es decir, donde la identificación territorial espacio natural-espacio agrario se ha tornado más clara. El espacio geográfico mediterráneo responde muy fielmente a tales caracteres, aún más en particular en sus numerosas montañas (Mazurek y Blanchemanche, 1992; Mata, 2012). Estas resultan espacios profundamente trabajados y modelados por la mano del hombre, gozando en numerosos sectores de un elevado valor ambiental y paisajístico —pudiendo hablar de *agrosistemas* o, incluso, *agroecosistemas* (Gómez, 2007) —, lo que explica su recurrente conservación, bajo distintas figuras de protección (concreción de las categorías IUCN), entre las que ha resultado predominante, al menos en el contexto normativo español, la de *Parque*³.

Sobre esta base, en las páginas que siguen se plantea un análisis específico respecto de la realidad usos agrarios-áreas protegidas, aplicado al caso de la media montaña mediterránea y concretado geográficamente en la Sierra Morena andaluza, uno de sus ámbitos paradigmáticos y privilegiados a escala española. El análisis propuesto se centra en la evolución de los usos agrarios y de los agrosistemas que los sustentan, tratando de reconocer la incidencia específica —en forma de logros, posibles carencias, conflictos y posibilidades— de la protección legal en ello.

2. Metodología

La definición y articulación de los fundamentos epistemológicos del trabajo se ha sustentado en el manejo de fuentes bibliográficas especializadas, relativas a tres aspectos clave: la conceptualización de las áreas protegidas, la caracterización de la agrarización mediterránea, y la consideración de aquellas aportaciones centradas en el análisis de la relación usos agrarios-espacios protegidos.

Por su parte, para el estudio específico de la unidad territorial de referencia —la Sierra Morena andaluza— se ha adoptado un enfoque metodológico dual, que permite estructurar el análisis en un plano funcional (relativo a los procesos o dinámicas) y otro físico (relativo a la plasmación sobre el terreno de tales procesos). Dicho enfoque posibilita un acercamiento sistemático y riguroso al objeto de estudio, ya que ambos planos, en estrecha interrelación, constituyen las dos caras de cualquier realidad territorial. En este trabajo, el plano funcional remite a los usos o actividades agrarias, mientras que el plano físico lo hace a la concreción de las actividades agrarias en sectores territoriales bien reconocibles, los agrosistemas. A partir de este planteamiento metodológico, se ha hecho uso de varios tipos de fuentes: bibliográficas, cartográficas, planificación ambiental, fuentes documentales y estadísticas, y trabajo de campo.

En este sentido, las fuentes bibliográficas han permitido la caracterización básica de Sierra Morena como espacio de antigua humanización y agrarización, caracterizado por las diferentes rupturas de su equilibrio agroecológico, con especial intensidad desde el siglo XIX y hasta la actualidad. El análisis de la configuración actual de los espacios y paisajes agrarios mariánicos, en particular aquellos localizados en el interior de sus parques naturales, se ha sustentado tanto en el propio manejo bibliográfico, en el empleo de cartografía digital oficial (*Datos Espaciales de Referencia de Andalucía [DERA]*, *Sistema de Información sobre Ocupación del Suelo en España [SIOSE]* y *CORINE Land Cover*) y en el exhaustivo trabajo de campo desarrollado sobre el terreno. Tales fuentes han permitido la contrastación de la realidad agroecológica de la Sierra Morena andaluza con su protección legal. De especial interés resulta el empleo de la cartografía digital ambiental (SIOSE y CORINE Land Cover), ya que ha permitido, a partir del tratamiento mediante SIG, la obtención de las superficies exactas de los agrosistemas para varios años de referencia (aquellos para los que se han elaborado dichas fuentes cartográficas), pudiendo establecer una secuencia evolutiva, lo que constituye una de las principales aportaciones del trabajo (Anexos 1 y 2).

3 Categoría reconocida como tal en la legislación española de áreas protegidas: inicialmente en la derogada *Ley 4/1989, de 27 de marzo, de Conservación de los Espacios Naturales y la Flora y Fauna Silvestres*, y actualmente en la *Ley 42/2007, de 13 de diciembre del Patrimonio Natural y la Biodiversidad* (art. 30).

Finalmente, el análisis se culmina con la consideración específica de la ordenación y evolución de los usos agrarios que sustentan los principales agrosistemas en los parques naturales de Sierra Morena. Para ello se ha recurrido al manejo de sus instrumentos de planificación ambiental (*Plan de Ordenación de los Recursos Naturales* [PORN] y *Plan Rector de Uso y Gestión* [PRUG]), así como a fuentes estadísticas y documentales (destacando las *Memorias de Actividades* de los parques) y al trabajo de campo, para la observación de la dinámica agraria y su incidencia sobre los territorios protegidos.

3. Resultados

El presente apartado se estructura en cuatro epígrafes que se ordenan según una secuencia lógica llevada a cabo en la investigación.

3.1. Caracterización general de la agrarización en la montaña mediterránea

La cuenca mediterránea, región natural reconocible por sus caracteres físicos bien definidos, sobre todo de carácter climático (Gómez, 2007), se ha conformado ya desde el Mesolítico como un espacio antropizado, concretado en lo esencial en un proceso de agrarización expandido por la práctica totalidad de la cuenca y singularizado por su dinamismo y pluralidad de manifestaciones funcionales y paisajísticas (Zoido, 2007).

Cabe hablar, pues, de un paisaje rural mediterráneo o, más bien, de múltiples paisajes rurales mediterráneos, resultado de un histórico proceso de acondicionamiento de un sustrato físico-natural de condiciones frecuentemente hostiles (González, 1992; Gómez, 2007). Dicha antropización se ha hallado y aún hoy se halla en constante mutación, al generarse a partir de una sucesión de equilibrios hombre-medio natural muy diversificados (Mazurek y Blanchemanche, 1992). Y es en la media y baja montaña (excluidos los sectores de altas cumbres, de muy escasa o nula humanización) donde el equilibrio u *orden territorial* mediterráneo ha resultado más imprescindible y al mismo tiempo complejo, a tenor de las mayores limitaciones y fragilidad del medio (Ojeda, 2006; Mata, 2012).

Prueba de ello han sido las recurrentes *rupturas* de dicho orden, en forma de cambios de los equilibrios agroecológicos, lo que ha conllevado diversos procesos de readaptación o recuperación del equilibrio (Zoido, 2007). La conjunción de todos los factores referidos explica la complejidad, diversidad y dinamismo en el plano territorial y paisajístico de las montañas mediterráneas, en tanto que expresión de “unas *complejas culturas* en las que dominan lo diverso, lo pequeño, lo relacional, lo dinámico, lo domesticado y lo simbólico” (Ojeda, 2006, p. 181). Se plantea así el gran reto de fondo de la integración entre las viejas y nuevas formas de aprovechamiento —esencialmente agrarias— y la conservación y mejora de los valores naturales y paisajísticos.

3.2. Evolución y caracterización actual de los agrosistemas de Sierra Morena

El macizo de Sierra Morena, en su sector andaluz, responde en lo esencial al patrón dibujado de montaña media mediterránea, si bien desde una innegable especificidad. Se singulariza por su notable complejidad orográfica y el predominio de suelos pobres sobre un sustrato principalmente silíceo. Pese a su escasa población —en contraste, sobre todo, con la gran depresión bética que lo delimita por el sur— se halla humanizado desde antiguo, en virtud de la generalización de unos usos agrarios de carácter esencialmente extensivo —forestales, ganaderos y cinegéticos (Rivera, 1992; Valle, 2001)—, lo que determina su elevado grado de conservación general, incluso con determinados sectores de excepcional valor ecológico (Ojeda y Silva, 2002; Mulero y Silva, 2013).

La Sierra Morena andaluza se define por su acusada diversidad, riqueza y dinamismo territorial y paisajístico, lo que se explica, además de por los condicionantes físico-naturales, por la variedad histórica de formas de aprovechamiento agrario y de su concreción en agrosistemas o agroecosistemas (Valle, 1981; Zoido, 2012). En dicho proceso cabe destacar sobremanera la doble ruptura —o *quiebra*— de los equilibrios agroecológicos registrada durante los dos últimos siglos (Roux, 1975; Valle, 2001), lo que ha conducido a la situación actual.

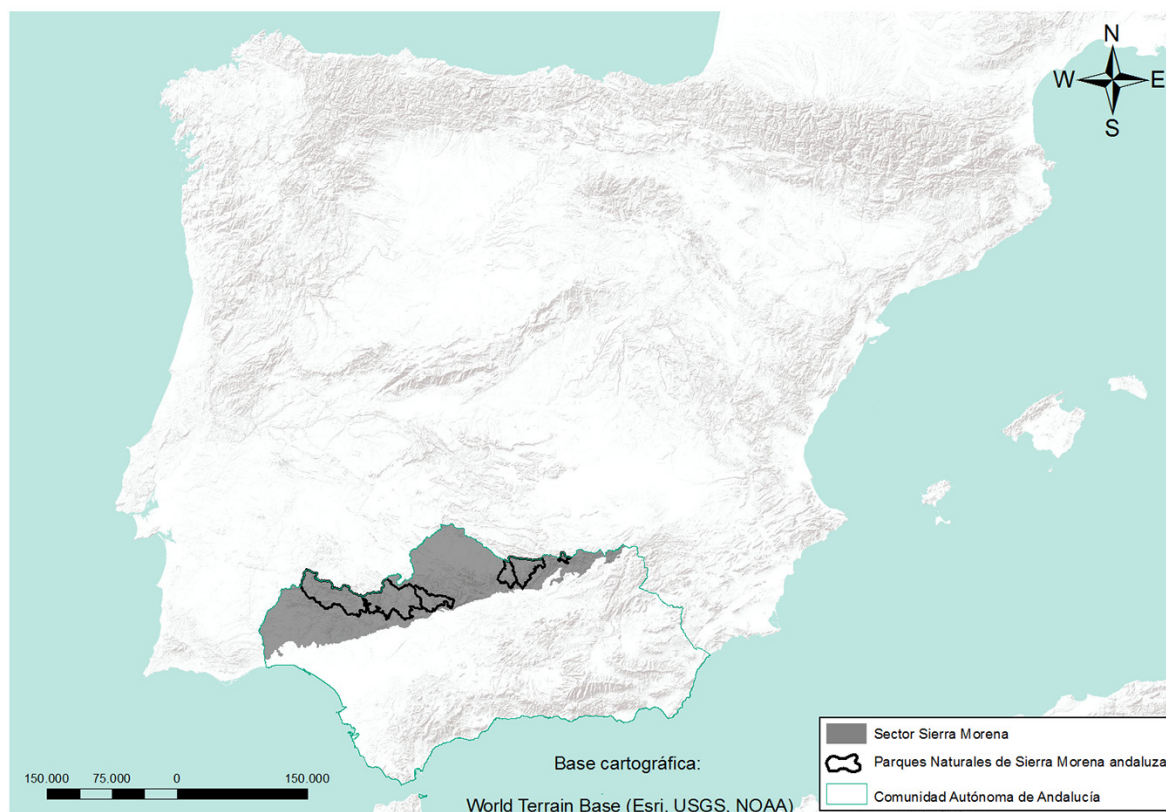
Ésta incluye la preservación de ciertos agrosistemas precedentes, la reestructuración de otros, e incluso casuísticas de abandono o regresión agraria y consiguiente artificialización. Se ofrece acto seguido un recorrido por los principales sistemas y paisajes agrarios de la Sierra Morena andaluza, que muestran

una plasmación territorial claramente dispar, destacando sobremanera el contraste entre la continuidad superficial de ciertos agrosistemas y el mosaicismo vegetal y paisajístico patente en otros ámbitos del macizo, principalmente en su mitad occidental (Figura 2).

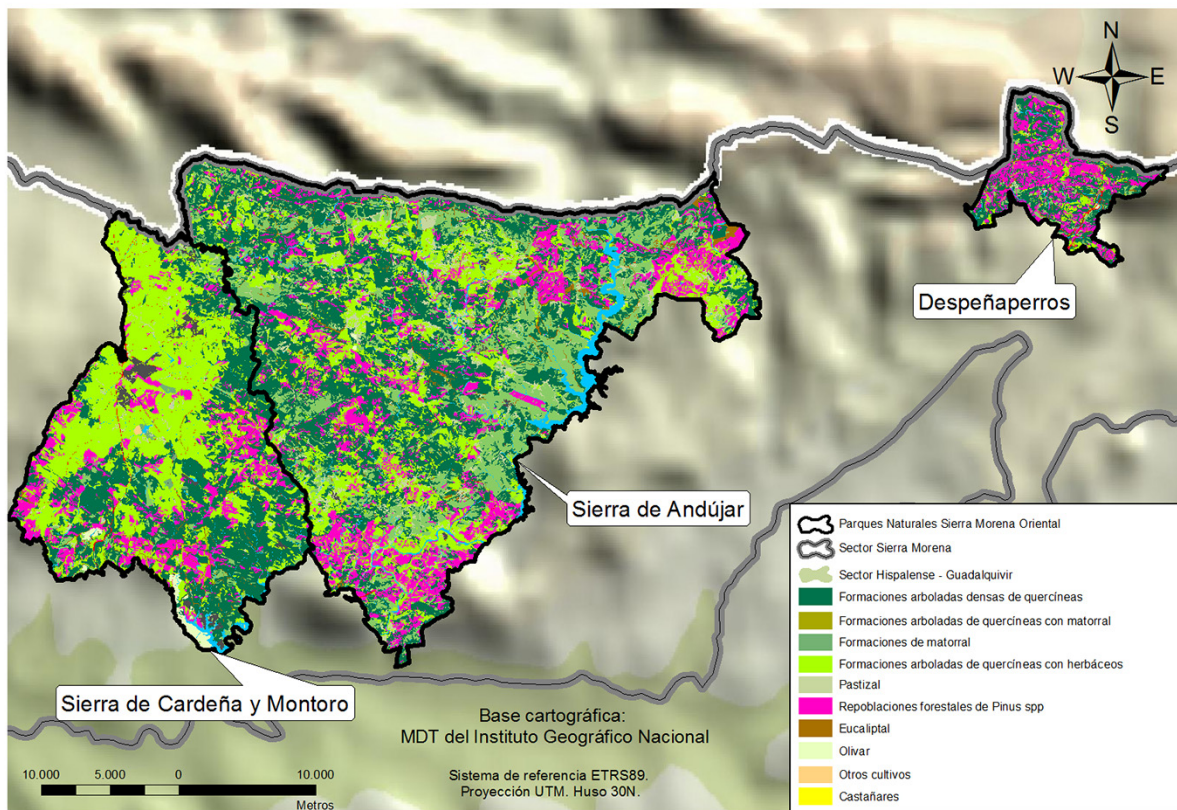
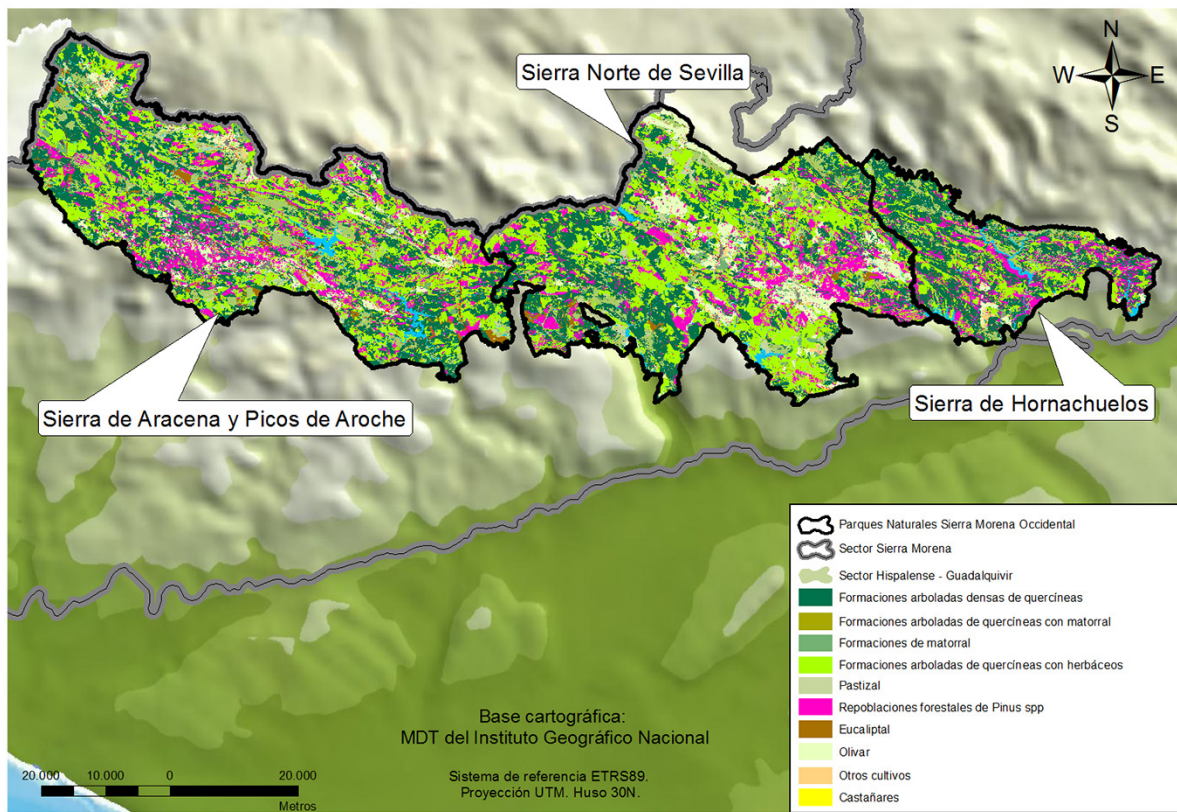
Quizá el agroecosistema más emblemático de Sierra Morena —y de gran parte de las sierras y altiplanicies del centro-oeste de la Península Ibérica— son las *dehesas ganaderas*. Estas alcanzan una muy notoria representación en el macizo mariánico andaluz (1.491.388 hectáreas según datos aportados por el CORINE Land Cover 2018)⁴, además de una considerable continuidad territorial, particularmente en la franja más septentrional de la provincia de Córdoba, coincidente con la altiplanicie granítica de Los Pedroches (Figura 1). Buena parte de las dehesas de Sierra Morena, sobre todo aquellas localizadas en sectores de pendientes más suaves, han mantenido en lo esencial los viejos equilibrios, gracias fundamentalmente a las primas de la UE (Silva y Ojeda, 1997). Pero tales primas han inducido al mismo tiempo y en cada vez más terrenos adhesionados una creciente especialización e intensificación ganadera, de importantes impactos ambientales y paisajísticos en enclaves localizados, como se expondrá con posterioridad.

Otras dehesas, las que ocuparon zonas de más complejo relieve, sufrieron con posterioridad el abandono de su uso ganadero, lo que ha conllevado frecuentemente su matorralización (Lasanta, Álvarez y Gómez-Villar, 2014), todavía en proceso en numerosos sectores. Los nuevos espacios invadidos por el matorral también provinieron —aunque en menor medida— de viejas zonas de cultivo abandonadas. Sea como fuere, tales zonas, caracterizadas en la cartografía ambiental como *formaciones de matorral o formaciones arboladas de quercíneas con matorral* (Figura 1) y que cuentan con un muy significativo alcance territorial en el conjunto del macizo (529.897 ha las primeras y 1.394.307 las segundas), han sido reorientadas durante las últimas décadas en su vocación funcional y productiva, principalmente hacia la caza mayor, el otro gran vector del uso agrario actual de la Sierra Morena andaluza, junto al pecuario.

Figura 1. Sierra Morena andaluza: localización, principales agroecosistemas y su relación con los Parques Naturales



⁴ Fuente que se ha empleado para la determinación de las superficies totales de los agrosistemas en este apartado, por tratarse de la base cartográfica más actualizada de entre las disponibles.



* La partición de Sierra Morena en dos mapas se ha realizado con el objetivo de facilitar la visualización de la distribución de los agrosistemas

Fuente: MDT y CORINE LAND COVER 2018. Elaboración propia

La caza mayor se halla presente asimismo en aquellos sectores de bosque mediterráneo en mejor estado de conservación (caracterizados en la Figura 1 como *formaciones arboladas densas de quercíneas*), dotados asimismo de una importante entidad territorial (577.645 ha), pese a localizarse en aquellas zonas de más difícil accesibilidad por su relieve. La caza y los usos forestales se configuran como realidades funcionales decisivas para la conservación y configuración actual de estas formaciones, que en el caso de aquellas dotadas de mayor continuidad territorial y especialización venatoria han sido acertadamente caracterizadas por Mulero (2013) como representativas del denominado *paisaje forestal-cinegético* del macizo mariánico.

La expansión de la caza mayor ha hallado asimismo un adecuado sustrato territorial en los sectores ocupados por las *repoblaciones forestales pinariegas*, que aún gozan de considerable peso en la Sierra Morena andaluza (alcanzando una superficie de 377.973 ha) a partir de la gran expansión repobladora desarrollada entre los años cuarenta y setenta del pasado siglo, sobre terrenos degradados y baldíos en su mayoría y con una motivación tanto protectora —de carácter hidrológico-forestal— como productora —de carácter maderero, sobre todo— (Sánchez, 2009). La compatibilización entre el uso cinegético, forestal (de escasa relevancia) y los tratamientos silvícolas de mejora forestal (en aras de la evolución hacia formaciones de bosque mediterráneo más maduras y estables) resulta hoy día una constante.

Junto a las repoblaciones de coníferas, se detectan igualmente formaciones que pueden ser conceptualizadas como *cultivos forestales*. No obstante, en este caso cabe realizar una distinción clave. Deben referirse, por una parte, aquellas plantaciones recientes, y carácter masivo e impactante (y por ello de difícil conceptualización como agroecosistemas), como es el caso de los eucaliptales, que en la Sierra Morena occidental ocuparon desde los años centrales del pasado siglo la práctica totalidad de tierras más pobres y marginales, alcanzando una expansión actual de 66.300 ha. Y, por otra, aquellos cultivos de carácter histórico y adecuada adaptación al medio, entre los que los castañares constituyen el mayor exponente, pese a hallarse reducidos en su ocupación a los enclaves más húmedos y frescos de la mitad oeste del macizo (ocupando una superficie de 5.917 ha).

Este sintético recorrido por los grandes agroecosistemas de la Sierra Morena andaluza no puede obviar la presencia asimismo de cultivos agrícolas. Destaca el gran predominio del *olivar*, que alcanza una importante continuidad territorial en los sectores sevillano, cordobés y, sobre todo, jiennense de la Sierra Morena, ocupando una superficie total de 249.066 ha; se trata de una pieza fundamental del paisaje del macizo y de la socioeconomía de muchos de sus municipios. Al margen de él, otros cultivos, de histórica presencia en Sierra Morena, hoy se ciñen casi en exclusiva a restos de ruedos en el entorno de numerosos núcleos de población, así como a vestigios de cultivos de mayor extensión pretérita, como es el caso de algunas manchas de viñedos en la Sierra Morena de Sevilla. Una presencia algo más significativa alcanzan los cultivos herbáceos, si bien ceñida casi en exclusiva a sectores de pendientes suaves en el extremo septentrional del espacio mariánico andaluz, principalmente en su sector cordobés.

Muchos de estos agrosistemas han sido objeto de reconocimiento y protección durante las últimas décadas en virtud de sus valores ambientales, ecológicos y paisajísticos. Este proceso de institucionalización (Ojeda y Silva, 2002) ha supuesto un hito de indudable significación en la continua dinámica evolutiva de tales paisajes y los usos agrarios que los sustentan. Al análisis específico de los fundamentos y claves de dicho proceso —tanto de índole geográfica como planificadora— se dedican las páginas que siguen.

3.3. La disparidad de criterios para la protección de los agrosistemas

En consonancia con la gran expansión de los espacios protegidos durante las últimas décadas (Naughton-Treves *et al.*, 2005), los terrenos de mayor valor ambiental y paisajístico de la Sierra Morena andaluza han sido sometidos a protección desde finales del siglo XX, resultando clave al respecto el año de 1989. Al margen del reconocimiento otorgado —bajo diversas figuras protectoras— a enclaves de modesta extensión, debe destacarse la protección de amplias porciones territoriales, de nítida dinámica agraria, bajo la figura de Parque Natural (Mulero, 2001; Garzón, 2016). Como muestra del alcance del fenómeno, 577.476 hectáreas se hallan protegidas, de las que un porcentaje mayoritario —545.215 hectáreas— lo son por los seis parques naturales declarados⁵.

5 Según datos aportados por la Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible de la Junta de Andalucía (en la web www.juntadeandalucia.es/medioambiente), en tanto que órgano gestor de la Red de Espacios Naturales Protegidos de Andalucía (RENPA).

El criterio general respecto de la protección de los agrosistemas y formaciones vegetales fue la exclusión de aquellas que implicaban un mayor grado de artificialización y dotadas por ello de un menor valor ambiental; fue el caso de las principales bandas olivareras, las manchas septentrionales de cultivos herbáceos y las zonas dominadas por repoblaciones y plantaciones forestales (Figura 1). No obstante, desde una aproximación más detallada se aprecia una clara disparidad entre los seis parques, con dos modelos reconocibles, que se hallan en correspondencia con la propia divergencia de la Sierra Morena andaluza en la organización espacial de sus agrosistemas. De este modo, la mayor diversidad de sistemas agrarios en su mitad occidental se acompaña de la configuración de dos parques (Sierra de Aracena y Picos de Aroche, y Sierra Norte de Sevilla) de gran extensión —superior a 150.000 hectáreas— y que aglutinan una gran complejidad agraria y paisajística. Frente a ello, el predominio y continuidad de ciertos agrosistemas en su mitad oriental tiene su correlato en el diseño de unos parques de mediana extensión (Sierra de Hornachuelos y Sierra de Cardeña y Montoro, en Córdoba, y Sierra de Andújar y Despeñaperros, en Jaén) y mayor homogeneidad en su estructura territorial y paisajística.

Los dos grandes parques occidentales, coincidentes en lo esencial con ámbitos comarcales de fuerte impronta histórica (Ojeda y Silva, 2002), se singularizan por su mayor grado de humanización directa y las múltiples formas de utilización de la tierra. Conviven aquí variados agrosistemas, combinados en fragmentos territoriales de pequeña o mediana extensión que definen un marcado mosaicismo paisajístico, más acusado en todo caso más al oeste, en la Sierra Morena onubense (Figura 2). Resultan relativamente escasos los vestigios de bosque denso, hallándose por lo general la cubierta forestal originaria profundamente transformada. Esta se identifica tanto con las dehesas de uso ganadero dominante, distribuidas en numerosas manchas salpicadas en las áreas de relieve más favorable, así como con las dehesas matorralizadas, de presencia creciente en sectores de relieve más quebrado, constituyéndose como los ámbitos principales del pujante uso cinegético. Pero quizá el exponente más claro de la diversidad agrosistémica de estos parques —y del criterio de laxitud y multifuncionalidad seguido en su delimitación— radica en el peso asumido por los cultivos, excluidos con carácter general de los límites de los parques cordobeses y jiennenses. Sobresale la presencia del olivar, en bandas de relativa continuidad ocupando laderas de pendientes suaves o moderadas. Pero, junto a él, se hallan presentes otras zonas de cultivos que, pese a su modestia superficial, conforman agrosistemas muy representativos, de gran cualificación pero sujetos hoy en buena medida a procesos de degradación o abandono; es el caso de los viñedos de Cazalla de la Sierra (Sierra Norte), las huertas de la cuenca alta del río Múrtigas (Sierra de Aracena) y, muy especialmente, los ruedos que circundan los numerosos núcleos poblacionales radicados en el interior de los parques (Coronado, 2020). Dicho componente resulta asimismo extensible a los cultivos de carácter forestal, como los castañares, que cuentan con una cierta presencia en zonas elevadas, frescas y húmedas, destacando el sector central de la Sierra de Aracena. Pero, además, la diversidad funcional y paisajística de estas áreas protegidas se completa con una representación no desdeñable de eucaliptales, pese a su carácter impactante.

Figura 2. Dispar configuración agro-territorial: mosaicismo en el entorno del núcleo de Aracena en contraste con la continuidad del bosque mediterráneo en la Sierra de Hornachuelos



Fotografías de los autores

Frente a esta realidad, la instrumentación de la protección en los parques naturales de la Sierra Morena centro-oriental siguió criterios distintos, lo que se halla en consonancia con una estructura territorial diferenciada, definida por un menor grado de humanización directa y de diversificación funcional. De este modo, se ha otorgado protección a sectores territoriales bien reconocibles por su alto valor y cualificación ambiental, lo que se vincula a unos usos agrarios muy extensivos (sobre todo ganaderos y cinegéticos), principalmente ligados a una gran propiedad privada preponderante. En cuanto a los agroecosistemas, resultan muy dominantes aquellos de carácter nítidamente forestal, destacando las zonas de bosque mediterráneo maduro (con especial representación en la Sierra de Hornachuelos), las importantes extensiones ocupadas por el matorral (de procedencia diversa: degradación del bosque maduro, dehesas matorralizadas y zonas de cultivo abandonadas) y uso cinegético dominante en la actualidad, así como las repoblaciones de *Pinus* spp. En el caso de estas últimas, la Figura 1 evidencia con nitidez la aplicación de un criterio muy diferenciado entre parques, constatándose tanto la exclusión de sus límites (en la Sierra de Hornachuelos) como la incorporación de importantes manchas en el interior de los restantes parques, resultando incluso mayoritarias en Despeñaperros. La consideración de una motivación protectora (hidrológico-forestal) para su implantación, la compatibilidad del uso forestal y cinegético, o los criterios —hoy consolidados y en aplicación— de transición de las masas pinariegas hacia formaciones de bosque mediterráneo explican la inclusión de muchas de estas masas dentro del perímetro de los parques (Sánchez, 2009), si bien resulta evidente la ausencia de un criterio unívoco por parte de la Administración ambiental. En el caso de las dehesas, se ha otorgado protección principalmente a aquellos espacios adhesionados contiguos a las zonas boscosas y sustentadores de un uso mixto ganadero-cinegético, excluyendo con carácter bastante general las dehesas más estrictamente ganaderas, como las radicadas al sureste del Parque Natural Sierra de Andújar y en el gran *continuum* adhesionado localizado de la comarca de Los Pedroches (Figura 3).

Figura 3. Disparidad en la evolución de los agrosistemas: consolidación de la dehesa ganadera (Los Pedroches, norte de Córdoba) frente a dehesa sujeta a matorralización (Parque Natural Sierra de Andújar)



Fotografías de los autores

3.4. *¿Una efectiva ordenación de los usos agrarios?: la aportación de la planificación y claves de la evolución reciente*

Considerando la disparidad agrosistémica patente entre parques naturales, se abordan los criterios de ordenación y gestión de los usos y paisajes agrarios desde los espacios protegidos y su incidencia en la evolución registrada por ellos.

Para regular su ordenación, los parques naturales andaluces cuentan, al igual que el resto de los parques españoles⁶, con dos instrumentos básicos de planificación (PORN y PRUG), que en su mayor parte fueron aprobados en el año 1994 y renovados en 2003/2004⁷. Ambos incorporan una ordenación de carácter

6 Según lo establecido en la Ley 42/2007, de 13 de diciembre, del Patrimonio Natural y de la Biodiversidad.

7 Los PORN cuentan con una vigencia indefinida (aunque pueden renovarse cuando así se estime conveniente por la instancia administrativa responsable de los parques naturales), mientras que los PRUG —cuya vigencia es de ocho años— fueron en su práctica totalidad prorrogados para un periodo de otros cuatro años mediante diversas Órdenes promulgadas durante los años 2011 y 2012, sin que hasta la fecha se hayan aprobado los nuevos documentos (www.juntadeandalucia.es/medioambiente).

funcional, centrada en la regulación de usos y actividades. La ordenación se caracterizó inicialmente por una cierta confusión entre instrumentos, superada tras la dotación planificadora de 2003/2004; desde entonces los PORN definen la regulación básica de usos y actividades (permitidas, prohibidas y autorizables), mientras que los PRUG contienen la regulación específica (condiciones) de los usos permitidos y autorizables.

La regulación aportada por los PORN y PRUG se plantea con el objetivo primordial de conservación de los valores naturales y paisajísticos justificativos de la declaración de los parques, si bien de manera compatible con las dinámicas funcionales —esencialmente agrarias— explicativas de tales valores (López, 2002). La ordenación de los usos agrarios se torna, pues, como un aspecto esencial de la planificación ambiental, como se observa a través de sus contenidos clave: objetivos, zonificación y determinaciones. Se trata, por tanto, de una regulación no muy restrictiva, con aportaciones destacables para la preservación y recuperación de los agroecosistemas, pero también con insuficiencias, referentes sobre todo al reconocimiento de la riqueza agrosistémica y paisajística de los territorios protegidos así como a la necesidad de una mayor concreción y operatividad frente a ciertas dinámicas o amenazas específicas hoy patentes en ellos.

3.4.1. Objetivos

En efecto, la relevancia agraria de Sierra Morena y la multifuncionalidad inherente al concepto de Parque Natural se trasluce desde la propia definición de los objetivos de los planes. Con todo, la formulación de los objetivos ha resultado bastante superficial, carente del grado de adaptación y concreción necesario en función de la especificidad y complejidad de cada territorio protegido. Declaraciones programáticas del tenor de “garantizar la conservación y restauración de la cubierta vegetal como elemento esencial para la protección de los suelos frente a la erosión” o “promover un uso económico y social compatible con la conservación de los recursos naturales” (Consejería de Medio Ambiente, 2003/2004) han resultado comunes. Tan solo los objetivos específicos recopilados en los PRUG (Tabla 2) se han planteado con un mayor nivel de concreción que, pese a resultar un tanto insuficiente, sí al menos parecían apuntar a las prioridades de ordenación y gestión de los usos y paisajes agrarios en las diferentes áreas protegidas.

Tabla 2. Objetivos específicos relativos a usos y paisajes agrarios formulados en los PRUG de los parques naturales de la Sierra Morena andaluza

<i>Parque Natural</i>	<i>Elementos de especificidad en los objetivos de los PRUG</i>
Sierra de Aracena y Picos de Aroche	<ul style="list-style-type: none"> - Conservar y mejorar los pastizales de las zonas de dehesa. - Conservar los castañares como cultivo característico del espacio. - Reducir progresivamente la superficie de eucaliptales. - Recuperar las zonas agrícolas con cultivos abandonados o marginales, promoviendo su tránsito hacia una agricultura ecológica o formaciones forestales. - Establecer mecanismos para controlar las poblaciones de especies cinegéticas.
Sierra Norte	<ul style="list-style-type: none"> - Sustituir progresivamente la superficie de eucaliptales por formaciones forestales autóctonas maduras acordes con la potencialidad del ecosistema. - Conservar y regenerar las áreas de matorral noble. - Recuperar las zonas agrícolas con cultivos abandonados o marginales, promoviendo su tránsito hacia una agricultura ecológica o formaciones forestales. - Minimizar las afecciones ambientales negativas de las explotaciones ganaderas intensivas y extensivas.
Sierra de Hornachuelos	<ul style="list-style-type: none"> - Favorecer la regeneración de formaciones de matorral y la mejora de pastizales. - Minimizar la incidencia de la superpoblación de individuos en la pureza genética de las especies cinegéticas. - Fomentar la aplicación de técnicas agropecuarias que no supongan el deterioro de los recursos naturales.
Sierra de Cardena y Montoro	<ul style="list-style-type: none"> - Conservar y mantener los pastizales de las zonas de dehesa. - Conservar, mantener y proteger el regenerado natural frente a la influencia del ganado en las dehesas puras o mixtas de encina y/o alcornoque. - Promover la aplicación de técnicas agropecuarias que no supongan el deterioro de ningún otro recurso, especialmente el suelo. - Minimizar la incidencia de la superpoblación de individuos de especies cinegéticas sobre sus poblaciones.
Sierra de Andújar	- Ídem al anterior
Despeñaperros	<ul style="list-style-type: none"> - Conservar, mantener y asegurar el regenerado natural frente a la influencia de los herbívoros silvestres. - Conservar y mejorar los pastizales

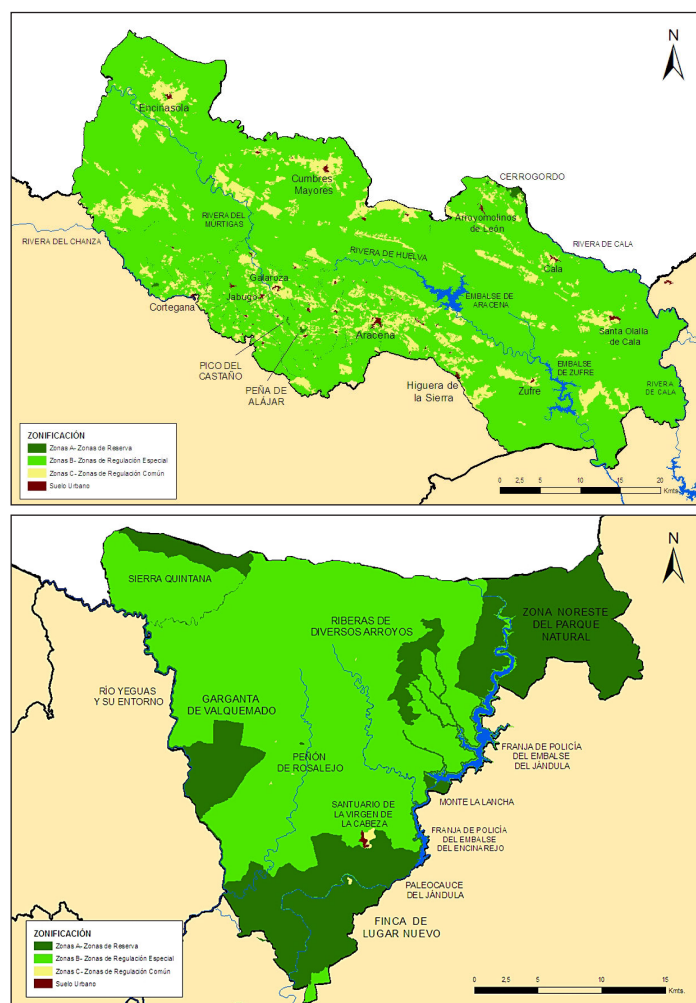
Fuente: Consejería de Medio Ambiente (2003/2004). Elaboración propia

3.4.2. Zonificación

En cuanto a la zonificación, su carácter necesariamente sintético (Martínez y Martín, 2003) ha tenido su reflejo, en los parques naturales andaluces, en la definición de tres tipos básicos de zonas según su valor ambiental (zonas A o *de Reserva*, B o *de Regulación Especial*, y C o *de Regulación Común*), de incidencia directa en la regulación de usos y actividades. De este modo, en las zonas A —de valor natural excepcional— pueden desarrollarse ciertos usos agrarios, pero muy extensivos y supeditados al objetivo primordial de conservación; las Zonas B —de valor ambiental alto— sustentan aprovechamientos compatibles con la conservación; las Zonas C —de valor ambiental medio o bajo— se corresponden con las zonas más transformadas, que en términos agrarios se identifican en general con cultivos agrícolas y plantaciones de eucalipto.

Sin embargo, dicha sistematización de la zonificación no debe conllevar una excesiva simplificación, que se traduzca en la no captación de la riqueza y diversidad de los territorios sujetos a protección. En este sentido, la zonificación establecida en los PORN analizados apenas ha implementado una concreción a partir de las tres zonas básicas, que permitiese definir subzonas coincidentes con los principales agroecosistemas, a las que aplicar criterios de ordenación específicos. Por el contrario, la zonificación se ha ceñido en lo esencial al nivel básico, donde se ha hecho patente el gran predominio de las Zonas B, que por ello han concernido a agrosistemas y paisajes muy dispares (que han abarcado desde formaciones densas de quercíneas, dehesas, cultivos forestales tradicionales e incluso espacios de repoblación), en una praxis simplificadora de especial incidencia en aquellos parques de mayor complejidad como los de Sierra Morena occidental (Figura 4).

Figura 4. Simplificación patente en la zonificación de los Parques Naturales Sierra de Aracena y Picos de Aroche y Sierra de Andújar (PORN de 2003)



Fuente: DERA. Elaboración propia

3.4.3. Determinaciones de aplicación directa

Las limitaciones de los PORN y PRUG se han hecho asimismo patentes en el caso de su contenido sustantivo, es decir, de aquellas determinaciones —tanto de carácter proactivo como normativo— de aplicación directa sobre los territorios protegidos.

Es el caso, muy en particular, de las medidas o acciones de fomento de los usos y paisajes agrarios, ceñidas de hecho a las *líneas de actuación* de los PRUG, a las que se ha dotado de un carácter meramente indicativo y, por ello, de nula trascendencia efectiva⁸.

La debilidad de tales determinaciones contrasta con la profusión de la *normativa* de los PORN y PRUG. No obstante, dicha regulación, planteada en pro de la compatibilización de la actividad agraria con la conservación y recuperación de la cubierta vegetal autóctona (en especial el bosque mediterráneo), ha evidenciado una clara laxitud con respecto a las normativas sectoriales de aplicación a escala española y andaluza.

Así lo prueba, primeramente, el que sean escasas las prohibiciones específicas contenidas en las normas generales de los PORN, limitadas a un reducido elenco de praxis consideradas como especialmente impacantes. La principal limitación contenida en los planes se halla, de hecho, en la normativa particular (asociada a la zonificación). Se trata de la regulación sobre los cambios de usos del suelo. A este respecto, sobre la base de la definición de un régimen general para la totalidad del medio natural andaluz, que establecía la necesidad de autorización administrativa para todo cambio de uso de los terrenos forestales para cultivos agrícolas u otros forestales (*Ley 2/1992, de 15 de junio, Forestal de Andalucía*, artículo 69.1), los parques naturales de Sierra Morena han dispuesto de un régimen propio y común, de notable coherencia global:

- En las zonas A se calificaba como incompatible cualquier cambio de uso del suelo, en función de la fragilidad ecológica y paisajística de estas zonas.
- En las zonas B se estipulaba una norma genérica orientada a salvaguardar el bosque mediterráneo —en cualquiera de sus manifestaciones— de todo tipo de merma. Se trata de la incompatibilidad de la eliminación de especies arbóreas o arbustivas autóctonas, a excepción de los tratamientos silvícolas de conservación y mejora de la vegetación. Pero, a la integridad del bosque mediterráneo se añadía, en un sentido más general, la pretensión de conservar el carácter forestal de los terrenos incluidos en las zonas B. En esta línea se situaba la prohibición directa —en la Sierra de Aracena y Picos de Aroche y Sierra Norte— del cambio de uso forestal a agrícola. Por su parte, en los parques cordobeses y jiennenses dicha disposición se reemplazaba por otra (incompatibilidad de la roturación de terrenos forestales con fines agrícolas) que, además de incluir a la anterior, respondía a las posibles presiones de esta índole en las dehesas y pastizales de estos territorios protegidos⁹.
- Por último, en las zonas de Regulación Común (zonas C), su escaso valor ecológico general explica la carencia de disposiciones en un sentido restrictivo, limitándose los PORN a especificar que se consideraría incompatible cualquier actuación para la que así se determinase en el correspondiente procedimiento de autorización. Con todo, el carácter residual de muchas de las manchas de cultivos aún presentes en las zonas C llevó al planificador a incluir una disposición con un carácter esencialmente orientativo. Se trató de la calificación como actividad compatible de “la transformación de los cultivos hacia el uso forestal con especies autóctonas”, hecho que se hallaba en plena sintonía con la esencial vocación forestal del macizo.

La regulación de los cambios de uso constituye una aportación muy interesante de la planificación, sobre todo en el caso de las zonas B, preponderantes superficialmente en los parques naturales. Dicha regulación se ve además complementada por la normativa general de los PORN y PRUG, relativa a la ordenación tanto de los usos agrarios (ver epígrafe siguiente) como de las labores sobre el terreno que posibilitan su desarrollo.

A este respecto, se otorga una especial relevancia a las disposiciones orientadas a prevenir el impacto de los trabajos culturales de carácter tradicional sobre la vegetación mediterránea. En efecto, los PORN y PRUG de 2003/2004 incorporaron un régimen protector propio para el desarrollo de tales trabajos,

⁸ Acciones o medidas de fomento de los usos agrarios se han incorporado asimismo a otras iniciativas planificadoras, como es el caso de los Planes de Desarrollo Sostenible (PDS) de los parques naturales, que en todo caso han venido adoleciendo asimismo de una notable inoperatividad en lo relativo al manejo agrario sobre el terreno (Mulero y Garzón, 2005; Garzón y Ramírez, 2016).

⁹ De hecho, la normativa particular de los dos parques naturales de la Sierra Morena cordobesa especificaba la compatibilidad —en zonas B— de “la siembra de especies forrajeras para su consumo a diente siempre que no supusiesen alteración de los prados naturales ni remoción del suelo”.

complementario a lo dispuesto en la legislación forestal (Tabla 3)¹⁰. Los condicionantes establecidos (para la concesión de autorización administrativa) apuntaban a una ejecución selectiva a nivel de especies y formaciones, así como en cuanto a la ineludible conservación de la capa edáfica fértil.

Tabla 3. Regulación específica de trabajos forestales de orientación agraria contenida en los PORN y PRUG de 2003/2004 de los parques naturales de la Sierra Morena andaluza

Trabajo forestal	Regulación específica
Desbroce o roza de matorral	<ul style="list-style-type: none"> - Solo pueden realizarse para prevención de incendios, favorecer la regeneración de formaciones arbóreas o pastizales, y en ruedos de descorche, debiéndose respetar una franja de 5 m. en las márgenes de los cursos de agua - Deben respetar el regenerado de especies arbóreas, las especies arbustivas que hubiesen alcanzado porte arbóreo, y, de manera general, los ejemplares de especies forestales o de matorral noble mediterráneo presentes - Con remoción de suelo, se prohíben en pendientes superiores al 20%
Laboreo en dehesas (para plantas forrajeras o cultivos herbáceos)	<ul style="list-style-type: none"> - Se limita la profundidad máxima del laboreo a 30 centímetros - Se ha de tener en cuenta la aplicación del ciclo tradicional de la dehesa para fomentar la matorralización y el aporte de materia orgánica al suelo
Repoblación y/o plantación forestal	<ul style="list-style-type: none"> - Se han de conservar los enclaves de vegetación arbórea y matorral noble mediterráneo existentes con capacidad de regeneración natural. - Se prohíben los nuevos aterrazamientos en labores de preparación del suelo
Corta de árboles	<ul style="list-style-type: none"> - No se permite en los siguientes supuestos: que contuviesen nidos de rapaces u otras especies de aves protegidas; que fuesen excepcionales por tener alguna especial significación natural, cultural o histórica; que estuviesen en lugares de pendiente superior al 50% y no tuviesen asegurada su sustitución o pudiesen causar graves daños en el arrastre; que se situasen en las márgenes de ríos y arroyos, en la franja de cinco metros correspondientes a la zona de servidumbre
Tratamientos silvícolas (sobre la vegetación arbórea)	<ul style="list-style-type: none"> - Se realizarán de forma selectiva, evitando toda afección a las especies características del matorral noble y a individuos o poblaciones de especies endémicas y/o amenazadas

Fuente: Consejería de Medio Ambiente (2003/2004). Elaboración propia

3.4.4. Gestión y evolución específica de los usos agrarios

La planificación ambiental de los parques naturales de Sierra Morena contiene asimismo en su normativa general una regulación de los principales usos agrarios y agrosistemas, que tampoco resulta especialmente restrictiva respecto de lo dispuesto en las legislaciones sectoriales aplicables. De una manera necesariamente sintética, en este epígrafe se aportan las claves fundamentales de esta regulación, así como de su incidencia en la evolución reciente de los principales usos agrarios de los espacios considerados.

A) La caza mayor

La ordenación de la actividad cinegética (caza mayor, muy dominante en Sierra Morena) se ha hallado decisivamente marcada por la generalización –en los acotados incluidos en el interior de los parques naturales- de los *Planes Técnicos de Caza* (PTC)¹¹, para la regulación de la actividad. Ello, junto a la completa legislación andaluza en la materia¹², explica que sean pocas las determinaciones específicas de los PORN y PRUG. Estas se han ceñido en lo esencial a lo dispuesto acerca de varias problemáticas singulares patentes en los parques respecto de la caza mayor: la sobrecarga de reses (sobre todo de ciervos, especie cinegética

10 En este caso, era el artículo 96 del Reglamento Forestal Andaluz de 1997 el que extendía la necesidad de autorización administrativa para todas las labores de “corta, quema, arranque o inutilización de las especies arbóreas y arbustivas” enumeradas en su anexo, con la excepción de las “labores de limpieza de matorral en dehesas con pendientes inferiores al 20 %, siempre que no afectasen a especies incluidas en el Catálogo Andaluz de Flora Silvestre Amenazada”. Se estipulaba igualmente la obligatoriedad de la autorización para la “roturación de terrenos forestales y la realización de actuaciones que originasen o pudiesen originar procesos de erosión”, señalándose en este caso como excepción “los terrenos forestales adhesionados que tradicionalmente hubiesen sido cultivados y cuya pendiente fuese inferior al 20 %”.

11 Instrumento ya previsto en el Capítulo III del Título IV de la Ley estatal 4/1989, de 27 de marzo, de *Conservación de los Espacios Naturales y la Flora y Fauna Silvestres* (hoy derogada por la Ley 42/2007, de 13 de diciembre, del Patrimonio Natural y la Biodiversidad), en el que se disponía la obligatoriedad de que “todo aprovechamiento cinegético en terrenos acotados al efecto debiese hacerse, por el titular del derecho, de forma adecuada y conforme al Plan Técnico justificativo de la cuantía y modalidades de las capturas a realizar, con el fin de fomentar y proteger la riqueza cinegética” (artículo 33.3).

12 Cuyo hito fundamental lo constituye hoy día el Decreto 126/2017, de 25 de julio, por el que se aprueba el Reglamento de Ordenación de la Caza en Andalucía (BOJA núm. 149, de 04/08/2017).

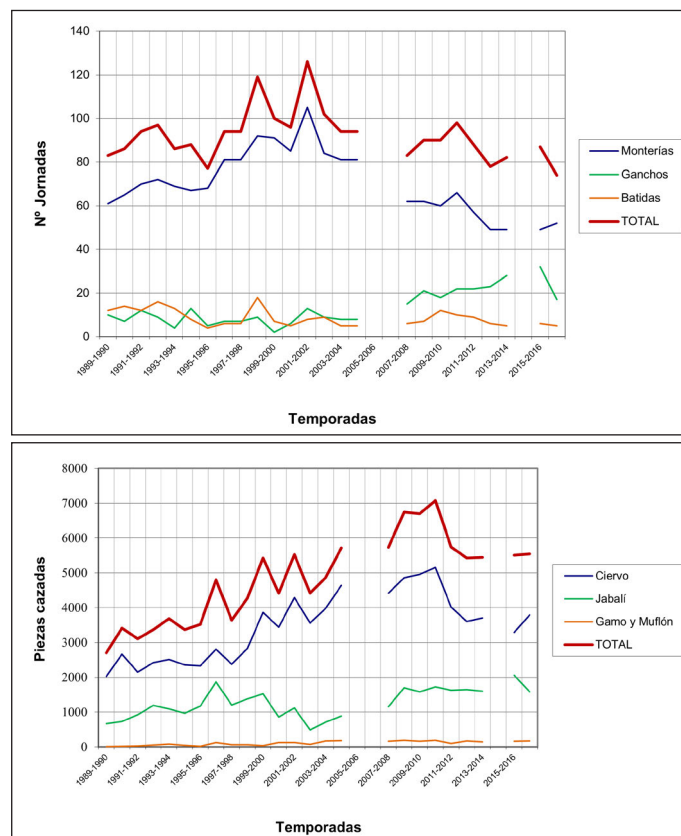
por excelencia en el macizo de Sierra Morena), el recurrente desequilibrio poblacional (en favor de las hembras), y la gran expansión de los cercados cinegéticos.

En el caso de los cerramientos cinegéticos, su importante impacto ecológico (al limitar la movilidad de las reses) explica dos determinaciones incluidas en la planificación ambiental de los parques naturales. Por una parte, la incompatibilidad del establecimiento de nuevos cercados en aquellos sectores clasificados como de máxima protección (zonas A), de significativa representación en parques de gran peso cinegético como Sierra de Hornachuelos o Sierra de Andújar; y, por otra, la potestad de declarar obligatorias actuaciones de control poblacional (por ejemplo, descastes o caza selectiva en cotos con un excesivo número de ciervas) y de renovación genética (que se llevaría a efecto mediante la introducción de hembras, que además procederían, cuando fuese posible, de capturas realizadas en cotos cercanos donde se detectase desequilibrio poblacional).

Sea como fuere, las problemáticas referidas evidencian bien a las claras que la protección no ha conllevado una limitación y merma del uso cinegético, sino, antes, al contrario, una consolidación y desarrollo desde la declaración de los parques naturales en 1989. Los datos disponibles de diversas variables básicas¹³, como número de jornadas cinegéticas y capturas, que se ejemplifican para el caso del Parque Natural Sierra de Hornachuelos, así lo muestran, pese a la existencia de fluctuaciones interanuales, mayoritariamente explicadas por condicionantes meteorológicos (Figura 5).

Otros datos también evidencian el importante desarrollo de la caza mayor en los parques naturales. Es el caso de la evolución superficial de los principales agrosistemas que sustentadores de la actividad cinegética de calidad (formaciones arboladas densas de quercíneas y formaciones arboladas de quercíneas con matorral), que han visto incrementar su superficie en el interior de los territorios protegidos (Anexo 2).

Figura 5. Evolución del número de jornadas cinegéticas de las principales modalidades de caza mayor y del número de capturas por especies en el Parque Natural Sierra de Hornachuelos



Fuente: Memorias Anuales de Actividades del Parque Natural Sierra de Hornachuelos. Elaboración propia

13 Aportados por las Memorias de Actividades, que presentan diversas lagunas en lo que a la continuidad de la información aportada respecta (como se puede constatar al observar la Figura 5).

B) La ganadería

En el caso de la ganadería, segundo gran uso agrario de los parques naturales de Sierra Morena, la normativa contenida en la planificación ambiental evidencia una preocupación clave respecto de su posible impacto sobre los recursos naturales sustentadores.

La disposición fundamental de los PORN establece que la Administración ambiental, en aquellas fincas dedicadas a la ganadería donde se hubiesen detectado problemas severos de sobreexplotación de la vegetación o de erosión del suelo, adoptaría las medidas necesarias para hacer frente a tales problemas, como limitar la carga ganadera, establecer un acotamiento temporal u otras, hasta que se adoptasen medidas correctoras que no pusiesen en riesgo el mantenimiento de estos recursos. Esta determinación básica se ha acompañado de otras disposiciones de sesgo más específico, que reflejaban algunos de los aspectos de conflictividad que han venido afectando al aprovechamiento ganadero.

Una primera muestra ha sido la regulación de la necesaria adecuación del uso ganadero a los recursos disponibles de acuerdo con los restantes aprovechamientos, en particular en lo relativo a la carga que representan tanto el ganado doméstico como las especies de caza mayor. Dicha prevención se limitaba a cuatro de los parques naturales (Sierra Norte, Sierra de Hornachuelos, Sierra de Cardeña y Montoro, y Sierra de Andújar), aquellos más claramente afectados por la creciente compatibilidad cinegético-ganadera.

Una segunda disposición regulaba acerca de los recursos pastables y su necesaria conservación. Se estipulaba que el tiempo de permanencia del ganado en los pastos naturales no debería prolongarse más allá de lo necesario para que consumiese su producción estacional, permitiendo la supervivencia de especies pratenses perennes y la producción de semillas de especies anuales que asegurase la renovación de los pastos. No obstante, en los PRUG de algunos parques (Sierra de Aracena y Picos de Aroche, Sierra de Hornachuelos y Sierra de Cardeña y Montoro, aquellos con mayor implantación de las explotaciones semiextensivas para la cría del ganado porcino) se incorporaba la apostilla “salvo en las cercas necesarias para el manejo tradicional del ganado porcino” (Consejería de Medio Ambiente, 2003/2004), lo que parecía justificar los fuertes impactos de carácter vegetal y edáfico sobre parcelas específicas de los espacios protegidos.

Este aspecto de conflictividad respecto de las parcelas de cría o cebado del porcino se contrapone a la regulación general del uso ganadero en la planificación, de notable interés en su espíritu. Pese a ello, esta normativa se ha singularizado por su inconcreción, al no incorporar variables necesarias como umbrales de sobreexplotación vegetal y deterioro edáfico, cargas ganaderas por especies, o tiempos de permanencia en los pastos.

Pero, además de la inconcreción de la normativa, su aplicación se ha visto dificultada por una casuística particular registrada desde la creación de los parques naturales en Andalucía. A diferencia de la caza y los usos y prácticas de carácter forestal, reguladas directamente desde la Administración ambiental autonómica (que es, a su vez, la entidad gestora de los parques naturales), las actividades ganaderas y agrícolas lo han sido desde la Administración agraria. Se impone, pues, una imprescindible colaboración entre diferentes instancias administrativas, que no siempre se ha dado con la suficiente fluidez. Se ha dificultado así la aplicación de las disposiciones de la planificación ambiental, lo que permite explicar situaciones impactantes en el interior de los espacios protegidos, como por ejemplo episodios evidentes de sobrecarga ganadera en pastizales y dehesas (Figura 6). La reciente unificación registrada en Andalucía entre las administraciones ambiental y autonómica¹⁴ sin duda puede contribuir a una mejora de la gestión de la ganadería en los parques naturales, aunque esta habría de afrontar diversos retos, entre los que cabe destacar la cuantificación precisa de las cabañas y la carga ganadera, y la aportación de una regulación que defina umbrales precisos de sobrecarga ganadera y limitaciones concretas cuando fuese necesario (Schröder, 2005; Lázaro y Vera, 2009; Silva, 2010). Sin duda la reformulación de la planificación de los parques debe resultar clave en este sentido, pero también podría serlo la definición de una planificación de manejo ganadero para la totalidad de las explotaciones, de manera similar a lo que aportan los PTC para el uso cinegético¹⁵.

14 Con la creación en 2019 de la Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible.

15 En esta línea, en Andalucía tan solo se contempla en la actualidad la obligatoriedad de que las explotaciones intensivas (con carga ganadera superior a 1,5 UGM por hectárea) cuenten con un Plan de Gestión de Subproductos Ganaderos (PGSG), según lo establecido en el Decreto 14/2006, de 18 de enero, por el que se crea y regula el Registro de Explotaciones Ganaderas de Andalucía.

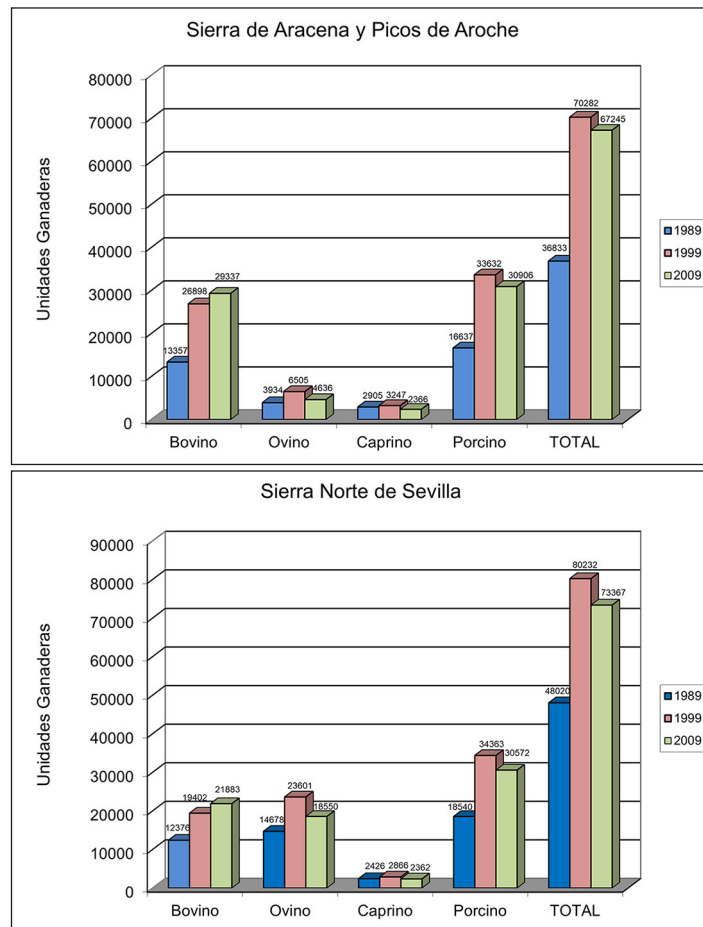
Figura 6. Parcela para la cría y cebo del ganado porcino (Sierra de Aracena y Picos de Aroche) y sobrecarga ganadera en explotación extensiva de vacuno (Sierra Norte)

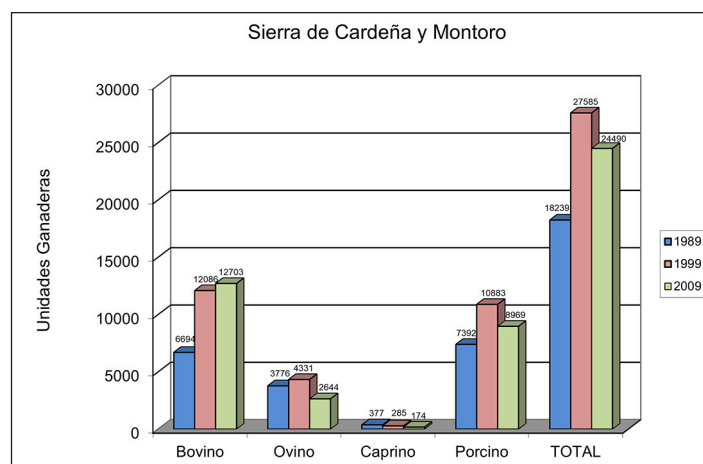


Fotografías de los autores

En todo caso, y de manera similar a lo que se señaló para el uso cinegético, lo expuesto en párrafos anteriores parece apuntar no a una limitación del uso ganadero en los parques naturales, sino antes bien a un mantenimiento e incluso a un reforzamiento. Así parece reflejarse, por ejemplo, en los datos de evolución de las cabañas en los tres parques de mayor peso pecuario, extraídos de los Censos Agrarios, ante la referida ausencia de censos específicos para las explotaciones de los parques naturales (Figura 7).

Figura 7. Evolución de la cabaña ganadera en municipios de los parques naturales Sierra de Aracena y Picos de Aroche, Sierra Norte, y Sierra de Cardena y Montoro





* La utilización de las UG se explica porque era la única medida utilizada para la contabilización ganadera en el Censo Agrario de 1989. No se utiliza el Censo Agrario de 2019 por no haberse publicado en el momento de finalizar este trabajo

Fuente: Censo Agrario de 1989, Censo Agrario de 1999 y Censo Agrario de 2009 (www.ine.es). Elaboración propia

En cuanto a los agrosistemas sustentadores del uso ganadero, la expansión del principal de ellos, la dehesa (formaciones arboladas de quercíneas con herbáceos), pero también de los pastizales (Anexo 2), aunque con importantes impactos ambientales en sectores concretos (no cuantificados, como se señaló), parece ser un fiel reflejo también de esta dinámica apuntada.

Igualmente, la consolidación del importante entramado empresarial vinculado al porcino en la Sierra de Huelva y la pujanza de otras iniciativas —como por ejemplo *CorSevilla* en la Sierra Norte— parecen apuntar en la misma línea, aunque su tratamiento detallado excedería con mucho los límites de esta aportación.

C) Los cultivos agrícolas

Los cultivos agrícolas tienen mucha menor relevancia que la caza y la ganadería en los parques naturales de Sierra Morena (Anexo 2). Al margen de las pequeñas manchas de cultivos frutales y hortícolas que aún perduran en ruedos y proximidades de cursos fluviales, y que se destinan principalmente al autoconsumo y mercados locales, tan solo los viñedos del sector central de la Sierra Norte y, de manera más generalizada, el olivar, alcanzan una entidad que pueda considerarse representativa.

En cuanto a su evolución superficial, la estabilización o ligera regresión constatada en el interior de los parques, a diferencia de la expansión registrada en el exterior de ellos (Anexos 1 y 2), se ve decisivamente influida por la planificación ambiental, en concreto por la imposibilidad de expansión de los cultivos por la normativa de cambios de uso vinculada a la zonificación de los parques naturales, expuesta en páginas anteriores.

Junto a esto, la regulación específica de los usos agrícolas en los parques de Sierra Morena se centra fundamentalmente en la prohibición de ciertas praxis especialmente impactantes sobre los recursos sustentadores de la actividad, particularmente el suelo fértil: el laboreo del suelo siguiendo las líneas de máxima pendiente, los aterrazamientos en las labores de preparación del terreno, y la eliminación de los setos o restos de formaciones forestales existentes en terrenos agrícolas. Además de lo anterior, la normativa de los PORN establece la necesidad de autorización para otros usos (como la transformación de las huertas tradicionales o el arranque de cultivos leñosos para instalación de cultivos herbáceos), en la línea de asegurar en lo posible la preservación de cultivos históricos y de alto valor paisajístico.

No obstante, la ordenación ha evidenciado nuevamente claros incumplimientos ante la falta de control sobre el terreno (Figura 8), en lo que también ha influido la casuística de dualidad competencial antes expuesta a propósito de uso ganadero.

La insuficiencia de la ordenación se ha hecho también patente en la ineludible consideración de nuevas realidades, como por ejemplo el creciente adhesionamiento de olivares convirtiéndolos en explotaciones mixtas (Figura 8), o la necesaria incorporación de medidas proactivas para garantizar la funcionalización —en aras de la efectiva preservación— de las zonas de cultivo tradicional aún existentes.

Figura 8. Olivar en pendiente sometido a intensa erosión edáfica y olivar adhesado (Arroyomolinos de León, Parque Natural Sierra de Aracena y Picos de Aroche)



Fotografías de los autores

D) El cultivo del castaño

La planificación ambiental ha incorporado también una regulación de los cultivos y plantaciones forestales. Entre los de carácter tradicional, estos se ciñen en lo esencial a los castañares que, aunque se extienden por diversos enclaves de Sierra Morena y sus parques naturales, es en el sector central de la Sierra de Aracena donde alcanzan una representación de entidad. La planificación ambiental (PORN y PRUG del Parque Natural Sierra y Picos de Aroche) incorpora una regulación escasa, aunque en ella se reconoce un sesgo protector en pro del mantenimiento de estos agrosistemas tradicionales. Se dispone así la prohibición de la eliminación, arranque o deterioro de antiguos castañares, salvo en caso de renovación controlada, a lo que se añade el requerimiento de autorización para la introducción de nuevas variedades de castaño con fines productivos.

No obstante, los datos de evolución de la superficie de castaño reflejan un claro retroceso durante los últimos lustros (Anexo 2), lo que evidencia una situación problemática que la escasa regulación contenida en la planificación no ha permitido afrontar. La problemática ha afectado a la doble dimensión básica de este agrosistema: el manejo en el campo, y la transformación y comercialización de las producciones.

En cuanto al manejo en el campo, hay que destacar el problema decisivo que ha venido suponiendo la creciente pérdida de rentabilidad para las pequeñas explotaciones castañeras de la Sierra de Aracena (Rubio, 2011). Ello se explica por la conformación de estos castañares, caracterizados por un arbolado envejecido y con escasez de pies polinizadores, lo que repercute en la menguante producción de castañas (desde más de 3.500 tm anuales en los años 90 a cifras inferiores a las 1000 tm durante los últimos años). Además, las variedades cultivadas han resultado poco adaptadas a las demandas del mercado, con lo que el valor en bruto de la castaña ha sido durante los últimos años menor que los costes de producción. La pérdida de rentabilidad ha conducido al abandono o semiabandono de muchas explotaciones (Garzón, 2016).

A todo ello se han añadido las importantes carencias a nivel de manufacturación y comercialización de los productos, de manera que gran parte de la producción castañera se exporta en bruto, sin recibir ningún tipo de labor industrial, ni siquiera de preparación.

Ante esta situación tan problemática, durante los últimos años se ha registrado un reforzamiento de la acción administrativa (principalmente autonómica) en favor del castaño, en el que el papel de la realidad Parque Natural ha resultado de especial importancia. Además de incentivos financieros¹⁶, que subvencionan las labores de mantenimiento de las explotaciones pero que no abordan las causas de fondo de su pérdida de rentabilidad, el aspecto más destacado y novedoso de la intervención pública ha sido el impulso de la investigación en pro de la posible introducción en la Sierra de Aracena de nuevas variedades de castaño más productivas y resistentes a plagas (posibilidad ya contemplada por el PORN, como se refirió con anterioridad).

¹⁶ Cuyo punto de partida vino dado por el Decreto 280/2001, de 26 de diciembre, por el que se establecen las ayudas de la Junta de Andalucía a los sectores agrícola, ganadero y forestal incluidas en el Programa Operativo Integrado Regional de Andalucía para el Desarrollo del Marco Comunitario de Apoyo 2000-2006. En el caso particular del castaño, se ha venido otorgando prioridad a las explotaciones de menor tamaño (con superficie inferior a 30 hectáreas) y localizadas en el interior de áreas protegidas.

Figura 9. Castañar abandonado y castañar en producción en la Sierra de Aracena



Fotografías de los autores

En esta línea, han sido varios los proyectos pioneros específicamente impulsados en el Parque Natural Sierra de Aracena y Picos de Aroche. Para ello se ha recurrido a la práctica de la polinización cruzada, es decir, cruces de individuos locales con ejemplares de variedades de castaños procedentes de Francia, Alemania, Italia y Galicia, que destacan por su productividad y su calidad. Los primeros resultados obtenidos de los ensayos de polinización parecieron mostrar una buena adaptación de las nuevas variedades a las condiciones ambientales de la Sierra de Aracena, hecho que se manifestó en la rapidez del crecimiento, lo que parece atisbar un panorama algo más halagüeño en un medio plazo. El objetivo último, cuya consecución se encuentra aún en curso, es el de hallar la especie que mejor se adapte a los suelos de la zona, mediante el estudio de parámetros relativos al fruto como el sabor, tamaño, temporalidad o facilidad de pelado, que convirtiese al fruto en más apto para la transformación y comercialización (Garzón, 2016). Una vez reconocida la variedad o variedades más aptas, el paso final sería el de su implantación (mediante injertos) en las explotaciones de la Sierra de Aracena, para lo que se pondrían plantas madre a disposición de los titulares de las explotaciones.

Se trata a nuestro juicio de un proyecto muy interesante el impulsado desde este parque natural para la renovación y mejora del arbolado de castaño, en la línea, defendida en este trabajo, de fomentar intervenciones proactivas que respondan a los desafíos específicos de los usos agrarios y agrosistemas en el interior de las áreas protegidas.

4. Discusión de resultados

El análisis desarrollado y los resultados obtenidos cabe situarlos en el marco de una escasez general de trabajos en el contexto español acerca de la cuestión de la incidencia de las áreas protegidas en la ordenación y evolución de los usos agrarios.

En efecto, son pocas las aportaciones que se han podido rastrear desde dicha perspectiva básica. Entre esas aportaciones cabe destacar la de Fernández (2010) respecto del Parque Natural Regional del Vexin (Francia), que incorpora una visión integral muy interesante, analizando la evolución de los usos del suelo, en particular el espacio agrícola, y la incidencia en ello de los instrumentos de planificación, principalmente la Carta del Parque Natural Regional. También hay que reseñar algunos de los trabajos y proyectos desarrollados por EUROPARC-España, principalmente mediante casos de estudio en áreas protegidas determinadas (<http://www.redeuroparc.org>). En un sentido similar, aunque diferenciado, se hallan otras investigaciones que abordan en un sentido más general los cambios de uso del suelo en áreas protegidas, como por ejemplo los parques nacionales españoles (Hewitt, Pera y Escobar, 2016). E igualmente puede afirmarse de la cuestión de los usos agrarios en zonas periurbanas y metropolitanas, incluyendo medidas de protección para asegurar la preservación de tales usos como el Parque Agrario (con aportaciones recientes muy interesantes, como las de Zazo, Yacamán, entre otros).

Así pues, a tenor del panorama someramente descrito, no cabe sino remarcar la importante novedad que supone el análisis de la dinámica de los usos y paisajes agrarios como objetos de ordenación y gestión desde las áreas protegidas convencionales. Con todo, ello no significa que no se hayan analizado los usos y espacios agrarios sujetos a protección, ya que son numerosas las aportaciones que así lo han hecho, pero no desde la vinculación específica con la protección legal, sino más bien desde el enfoque más básico y

general centrado en la descripción, valoración y diagnóstico de los agrosistemas, muchos de los cuales se localizan en el interior de grandes áreas protegidas diseñadas con criterios de multifuncionalidad (parques). Precisamente, algunas de las más destacadas aportaciones en esta línea se han centrado en la media montaña mediterránea, y más en particular en la Sierra Morena andaluza (Valle, 2001; Ojeda y Silva, 2002; Schröder, 2005; Lázaro y Vera, 2009; Mulero, 2013; Mulero y Silva, 2013; Zoido, Dir., 2012), sirviendo como soporte bibliográfico básico a este estudio, así como a posibles líneas de trabajo que profundicen en el mismo, como se apuntará en el apartado de Conclusiones.

5. Conclusiones

Después del estudio realizado, necesariamente sintético a tenor del espacio disponible, la constatación más evidente remite a la complejidad de la cuestión analizada. La propia diversidad agrosistémica y paisajística de una montaña media mediterránea humanizada y multifuncional como Sierra Morena, la disparidad de criterios entre parques naturales en la consideración y valoración de las distintas formaciones vegetales y agrosistemas, la incidencia de la normativa sectorial y los instrumentos de planificación ambiental de los parques, y la dinámica particularizada de los diferentes usos agrarios contribuyen a explicar la referida complejidad. Con todo, se pueden extraer una serie de conclusiones y enseñanzas básicas y de carácter general, que se sintetizan a continuación:

- 1) Los usos agrarios no han experimentado una merma desde la declaración de los parques naturales, sino antes bien una consolidación e incluso un reforzamiento, particularmente aquellos usos (forestales, cinegéticos y ganaderos) más favorecidos por la planificación ambiental, que ha resultado flexible y poco restrictiva en términos generales.
- 2) En el caso de la ordenación contenida en la planificación ambiental, y a propósito de lo apuntado en el punto anterior, resulta muy interesante la regulación básica de usos de los parques naturales de la Sierra Morena andaluza, impidiendo el retroceso desde formaciones forestales autóctonas a espacios de repoblación o agrícolas.
- 3) A pesar lo anterior, el trabajo desarrollado permite constatar la necesidad de una mejora de la planificación ambiental en favor de una ordenación más territorializada y adaptada a la especificidad de los usos agrarios y agrosistemas sustentadores de las áreas protegidas. A este respecto, se han detectado varios retos principales, como son:
 - Una zonificación que, partiendo de los niveles básicos ya definidos (zonas A, B, y C), pudiese concretar más la delimitación de los agroecosistemas y formaciones existentes. La zonificación, una vez definida desde dicha perspectiva territorial y adaptativa, ha de llenarse de contenido a través de la regulación normativa y la dimensión proactiva.
 - En cuanto a la normativa, esta debería resultar más concreta y actualizada en aspectos clave para la adecuada conservación de los recursos naturales y agrosistemas sustentadores de los usos agrarios. Así podrían abordarse impactos ambientales graves aún hoy día patentes en el interior de los parques naturales, como las cargas ganaderas excesivas en pastizales y dehesas, o los procesos erosivos severos en determinados cultivos en pendiente. La necesidad de un nuevo enfoque —más decididamente territorial— para dicha ordenación podría concretarse en una regulación de los usos agrarios pero vinculados a los principales agroecosistemas presentes en cada parque natural, a modo de marco espacial bien reconocible. La regulación lo sería para la ganadería, la caza o las actividades agrícolas, pero en el marco de las dehesas ganaderas (o, en su caso, ganadero-cinegéticas), los espacios forestal-cinegéticos o las zonas de olivar. El marco territorial aportado por los agroecosistemas permitiría definir una regulación normativa más particularizada y efectiva de cada uno de los usos agrarios que los explican y dan forma.
 - En consonancia con lo anterior, un impulso de la dimensión proactiva, incluyendo líneas de acción específicas y acompañadas de una programación bien definida, a corto-medio plazo, que permitiesen igualmente ofrecer una respuesta efectiva ante situaciones problemáticas, en la línea de lo que se viene planteando en años recientes para el castañar en el Parque Natural Sierra de Aracena y Picos de Aroche.
- 4) La incorporación de referencias territoriales a la ordenación de los usos y sistemas agrarios ha de acompañarse de mecanismos para su efectividad, lo que habría de articularse mediante una coordinación y colaboración entre todos los agentes (públicos y privados) encargados de la regulación y desarrollo de las actividades agrarias. Ello solo sería posible de una manera efectiva sobre la base

de la implicación total de tales agentes en la definición de los criterios para la ordenación de los usos y sistemas agrarios, a través de un verdadero proceso participativo en la elaboración de los planes ambientales.

Tras estas conclusiones generales, finaliza esta aportación remarcando su carácter de trabajo panorámico y de base, que sin duda puede y debe ser objeto de una profundización ulterior. El trabajo abre la puerta a análisis más detallados, que, en función del enfoque, pueden asumir una doble orientación: territorial, a escala de cada parque natural (estudio pormenorizado de sus usos y paisajes agrarios), o temático (estudio de cada uno de los grandes usos agrarios considerados para los parques naturales de Sierra Morena). En todo caso, tales análisis habrían de abordar con mayor detalle aspectos que solo han podido apuntarse en este trabajo, como la incidencia más particular de la protección sobre los usos agrarios, su reflejo sobre los agrosistemas y su evolución, los impactos ambientales y su cuantificación dentro de las áreas protegidas, además de la proyección económica de la actividad agraria (papel de los agentes locales, entramados empresariales asociados a los usos agrarios, posibles marcas de calidad vinculadas a la protección,...).

Anexos

Anexo 1. Evolución superficial de los grandes agrosistemas (ha) en la Sierra Morena

Agrosistemas	1990 (Corine Land Cover)	2000 (Corine Land Cover)	2005 (SIOSE)	2018 (Corine Land Cover)
a	692.675.340	711.490.523	790.479.348	877.645.683
b	1.276.138.774	1.051.607.593	1.333.325.914	1.394.307.208
c	624.988.215	563.860.105	544.957.236	529.897.783
d	1.412.405.855	1.448.487.763	1.453.370.498	1.491.388.639
e	232.517.772	231.583.546	231.763.435	233.722.812
f	11.384.390	15.895.410	16.437.871	17.534.783
g	6.668	8.608	7.485	5.917
h	69.291.835	64.346.348	65.478.878	66.300.573
i	142.191.626	141.725.593	143.412.460	174.459.749
j	208.818.286	381.769.365	378.805.350	377.973.592

- a. Formaciones arboladas densas de quercíneas
- b. Formaciones arboladas de quercíneas con matorral
- c. Formaciones de matorral
- d. Formaciones arboladas de quercíneas con herbáceos (dehesas)
- e. Olivares
- f. Otros cultivos leñosos
- g. Castañares
- h. Eucaliptales
- i. Pastizales
- j. Repoblaciones forestales de Pinus spp

Fuente: Bases cartográficas referidas en la tabla. Elaboración propia

Anexo 2. Evolución superficial de los grandes agrosistemas (ha) en los parques naturales de la Sierra Morena andaluza

Agrosistemas	1990 (Corine Land Cover)	2000 (Corine Land Cover)	2005 (SIOSE)	2018 (Corine Land Cover)
a	69.268	71.149	79.048	87.765
b	127.634	132.161	133.333	139.431
c	62.499	56.386	54.496	52.990
d	141.241	144.849	145.337	149.139
e	23.252	23.178	23.176	23.172
f	1.858	1.690	1.664	1.653
g	8.668	8.708	7.485	5.917
h	6.929	6.435	6.548	6.630
i	14.219	14.173	14.341	17.446
j	41.882	38.177	37.881	37.797

Fuente: Bases cartográficas referidas en la tabla. Elaboración propia

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Singularidades toponímicas de las islas Pitiusas. La mediterraneidad de un paisaje insular a través de los nombres geográficos

*Naming singularities of the Pine Islands. The Mediterranean nature
of an island landscape seen through geographical names*

Antoni Ordinas Garau^{1*} 
Jaume Binimelis Sebastián² 

Resumen

Este trabajo supone la continuidad en una línea de investigación iniciada en su aplicación a la isla de Menorca cuyo principal objetivo es constatar como el análisis de la toponimia constituye una importante fuente de información geográfica y en la que durante los últimos años se ha producido un importante auge en su estudio y producción científica. A partir del análisis cualitativo y cuantitativo del mayor corpus toponímico sobre el conjunto de las islas Pitiusas (Ibiza y Formentera) se constata el cumplimiento de los principios de transparencia y de significación territorial con los que se describen las características generales y las singularidades del paisaje y el espacio geográfico. La clasificación y sistematización de los nombres de lugar y sus genéricos más frecuentes y genuinos permiten ahondar en los rasgos más específicos y representativos de unas islas mediterráneas con una marcada identidad histórica y cultural. Es por ello que tanto la metodología como los resultados aquí obtenidos se ofrecen como modelo y contribución al avance de la geografía como ciencia innovadora en el aprovechamiento de la toponimia como herramienta del conocimiento territorial.

Palabras clave: Toponimia; clasificación; geografía; paisaje; islas Pitiusas; Ibiza; Formentera.

Abstract

This article continues an area of research undertaken and applied in Minorca and main aim is to verify how an analysis of names can provide an important source of geographical information. There has been a huge increase in naming or toponymy analysis in recent years. A qualitative and quantitative analysis of the largest corpus of names in the Pine Islands (Ibiza and Formentera) confirms compliance with the principles of transparency and territorial significance with which the general characteristics and singularities of the island landscapes are described. The classification and systematisation of place names and their most frequent and genuine generics enables us to delve into the most representative features of the distinct historical and cultural identity of these Mediterranean islands. Both the methodology and results are suggested as a template and contribution to progress to geography as an innovative science that uses names (or toponymy) as a tool for territorial knowledge.

Keywords: Toponymy; classification; geography; landscape; Pine islands; Ibiza; Formentera.

1 Departamento de Geografía. Universitat de les Illes Balears, España. antoni.ordinas@uib.es. * Autor para correspondencia

2 Departamento de Geografía. Universitat de les Illes Balears, España. jaume.binimelis@uib.es

1. Introducción: El trinomio toponimia-paisaje-geografía

Han sido muchos los literatos —algunos tan célebres como Unamuno o Azorín—, en cuya obra está explícito el valor del paisaje como identidad cultural (Martínez de Pisón, 2010). Pero más allá de la mera contemplación a la que pueda invitar la belleza del paisaje, como disciplina científica, la Geografía analiza las relaciones entre el hombre y el medio físico que le rodea. De la confluencia de las fuerzas naturales y de las sociales surge el medio geográfico, cuya expresión es el paisaje. Cabe recordar que la disponibilidad de los recursos naturales condiciona la configuración territorial de los paisajes, que existen en tanto que son observados e interpretados por las sociedades humanas que a su vez los modelan. Concretamente, el paisaje no es más que una construcción histórica resultante de la interacción entre factores bióticos (vegetación y fauna) y abióticos (la interacción de las masas gaseosa, líquida y sólida, esencialmente) del medio natural, a los que se superponen los antrópicos. Por tanto, el paisaje es el resultado de una transformación colectiva de la naturaleza. La actividad humana crea los paisajes, modificando la sucesión natural y manteniendo estados antrópicos intermedios convenientes para sus fines. Y al respecto, los topónimos como una de las expresiones más humanas de los procesos de ocupación del medio y de la compleja construcción de los paisajes, se constituyen no sólo en referente también de la cartografía, instrumento propio del geógrafo, sino que también expresan una determinada organización del medio y del territorio. Aún más, la toponimia, en su papel de herramienta geográfica y humanística, permite al geógrafo demostrar su valor en la organización cultural de unos paisajes vividos a lo largo de milenios (Mateu, 2000).

La larga historia de impactos humanos en el paisaje es responsable de algunas de sus características distintivas que comprenden una transformación particularmente intensiva del territorio. El paisaje actual de las Islas Baleares es, por tanto, el resultado de la evolución natural y de la transformación producida por la humanidad desde hace más de 5.000 años y especialmente, por generaciones de agricultores y ganaderos. Esta larga intervención humana ha producido múltiples transformaciones que han dado lugar a una gran variedad de paisajes en muy poco espacio. De ahí que sea referido como microcosmos. Al margen de los paisajes más “naturales”, aquellos en que la huella del hombre pasa más desapercibida, han sido las culturas agrarias quienes han conformado el escenario o marco espacio-temporal donde tienen lugar los procesos naturales y sociales. Este marco heredado de las generaciones pasadas y que es legado a las futuras es lo que se llama paisaje y sobre él seguimos construyendo la identidad personal y colectiva. Los paisajes baleares forman parte del mosaico mediterráneo, un mosaico de paisajes diversos, pues una de las originalidades de los paisajes humanos mediterráneos es su diversidad en los dos sentidos de la palabra: por una parte, organización de una diversidad de especies en cada paisaje; y por otra, paisajes varios donde cada uno de ellos se caracteriza por combinaciones distintas de especies adaptadas a las condiciones específicas de cada lugar: tipo de suelo y de relieves, pluviosidad y escorrentía, así como oscilaciones térmicas e insolación. De manera que, si desaparecen los agricultores, el paisaje puede sobrevivir durante un tiempo, pero como un paisaje muerto, como un paisaje fósil. En este contexto es cuando se aprecia el valor de la toponimia para interpretar la complejidad de los paisajes rurales (Mateu, 2000) al que se une la aplicación de los principios teóricos de transparencia, excepcionalidad y significatividad territorial enunciados por Tort (2001) y que suponen una de las principales aportaciones para la interpretación y análisis del paisaje a través de la toponimia, se convierten en guía y referencia para su aplicación al trinomio paisaje-toponimia-geografía. Y es que el propio mecanismo de fijación de los nombres de lugar explica su relevancia como indicadores de paisaje. Es más, los topónimos pueden identificar y reflejar aspectos de la cultura, el patrimonio y el paisaje, fruto de una estrecha y prolongada relación entre el territorio y sus habitantes, en un ejercicio que Riesco (2010) denomina mnemotecnia del paisaje.

Las relaciones entre toponimia, paisaje y geografía se conforman como los vértices de un triángulo por su estrecha interconexión. En un estudio previo que tenía por objeto el análisis del paisaje de Menorca a través de la toponimia (Ordinas y Binimelis, 2013) ya se expusieron los precedentes teóricos sobre los que se sustenta la intensa relación entre toponimia y geografía. A los datos y argumentos allí desarrollados sólo cabe subrayar que la numerosa y valiosa información transmitida por los topónimos puede proceder tanto por su parte genérica como por su parte determinante. En los genéricos o apelativos toponímicos aparece a menudo la terminología geográfica que describe las características generales del país, mientras que en los determinantes de los topónimos abundan los detalles específicos que ahondan en la información particular de cada lugar denominando aportando un amplio abanico de potencialidades referidas a múltiples aspectos de carácter muy diverso (geográfico, histórico, antropónimo...). Al respecto, resultan especialmente ilustrativas las palabras del ibicenco Marià Torres (1995) al remarcar el valor enciclopédico o interdisciplinar que brota de la toponimia: personas, hechos históricos, plantas y animales, pesca y navegación, la morfología del terreno, religiosidad y superstición, aspectos que recogen el amplio espacio

que existe entre el hombre y la naturaleza. Asimismo, y más allá de la amplia interdisciplinariedad que atañe la toponimia, interesa destacar cómo los nombres de lugar de un territorio constituyen un fiel reflejo de las interrelaciones entre los aspectos físicos y humanos del mismo, de su evolución y de su paisaje. Su objetivo esencial es definir el orden y la coherencia espacial que revela la red de topónimos de una comarca o región a través de la observación como base de la interpretación toponímica (Arroyo, 2010).

Retomando la esencia de los nombres de lugar, Martínez de Pisón (2010) recuerda tanto la función identificadora como la descriptiva que éstos aúnan cuando afirma que:

La toponimia no es sólo una especialidad lingüística ni un repertorio de nombres azarosos, sino también y muy directamente una referencia geográfica. Primero para designar puntos, y sobre todo porque encierra un enigma y pide una explicación coherente con los hechos territoriales, los de hoy o, más frecuentemente, los de ayer. Porque es un documento clave de la historia de una relación territorial. Esto lo sabían antes los geógrafos, no era necesario decirlo, pero hoy es preciso volver a ejercitarlo (Martínez de Pisón, 2010, p. 24-25).

Y como señala Riesco (2010),

El encuadre metodológico de los paisajes históricos (...) tiene en cuenta la toponimia documental y oral. (...) El espesor histórico de un área paisajística, esto es, la sucesiva imprimación del territorio por la actividad humana desde siglos remotos, es una de las claves del carácter de los paisajes; la reconstrucción de paisajes antiguos saca partido de los nombres de lugar, combinados con aportaciones de la arqueología, antropología, historia, socio-ecología y otras disciplinas concurrentes. (p. 27)

Una de sus aplicaciones más claras se encuentra en el paisaje vegetal, donde el estudio toponímico permite comprobar la riqueza y alto grado de contingencia de las evoluciones seguidas (Fernández, Gómez-Gonçalves, y Luengo, 2019). Así se ha podido corroborar en diversos estudios realizados sobre la fitotoponimia del paisaje natural menorquín (Grimalt, Ordinas, Caldentey, 2009) y también sobre el paisaje vitícola actual e histórico de Mallorca (Caldentey, Grimalt, Ordinas, 2006).

Por otro lado, y entroncando con la utilización cartográfica de la toponimia, permite abordar el estudio histórico del paisaje, pues los topónimos sobre el mapa sirven al geógrafo para rescatar paisajes perdidos de forma que “el conocimiento histórico sumado al del terreno (...) permiten identificar sus significados paisajísticos y sus sencillas conceptualizaciones de los lugares. Por ello se afirma que la toponimia es parte de la historia del paisaje” (Martínez de Pisón, 2010, p. 17). De hecho, al acometer la complejidad de la casuística toponímica en sus aplicaciones cartográficas, también descubrimos la mayor riqueza y articulación de la toponimia menor o microtoponimia en la descripción paisajística, así como su densidad y distribución en la que se producen superposiciones, solapamientos y casos de topónimos que incluyan otros subtopónimos. Tampoco resulta extraño que un mismo lugar pueda recibir distintas denominaciones que rivalizan y conviven temporalmente como resultado de una implantación sucesiva. En ocasiones, paralelamente a los nombres más o menos oficiales existen nombres afectivos, menos conocidos, de carácter y uso familiar de propietarios y vecinos. En otras, los herederos de tierras con vínculos familiares antiguos respetan los nombres arcaicos. Esta actitud contrasta con la de los nuevos propietarios que implantan neotopónimos en un ejercicio de innovación cada vez más extendido, pero incompatible con la preservación de un patrimonio cultural intangible y escasamente protegido como el de la toponimia. Sin duda, el fenómeno de la doble, o triple, denominación conlleva implicaciones sociolingüísticas entre las que destaca la retonponimización (Riesco, 2010) que se traduce en una neotoponimia rururbanizadora y turística y que no deja de ser un reflejo de los valores y la cultura de la sociedad contemporánea.

Por otra parte, es importante reseñar la aplicación de la toponimia como técnica auxiliar en la descripción de cambios en el paisaje, así como de su identidad y simbología. Las alusiones al color en los topónimos, los cromotopónimos, aportan información visual del paisaje al que se refieren. En un estudio sobre la cromotoponimia de las Baleares (Ordinas y Binimelis, 2020) se descubren los colores de mayor presencia en la toponimia que, en el caso de Ibiza donde abundan las alusiones al negro y al verde, no se amoldan a los estereotipos turísticos, no exentos de cierto glamur, que la asocian a la isla blanca por las tradicionales edificaciones rurales, de arquitectura cúbica de origen púnico, y de paredes encaladas que tanto caracterizan el paisaje mediterráneo.

1.1. La toponimia pitiusa. Estudios previos

El estudio de la toponimia pitiusa y, más concretamente, ibicenca y/o formenterera no puede desvincularse en muchos casos de estudios de ámbito más general, como el balear, en los que el territorio del

subarchipiélago es incluido al formar parte de circunscripciones territoriales, lingüísticas y culturales más amplias. No obstante, la recopilación y estudio de la toponimia pitiusa, en un sentido vasto y generalizado, se abordó en fechas relativamente recientes y sólo de forma puntual y parcial, pero nunca, al menos a lo largo de una primera etapa, en su conjunto a partir de recopilaciones toponímicas exhaustivas³. No obstante, el análisis y estudio lingüístico de algunos topónimos ya queda reflejado en diversas publicaciones que van apareciendo en una primera etapa que se desarrolla durante las décadas de los 60 y 70 del siglo XX y cuyos autores son mayoritariamente ibicencos. Dicha etapa se inicia con un artículo de Joan Castelló (1963) sobre la toponimia de Ibiza y Formentera y que tendrá continuidad en las diversas aportaciones sobre etimologías toponímicas realizadas por Isidor Macabich (1966a, 1966b, 1966c, 1966d, 1966e, 1966f, 1966g, 1966h, 1966i) en su *Historia de Ibiza*. Marià Villangómez (1969, 1977a, 1977b) también contribuye al estudio de topónimos ibicencos en algunos artículos publicados entre 1969 y 1977. Cerrando la década de los setenta, destaca un artículo de Isidor Marí (1979) sobre la toponimia básica de las Pitiusas.

En los años ochenta comienza una nueva etapa, más prolífica, que se inicia con un estudio sobre la toponimia formenterera (Gordillo, 1981) al que se sumarán otros de Ángel Poveda (1984) y Martínez y Epalza (1987), ambos sobre la arabización de la toponimia pitiusa. También a esa década pertenecen las diversas obras de Cosme Aguiló (1986, 1989, 1990, 1993a, 1993b), algunas de las cuales prolongan su publicación en la década de los 90 y de las que destaca el mapa toponímico de los islotes pitiusos (Aguiló, 1987). En 1989 comienza a editarse la *Enciclopèdia d'Eivissa i Formentera*, obra magna donde ya aparece, en temas toponímicos y entre otras, la autoría de Enric Ribes, cuya vasta e importante obra sobre múltiples aspectos y recopilaciones toponímicas de las Pitiusas iniciada en los años 80 y aún vigente, le convierte en su principal referente (Ribes, 1986, 1991, 1992a, 1992b, 1992c, 1993a, 1993b, 1993c). Destacan sus recopilaciones exhaustivas de la toponimia litoral correspondiente a los municipios de Sant Joan de Labritja, Sant Antoni de Portmany y Eivissa (Ribes, 1993d, 1995 y 2006). Por último y entre otras⁴, cabe citar diversas contribuciones sobre antiguos topónimos isleños (Marí Cardona, 1991), la antropotoponimia de Formentera (Ordinas, 1994) o a la utilidad didáctica de la toponimia pitiusa y otros aspectos culturales (Torres, 1987 y 1995).

1.2. Objetivos

El principal objetivo de este trabajo es el de constatar como la toponimia es un magnífico instrumento para la lectura del paisaje a la vez que constituye una importante fuente de información geográfica cuyas potencialidades se descubren a través de su análisis y como resultado de su previa clasificación. Más específicamente, se pretende constatar el cumplimiento de los principios de transparencia y de significación territorial con los que se describen las características generales y las singularidades del paisaje y el espacio geográfico, en este caso, de las Islas Pitiusas. Asimismo, también se pretende profundizar en el estudio de la caracterización del paisaje a través de la toponimia del archipiélago balear que iniciamos con la isla de Menorca (Ordinas y Binimelis, 2013) y que ahora tiene su continuidad en el subarchipiélago pitiuso (Ibiza y Formentera). La separación al abordar ambos análisis se debe tanto al ingente volumen de datos toponímicos que cada uno de estos territorios genera como a las diferentes identidades geográficas de sus respectivos paisajes insulares.

Finalmente, la clasificación y sistematización de los nombres de lugar y sus genéricos más frecuentes y genuinos ha de permitirnos ahondar en los rasgos más específicos y representativos de unas islas mediterráneas con una marcada identidad histórica y cultural.

2. Metodología

2.1. El área de estudio: las islas Pitiusas, un subarchipiélago con identidad propia

Las islas Baleares, situadas en el centro-oeste del sector occidental del Mar Mediterráneo, constituyen un archipiélago formado por cinco islas mayores (Mallorca, Menorca, Ibiza, Formentera y Cabrera⁵) y más de 150 islas menores e islotes con una extensión total de 4.968,3 km² y una longitud de costa, en su conjunto, de 1.428 km (Figura 1). Las islas de Mallorca, Menorca, Cabrera y sa Dragonera junto con sus

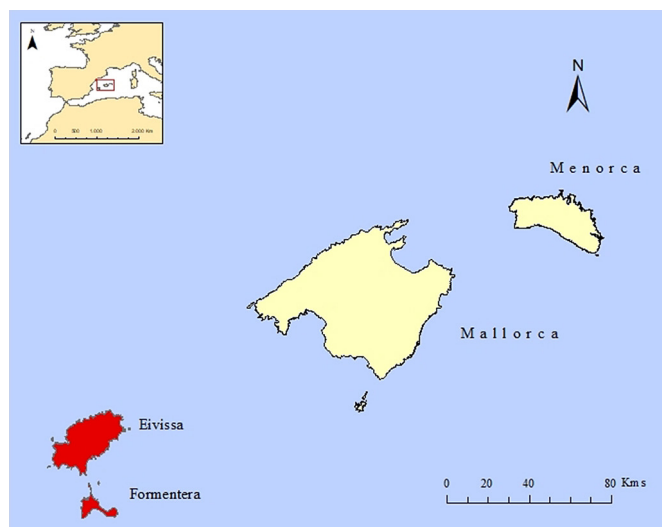
³ Lamentablemente, la meritoria labor de Josep Mascaró Passarius, precursor balear en recopilaciones toponímicas, quien recogería buena parte de la toponimia de las islas de Menorca y de Mallorca a mitad del siglo XX, no alcanzó, sin embargo, las tierras pitiusas.

⁴ En varias publicaciones (Ordinas, 1998) se recoge la bibliografía específica sobre la toponimia pitiusa publicada hasta la fecha.

⁵ Tanto Cabrera como sa Dragonera, por sus reducidas dimensiones, históricamente han permanecido prácticamente deshabitadas. En el caso de Cabrera se trata de un subarchipiélago formado por 19 islas e islotes de apenas 13 km².

islotes adyacentes forman el subconjunto que desde el punto de vista histórico genuino se denominaban Islas Baleares (o Gimnesias), mientras que Ibiza, Formentera y sus islotes⁶ forman las islas Pitiusas.

Figura 1. Situación geográfica del archipiélago pitiuso



Elaboración propia

Las Pitiusas constituyen, por tanto, un subarchipiélago de 654,2 km² que ocupa el sector sud-occidental del archipiélago balear, situándose en el extremo nordeste de las sierras sub-béticas, de cuyo territorio peninsular se encuentran más próximas lo que ha supuesto un mayor contacto comercial y humano; y más alejadas⁷, en cambio, de las antiguas Baleares (Mallorca y Menorca). Esta situación geográfica ha condicionado la vida y la cultura pitiusas a lo largo de la historia.

La isla de Ibiza (571,7 km² y 334 km de costa) se orienta de NE a SO con una distancia máxima de 41 km entre sus extremos. En ambos se encuentran los dos conjuntos montañosos más importantes, separados por un área cóncava por donde discurren los torrentes que mayoritariamente drenan hacia el sur. En el área del SO se alza sa Talaia o Talaia de Sant Josep (475 m) (Figura 2), la máxima altitud isleña. La costa ibicenca se articula en numerosas calas, en cuyo fondo se descubren playas de arena o de guijarros (*es Codolar/Platja des Còdols*), y dos bahías, la de Sant Antoni de Portmany⁸ y la de Ibiza, situadas en los extremos de una franja deprimida que separa las áreas de mayor relieve. Predominan los materiales calcáreos y sus manifestaciones cársticas (lapiaz, cuevas, simas), destacando los poljes que originan algunos valles sin drenaje superficial (*Pla de Corona, Pla d'Albarca*).

Un canal de 6 km jalonado por numerosos islotes separa Ibiza de Formentera, la pitiusa menor, de apenas 82,4 km² y 115,2 km de costa. Formada por dos macizos opuestos: la Mola (122 m) y el cap de Barbaria⁹ (107 m) comunicados por un istmo en cuyos lados se extienden largas playas arenosas (Figura 3), carece de una red hidrológica a causa de su régimen pluviométrico, el más escaso de las Baleares. Tales características, que marcan su personalidad, se remontan a su origen histórico que data del siglo VII aC cuando los cartagineses iniciaron la explotación de sus salinas y fundaron la ciudad de *Ebusus*¹⁰ en una isla que hasta entonces no había tenido población estable. Las reducidas dimensiones insulares favorecieron desde un principio la macrocefalia de su ciudad¹¹ cuyo monopolio urbano ya contrastaba con el resto del territorio de escasa población.

6 En la costa de Ibiza se contabilizan un total de 38 islotes entre los que destacan sa Conillera, s'Espartar, illa des Bosc, Tagomago, es Vedrà y es Vedranell. Próximos a Formentera se sitúan otros 14 islotes entre los que sobresalen s'Espalmador y s'Espardell.

7 La distancia mínima que separa las islas de Mallorca e Ibiza es de 81 km.

8 Su etimología, del latín '*portus magnus*', así también lo indica.

9 El topónimo obedece a su orientación hacia las cercanas costas del norte de África, siendo el punto extremo sur del archipiélago balear con una latitud de 38°38'25.39"N.

10 El topónimo procede de la antigua denominación fenicia 'Y-b-š-m, 'isla de Bes', en alusión a esta deidad del panteón fenicio, aunque de origen egipcio.

11 Tanto la simpleza de su modesta denominación popular, *Vila* (villa), que ya la define implícitamente como su único núcleo urbano, como la coincidencia toponímica entre el nombre de la isla y de la ciudad refuerzan la total identificación del conjunto de la isla con su ciudad siguiendo el modelo de las *polis* o ciudades-estado mediterráneas del mundo antiguo.

Figura 2. *Talaia* designa los montes que sirvieron de observatorios en los lejanos tiempos en que el peligro de invasiones piráticas era frecuente (Castelló 1963). No en balde la máxima altura de la isla (475 m) se denomina *Talaia de Sant Josep* o *sa Talaia*



Fotografía de los autores

Figura 3. En Formentera, desde la máxima altitud de la Mola (202 m) se extiende un istmo bordeado por extensas playas de cristalinas aguas



Fotografía de los autores

Son casi imperceptibles las diferencias que se pueden señalar entre las dos islas pitiusas. La reducida proporción territorial y la tardía ocupación histórica de Formentera por su indefensa exposición a ataques e invasiones exteriores, la han convertido en un apéndice cultural —en concordancia con su posición geográfica— de su cercana metrópolis de Ibiza. Frente a la despoblación secular del pasado, a tenor del desarrollo turístico Formentera ha experimentado un importante crecimiento poblacional que llega a la saturación en la época veraniega, cuando los turistas prácticamente colapsan sus playas. La riqueza generada por la actividad turística ha supuesto la consecución de una mayor autonomía político-administrativa frente al poder centrípeto de la cercana Ibiza y también del centralismo balear personificado en Mallorca. A pesar, no obstante, de las ya señaladas escasas y lógicas diferencias entre las dos islas Pitiusas.

El paisaje de las Pitiusas, aunque refleja aspectos que lo diferencian del de las Gimnesias, resulta, sin embargo, menos diverso por su menor extensión. Destaca, por su mayor personalidad, la región de es Amunts, al norte de Ibiza, la más alejada de la capital, de orografía más abrupta y menor densidad de población. No obstante, la práctica totalidad del territorio insular se caracteriza por un poblamiento rural muy diseminado acorde con una estructura minifundista de la propiedad. Todo ello favorece el policultivo

cuyo protagonista es el arbolado mediterráneo (almendro, algarrobo, olivo, higuera) compatible con una práctica ganadera extensiva de ovino y caprino. En unas islas donde tradicionalmente se exigía la autarquía, no faltaban pequeñas zonas de huerta de regadío, destacando el área de ses Feixes (Figura 4), muy próxima a la capital, Eivissa. Formentera, por su parte, despoblada durante siglos por su desprotección ante ataques de piratas y corsarios, constituye un apéndice paisajístico de la cercana Pitiusa mayor y en la que la omnipresencia del mar circundante junto a unas condiciones climáticas más severas, sólo permiten destacar las higueras de copas frondosas y apuntaladas como símbolo más representativo de un paisaje de agricultura de secano.

Figura 4. En un área pantanosa próxima a la ciudad de Ibiza, un típico portal de *feixa*, un tradicional paisaje de regadío por endosmosis, actualmente abandonado



Fotografía de los autores

No obstante, el importante desarrollo de la actividad turística iniciada a partir de los años sesenta y que supuso la llegada de los primeros hippies se tradujo en una progresiva urbanización del litoral (Figura 5) y la rururbanización del interior, transformando buena parte del paisaje isleño. Los fuertes impactos de la terciarización y la especialización turística han proyectado una imagen cosmopolita que ha eclipsado la cultura tradicional. Tales cambios también se han visto reflejados en la toponimia, con la abundante aparición de neotopónimos (Picornell, 1982) surgidos ante los nuevos usos de un territorio sometido a la fuerte presión del turismo de masas.

Figura 5. La platja d'en Bossa, en el municipio de Ibiza, un enclave paradigmático del turismo de sol y playa



Fotografía de los autores

2.2. Fuente y métodos

Se ha analizado el mayor corpus toponímico hasta ahora obtenido de las islas Pitiusas en cuya recolección uno de los autores participó personalmente. Se trata de la toponimia obtenida para vestir el *Mapa Topográfico Balear* a escala 1:5.000 con cuyo trabajo de campo (Tabla 1) se consiguieron reunir 7.731 topónimos, cifra de la que se deriva una densidad media de 11,8 topónimos/km² como resultado de las entrevistas realizadas sobre el terreno a numerosos informadores, seleccionados por su especial conocimiento de una determinada área del territorio sobre la que fueron interpelados.

Tabla 1. Datos relativos al corpus toponímico de las islas Pitiusas

	Ibiza	Formentera	Pitiusas
Superficie (km ²)	571,76	82,49	654,25
Topónimos	6.710	1.021	7.731
Densidad (topónimos/km ²)	11,7	12,3	11,8

Elaboración propia

Siguiendo la metodología utilizada en el análisis de la toponimia de Menorca, se ha clasificado y contabilizado la toponimia de las islas Pitiusas a partir de la codificación del *Institut Cartogràfic de Catalunya* (ICC), organismo encargado de la coordinación de la recopilación toponímica del *Mapa Topográfico Balear* a escala 1:5.000 cuyos resultados se muestran en la Tabla 1. La rotulación cartográfica de la toponimia exige su codificación y para ello cada uno de los topónimos debe ser clasificado atendiendo a diversos parámetros entre los que destacan el de su magnitud (extensión, longitud, altura...) y el de su identificación o realidad geográfica que no siempre se corresponde con la que su apelativo toponímico indica y prestándose, en tales casos, a un claro equívoco. Así pues, la propuesta de codificación del ICC, organismo encargado del levantamiento del mapa, es la utilizada para nuestro estudio y a través de la que podemos conocer, mediante un análisis cuantitativo de la distribución temática de los topónimos que nos ofrece su clasificación, las principales características geográficas del conjunto de la toponimia pitiusa. La jerarquización toponímica mediante el número de frecuencias y su porcentaje correspondiente, permite alcanzar un nivel de análisis más detallado. Para ello, hemos seleccionado las categorías toponímicas que presentaban las frecuencias más elevadas de las entradas de la codificación. La Tabla 2 refleja dicha clasificación, así como los datos generales del recuento toponímico relativo a las islas Pitiusas en su conjunto y de cada una de las islas (Ibiza y Formentera) por separado.

Tabla 2. Recuento y clasificación de la toponimia de las islas Pitiusas

Topónimos relativos a:	Ibiza	Formentera	Pitiusas
Lugares de habitación permanente	3.845 (57,3%)	511 (50%)	4.356 (56,3%)
Implantación industrial	21 (0,3%)	5 (0,4%)	26 (0,3%)
Servicios de comunicación y transporte	190 (2,8%)	42 (4,1%)	232 (3%)
Servicios comunitarios	104 (1,5%)	16 (1,5%)	120 (1,5%)
POBLAMIENTO	4.160 (62%)	574 (56,2%)	4.734 (61,2%)
Orografía terrestre y marítima	1.981 (29,5%)	391 (38,3%)	2.372 (30,6%)
Hidrografía	569 (8,4%)	56 (5,4%)	625 (8%)
MEDIO FÍSICO	2.550 (38,%)	447 (43,7%)	2.997 (38,7%)
TOTAL	6.710 (86,8%)	1.021 (13,2%)	7.731 (100%)

Elaboración propia

3. Resultados: los topónimos en el paisaje pitiuso

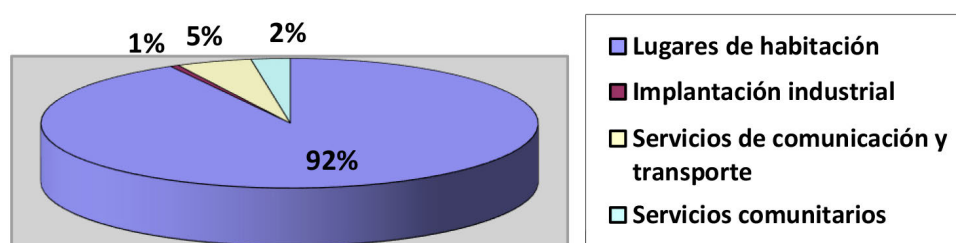
A partir de la tradicional división que en Geografía distingue entre medio físico y humano se observa, como rasgo fundamental, la superioridad de la toponimia relativa al poblamiento (61,2%) frente a la del

medio físico (38,7%), datos que resultan muy significativos respecto al paisaje pitiuso y que contrastan con los del menorquín, donde se observa una realidad totalmente opuesta. En la Tabla 2 aparecen detalladas las cifras absolutas y sus respectivos porcentajes que permiten profundizar en la descripción de un territorio insular con características propias.

3.1. La toponimia relativa al poblamiento

Entre los topónimos referidos al poblamiento se distinguen cuatro grupos de muy desigual peso (Figura 6), destacando el de los lugares de habitación con un 92%, muy alejado del resto de los nombres geográficos referidos a servicios de comunicación y transporte, servicios comunitarios e implantación industrial cuyos respectivos porcentajes se reducen a un 5%, 2% y 1%, respectivamente.

Figura 6. Toponimia relativa al poblamiento



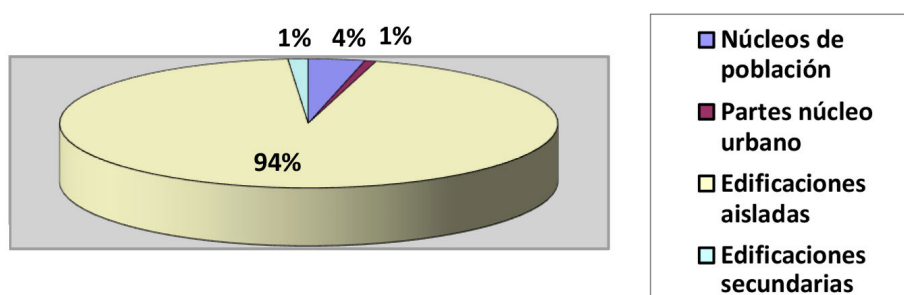
Elaboración propia

3.1.1. Lugares de habitación

Constituyen el grupo mayoritario tanto entre los topónimos indicadores del poblamiento como en el conjunto de la toponimia pitiusa (56,3%). Se dividen en tres subgrupos: los relativos a núcleos de población, partes de un núcleo urbano y edificaciones aisladas. En la Figura 7 se observa como destaca con un 94% éste último, cuya plasmación paisajística se evidencia claramente en la Figura 8. La abundancia de pequeñas propiedades, producto de una tradicional y repetida fragmentación como consecuencia del legado de generaciones, donde se levanta una vivienda unifamiliar permanente ha dado lugar a su característico poblamiento intensamente diseminado, el más acusado de las Baleares y que contrasta con el de ciertas áreas de Mallorca y Menorca en su conjunto.

El resto de subgrupos apenas reúnen el 6% de los topónimos de este apartado, de los cuales un 4% corresponden a núcleos de población que agrupan a ciudades, pueblos y urbanizaciones. La insignificancia del subgrupo relativo a las partes de un núcleo urbano (1%) donde se incluyen los barrios, avenidas, paseos y plazas más importantes se debe en buena parte a que la recolección toponímica de carácter urbano ha sido muy selectiva y reducida, condicionada por el carácter topográfico de la cartografía a la que iba destinada la recolección toponímica. Por último, suman el restante 1% las edificaciones secundarias, también aisladas y no siempre habitadas de forma permanente (barracas, cabañas).

Figura 7. Toponimia relativa a lugares de habitación



Elaboración propia

Figura 8. Poblamiento diseminado, fruto de una densa rururbanización, en el municipio de Sant Antoni de Portmany. Al fondo, junto a la bahía, su núcleo urbano



Fotografía de los autores

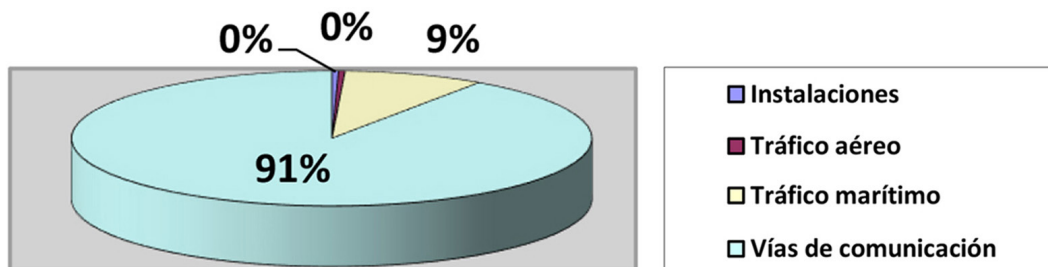
3.1.2. Implantación industrial

Sólo un 1% de este grupo (que se reduce al 0,3% del total de los topónimos) supone la representación toponímica que corresponde a la implantación industrial. Ello es debido no sólo a la escasa presencia industrial en las islas sino también a que la mayor parte de los nombres de lugar que su actividad genera resultan ser microtopónimos y neotopónimos de carácter comercial que frecuentemente aluden a marcas cuya publicidad no se adecúa a las características de un mapa topográfico oficial ni consiguen el arraigo y perdurabilidad toponímicas, por lo que resulta desaconsejable su inclusión en la cartografía cuya toponimia constituye la fuente del presente estudio. En cualquier caso, la irrelevancia del sector industrial y, en consecuencia, de su nomenclatura geográfica se extiende al conjunto del archipiélago balear, aunque las Pitiusas son el territorio que acusa la mayor escasez.

3.1.3. Servicios de comunicación y transporte

Sólo el 3% de los topónimos pertenecen a este subgrupo y una amplia mayoría de ellos (91%) corresponde a vías de comunicación (carreteras, caminos, puentes, túneles...), en las que caminos y carreteras resultan mayoritarios. Aunque también se incluyen los topónimos referidos a otras instalaciones para los medios de transporte, en general, así como los relacionados con el tráfico aéreo, su representación toponímica es exigua. En cambio, como lógica consecuencia de su insularidad, los topónimos relativos al tráfico marítimo alcanzan un 9% de su grupo (Figura 9).

Figura 9. Toponimia relativa a servicios de comunicación y transporte



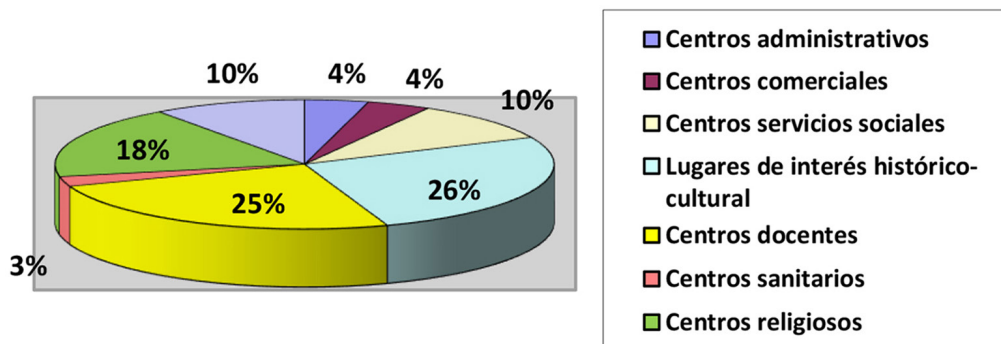
Elaboración propia

3.1.4. Servicios comunitarios

Finalmente, un último subgrupo entre los topónimos relativos al poblamiento lo constituyen los relacionados con los servicios comunitarios que, en conjunto, suponen un 1,5%. Su escasa representatividad se acentúa por su atomización en ocho apartados. Los de mayor representación son los referidos

a lugares de interés histórico-cultural, centros docentes, centros religiosos y centros de ocio (Figura 10). En el otro extremo, con una menor presencia, se sitúan los centros de servicios sociales, administrativos, comerciales y sanitarios.

Figura 10. Toponimia relativa a servicios comunitarios

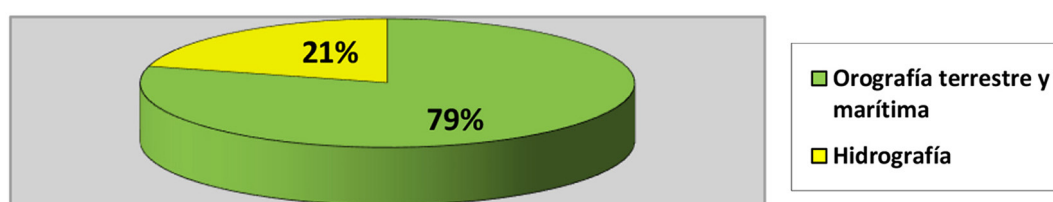


Elaboración propia

3.2. La toponimia relativa al medio físico

El medio físico, al que va referida el 38,7% de la toponimia pitiusa, se encuentra dividido en dos grandes bloques de desigual representación (Figura 11). Se trata de la orografía terrestre y marítima (79%) y la hidrografía (21%). Antes de entrar en el detalle pormenorizado de estos últimos datos, cabe destacar no sólo el acusado desequilibrio entre la toponimia correspondiente al medio físico y la del poblamiento y, más aún, cuando en el resto del territorio balear y especialmente en el caso de Menorca (Ordinas y Binimelis, 2013) sucede todo lo contrario. La explicación de los porcentajes de la toponimia pitiusa reside sobre todo en el sobredimensionamiento de la toponimia relativa al poblamiento en diseminado y no en una infranomenclatura toponímica del medio físico que, por otra parte, es abundante tanto por las características geomorfológicas de las islas como por su articulado y extenso litoral con un total de 449,2 km.

Figura 11. Toponimia relativa al medio físico

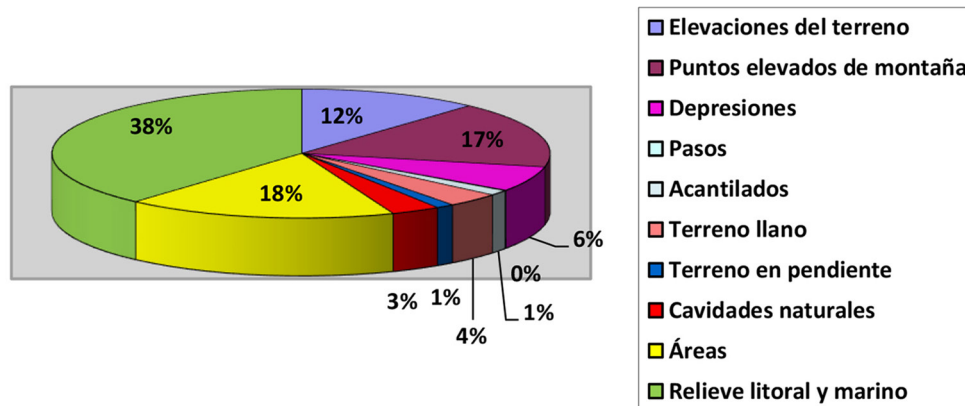


Elaboración propia

3.2.1. Orografía terrestre y marítima

La oronimia pitiusa supone el 30,6% del total (con importantes diferencias entre Ibiza, con un 29,5% y Formentera con un 38,3%). Su conjunto (Figura 12) incluye hasta diez tipologías orográficas: elevaciones del terreno en general, montañas y/o puntos elevados de una montaña, depresiones de la superficie terrestre, pasos a través de una cresta, acantilados, terrenos llanos, terrenos en pendiente, cavidades naturales, áreas, y relieves litorales marinos. El recuento descubre el predominio de la toponimia litoral (38%) seguido de las áreas (18%), las prominencias que culminan en los puntos más elevados de una montaña (17%) y las elevaciones del terreno (12%) que incluye macizos, montañas, sierras, cordilleras, colinas, cerros, etc. Todo ello desvela de forma fidedigna algunos de los rasgos básicos del paisaje pitiuso, donde destaca la costa (Figura 13) y la omnipresente orografía interior. Juegan, en cambio, un papel más secundario las depresiones (6%), el terreno llano (4%), las cavidades naturales (3%), los acantilados (1%) y el terreno en pendiente (1%).

Figura 12. Toponimia relativa a la orografía terrestre y marítima



Elaboración propia

Figura 13. Desde el faro del Cap de Barbaria (Formentera), enclave más meridional del archipiélago, como ya indica el propio topónimo, se otea el mar que baña las costas norteafricanas



Fotografía de los autores

3.2.2. Hidrografía

La toponimia correspondiente a la hidrografía (hidronimia) suma un discreto 8% del total de los nombres de lugar pitiusos. Se trata de un valor bastante significativo respecto al territorio que describe y que concuerda con las características de un clima mediterráneo de escasas precipitaciones, semiárido, sobre un espacio insular de reducida extensión donde escasean tanto las surgencias de agua como sus breves cursos que, con una sola excepción (Figura 14), permanecen secos la mayor parte del año.

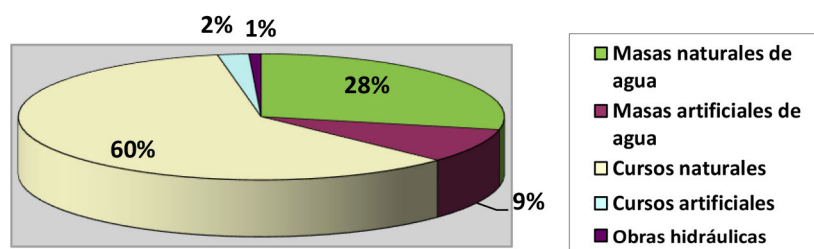
Los hidrónimos pitiusos han sido clasificados (Figura 15) en cinco grupos: masas naturales y artificiales de agua, cursos naturales y artificiales de agua y obras hidráulicas. Encabezan su ponderada clasificación los cursos de agua naturales (60%) que incluyen esencialmente torrentes y fuentes. Le siguen, con un 28%, las masas de agua naturales que agrupan en su conjunto a albuferas, humedales, marismas, bahías, calas, lagunas, estanques, estrechos y mares, aunque las más abundantes, lógicamente, se refieren a aguas marinas. Sólo un 9%, también inferior al del conjunto de las Baleares (11,9%) se refiere a las masas artificiales de agua formadas por pozos, cisternas y depósitos. Finalmente, la obra hidráulica es la que presenta una menor representación toponímica, pues tanto los cursos artificiales (canales y acequias) como el resto (norias) apenas suman el 3% restante, por debajo de la media insular balear que alcanza el 5,8%.

Figura 14. El río de Santa Eulària des Riu —incluido como determinante en el propio topónimo del municipio—, a pesar de su escaso caudal y recorrido, es el único ejemplar en las islas Baleares



Fotografía de los autores

Figura 15. Toponimia relativa a la hidrografía



Elaboración propia

4. Discusión: las singularidades del paisaje pitiuso a través de la jerarquía toponímica

A partir de las entradas que plantea la codificación del ICC para la toponimia del *Mapa Topográfico Balear* a escala 1:5.000, se han seleccionado las categorías toponímicas que presentan las mayores frecuencias y se han ordenado de mayor a menor, indicando junto al número de ejemplares, su porcentaje correspondiente con respecto al conjunto de la toponimia isleña. Esta jerarquización (Tabla 3) permite ahondar en la caracterización toponímica y alcanzar un nivel de análisis más detallado. También se ha adscrito cada una de las tipologías toponímicas a una temática definidora de su realidad geográfica, permitiendo distinguir entre topónimos relacionados con la orografía (precisando incluso si es interior o litoral), la hidrografía (natural o humana), la vegetación, el poblamiento y las actividades agrícolas. A partir de una dicotomía básica, se observa cómo las tipologías correspondientes a la toponimia humanizada acumulan un total del 59,4%, frente a las que corresponden a toponimia relativa al medio natural, cuyo porcentaje global es del 31,7 %.

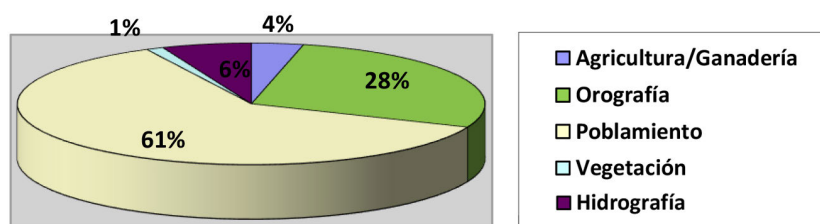
Tabla 3. Pitiusas. Topónimos con mayor número de frecuencias

Topónimos	Número de frecuencias	% sobre el total	Adscripción temática
Casa (aislada)	4.106	50,9	Poblamiento
Punta, costa	614	7,6	Orografía litoral
Puig, penya, roca	392	4,9	Orografía interior
Torrent, barranc	300	3,7	Hidrografía natural
Parada, camp	227	2,8	Agricultura
Camí, carretera	200	2,5	Poblamiento
Mola, pujol, turó	167	2,1	Orografía interior
Cala	113	1,4	Orografía litoral
Serra	111	1,4	Orografía interior
Vall	105	1,3	Orografía interior
Pla, plana	82	1,0	Orografía interior
Platja	82	1,0	Orografía litoral
Barri, raval	82	1,0	Poblamiento
Cova, forat	75	0,9	Orografía
Illa, illot	71	0,9	Orografía litoral
Cap litoral	62	0,8	Orografía litoral
Escull, faralló	62	0,8	Orografía litoral
Font	62	0,8	Hidrografía natural
Barraca, cabana	57	0,7	Poblamiento
Estany, llacuna	49	0,6	Hidrografía natural
Cisterna	49	0,6	Hidrografía humana
Paratge	48	0,6	Vegetación
Bosc	43	0,5	Vegetación
Solà, solana	41	0,5	Orografía
Hort	39	0,5	Agricultura
Urbanització	37	0,5	Poblamiento
Poble, llogaret	33	0,4	Poblamiento
Coll	28	0,3	Orografía interior
Costa, coster (falda)	28	0,3	Orografía interior
Penya-segat	27	0,3	Orografía
Pont	27	0,3	Poblamiento
Talaia, torre de defensa	19	0,2	Poblamiento

Elaboración propia

En el gráfico de la Figura 16 se jerarquizan las temáticas antes descritas que de alguna manera caracterizan el paisaje pitiuso. La encabezan los topónimos relacionados con el poblamiento que suponen el 61% de este ranking formado por las 32 tipologías de topónimos con mayores frecuencias. Le siguen, en segunda posición con un 28%, los relativos a la orografía, mayoritariamente litoral frente a la de interior; y la hidrografía (6%). Algo más lejos quedan los grupos toponímicos relativos a la agricultura (4%) y la vegetación (1%).

Figura 16. Adscripción temática de la toponimia



Elaboración propia

Al analizar pormenorizadamente los datos de la Tabla 3, entre los topónimos alusivos al poblamiento destacan sobremanera los referidos a las casas aisladas que pueblan de forma diseminada el territorio pitiuso. Al mismo grupo pertenecen, con una representación mucho más modesta, los nombres relativos a las vías de comunicación (caminos, carreteras y puentes), a barrios o áreas de población, urbanizaciones, pueblos y aldeas, a construcciones modestas (barracas, cabañas) y antiguas construcciones defensivas (torres, atalayas) ubicadas en el litoral por donde tradicionalmente acechaban las peligrosas incursiones de piratas y corsarios.

La oronimia, segundo grupo con mayor representación, también constituye un fiel reflejo del paisaje isleño. De entre el conjunto de los topónimos que identifican la orografía predominan los enclaves litorales a tenor de la considerable longitud de costa (tramos de costa y puntas litorales), otro rasgo sintomático de un entorno isleño de articuladas costas (calas, playas, cabos) y abundantes islas e islotes, además de arrecifes y farallones. No extraña que en el contexto insular abunden, lógicamente, los topónimos litorales, pues el mar resulta determinante en su paisaje y su cultura, en la que destacan los recursos tradicionales de la pesca y, más modernamente, el del turismo de sol y playa, cumpliendo las fases del paisaje de las islas mediterráneas descritas por King (1993). A escasa distancia porcentual se encuentra la oronimia correspondiente al interior insular que nombra todo tipo de relieves de diferentes dimensiones: positivos (*puig, penya, roca, serra, talaia, pujol, picatxo, picossa*), negativos (*canal, coll*); horizontales (*pla, plana, barda*); inclinados (*costa, coster*) y verticales (acantilados). Bien es cierto que éstos últimos al igual que otros como *solana* y *cova* podrían adjudicarse, según cada caso, tanto a la oronimia litoral como a la interior.

En una tercera posición, con una representación muy discreta, se hallan los hidrónimos, tratándose mayoritariamente de torrentes, fuentes y estanques, éstos últimos formando parte de las salinas de Ibiza y Formentera (Figura 17).

Figura 17. La explotación de las salinas de Ibiza se remonta a la dominación cartaginesa de la isla. Junto a las de Formentera han constituido una actividad estratégica y un elemento paisajístico singular



Fotografía de los autores

Las alusiones toponímicas a la actividad agrícola son escasas y se reducen a campos y huertos¹², además de algunos otros genéricos como *feixa, terç, rota, tancó* y *trull*. Sólo los fitotopónimos obtienen todavía

12 Relacionada precisamente con la agricultura existe una propuesta etimológica de Formentera, del latín *Frumentaria* (isla de trigo), abandonada ante la que la empareja lingüísticamente con otro topónimo balear, Formentor. La realidad geográfica de ambos lugares junto con la pronunciación bereber de los marineros árabes que, desde el siglo VII, al escuchar como latinos e hispanos se referían a la isla con el plural *Promontoria* (que significa 'los dos cabos', refiriéndose al Cap de Barbaria y al Cap de la Mola que destacan en la lejanía), al no tener el sonido de p, lo articulaban como f.

una menor representación, a pesar de que la masa forestal se halla muy presente en el paisaje. Entre los genéricos fitotoponímicos, no especialmente frecuentes, destaca *bosc* (bosque), que aquí equivale a *pinar* (bosque de pinos, *Pinus halepensis*), término que junto con el de *alzinar* (encinar, *Quercus ilex*) no aparecen en la toponimia de Ibiza. Este hecho, sorprendente en el caso del pino por su abundancia (cabe recordar que la hipótesis más aceptada sobre la propia etimología del término Pitiusas la atribuye a los griegos debido al elevado número de pinos que poblaban las dos islas¹³), no lo es tanto en el caso de la encina, allí escasa y conocida como *bellotera*.

5. Conclusiones: la percepción del paisaje pitiuso a través de su toponimia. Los principios de transparencia y significatividad territorial

El conjunto de la toponimia describe el paisaje al que designa, proporcionando información detallada sobre múltiples aspectos de los diversos elementos, naturales y humanos, que individualizan cada territorio. Dicha descripción adquiere, además, un sentido diacrónico en su dimensión temporal, de forma que frecuentemente acumula rasgos pretéritos, en una escala temporal diversa que puede comprender conocimientos de culturas y lenguas antiguas hasta incorporar los de otras recientes y contemporáneas. La clasificación y contabilización de la toponimia de las islas Pitiusas confirma estas características y refleja sistemáticamente, mediante la abundancia o repetición, los rasgos más comunes, cumpliendo así el denominado principio de transparencia. No obstante, también se constata el cumplimiento del principio de significatividad territorial por el que se reconocen topónimos de mayor singularidad que recogen aspectos geográficos y paisajísticos relevantes, aunque no siendo tan abundantes, por lo que exigen un cierto grado de conocimiento especializado para ser identificados y correctamente interpretados (Tort, 2003).

El estudio de la terminología geográfica presente en los genéricos toponímicos también permite corroborar y completar los rasgos identitarios y singulares del paisaje y el territorio pitiusos, aun siendo prácticamente inexistentes las diferencias entre Ibiza y Formentera respecto de los genéricos toponímicos, pues la reducida extensión y la tardía ocupación humana de esta última, la convierten en un apéndice de la cercana isla mayor¹⁴. De este modo, entre los genéricos más emblemáticos cabe citar *serra, talaia, puig, pujol, canal, coll, pla, plana, barda, quartó, vénda*¹⁵, *feixa, terç, tancó, trull...*; mientras otros apelativos son genuinamente pitiusos (*albadar, barda, canyer, carnatge, cornetar, empenyalador, encorralador, escala, feixa, joveria, llevantot, llenegador, parancó, picatxo, primall, quintal, quintalar, terç, traguedor, xarco, xiscarra, xuclar*); o conllevan acepciones genuinamente pitiusas (*alliserany, ansa, bitzarrot, cap, paret, cinta, clotada, contrafita, cordó, covarxa, montgó, muro, penyal*). Al margen de esta apreciación sobre la singularidad de los genéricos que denotan la identidad territorial y paisajística, su visión se completa con su jerarquización numérica, siendo los más frecuentes y por este orden: *can, cas, puig, costa, torre, punta, torrent, canal, pla, pujol, cal, camí, racó, serra, cala, cova, cap y platja*.

El análisis de los genéricos presentes en los topónimos pitiusos así como de su intensidad o frecuencia, permite descubrir una clara correspondencia con los rasgos fundamentales del espacio geográfico al que pertenecen. El elevado nivel de rururbanización y urbanización turística en comparación con el resto de las Baleares queda así reflejado en la toponimia, postergando a una posición secundaria desde un punto de vista cuantitativo a otros aspectos físicos del paisaje y, especialmente, a los orónimos, a pesar de ser relativamente numerosos. Entre ellos, destaca el apelativo *canal* que aparece fuertemente extendido por toda la isla de Ibiza constituyéndose en el máximo representante de las depresiones alargadas situadas en las faldas montañosas. Las prominencias orográficas de interior son denominadas preferentemente mediante los genéricos *puig, pujol y serra*, mientras que en el litoral abundan *punta, racó, cala, cap y platja*.

13 De *pitys*, pino en griego, derivaría *Pitioussa*, según el autor clásico Diodoro. También los romanos, como Plinio el Viejo, comentaron la abundante población de pinos de las islas. No obstante, existen otras hipótesis como la que la relaciona con los seguidores de un culto a un dios vencedor de la serpiente (Python). De este modo, se conectarían los antiguos topónimos de Ibiza y Formentera (Pythiusa y Ophiusa), ésta última por la abundancia de ofidios (serpientes).

14 Tanto es así que durante un largo período histórico la isla de Formentera estuvo adscrita administrativamente al municipio de Ibiza.

15 *Quartó y vénda* son términos históricos de origen medieval, propios de la división territorial y administrativa de Ibiza que han perdurado hasta día de hoy.

De todo ello se infiere, como principal rasgo de la toponimia pitiusa, la considerable presencia¹⁶ de las partículas indicadoras de vivienda (*Can, Cas y Cal*)¹⁷, acompañadas de antropónimo. Moreu-Rey (1982) apuntaba que la proporción de antropotopónimos, o topónimos procedentes de antropónimo, es extraordinaria en todos los países y en cualquier época, estimando que en algunas regiones su proporción podía superar el 40 o 50% del total de topónimos. El caso pitiuso lo demuestra claramente, al exceder dichas estimaciones, debido a dos factores: un minifundismo ligado al crecimiento demográfico y a un tipo de poblamiento en diseminado que incide sobre el elevado número de topónimos relativos a nombres de casa; y la repetición de los mismos apellidos –agravada por la tradición de reproducir los mismos nombres de persona, generación tras generación–, que inutiliza la antroponimia legal, de forma que la fórmula ‘nombre-apellido’ pierde la capacidad de distinguir entre los numerosos individuos con designación homónima, fenómeno muy extendido en Ibiza y Formentera. Se comprueba como en las islas menores se intensifica el carácter endogámico de la sociedad y que se refleja en la antropotoponimia que aparece en la designación topónimica de la propiedad y de los nombres de casa. Un reducido grupo de genéricos (*finca, hisenda, pallissa/païssa y casilla*) completan la temática poblacional a la que se puede añadir aún el genérico *torre* (Figura 18), cuyas funciones de vigilancia y defensa de la costa resultaron imprescindibles durante siglos. No es casualidad que algunas de las cimas de la isla se denominen mediante el genérico *talaia*¹⁸, definido como un lugar elevado apropiado para la observación y desde donde dar aviso de lo que se aviste.

Figura 18. Desde la torre des Savinar se divisan los islotes de es Vedrà y es Vedranell, configurando uno de los paisajes más emblemáticos del litoral ibicenco



Fotografía de los autores

En conclusión, se constata la reciprocidad entre la toponimia de las islas de Ibiza y Formentera y la geografía de sus paisajes, crisol de una cultura milenaria en la que se conjuga el testimonio secular de los diversos pueblos mediterráneos y sus respectivas lenguas y costumbres. Su huella en unas tierras cuyos nombres identifican una clara personalidad —incluso en el conjunto del archipiélago balear—, todavía perdura a pesar de la amenaza culturalmente uniformadora que supone el turismo cosmopolita en la era de la globalización.

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16 Dicha abundancia contrasta con la ausencia de la partícula *Son*, partícula también indicadora de propiedad muy presente en Mallorca y, en menor medida, en Menorca.

17 Fórmulas sincopadas de *Ca* (casa de) + *en/es/el* (artículos en sus variedades pronominal y determinados derivados del latín *ipse* o *ille*, que anteceden un antropónimo, ya sea en forma de nombre de pila, apellido o apodo personal o familiar).

18 *Talaia* de Sant Josep, *Talaia* de Jesús, *Talaia* de Sant Vicent, *Talaia* de Sant Llorenç, *Talaia* de Sant Joan, *Talaia* de Sant Antoni son algunos ejemplos.

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Regional identity in a geopolitically contested area: Preševo Valley (South Serbia) scientific argumentation and political use

Identidad regional en un área de disputa geopolítica: el Valle de Preševo entre la argumentación científica y el uso político

Arsim Ejupi¹ 

Miguel Borja Bernabé-Crespo^{2*} 

Abstract

This paper discusses the theoretical and methodological principles in the process of regionalization and analyzes the criteria used during the designation of the region as a category of special importance in geographical research. Methodological principles of regionalization were applied during the differentiation of the Preševo Valley as an individualized region. The Preševo Valley is a small region in South Serbia with a very favorable geographical position because it is located in the central part of the Balkan Peninsula between the Morava and Vardar valleys. Theoretical and methodological discussion highlights elements of a geographical and socio-economic basis that contribute to a regional-geographical differentiation of the area, as well as those elements that appear as an obstacle in attempts to differentiate this area in regional terms. A critical overview of the use of the name 'Preševo Valley' between scientific argumentation and political usage is also given. A survey was carried out to identify the main elements that constitute Preševo Valley's regional identity. The main results show that this region is characterized by a mostly Albanian population, poor economic development, high migration rates, strategic position, and a strong national consciousness.

Keywords: region; identity; regionalization; Preševo Valley; Serbia.

Resumen

Este artículo discute los principios teóricos y metodológicos en el proceso de regionalización, y analiza los criterios utilizados durante la designación de la región como categoría de especial importancia en la investigación geográfica. Se han aplicado los principios metodológicos de regionalización en la diferenciación del Valle de Preševo como región individualizada. El Valle de Preševo es una pequeña región del sur de Serbia con una posición geográfica muy favorable ya que se encuentra en la parte central de la península balcánica, entre los valles del Morava y Vardar. Se ha procedido a la discusión teórica y metodológica para resaltar aquellos elementos de base natural-geográfica y socioeconómica que contribuyen a la diferenciación regional-geográfica, así como aquellos que representan un obstáculo en los intentos de diferenciar esta área en términos regionales. Igualmente, se ofrece una descripción crítica del uso del nombre "Valle de Preševo" entre la argumentación científica y el uso político. Se ha llevado una encuesta para identificar los principales elementos que constituyen la identidad regional del Valle de Preševo. Los principales resultados muestran que esta región está caracterizada por una mayoría de población étnica albanesa, con escaso desarrollo económico, altas tasas de emigración, posición estratégica y fuerte conciencia nacional.

Palabras clave: región; identidad; regionalización; Valle de Preševo; Serbia.

1 Department of Geography, University of Prishtina, Kosovo. arsim.ejupi@uni-pr.edu

2 Departamento de Geografía, Universidad Autónoma de Madrid, España. miguelb.bernabe@uam.es. * Corresponding author

1. Introduction

1.1. Preface

The sense of belonging to a society within a region, formed when a significant part of inhabitants share symbols, values and aspirations creates regional identity and an own cultural system (Giménez, 2005). Unconsolidated borders, presence of frozen conflicts and gray zone tactics in Eastern and Southeastern Europe make this region of notable interest for the study of identity and their implications to geopolitics (Marcu, 2011; Bernabé-Crespo, 2020), where territorial exchange ideas derived by strong and differentiated identity –among others– may play a key role.

Located within Serbia, Preševo Valley lies just in the border with Kosovo and its major population is claimed to be Albanian. Between 1999-2001, the so-called Liberation Army of Preševo, Medveđa and Bujanovac operated with the aim of breaking away from Yugoslavia and joining Kosovo. These ideas of border changes and exchanges of municipalities appear in order to create more ethnic homogeneous territories and stabilize the region politically, although risk of violence should also be contemplated and warned (Bernabé-Crespo, 2021). As Viales (2010) spots, national or bordering issues cannot be understood without transnational or global, also taking into account that the ‘region’ construct changes throughout time. The latter leads to reflect on how the influence of foreign actors may reshape the sense of regional identity. In the context of the Balkans, redrawing of borders is an issue commonly expressed by certain political thoughts, along with the external political interferences. When claiming a territory, historical rights are commonly appealed (Murphy, 1990), what shows the relevance of the study of the regionalization process. Acknowledging the recent history of this area in particular, the Balkans, and more specifically, Preševo Valley and the pursue of Albanian rights (Zejnnullahi, 2015), it is of crucial importance to achieve a pacific coexistence by strengthening the process of State building which needs to respect ethnic minorities, and thus, different shapes of regional identities within a country (Horowitz, 1993; Finlay, 2011). This article first discusses the process of regionalization and its methodological principles, providing a theoretical basis for this study and analyzing the criteria used for categorization of the region as a unit of special importance within geographical research. Methodology is shown next, detailing the qualitative analyzes made through 328 interviews to the local population of Preševo Valley, as well as the description of the area of study, including an overview of the different naming made by different ethnic groups and political views. After this, a demographic analysis is carried out regarding the evolution of population and ethnic groups which inhabit this area and the results of the survey about the elements that compose their regional identity. Lastly, these are discussed bearing in mind the current situation of Preševo Valley and conclusions are finally presented.

1.2. Theoretical background

Depending on the criteria used in the literature, there is a number of definitions of the region as category and regionalization as a process. According to Petrović (1957) the number of different concepts and the wide possibility of combining them during the designation of a geographical region is due to the fact that many authors tried to develop it without explaining the concept of the latter. This concept is based on the dialectical unity of nature and society, which results by the formation of certain spatial units that are distinguished by a harmonious arrangement of natural and social elements, but also the interaction between them. This fact shows the complexity of such definition and highlights the need for a multidimensional approach to the study of regions as a geographical phenomenon and regionalization as a complex process.

‘Region’ is defined as a cohesive area that is homogeneous in the selected criteria. Geographers have widely studied the process of regionalization (Nogué, 1989; Plaza, 2001; Viales, 2010), also reflecting about the impact of globalization (Nogué, 2007).

The geographical region is thus conceived as a concrete, tangible entity, a physical reality that exists as a reference framework for the population living there (Contel, 2015). In Geography and Demography there is a doctrine that explains the integration, differentiation and functional organization of space in the context of the development of demographic processes (Tošić, 2012). The main hypothesis of this doctrine is based on the axiom that population has a determinant role within the country and changes in regions and regional urban systems. Therefore, research on population as a decisive factor in the regional structure include the analysis of demographic development in quantitative terms (natural and spatial

mobility of the population), qualitative (changes in biological, social and economic structures), political, social and economic processes (employment, political organization, migration, depopulation), etc.

The task of a geographer is to explore and discover the importance of regions in geographical research the combination of factors responsible for such 'regional configuration' (Vujadinović and Šabić, 2017). Thus, homogeneity is taken as one of the main criteria in the process of regionalization. As a result, 'homogeneous region' refers to a spatial unit consisting of several basic elements with the same qualitative characteristics on the basis of which it differs from other units (Pavlović & Šabić, 2006). In all parts of the homogeneous region there is a unique set of the most important structural elements, but also the development and the same intensity of their concentration, for example tropical rain forests, Sahara Desert, Alps, etc.

Another important feature of the region is the consistency that comes from the combination of natural and social features. This harmonious combination allows the identification and separation of a region from neighboring regions. A region as a construct represents the end product of a research process. The search for formal/homogeneous ('natural' or 'geographical') regions was a standard practice in traditional regional geography. The regions constructed by scholars were represented as bounded, contiguous entities in divisions of larger units into regions. 'Perceptual regions' were another example. Both bear witness to a 'bordering' process carried out by the researcher (Paasi, 2010). The region is at the core of geographical research, especially socio-geographical, as well as the basic principle of territorial regulation. The pragmatism of the above approach lies in the fact that the region represents a model for achieving a set of goals in the research framework (Ejupi & Ramadani, 2016).

Breaking apart a large area into smaller regions is something known as the regionalization process. This is how geographers identify the parameters of regions within a greater area of space. For it to be useful, regionalization must break areas into practical units. Therefore, the regionalization process is not about creating regions as much as it is about identifying regions that already exist. Regionalization is an approach that aims to identify and determine homogeneous spatial units according to certain criteria. Each regional approach is based on the hypothesis of the division of space into certain units according to the variability of the features of one or more phenomena (Fuerst-Bjeliš, 2007). It represents a set of applied scientific and practical methods used to identify different regional structures. From this it can be understood that regionalization, in fact, is an applied part of Regional Geography. Regionalization is the process of creating a system of regions within the state area that enables the profiling of the region according to the dominant characteristics. It also represents one of the main approaches and principles of scientific knowledge about spatial differentiation, development orientation, planning and regulation of geographical space (Vojković, 2003). Regionalization is also a very important process from a social, economic and political point of view. It helps to regulate the state through its organization in certain regional units, preserve and improve the socio-economic order of the country, alleviate political differences, social and economic inequalities between different regional units within the state, etc.

From the initial phase of development of Regional Geography as a scientific discipline until today, several ideas and definitions of the region as a separate geographical category have been developed, and the importance of the criteria has also changed. Initially, regions were usually determined taking into account the physical factors of the area, with an emphasis on certain natural-geographical factors of a particular territory. Later, in addition to the analysis of the internal structure of such individualized units, other characteristics such as demography (population), economy, etc. were taken into account. Rogić (1963) emphasizes the changing role and importance of physical-geographical and social economic factors in the definition of these regions, depending on the size of the space defined in the regional aspect. While in most cases larger regional units that belong to higher levels of the hierarchy are mainly defined by the main natural-geographical features, in small spatial units, socio-economic factors play also an important role. With the aim of primarily designating regions in accordance with the criteria established in the principle of dominant physiognomy, functionality and homogeneity, other methodological aspects have made progress over time (García, 2006; Paasi, Harrison & Jones, 2018).

Physical-geographical regionalization takes as a starting point the assumption that elements, factors and physical-geographical processes play a decisive role in regional differentiation, integration or regional organization of the geographical space. Nir (1990) displays different approaches related to systems theories. According to this view, a natural region is a part of geospace, the uniqueness and homogeneity that arises from the interaction of elements and geographical factors. Therefore, geospace is divided into

large or small natural units that have similar characteristics as relief, climate, hydrology, biogeography and pedology.

The second approach of physical-geographic regionalization focuses in the differentiation of geographical space into more complex regional systems known as geocomplexes. Kulczyk (2000) noted that geocomplexes as units having concretely defined boundaries remain one of the most often used reference areas in geographical research. They appear in two models: according to the first model, natural regions are the result of homogeneity, development of synergy and interactive relations of several processes, factors and elements. This form of regionalization makes it possible to distinguish complex regions. In the scientific literature these are known as 'geocomplexes' or 'natural landscapes'. According to the second model, which does not exclude the previous one, geocomplexes can be formed by merging and functional integration of several heterogeneous natural units formed in different ways and circumstances.

From this brief review of the definition of the region as a phenomenon and regionalization as an approach, it can be understood that there are different criteria for defining individual areas in regional frameworks, including the homogeneity of natural elements, social and economic factors, uniformity, perception and sense of regional affiliation, pragmatism, etc.

2. Methodology

2.1. Area of study

Located in the south of Serbia, Preševo Valley occupies a strategic position within the central part of the Balkan peninsula, between Morava valley in the north (where it naturally belongs to), and Vardar valley in the south (Figure 1), which renders this area of special strategic relevance in terms of connectivity and natural resources (Bernabé-Crespo and Peña-Ramos, 2019).

The use of the term 'valley' is even contested from a geomorphological term because the areas around Preševo are created by tectonic processes, there is no large water body. However, elements of the socio-economic sphere such as the Albanian majority, demographic characteristics, backwardness in economic development, historical past and perception of the population of the same affiliation are those elements that give attributes of a separate geographical unit used in literature as Preševo Valley. It began to be used as a name during the war in Kosovo (1998) and the armed conflict in Preševo and Bujanovac, initially by American and European political and diplomatic circles and then Albanian ones. It should be pointed out that except this name there are also other names such as *Kosova Lindore*, (meaning 'Eastern Kosovo', which is sometimes used amongst Albanians) and *Jug Centralne Srbije* ('South of Central Serbia', which is used by Serbs) are inconvenient from scientific view and have political background. The notion 'Preševo Valley' has been contested by Serbian scientific community and is little mentioned. For example, Kostić (1969) mentioned the name 'Moravica Valley and the area of Bujanovac' and the area from Preševo watershed to Levosoje to be known as 'Moravica Valley'. According to this author, Moravica Valley is a separate entity, while Bujanovac area is integral part of the Vranje and Bujanovac valley. The same author mentioned the name 'Preševo Plain', (in Albanian: *Fusha e Preshevës*) in his paperwork in *Vranjske Novine*, Irić (2012) refers to an interview of well-known linguist M. Zlatanović who makes a clear distinction between the words 'valley' and 'plain', and builds on Trifunoski's ideas that the areas along the upper course of the river Tabanoci, Moravica and Preševo are an integral part of the so-called Valleys of Preševo and Kumanovo, as well as the low watershed between Morava and Vardar (Trifunoski, 1951). The common name for Preševo, Bujanovac and Medvedja remains in the function of a clearer articulation of the demands of the Albanian population for the realization of their civil and national rights.

According to regional and geographical studies, geographic space is not a chaotic mixture of components, elements and factors, but the above-mentioned units are grouped under certain laws, thus they built systems of different sizes where objects, processes and factors are harmonized inside a particular spatial unit. Because of this fact, it is necessary to make a regional differentiation of individual geographical areas.

This complexity requires application of theoretical methods and principles which make possible regionalization of a certain territory. The aim of this article is to characterize a singular region which entails great geopolitical importance, and appears to be threatened by ethnic confrontation. First, it is presented a theoretical background, followed by an overview about the geographical-regional differentiation. A deep analysis about Preševo Valley's identity is presented, which allows us to discuss about the use of the term regarding political spheres.

Figure 1. Physical map of Preševo Valley



Own elaboration (by Kaltrina Misini)

2.2. Method

The large number and various aspects under which the regional-geographical differentiation of space is done, makes it clear that complex process of regionalization may take into account all the features that have spatial attributes. Thus, the method of regionalization itself was taken out of the framework of Geography as a classical science and acquired the character of a general method in all sciences that study spatial relations and phenomena from various aspects (Radovanović, 1994). For the purposes of our research object complex geographical analyzes and synthesis of basic natural, demographical and economic elements were used aiming to find common features that may give to the study area attributes of a unique region. Cartographic method was used to present main geographical units that point out physical and geographical heterogeneity on one hand, and territorial discontinuity between municipalities in Preševo Valley on the other hand, which itself represents the main obstacle during the process of regionalization.

In order to determine the regional identity of the population, a survey was conducted in June 2020 with 328 respondents (203 men and 125 women) in 62 settlements of the Preševo Valley, both in villages and in cities of the region. The questionnaire contained basic data on respondents while semi-closed questions dominated with the possibilities to give own answers which are different from those offered in the questionnaire. For the questions aiming to understand the degree of agreement or disagreement with the findings in the questionnaire, Likert Scale was used with five categories, ranging from 1 (strongly disagree) to 5 (strongly agree). Using this scale, we have tried to gather information about a topic by including a neutral answer option for respondents to select if they don't wish to answer from the extreme choices. During the analysis of the meaning and use of the name 'Preševo Valley' scientific works and cartographic sources on this area were used. Since the name 'Preševo Valley' is used by all residents, often

without knowing its meaning, this research is intended to collect data on the contemporary perception of the name 'Preševo Valley'. Census data of different periods were also used to present ethnical composition of population and main economic characteristics.

3. Results

3.1. Advantages and disadvantages of the process of regional-geographical differentiation of the Preševo Valley

In the attempts to define the Preševo Valley in regional terms, certain difficulties are faced, which primarily derive from a certain degree of physical and geographical heterogeneity, especially geomorphological. The Preševo Plain is a unique morphological unit, while the area of Bujanovac is an integral part of the valleys of Vranje and Bujanovac; and Medvedja is separated and belongs to Jablanica watershed. All other natural-geographical elements, such as climate, water, soil, vegetation and landscape features have a high degree of homogeneity and uniformity (Marković, 1980).

Another obstacle that is obvious is the territorial discontinuity between Preševo and Bujanovac municipalities with Medvedja municipality. This fact highlights the political reasons of using the common name 'Preševo Valley', which will be discussed further in this paperwork.

Despite the low level of homogeneity of the physical-geographical components, Preševo Valley has demographic, social and economic homogeneity. One of the elements that has a high degree of homogeneity in the Preševo Valley is the population that fulfill the above criteria in all elements of the demographic regime with the same fertility and mortality rate, natural growth, with the same or similar intensity of development. Until now, all three municipalities had the highest birth and mortality rate in all Serbia, which results in a high natural growth.

Other structural features of the population of the Preševo Valley are also distinguished by a high degree of homogeneity, uniformity and consistency, where it should be mentioned the ethnic structure with dominance of the Albanians (Table 1). This important structural element is evident in Preševo and Bujanovac, while in Medvedja this intensity is disturbed due to a different ethnic structure of the population, where Albanians account a lower percentage of population than other ethnic groups.

Table 1. Ethnic structure of population in Preševo Valley for the period 1961-2002³

Ethnicity	2002		1981		1961	
	Number	%	Number	%	Number	%
Albanians	81,978	72.98	60,318	61.63	39,884	44.31
Serbs	24,134	21.38	29,772	30.41	45,229	50.21
Roma	4,306	3.91	4,646	4.74	-	-
Others	1,791	1.73	3,158	3.22	4,933	5.48

Source: Census of population and households, year 2002, National or ethnic structure, Book 1, results for settlements and municipalities. Own elaboration

According to the degree and type of homogeneity or heterogeneity, it is assumed that a compact ethnic composition consists of more than 90% of the total population of the same ethnic group. When they reach 80-89% of the total population, it is distinguished as 'significant ethnic homogeneity'; and between 70-79% as 'low homogeneity'. When these percentages account between 60-69% it is classified as 'high heterogeneity'; and between 50-59% as 'significant ethnic heterogeneity'.

In addition to the percentage of the largest ethnic group, the coefficient of ethnic heterogeneity is used to determine the degree of homogeneity or heterogeneity of the population in a certain region (Table 2).

³ Censuses after 2002 are not considered valid for this area as they have been boycotted by the Albanian community, so this record is the latest official.

This coefficient shows the number of members of all other ethnic groups together in 1000 members of the largest ethnic group.

Table 2. Percentage of biggest ethnic group and coefficient of ethnic heterogeneity

	Percentage of biggest ethnic group					Coefficient of ethnic heterogeneity				
	1961	1971	1981	1991	2002	1961	1971	1981	1991	2002
Preševo Valley	50.2	53.3	74.7	85.1	73.1	990	440	350	266	368
Vojvodina	54.9	55.8	54.4	56.8	65.1	822	793	817	762	537
Kosovo	67.2	73.7	77.4	81.6	-	489	357	291	226	-
Serbia	74.6	71.2	65.8	65.9	82.8	339	404	449	517	206

Source: Population census, year 1961: Vital, ethnic and migration features, Book VI, Belgrade, 1967; Population census year 1971, Ethnic features of population, municipality results, Belgrade 1974; Population and households census, year 2002, National or ethnic structure, Book I, Belgrade, 2003. Own elaboration

From the above data it is deduced that in the Preševo Valley, during the period 1961-1991 there has been a positive trend in percentage of the largest ethnic group, the Albanian. While in 1961 in the Preševo Valley Albanians consisted 44.3% of the population, in 1991 this number was doubled and reached 85.1%. These ethno-demographic processes were similar to those in Kosovo, where during the analyzed periods there is an evident continuous increase in the percentage of the largest ethnic group (Albanians), from 67.2% in 1961 to 81.6% in 1991.

Unlike the Preševo Valley and Kosovo, the ethno-demographic situation in Vojvodina and Serbia is completely different, with very small differences in the percentage of the largest ethnic group (Serbs). Thus, in Vojvodina this percentage changes in a positive direction from 54.9% in 1961, the participation increases to 65.1% in 2002, while Serbia's level shows a negative trend: it decreases from 74.6% in 1961, to 65.9% in 1991, followed by an increase to 82.8% in 2002.

The coefficient of ethnic heterogeneity in the Preševo Valley marks a negative trend from 990 as it was in 1961, to 266 in 1991. In 2002 there is an increase of this coefficient to 368. Also, in Kosovo in the analyzed periods there is a decrease of this coefficient from 489 as it was in 1961, to 226 in 1991. The negative trend of the coefficient of ethnic heterogeneity in the Preševo Valley shows that in the analyzed periods there is a constant increase in the degree of ethnic homogeneity dominated by Albanians.

When it comes to the ethnic structure of a region it is important to know about the territorial extent of ethnic groups within the region. The Albanian population has an absolute dominance in the hilly-mountainous part of Karadak in the west, with a homogenous ethnic composition, as well as in the plain part of the region. The slopes of Rujan and the eastern part of the region is distinguished by a more significant ethnic heterogeneity. The territorial extension of the Albanians shows that their ethnic area is functionally and naturally linked with Kosovo and Kumanovo-Skopje area, mostly inhabited by Albanians.

In addition, biological, educational, linguistic, religious, social and economic structures show a high degree of homogeneity and uniformity through the whole area, dominated by young people, the majority of people belong to the Islamic religion. It has high but declining levels of illiteracy among the population, especially among women, with dominance of the rural population. There is a high participation of the agricultural population in the total population, extremely unfavorable ratio of the active population, unfavorable structure of the active population by economic activity, etc.

According to the basic indicators of economic development (income, gross national product per capita, unemployment rate, etc.), Preševo Valley and the Albanian population are characterized by a significant backwardness, both in absolute and relative terms. According to the Strategy for Regional Development of Serbia 2007-2012 the municipalities of Preševo, Bujanovac and Medvedja are the most underdeveloped in entire Serbia. In the municipality of Preševo, with Albanian majority, national incomes that are only 14.1% of the Serbian average. In 2002 these municipalities with just 154.4 US dollars, had only 16.2% of national income compared to the Serbian average. Therefore, the economic structure of the population is extremely unfavorable. Due to the lack of investment for the development of industrial capacities and other sectors of economy, the Valley remains an undeveloped region, with a very unfavorable economic structure. Meanwhile, according to the Spatial Development Strategy of the Republic of Serbia,

the municipality of Medvedja belongs to the category of the most devastated as well as most depopulated municipalities in Serbia (Official Gazzete, 2004).

Preševo Valley, with a very low rate of socio-economic development and lack of investment in the secondary sector, has an unfavorable economic structure, with the dominance of the agricultural population, as well as the unfavorable ratio between active population and population without income, small number of population with income, dominance of the primary sector as well as extremely low participation of other sectors.

The valley is characterized not only by a low rate of economic activity of the population, but also by slow changes: from 39.1% in 1961 to 36.6% in 2002 (Table 3). This percentage is lower than Serbia's average of 49.3% as it was in 1991. The population without incomes, although having a downward trend in percentage, still shows very high values, above the Serbian average. The population without incomes in 2002 had a percentage of 53.7%, while in Serbia to this category belonged only 38.1% of the population. Such level and unfavorable tendency, especially when the volume of the general population increases, are the result of a number of factors and above all the economic underdevelopment and the unfavorable structure of the economy for a long time: the high percentage of the population cohort 0-14 years, as a result of the high rates of natural increase; low involvement of women in production and social activities; derived from these, the exponential increase of pupils and students, the influence of other social factors (traditions, norms) related to the engagement of women in economic and social life, shortcomings during registration of the active population, etc. (Islami, 1981, Sentić, Rančić, & Đošić, 1971; Rašević, Mulina & Macura, 1976).

Table 3. Population of Preševo Valley according to activity for the period 1961-2002

Years	Population number	Active population		With incomes	%	Without incomes	%
		Number	%				
1961	90,046	36,242	39.1	1,234	3.1	52,876	57.7
1971	94,371	35,316	38.7	1,567	4.4	53,731	56.9
1981	93,458	35,369	37.8	2,603	2.8	55,487	59.4
1991	101,549	34,302	37.8	4,543	5.7	57,324	56.5
2002	88,996	32,540	36.6	8,176	9.7	47,785	53.7

Source: Population census in Serbia: 1961, 1971, 1981, 1991 and 2002. Own elaboration

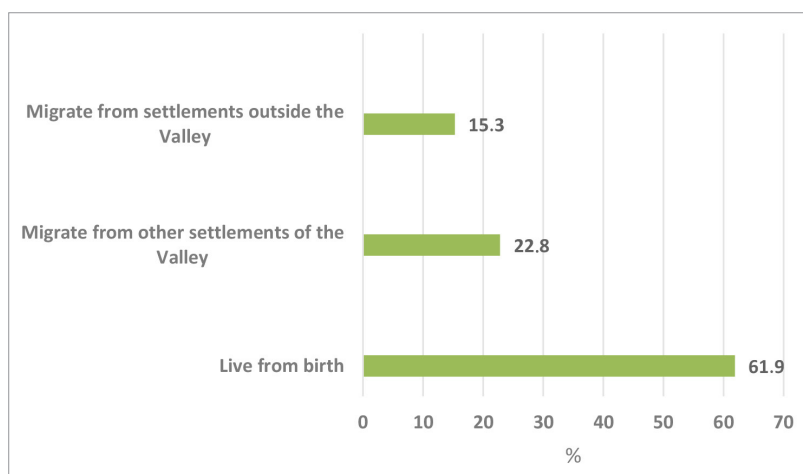
3.2. Regional identity of Preševo Valley

The diversity of geographical contents in the physical-geographical part is not the only criterion in the complex process of regional differentiation and regionalization. The individuality of each region, except natural, social and economic factors, is influenced by the behavior and attitude of each individual towards the region, or recognition of the environment as their own (local environment), the role and position of the individual in society, etc. This is studied as the affiliation (individual perception of geographical space) that any individual or even wider social groups (collective consciousness of regional affiliation) can have (Šabić & Pavlović, 2007). In this way, by adding socio psychological attitudes of the population towards regional identity to the geographical criteria, the individuality of the geographical region is pointed out even more. The term 'regional identity' is often used in both cultural and sociological literature. The content is related to certain systems of socio-cultural values. In this way, regional identity is very close to the categories of cultural and national identity. Cultural identity is known to be an integral part of the whole set, such as race, territory, language, tradition, customs, religion, etc. On the other hand, national identity contains certain characteristics of cultural identity, but it has more to do with a sense of belonging and solidarity within certain ethnic groups. Regional identity refers either to the supposed distinctive natural and cultural qualities of a region, the identification of people with such a region or both aspects at the same time (Paasi, 2012).

It is consciousness and regional identity that make up the region as a mental construction. This mental construction arises from the spatial perception of the population about uniformity or diversity. The population of the Preševo Valley perceives the region as an area of the same tradition, history, culture and

identity. Moreover, Preševo Valley is an entity that exists in the collective consciousness of the population, because there is a sense of connection and belonging that derives from a common origin, culture and history. The above-mentioned hypothesis is confirmed by field survey. A determining the permanent settlement (since birth) of an individual, the results show that the majority of respondents, (61.9%) live permanently in the settlement from their birth, whereas 22.8% have migrated from other settlements of the Valley (Figure 2). In this category are included individuals and families who moved from the settlements of hilly-mountainous area, mainly in the plain area as well as from villages to the cities. Meanwhile, only 15.3% moved to Preševo Valley from other regions. Out of 70% of respondents answered that they never lived outside Preševo Valley, which is an indicator of the reduced spatial mobility of the population and also relates the strong linkages and identification between birthplace and the region to which they belong.

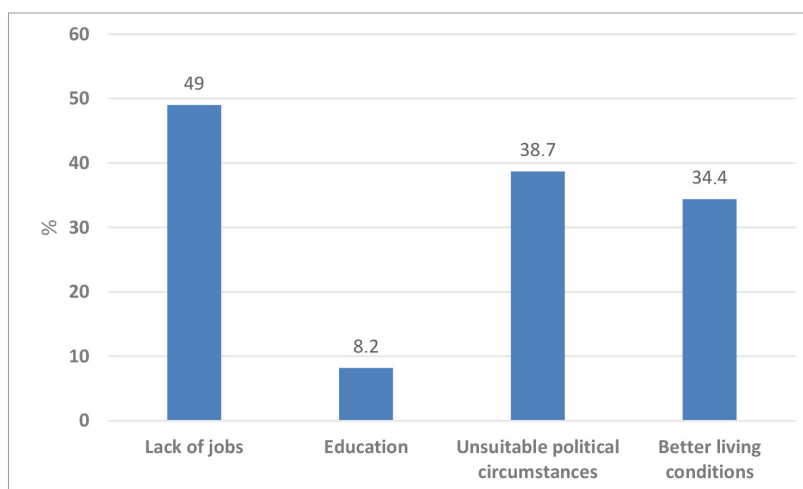
Figure 2. Linkages of residents with birthplace and region



Own elaboration

When asked about their future, 77% of respondents stated that they had plans to live outside the Preševo Valley in the future, while only 23% planned to stay in the region (Figure 3). This high percentage is caused by the very unfavorable economic, political and security circumstances that have for a long time dominated in the region. More than 49% of respondents said that the reasons of migration are lack of jobs. This is the way how especially young people think, because after they graduate, they have small choices to find a job. In this sense, 38.7% of them think that it is due to unstable political situation. Out of 34% will move due to better living conditions, while only 8% because of education.

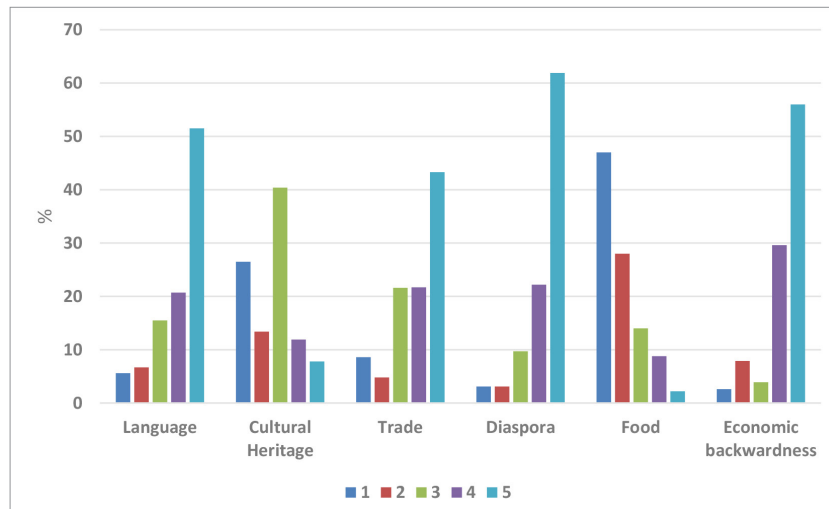
Figure 3. Reasons of migrations within Preševo Valley's population



Own elaboration

The purpose of the next question was to find some regional features that help to create a regional identity (Figure 4). Measured with the Likert Scale respondents rated the importance of language, cultural-historical heritage, trade, diaspora, food, and economic backwardness in the process of creation of regional identity. Out of 62% of respondents think that the diaspora is the most important element of regional identity. According to municipal authorities, about 30% of the Valley's population lives abroad, which has an impact not just in the population number of the Valley but also in the economy of the region. Another identifying element is the language, which is the most important element for 51.5% of the respondents, while trade as the most important element of regional identity has pointed 43.3% of the respondents.

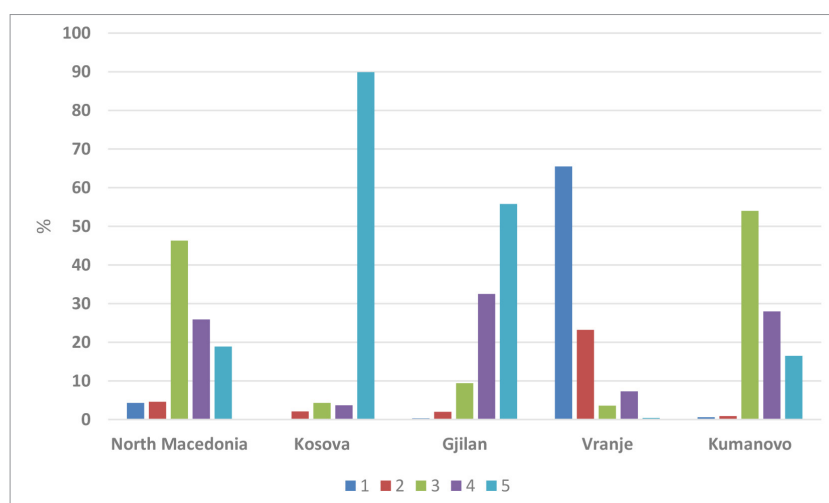
Figure 4. Main elements of regional identity



Own elaboration

Since Preševo Valley is located in Serbia, but has a cross-border position, the question about the cooperation that the Valley should have with certain regions and cities in vicinity, highlights the attitudes of the population for cooperation with Kosovo (Figure 5). Out of 90% of the respondents think that cooperation with Kosovo is the most important for Preševo Valley. Cooperation with Gjilan, which is a city located in the east of Kosovo, close to Preševo Valley is the most important for 55.8% of respondents; cooperation with Kumanovo, a city in North Macedonia, is the most important for 16.5% of respondents, while that Preševo Valley should have strong ties of cooperation with Vranje, which is the main administrative center of Pčinja district (Serbia) think only 0.4% of respondents.

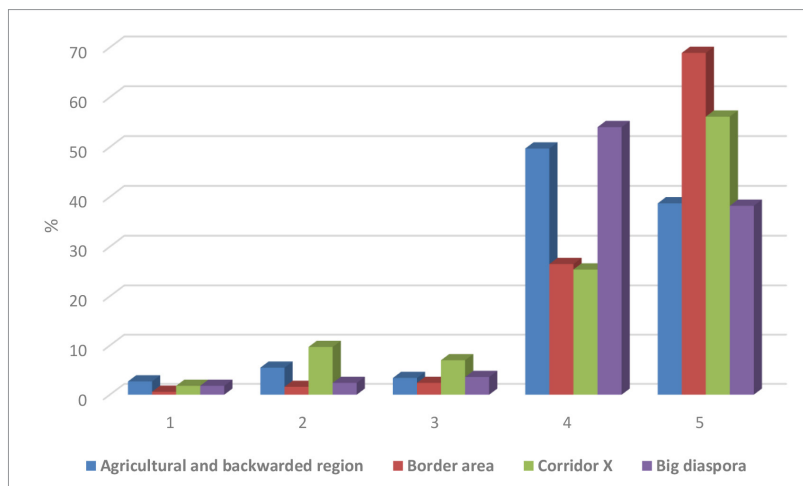
Figure 5. Cooperation of Preševo Valley with neighboring regions and cities



Own elaboration

Local think that other ‘outsiders’ rather identify Preševo Valley as a border region, more precisely out of 68.9% of the respondents consider it as the most important element of identification (Figure 6). More than 56% of the respondents think that others know the Valley as a region located in Corridor X⁴. Out of 37% of the respondents say that foreigners know the Valley as a backward agricultural region, while the same percentage thinks that diaspora is the most important identifying element of others for the Valley.

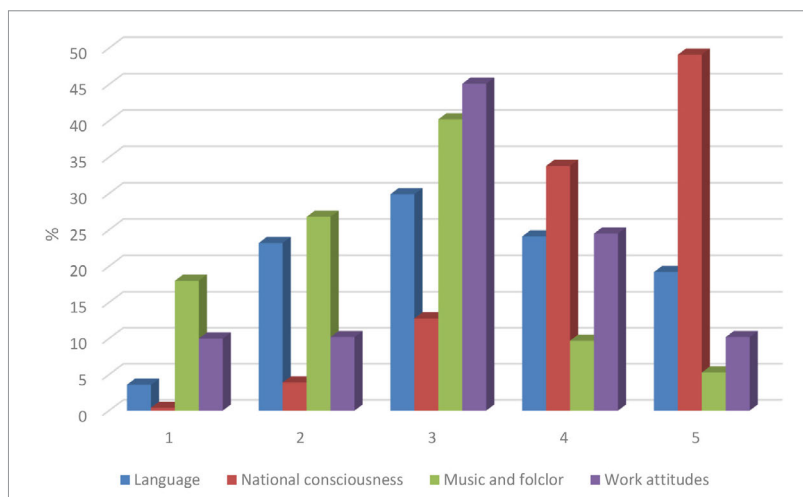
Figure 6. How others identify Preševo Valley, according to locals



Own elaboration

Lastly, when asked what distinguishes Preševo Valley-Albanians from other Albanians in the former Yugoslavia, over 49% of respondents consider national consciousness as the most important, 19.2% language, and 10.2% working attitudes (Figure 7).

Figure 7. What distinguishes Preševo Valley-Albanians from other Albanians



Own elaboration

4. Discussion

As previously shown, considering exclusively natural attributes does not allow the identification of an individualized region in Preševo Valley’s area. Although the main territory of the municipalities

⁴ Pan-European transport corridor that passes through Preševo Valley (road and railway), connecting Belgrade (Serbia) with Skopje (North Macedonia) and Thessaloniki (Greece). This corridor represents an important link between central Europe and the eastern Mediterranean region (Islami and Ejupi, 2015).

of Preševo and Bujanovac lies in the valley drained by the Morava River, Medvedja's municipality does not have connection with the rest of the natural unit. In this sense, naming 'Preševo Valley' to a region composed by these three municipalities does not correspond to natural attributes, in spite of occupying a major portion of this natural area. However, in the regionalization process, social elements must also be contemplated – the main hypothesis of the doctrine is that population plays a determinant role. Building on the concept on 'geocomplexes', Preševo Valley can be identified as one geocomplex, as it consists of different natural units (Preševo plain where Preševo and Bujanovac towns are located; and Medvedja hilly area) that due to similarities (social, economic, perception factors in addition to the proximity), share integrated functions derived from regional sense of belonging.

As for that, demographic analysis showed that Albanians represent more than 70% of population in Preševo Valley, which can be labelled as a society of a considerable homogeneity. It is interesting though to highlight the growing trend of the percentage (almost double 1961 figures, with an increase of +28.67%). If this trend continues, ethnic homogeneity will escalate. Moreover, more than 50% of the population do not count on any income, which rends this region with a high degree of poverty. When asking the survey respondents, one of the main reasons to migrate was the lack of jobs, and this migration process has affected the active population, which in 1961 represented 39.1% of the total population but in 2002 was of 36.6%, as young and adults are more likely to flee this poor situation. This is why, among the respondents, 77% do not expect to stay in Preševo. These facts enhance the assumption that Preševo Valley is a region of emigration, where due to the economic circumstances, does not attract foreign population, nor even succeeds in retaining local people. If this hypothesis is correct, no new arrivals from other ethnic groups are expected to come, as this area would be known for its dominant Albanian population, lack of opportunities and high rates of emigration. It is necessary to reflect on how to amend this situation and which factors contributed to the backwardness. In this sense, government needs to carry out a comprehensive investment in the region in order not to create a sense of abandonment which tense relations between Albanian and Serbs. This means to equalize investment and equipment to all regions, especially in Preševo Valley, which seems to be left behind. It must be pointed out the strategic location of the Valley, the only natural corridor between Serbia and Greece –close allies–, which also connects Central Europe to the Aegean Sea. The main highway (A1) from Belgrade to Skopje, North Macedonia, passes through Preševo, the same as the main railway, where old factories can nearby be seen (Figure 8). This is of a special importance, as in a context of geopolitical tensions, strategic sites are disputed and often constitute spots where civil unrest is fomented – succeeding in mobilizing civil society suffering from high inequalities.

Figure 8. Budućnost factory of construction materials, near railway line in Preševo



Photograph by M. B. Bernabé-Crespo

Collective consciousness of local population regarding identity is one of the main factor addressing demands for more civil rights and economic investments. In the survey, it was found out that Preševo

Valley does gather elements of strong regional identity, driven by an increasing ethnic Albanian population which shares a sense of inequality towards investment and equipment. In addition, diaspora (62%) was identified as the most important element of identity, followed by language (51.5%) supporting the idea that identity is strongly driven by ethnic affiliation. Furthermore, the preferred ties of cooperation were associated to Kosovo, what represents a strong connection between Albanian people and the newly proclaimed state (Figure 9). This is of a special concern, taking into account the recent historical events that took place in 2001, where Preševo Valley's guerilla armed units fight in order to make this region join Kosovo; and more recently, the reiterate documents about the exchange of municipalities between states and border changes in the Balkans, known as 'non-papers'. Not in vain, local population of Preševo Valley think that their region is regarded by foreigners as a 'border region', what put them in the constant focus of different redrawing of boundaries and the creation of 'greater' motherlands. The last question of the survey stresses out that Albanians in Preševo Valley are distinguished by their national consciousness, meaning the close connection between them and Kosovo. This is another example of how regional identity is shaped within a singular region, that claims an equal treatment regarding development and stability.

Figure 9. Albanian flags in fighter's tombs and paintings supporting Kosovo in the town of Preševo



Photograph by M. B. Bernabé-Crespo

These considerations about regional identity within a contested area may play a key role in spaces where de-stabilization tactics are applied. Recently, in 2014 Donbass region in Ukraine was the scenario of a newly proclaimed units known as Donetsk and Luhansk People's Republics (DPR and LPR, respectively), which showed that, although not constituting an administrative region it represented indeed a case where cultural consciousness used a region as a scale – Donbass, characterized as a Russophile and industrial region with closer ties to Russia. Other example might be the recent tensions in Montenegro, where large demonstrations were held during the summer of 2021, showing confrontation between Serbian and Montenegrin nationalists, over the enthronement of the Serbian Orthodox Church patriarch in Cetinje, considered to be the royal capital of Montenegro. This last case shows a deep local identity that in a scenario of political interference can lead to civil unrest. Given this circumstances, studies over regional identity and regionalization may help addressing issues of improving cohesion and improving the process of State building, by respecting rights and alleviating and reducing conflicts that may appear in a context of external inferences.

5. Conclusions

The study of regional identity is a central issue amidst geopolitical contested areas and, in particular, when redrawing of borders is being promoted by some sector of the society. Through this analysis, a better understanding of cultural consciousness can be reached and, as a consequence, pacific coexistence

in a State with different identities can be strengthened. In this article, the case of Preševo Valley was studied, although its procedures may be applied to other areas sharing similar features.

Morphological diversity, lack of natural cohesion and territorial-administrative discontinuity of the Preševo Valley are some of the shortcomings in the process of regional-geographical differentiation of the territory. However, history and geopolitics a high degree of homogeneity in the ethnic structure, with the dominance of Albanians, but also more elements of the demographic regime, severe economic backwardness and the collective perception of the Albanian population about regional identity seem to be the main factors that provide this area the attributes of a special region.

Albanians are the largest group in Preševo Valley, almost 73% of the total population in 2002. Active population is declining and the more than 50% do not have incomes, surpassing by a large extent Serbia's figures, which is a sign of the poorness of the region and derived from little investment. In the survey carried out in this study, it was found that almost 85% of the population was born in the Valley. Only 23% of them planned to stay in the region, and 49% of them planned to migrate because of the lack of jobs. When asked about the main elements that characterized Preševo Valley, diaspora, economic backwardness and language were the main features of identity. Being a strategic and cross-border region, respondents sued more cooperation with Kosovo, especially the city of Gjilan/Gnjilane; and thought it was not necessary to tighten relations to Vranje, Serbia. Regarding how others identify Preševo Valley, the nature of a border region seemed to be the main attribute, but also its position in the Corridor X, diaspora and agricultural and back warded region. Finally, according to the respondents, what distinguishes this local population from the rest of Albanians is their national consciousness the most.

Territorial discontinuity between the municipalities of Preševo and Bujanovac with Medvedja, but also the morphological diversity reduces the scientific justification for the use of the name 'Preševo Valley'. The use of this name by political and diplomatic circles, first American, then European and Albanian, was a necessity and a need to identify the population within a certain territory, with the purpose of a better articulation of their requests for individual and collective rights of Albanians in the Preševo Valley.

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Criterios de elección de centro y segregación escolar en la ciudad de Valencia

School choice criteria and school segregation in the city of Valencia

Félix Fajardo Magraner^{1*} 
Julia Salom Carrasco² 
María Dolores Pitarch Garrido³ 

Resumen

El objetivo de este estudio es conocer cuáles son los patrones que intervienen en la elección de centro escolar y detectar los factores sociodemográficos, económicos y de localización que subyacen tras ellos. Para ello, se ha realizado una encuesta a la demanda potencial de los centros públicos que imparten el segundo ciclo de educación infantil en la ciudad de Valencia. Los resultados indican que el principal criterio de elección de centro escolar es la proximidad entre el hogar y el colegio, y que el modo de desplazamiento más utilizado es el peatonal. Sin embargo, los costes de desplazamiento y los medios utilizados están directamente relacionados con las características socioeconómicas de las familias y con la morfología urbana de los barrios en los que se ubican los centros educativos y las residencias de los menores. Además, también existen diferencias de género en el cuidado de los menores y en la tarea de acompañamiento escolar. Por tanto, la elección de centro escolar implica un proceso de segregación que responde a factores demográficos, socioeconómicos y espaciales y que han de ser valorados por los planificadores de la red escolar a fin de garantizar un acceso a la educación pública en condiciones de equidad.

Palabras clave: segregación escolar; elección de centro educativo; movilidad escolar; brecha de género; Valencia.

Abstract

The objective of this study is to discover the patterns that intervene in the choice of school and detect the underlying sociodemographic, economic, and location factors. For this purpose, a survey has been carried out on the potential demand for secondary school places in the city of Valencia. The results show that the main criteria for choosing a school is the proximity between home and school. In addition, the most common way of travelling is by foot. However, this research reveals that travel costs and the means used to complete the school journey are directly related to the socioeconomic characteristics of the families and the urban morphology of the neighbourhoods. Furthermore, gender differences exist in the care of minors and in the school accompaniment task. For these reasons, the choice of school implies a process of segregation that responds to demographic, socioeconomic, and spatial factors. These processes must be valued by the school network planners to guarantee access to public education in equitable conditions.

Keywords: school segregation; choice of college; school mobility; gender gap; Valencia.

1 Instituto Interuniversitario de Desarrollo Local. Departamento de Geografía. Universitat de València, España. Felix.Fajardo@uv.es.

* Autor para correspondencia

2 Instituto Interuniversitario de Desarrollo Local. Departamento de Geografía. Universitat de València, España. Julia.Salom@uv.es

3 Instituto Interuniversitario de Desarrollo Local. Departamento de Geografía. Universitat de València, España. Maria.Pitarch@uv.es

1. Introducción

Los equipamientos educativos son instalaciones deseables de uso ordinario que generan externalidades positivas en el entorno en el que se ubican y poseen una serie de características propias que pueden condicionar la atracción o la repulsión que ejercen sobre su demanda potencial. Algunas de estas características son la distancia entre el centro escolar y el lugar de trabajo o del hogar, el horario, la titularidad y los equipamientos o la calidad percibida de la enseñanza. Además, la elección del centro educativo también está directamente condicionada por el sistema de asignación escolar vigente en cada territorio. Tanto los criterios de elección de centro como los sistemas de asignación escolar guardan una relación directa con las posibilidades de accesibilidad espacial y temporal a los centros educativos y pueden ser factores explicativos de procesos de segregación escolar (Andersson, Malmberg y Östh, 2012).

En España, la asignación del alumnado de nuevo ingreso a los centros escolares subvencionados con fondos públicos se realiza básicamente mediante dos sistemas. El primero de ellos se conoce como el modelo de Distrito Escolar y consiste en dividir el término municipal en varios sectores o distritos asignándoles a cada uno de ellos al menos un centro escolar. En este sistema los alumnos obtienen una mayor puntuación en el proceso de baremación para la obtención de plaza escolar si eligen aquellos colegios que han sido asignados al distrito escolar en el que se ubica su lugar de residencia. Así pues, en aquellos colegios en los que la demanda supera a la oferta de plazas, el hecho de residir en el distrito asignado a dichos centros puede ser determinante para la obtención de la misma. La segunda vía se conoce como el Sistema de Distrito Único o de Libre Elección. En este modelo los alumnos pueden solicitar plaza en cualquier colegio del término municipal, independientemente de su lugar de residencia. En España, la elección de uno u otro sistema de asignación es competencia de las Comunidades Autónomas. Actualmente, en la Comunidad Valenciana (zona del ámbito de estudio) se aplica el modelo de Distrito Escolar atendiendo a lo dispuesto en el Decreto 40/2016, de 15 de abril, del Consell, por el que se regula la admisión en los centros docentes públicos y privados concertados que imparten enseñanzas de Educación Infantil, Educación Primaria, Educación Secundaria Obligatoria y Bachillerato.

Cada uno de estos dos modelos tiene defensores y detractores, fundamentalmente por las posibilidades de elección de centro que implican. En un entorno urbano caracterizado por la segregación socioeconómica, dichas posibilidades pueden suponer una profundización en dicha segregación o, al contrario, una posibilidad de favorecer la mezcla social y la igualdad de oportunidades.

Por ejemplo, los defensores del distrito único argumentan que este sistema produce un aumento de la competitividad entre los distintos colegios a fin de incrementar la captación de estudiantes, hecho que propicia un aumento de la calidad de la educación; es decir, la competencia entre los distintos colegios hace que estos mejoren o incrementen sus servicios a fin de diferenciarse del resto de colegios y atraer a un mayor volumen de alumnado. Asimismo, algunos autores defienden que con el sistema de libre elección se mitiga la segregación escolar (Tooley, 1997; Lindbom, 2010), ya que los alumnos pueden acceder a cualquier centro con independencia de las condiciones socioeconómicas y demográficas de su zona de residencia.

Para otros investigadores, el sistema de distrito único aumenta la segregación escolar, ya que no todos los alumnos disponen de los mismos recursos ni de las mismas posibilidades reales de elección (Andrada, 2007; Barthón y Monfroy, 2010; Östh, Andersson y Malmberg, 2013; Murillo, Belavi y Pinilla, 2018), de modo que se beneficia a la población con más recursos, mejor cualificada e informada. Del mismo modo, los resultados obtenidos en algunos estudios (Manzo, 2013; Millington, Butler y Hamnett, 2014; François, 2002) afirman que existen una serie de factores sociales, económicos y geográficos que influyen en la elección escolar y que cuestionan seriamente el principio de libertad de elección de centros.

Atendiendo a las variables geográficas, diversos autores (Andre-Bechely, 2007; Poupeau y François, 2008; Andersson *et al.*, 2012); establecen que la distancia entre el centro escolar y el hogar actúa como factor limitante de las posibilidades de elección de centro, ya que la distancia recorrida para acceder a un servicio está fuertemente condicionada por las características demográficas, socioeconómicas y locacionales de la demanda (Sang, O'Kelly y Kwan, 2011; Chen, *et al.*, 2011).

Según Andersson *et al.* (2012), existen dos factores geográficos que van a influir en la elección del centro escolar. Por una parte, está el capital relacional que hace referencia a la capacidad que tienen los alumnos para sufragar los gastos atribuibles al desplazamiento entre el hogar y el centro escolar, de modo que aquellos alumnos que poseen un mayor capital relacional tienen una mayor capacidad para elegir el

centro escolar al que desean acudir, o, dicho de otro modo, tienen mayores posibilidades de accesibilidad locacional. Por otra parte, está el capital posicional, que alude a las oportunidades que ofrece el entorno local tanto en lo referente a la calidad de los centros escolares cercanos al lugar de residencia como en lo relativo a la percepción positiva o negativa que la población asocia a las distintas zonas de la ciudad. Según este estudio, a priori, los inmigrantes parten de un menor capital posicional debido al desconocimiento del proceso de elección de centro o bien por las barreras lingüísticas y culturales, de modo que su capacidad de elección es menor. Además, existen diferencias respecto a la distancia recorrida en función del origen de los inmigrantes. Los autores también señalan que los inmigrantes extranjeros recién llegados tienden a recorrer mayores distancias que aquellos que llevan más tiempo residiendo en el país debido a la concentración de recursos de aprendizaje lingüístico en determinados centros educativos que se ubican en puntos concretos de la ciudad, hecho que denota una evidente falta de equidad espacial en la distribución de estos recursos. Por otra parte, las minorías étnicas visibles tienen cierta tendencia a la concentración, por lo que las distancias que recorren son menores.

Otro de los factores que influyen en la distancia recorrida es la capacidad económica de los padres (Hofflinger, Gelber y Cañas, 2019). Aquellos padres sujetos a ayudas sociales tienen un menor capital relacional, de modo que tienden a matricular a sus hijos en centros cercanos a su lugar de residencia. Del mismo modo, el nivel educativo de los padres también ejerce cierta influencia sobre la distancia recorrida entre el colegio y el hogar, de modo que los alumnos procedentes de familias cultas tienden a recorrer mayores distancias para acceder a los centros escolares. No obstante, en aquellas zonas donde existe una elevada concentración de estudiantes pertenecientes a familias con un elevado nivel de estudios, la tendencia a alejarse del lugar de residencia disminuye, ya que, por lo general, en la zona encuentran colegios que cumplen las expectativas de los padres (Andersson et. al, 2012;).

Por tanto, todo ello conduce, tal y como afirman diversos expertos (Valenzuela, Bellei y De Los Ríos 2010; Gortázar, Mayor y Montalbán, 2020), a la existencia de una fuerte correlación entre la segregación escolar y la segregación residencial, de modo que, en ocasiones, los procesos de segregación residencial que se producen en los barrios en los que se ubican los centros escolares pueden ejercer un papel determinante en la composición social de los centros educativos.

Otros investigadores (Holme, 2002; Poupeau, François, y Couratier, 2007) establecen que la información que los padres obtienen de los distintos colegios por las redes familiares y de amistad tiene una mayor influencia en la elección de centro que el currículo, las características del colegio, los test de calidad o las visitas al centro educativo, hecho que contribuye a aumentar la segregación social en los centros educativos (Manzo, 2013).

Por tanto, de acuerdo con estos autores, la elección del centro escolar depende de factores individuales, familiares, sociales, y espaciales que propician que el sistema de libre elección no pueda garantizar que todos los alumnos tengan las mismas oportunidades para acudir a aquellos centros que desean, ya que los estudiantes procedentes de familias con pocos recursos económicos y/o culturales tienen la capacidad de elección mermada y tienden a realizar desplazamientos más cortos, produciéndose así un aumento de la segregación escolar. Si el lector desea profundizar más en estas cuestiones puede consultar el monográfico que la revista *Urban Studies* dedica al estudio de la segregación escolar en las ciudades contemporáneas (Boterman, Musterd, Pacchi, y Ranci, 2019).

Cabe señalar que la controversia sobre la segregación escolar que puede conllevar la asignación de los niños a las escuelas se debe a que la oferta no es igual en todas ellas, sino que existen diferencias, al menos percibidas, en la calidad de la enseñanza y de los equipamientos. Por otra parte, es necesario considerar que los estudiantes son menores que necesitan acompañamiento, tanto en la llegada al centro escolar como en la salida, lo que supone que los horarios de los servicios escolares necesitan acomodarse a los horarios de los acompañantes o viceversa, no a los de los estudiantes. Todo ello tiene una implicación muy clara sobre el concepto de accesibilidad. Tradicionalmente, la accesibilidad a los equipamientos o servicios se ha medido desde la perspectiva del lugar. Esta perspectiva mide la accesibilidad en términos de proximidad espacial a los servicios entre la residencia o el trabajo y no tiene en cuenta aspectos como los horarios de los equipamientos y el tiempo disponible de los usuarios (Neutens, Delafontaine, Scott y De Mayer, 2012). No obstante, en la actualidad, la sociedad hace un uso intensivo del tiempo y un uso extensivo del espacio, de modo que la toma de decisiones sobre la asignación de estudiantes a centros escolares debería migrar desde el tradicional enfoque espacial hacia un nuevo enfoque basado en las posibilidades personales de acceso y elección (Miller y Shaw, 2001). Así pues, no basta con que un centro

educativo se encuentre a una distancia determinada del hogar, sino que, además, dicho centro debe tener un horario compatible con el desarrollo de las actividades obligatorias de los responsables de realizar la tarea de acompañamiento escolar. Analizar cuáles son las preferencias horarias de la población, así como la posible existencia de patrones diferenciados en función de sus características sociodemográficas (como el género), puede aportar información muy relevante para los planificadores de la red escolar.

En resumen, en la elección del centro escolar intervienen múltiples factores demográficos (nacionalidad, etnia, etc...), socioeconómicos (ingresos del hogar, nivel de estudios de los progenitores, etc...), políticos (sistema de libre elección, sistema de distritos escolares etc...) y geoespaciales (localización de los colegios, domicilios y lugares de trabajo, horarios laborales y escolares, etc...) que influyen tanto en los criterios y preferencias de elección de centro escolar (proximidad, calidad de la enseñanza, equipamientos...) como en el modo de acceso a los mismos. En el ámbito español, existen pocos estudios empíricos dedicados al análisis de los criterios de elección de centro escolar por parte de las familias. Por ello, el objetivo de este trabajo consiste en conocer cuáles son las pautas y las variables que intervienen en la elección de centro escolar, así como detectar los elementos que subyacen en dichas decisiones y que pueden derivar en procesos de segregación escolar. Para ello, se ha realizado una encuesta a la demanda potencial de los centros públicos que imparten el segundo ciclo de educación infantil y el primer ciclo de primaria en la ciudad de Valencia. A partir de los resultados obtenidos en la encuesta se pretenden corroborar dos hipótesis:

1. Los centros escolares ofrecen un servicio de proximidad y, por tanto, el criterio de elección prioritario para la mayoría de los padres y madres es el de cercanía entre el hogar y el centro escolar.
2. Pese a lo establecido en la hipótesis 1, existen diferencias significativas en los criterios de elección y en las pautas de movilidad escolar en función del nivel socioeconómico de los progenitores.

Los resultados y las conclusiones obtenidas en el presente estudio pueden contribuir a mejorar la planificación de la red escolar, ajustándola al comportamiento real de la demanda potencial, y pueden ayudar a conocer y mitigar los procesos de segregación que se esconde tras la elección del centro escolar. Además, los resultados también servirán para corroborar o refutar, de una manera empírica, la existencia de patrones de segregación socioeconómica y/o residencial vinculados a la elección de centro escolar en la ciudad de Valencia y que han sido comentados de manera teórica en el presente apartado.

2. Metodología

2.1. Área de estudio

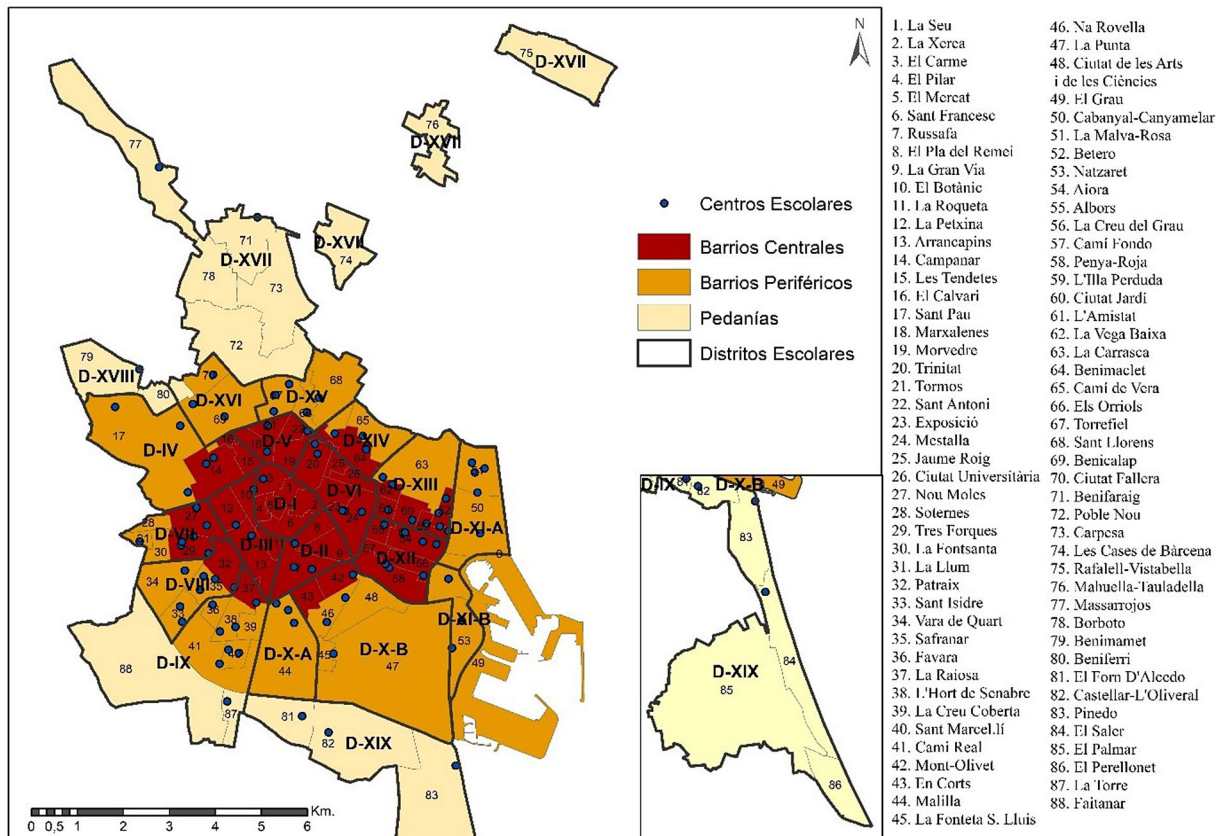
El área de estudio del presente trabajo es la totalidad del término municipal de Valencia. El municipio está dividido en 606 secciones censales que se agrupan en 88 barrios, que a su vez conforman 19 distritos administrativos. La estructura física y sociodemográfica de los barrios y distritos es bastante heterogénea, de modo que existen algunas diferencias físicas, demográficas y socioeconómicas entre las distintas unidades espaciales. En términos de política educativa la ciudad se divide en 19 distritos escolares de los que dos de ellos se subdividen en dos zonas más, de modo que el municipio queda compuesto por un total de 21 zonas educativas (Figura 1). Los distritos escolares coinciden en gran medida con los distritos administrativos, si bien introducen algunos cambios con el objetivo teórico de conformar un sistema de elección con una relación oferta-demanda más equilibrada.

El municipio cuenta con 169 centros públicos que imparten el segundo ciclo de educación infantil y/o educación primaria. Estos centros presentan un patrón de distribución espacial disperso, ya que, al tratarse de un servicio público, en su localización prima el criterio de equidad y justicia espacial, de modo que es posible encontrar algunos centros que se ubican en algunas pedanías y distritos periféricos donde la escasa demanda potencial provoca que estas zonas no resulten atractivas para los centros privados y concertados.

Por otra parte, si se atiende a la morfología urbana de los barrios, se observan notables diferencias entre los barrios centrales, los barrios periféricos y las pedanías. Los barrios centrales se ubican en torno al casco histórico del municipio y cuentan con una elevada densidad de población y de servicios urbanos. En cambio, los barrios periféricos son los que conforman el perímetro exterior del compacto urbano y, generalmente, presentan densidades de población inferiores a las de los barrios centrales y cuentan con una menor dotación de servicios. Finalmente, las pedanías son pequeños núcleos de población que se

encuentran dispersos y separados del núcleo urbano principal. En estas unidades, las densidades de población y la oferta de servicios urbanos son muy inferiores a las de los barrios centrales y periféricos y en ellas existe mucha edificación dispersa.

Figura 1. Distritos escolares, colegios públicos y barrios del municipio de Valencia



Fuente: Oficina de Estadística y Oficina Municipal de Escolarización del Ayuntamiento de Valencia. Elaboración propia

2.2. Diseño de la encuesta y explotación estadística

Con el objetivo de conocer los factores que subyacen en las pautas de elección de centro escolar se ha realizado una encuesta a las madres, padres o tutores legales de los niños y niñas escolarizados en el segundo ciclo de Educación Infantil y en el primer ciclo de primaria de los centros escolares públicos del municipio de Valencia. El cuestionario cuenta con 26 preguntas (cerradas y abiertas) que se estructuraron en cuatro bloques (Anexo I). Las preguntas del primer apartado versan sobre el vínculo personal de la persona encuestada con el menor y, además, buscan determinar quién es la persona encargada de realizar la tarea de acompañamiento escolar. El segundo bloque contiene cuestiones relacionadas con los criterios y preferencia de elección de centro escolar. El tercer apartado se destina a preguntas relacionadas con la accesibilidad espacio-temporal a los colegios (preferencias y compatibilidades horarias, duración del trayecto escolar, modos de desplazamiento, etc...). Finalmente, el cuarto apartado tiene por objetivo conocer las características demográficas y socioeconómicas de las personas encuestadas (nacionalidad, nivel de estudios, ingresos del hogar, etc...).

El universo de la encuesta se compone de un total de 13 950 alumnos matriculados en los 92 centros públicos que imparten el segundo ciclo de Educación Infantil o el primer ciclo de Educación Primaria en el curso 2017-2018. La encuesta se ha realizado durante el periodo de enero a junio del año 2018 a los padres o a las madres de los alumnos del segundo ciclo de Educación Infantil y del primer ciclo de Educación Primaria de los centros escolares que han autorizado la realización de la encuesta.

Se ha considerado un universo finito y se ha realizado un muestreo no aleatorio intencional. En primer lugar, se ha seleccionado un conjunto de centros escolares en función de sus características (titularidad,

equipamientos, servicios ofertados) a fin de obtener una muestra representativa de la diversidad de colegios. Además, también se ha tenido en cuenta la localización espacial de los centros a fin de valorar si las características físicas y socioeconómicas de los barrios condicionan el comportamiento de los padres y de las madres durante el proceso de elección. Así pues, atendiendo a estos criterios se ha seleccionado un total de 6 Colegios Públicos de Educación Infantil y Primaria (CEIP) que presentan unos valores medios de equipamientos y servicios, y que se encuentran ubicados en barrios con distintas condiciones socioeconómicas y de trazado urbano (centro, periferia, pedanía). El número de alumnos y alumnas matriculadas en estos 6 centros ha permitido obtener una cantidad de respuestas suficiente para que los resultados de la encuesta sean significativos. En concreto, la muestra estudiada está formada por un total de 284 encuestas. Así pues, los resultados obtenidos en la Encuesta son representativos para las personas que tienen hijos e hijas matriculados en el segundo ciclo de Educación Infantil y en el primer ciclo de Educación Primaria en los CEIPs de la ciudad de Valencia y presentan un margen de error del $\pm 5,8\%$ (para $pq=0,5$) a un nivel de confianza del 95%. Cabe señalar que el nombre de los centros que han participado en el estudio tiene carácter confidencial, tal y como han solicitado los mismos, ya que la asociación de algunos resultados a colegios concretos puede alterar el comportamiento de la demanda futura y/o las percepciones de las familias que acuden a dichos centros.

Respecto a las características demográficas y socioeconómicas de los encuestados cabe señalar que, de las 284 encuestas, un 79,9% han sido respondidas por mujeres y un 20,1% por hombres. Este hecho apunta a un posible desequilibrio por razón de sexo en algunas tareas relacionadas con la educación y el cuidado de los menores, como puede ser el acompañamiento escolar. Además, cabe destacar que un 87,1% poseen nacionalidad española, frente a un 12,9% que tienen nacionalidad extranjera. Esta proporción se sitúa en torno al porcentaje de extranjeros del municipio de Valencia para el año 2018 (12,8%). Respecto al nivel de estudios, destaca el elevado porcentaje de personas con educación superior (estudios universitarios), ya que éste se sitúa por encima del 50,5%. Asimismo, el 74,9% de la población encuestada se encuentra trabajando, sobre todo a jornada completa (57,6%) y solamente un 15,8% está buscando trabajo. Finalmente, cabe señalar que un 28% de los encuestados acude a centros ubicados en los barrios centrales del municipio, el 42,9% en barrios periféricos y el 29,1% en una pedanía.

Los datos obtenidos en la encuesta han sido analizados mediante el uso del programa estadístico IBM SPSS Statistics 24. A partir de las respuestas obtenidas se han calculado las frecuencias y algunos estadísticos descriptivos básicos como porcentajes y medias que han permitido realizar una descripción básica de las características demográficas y socioeconómicas de la muestra, así como establecer el valor relativo de cada categoría dentro de cada una de las variables analizadas.

Además, también se han construido diversas tablas de contingencia bidimensionales con el objetivo de estudiar las relaciones entre las distintas variables estudiadas. Para medir el grado de relación existente entre las distintas variables se ha utilizado la prueba de Chi Cuadrado (χ^2) propuesta por Pearson (1911), ya que este test permite determinar si las variables analizadas son dependientes o independientes entre sí. Concretamente se ha analizado el grado de dependencia existente entre distintas variables demográficas (sexo y nacionalidad), socioeconómicas (estudios, nivel de ingresos, situación laboral), de preferencias de elección de centro, de morfología urbana (tipología de barrios y características de los barrios), de horario (tipo de jornada escolar, ampliación horaria, compatibilidad horaria) y de distancia y tiempo (real, ideal, máximo) empleados para realizar el trayecto escolar. En el apartado de resultados se comentan todas aquellas asociaciones en las relaciones entre las variables son estadísticamente significativas, es decir, en las que el valor de χ^2 es inferior a 0,05.

Finalmente, cabe señalar que también se ha calculado la distancia existente entre los hogares de los encuestados y los colegios en los que se encuentran matriculados los menores. Para ello, mediante el uso de un Sistema de Información Geográfica, se ha calculado la ruta más corta a partir de la red de calles del municipio de Valencia. Cabe señalar que en este cálculo no se han tenido en cuenta las direcciones de circulación del tráfico rodado, de modo que estas distancias están asociadas a los desplazamientos peatonales.

3. Resultados

3.1. Accesibilidad y preferencias de elección de centro escolar

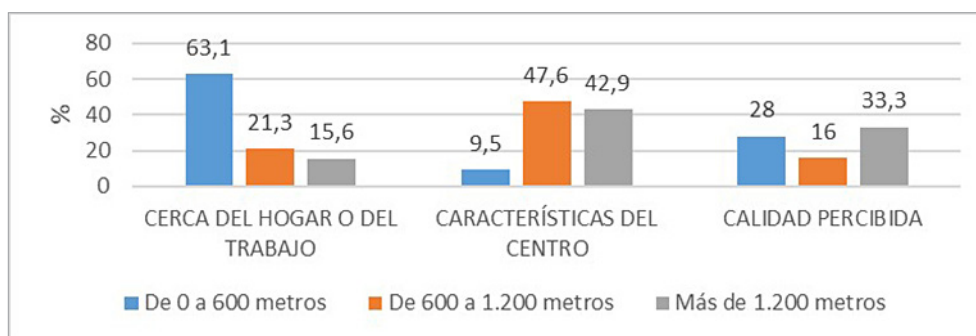
El principal criterio que se valora al elegir el centro educativo al que acuden los menores es la cercanía al hogar o al trabajo, ya que más de un 70% de los encuestados alegan que este fue el principal motivo

que guio la elección del centro escolar. Otros criterios con menor peso proporcional son la calidad percibida de la enseñanza (15,3 %) y las características físicas del centro (servicios y equipamientos) (13,8 %). Por tanto, el criterio de cercanía al hogar o al trabajo es, sin duda, el principal motivo de elección de centro escolar.

Este hecho queda constatado cuando se aborda el estudio de la accesibilidad a los centros educativos. Así pues, el 48,60 % de los encuestados residen a menos de 600 metros del centro escolar al que acuden los menores, mientras que un 25,70 % vive a una distancia de entre 600 y 1.200 metros y el 25,70 % restante reside a más de 1.200 metros del centro escolar en el que están matriculados los menores (Figura 12). Estos datos reflejan nuevamente, que la educación es un servicio de proximidad, ya que cerca del 75 % de sus usuarios residen a menos de 1.200 metros de su centro escolar.

Como cabría esperar, la distancia recorrida entre el centro escolar y el hogar presenta diferencias significativas en función del motivo de elección del centro (Figura 2). Dentro del grupo de personas que priorizaron el criterio de proximidad destacan aquellas que realizan recorridos inferiores a los 600 metros (63,1 %). Sin embargo, al cambiar de criterios de elección se produce un aumento importante de la distancia recorrida. Un claro ejemplo de ello lo protagonizan aquellos encuestados que han priorizado la calidad percibida del centro, donde más de un 56 % realiza trayectos superiores a los 1.200 metros.

Figura 2. Distancia entre el hogar y el centro escolar en función de los motivos de elección



Resultado de la prueba Chi Cuadrado: $X^2(4) = 35,722$; $p < 0,000$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

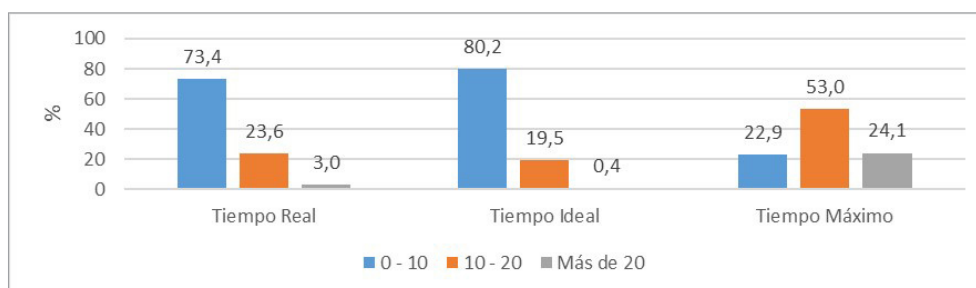
Respecto a la duración de los trayectos, cabe señalar que el tiempo medio del trayecto para llevar a los menores al centro escolar es de 9 minutos y 38 segundos. Este tiempo se sitúa en torno al tiempo medio que los encuestados consideran como deseable, que es de 9 minutos y 8 segundos. Finalmente, la media del tiempo máximo que los encuestados están dispuestos a invertir en el trayecto escolar se sitúa en los 18 minutos y 14 segundos, siendo prácticamente el doble que el tiempo considerado como ideal.

En la Figura 3 se muestra la distribución porcentual de las respuestas relativas al tiempo real dedicado al trayecto escolar, al tiempo ideal y al tiempo máximo. Como se puede observar, la mayoría de los encuestados dedican menos de 10 minutos a esta tarea, mientras que solamente un 3 % dedica más de 20 minutos. Si se comparan estas cifras con las del tiempo ideal se puede afirmar que, en general, los tiempos reales se ajustan a los tiempos ideales, ya que para un 80 % de los encuestados el tiempo ideal del trayecto escolar se sitúa por debajo de los 10 minutos. Finalmente, en cuanto al tiempo máximo que los encuestados están dispuestos a invertir en el desplazamiento escolar, existe una distribución de respuestas más equilibrada; si bien más del 75 % de los encuestados establece el umbral máximo de desplazamiento por debajo de los 20 minutos. No obstante, resulta destacable el elevado porcentaje de encuestados que estarían dispuestos a realizar trayectos superiores a los 20 minutos, si se tiene en cuenta el escaso peso que esta categoría tiene en las respuestas relativas al tiempo real y al tiempo ideal. Probablemente, este hecho se deba a que la educación es un servicio necesario y fundamental que ejerce un papel determinante en el desarrollo de los menores y que, por tanto, el acceso a este servicio justifica desplazamientos hacia centros escolares percibidos como de mayor calidad, que exceden con creces al tiempo que se considera como ideal.

Finalmente, en el análisis de la accesibilidad resulta pertinente analizar cuáles son los medios de transporte que se utilizan para realizar el trayecto escolar. Un primer análisis de los resultados de la

encuesta muestra que existen pautas de movilidad diferenciadas entre los desplazamientos realizados para acceder al centro escolar y los realizados por otros motivos. Por un lado, en la movilidad urbana por motivos generales predomina el uso del transporte privado (34,2 %), seguido muy de cerca por el transporte público (31 %). Además, un importante porcentaje de los encuestados (18,9 %) hace un uso combinado del transporte público y privado en función del trayecto que deseen realizar (Figura 4). Asimismo, las dimensiones de la ciudad de Valencia propician que existan trayectos urbanos que sean poco asumibles desde la movilidad peatonal, hecho que explica, al menos en parte, el bajo porcentaje de encuestados que solamente se desplazan a pie por el municipio (13,9 %).

Figura 3. Tiempo real, ideal y máximo destinado a realizar el trayecto escolar. En minutos

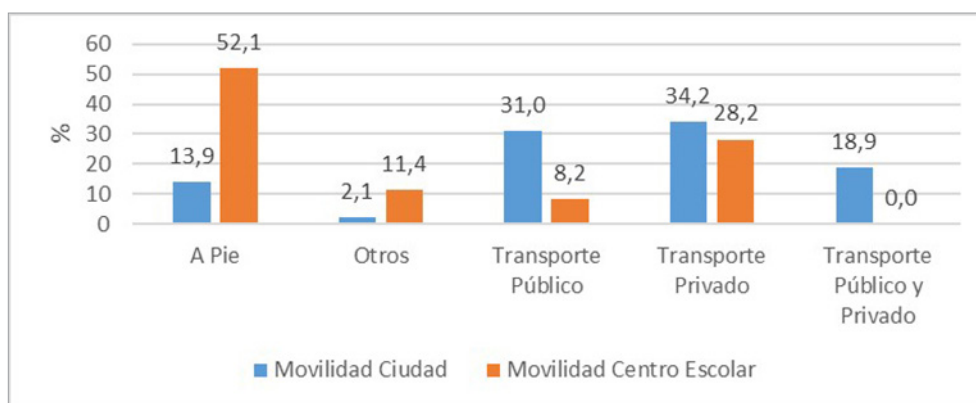


Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Por otro lado, como ya se ha comentado, la cercanía es el principal factor que determina la elección del centro escolar y, por tanto, es lógico que en el trayecto escolar predomine ampliamente la movilidad peatonal (52,1 %) frente al resto de modos de desplazamiento. En segundo lugar, se encuentra el uso del transporte motorizado privado (28,2 %), seguido de otros medios de transporte como las bicicletas y los patinetes (11,4 %). Finalmente aparece el uso del transporte público (8,2 %). El escaso uso del transporte público en el trayecto escolar puede estar relacionado con los tiempos de espera para usar dicho servicio, ya que estos pueden ser un inconveniente a la hora de realizar trayectos cortos, que se pueden hacer andando.

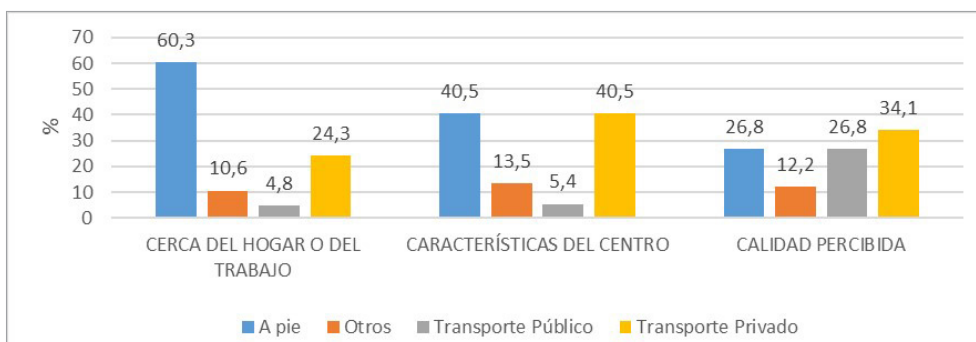
Entre aquellos que eligieron el centro escolar basándose en la cercanía al hogar o al trabajo predomina la movilidad peatonal (60,3 %) ya que, como se ha visto anteriormente, este grupo es el que recorre una menor distancia e invertía menos tiempo en el trayecto escolar (Figura 5). En cambio, el peso de la movilidad peatonal desciende entre aquellos que basaron la elección del centro en sus características y servicios (40,5 %) y, sobre todo, entre los que la basaron en la calidad percibida de la enseñanza (26,8 %). Este descenso del peso de la movilidad peatonal está relacionado con el incremento de las distancias y del tiempo de desplazamiento como consecuencia de basar la elección del centro educativo en criterios alternativos a la proximidad. Este hecho se traduce en un aumento del uso de medios motorizados, especialmente del vehículo privado. Por último, es importante mencionar el peso que adquiere el transporte público entre aquellos que optaron por basar la elección de centro en la calidad percibida de la enseñanza.

Figura 4. Medios de transporte utilizados para realizar el trayecto escolar y para desplazarse por la ciudad



Fuente Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Figura 5. Medios de transporte utilizados para realizar el trayecto escolar en función del criterio de elección del centro educativo

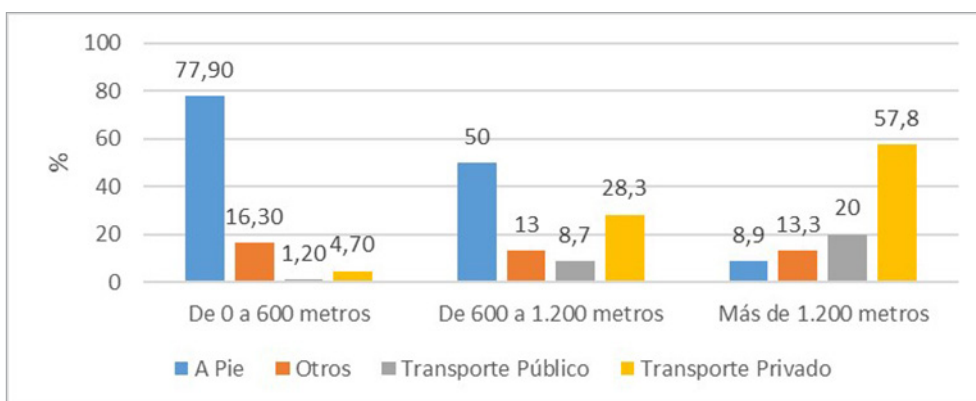


Resultado de la prueba Chi Cuadrado: $X^2(6) = 32,496$; $p < 0,000$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Por último, cabe señalar la existencia de diferencias significativas respecto al medio de transporte utilizado para acudir al centro escolar en función de la distancia entre el hogar y el colegio. Un 77,90 % de los encuestados que residen a menos de 600 metros de su centro educativo acuden andando y únicamente un 5,9 % utiliza medios motorizados para realizar este trayecto (Figura 6). Sin embargo, a medida que aumenta la distancia disminuye el número de encuestados que realizan el trayecto escolar andando de modo que entre los 600 y los 1.200 metros esta opción es elegida por un 50 % de los encuestados, mientras que a partir de los 1.200 metros el porcentaje decae hasta el 8,9 %. En cambio, el aumento de las distancias implica un aumento del uso de otros medios de transporte motorizados, especialmente de los vehículos privados. De este modo, un 28,3 % de los encuestados que residen a una distancia de entre 600 y 1.200 metros utilizan el transporte privado para realizar dicho trayecto, mientras que este porcentaje se eleva hasta el 57,8 % en el caso de los que residen a más de 1.200 metros. Del mismo modo, el transporte público gana protagonismo a medida que se incrementa la distancia, siendo utilizado por el 8,7 % de los encuestados que residen a una distancia de entre 600 y 1.200 metros y por el 20 % de los residentes a más de 1.200 metros del centro escolar.

Figura 6. Medios de transporte utilizados para realizar el trayecto escolar en función de la distancia entre el hogar y el centro educativo



Resultado de la prueba Chi Cuadrado: $X^2(6) = 74,926$; $p < 0,000$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

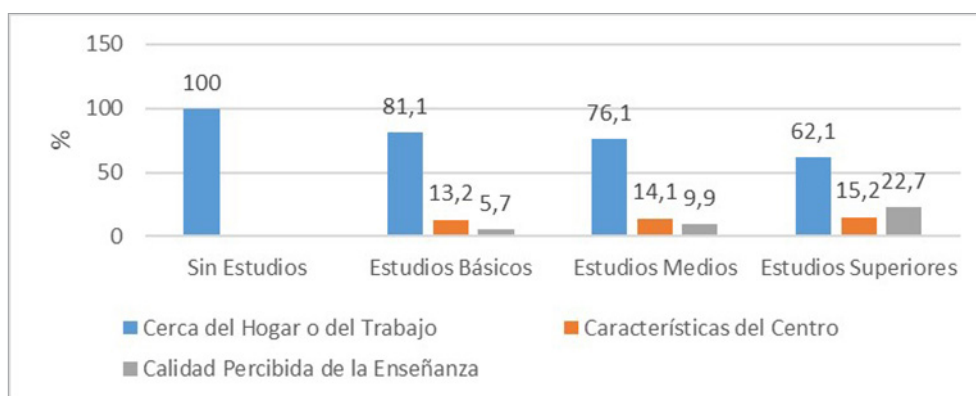
3.2. Patrones de segregación socioeconómica y elección de centro escolar

Como se ha visto en el apartado anterior la proximidad es el principal criterio de elección de centro educativo y la movilidad peatonal es el modo de desplazamiento prioritario para realizar el trayecto escolar. No obstante, el presente estudio ha permitido detectar diferencias significativas en los criterios de elección y en las pautas de movilidad de los encuestados en función de distintas variables demográficas y socioeconómicas como la nacionalidad, el nivel de estudios y el nivel de ingresos del hogar. Esta diferencia

de comportamiento entre los distintos grupos sociales puede derivar en procesos de segregación escolar vinculados, principalmente, al estatus económico.

Así pues, cabe señalar que el nivel de estudios de los padres influye de manera significativa en los motivos de elección del centro escolar, así como en el tiempo máximo que se está dispuesto a invertir en el trayecto escolar (Figuras 7 y 8). Todos los encuestados sin estudios han basado la elección del centro en el criterio de proximidad, mientras que, al aumentar el nivel de estudios, aparecen otras razones, como las características de los equipamientos y servicios que ofrecen los centros educativos y la calidad percibida de la enseñanza, que explican la elección de centro escolar. El criterio de cercanía, aunque sigue siendo el prioritario, pierde importancia relativa a medida que se incrementa el nivel de estudios y las familias están dispuestas a invertir más tiempo en el trayecto escolar.

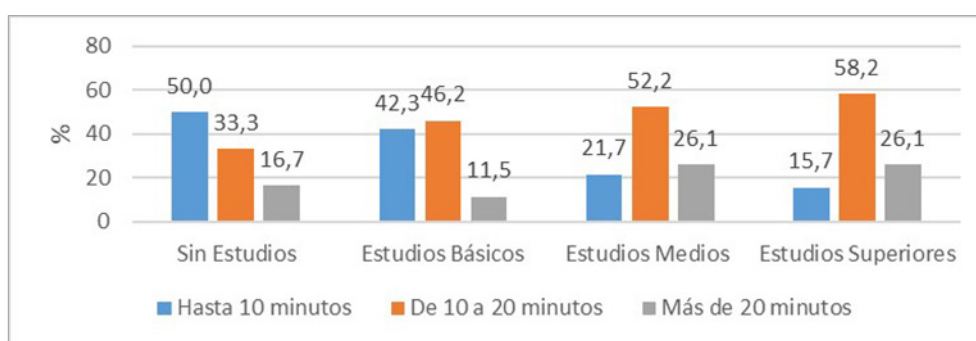
Figura 7. Motivos de elección del centro educativo en función del nivel de estudios



Resultado de la prueba Chi Cuadrado: $X^2(6) = 14,933$; $p = 0,021$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Figura 8. Tiempo máximo que se está dispuesto a utilizar para realizar el trayecto escolar en función del nivel de estudios



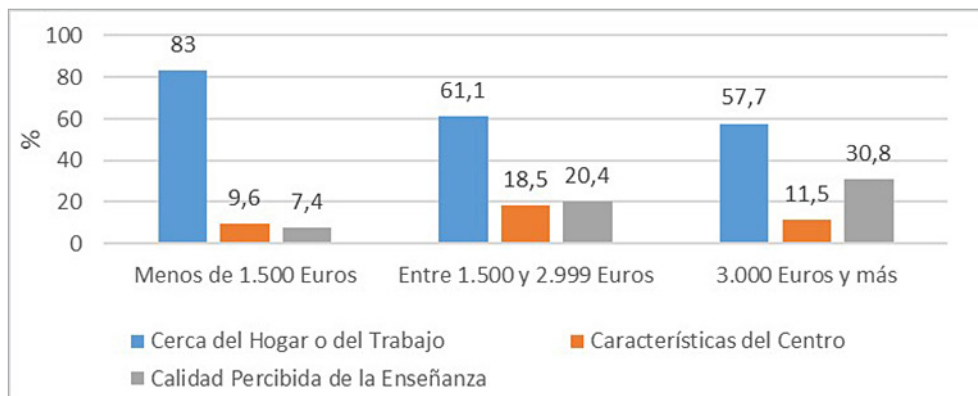
Resultado de la prueba Chi Cuadrado: $X^2(6) = 18,759$; $p = 0,005$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

El motivo de elección del centro escolar también guarda diferencias significativas en función del nivel de ingresos del hogar de los encuestados (Figura 9). En todos los grupos de ingresos del hogar predomina nuevamente el criterio de proximidad, aunque, del mismo modo que sucede en el caso del nivel de estudios, este criterio pierde importancia a medida que aumenta el nivel de ingresos. Al aumentar el nivel de ingresos, adquieren mayor relevancia otros aspectos como los equipamientos y servicios de los centros educativos y, sobre todo, como la calidad percibida de la enseñanza.

Los modos de transporte utilizados para realizar el trayecto escolar también varían en función de los ingresos del hogar. Al aumentar los ingresos del hogar disminuye el porcentaje de encuestados que realizan el trayecto escolar a pie y aumentan otras modalidades como el uso del transporte público y el uso de otros medios como el bus escolar (Figura 10), ya que las familias con rentas más altas están dispuestas a recorrer mayores distancias para acceder a los centros escolares, hecho que implica un aumento del uso de medios de transporte motorizados.

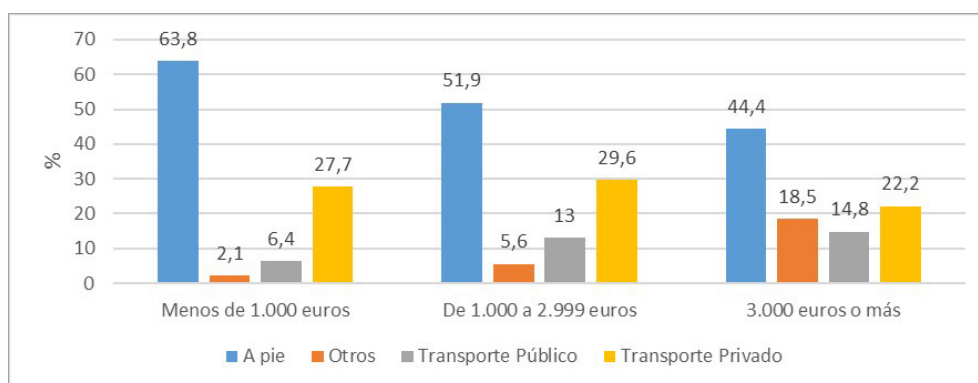
Figura 9. Motivos por los que se ha elegido el centro educativo en función del nivel de ingresos del hogar



Resultado de la prueba Chi Cuadrado: $X^2(4) = 14,337$; $p = 0,006$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Figura 10. Medios de transporte utilizados para realizar el trayecto escolar en función del nivel de ingresos del hogar

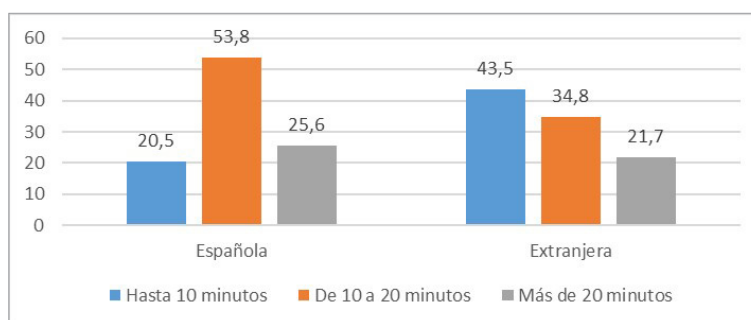


Resultado de la prueba Chi Cuadrado: $X^2(6) = 14,375$; $p = 0,026$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Finalmente, cabe mencionar que la población extranjera establece un tiempo máximo de desplazamiento inferior al de la población con nacionalidad española, de modo que un 43,5 % de los encuestados con nacionalidad extranjera considera que el trayecto escolar debe tener una duración máxima de 10 minutos frente a un 20,5 % de los españoles (Figura 11).

Figura 11. Tiempo máximo que se está dispuesto a utilizar para realizar el trayecto escolar en función de la nacionalidad



Resultado de la prueba Chi Cuadrado: $X^2(2) = 6,044$; $p = 0,049$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Por tanto, en la accesibilidad y en la elección de centro escolar intervienen factores relacionados con el nivel de estudios, la renta del hogar y la nacionalidad, elementos que, a priori, presentan una estrecha relación entre sí. Así pues, al aumentar el nivel de estudios y la renta del hogar el criterio de proximidad,

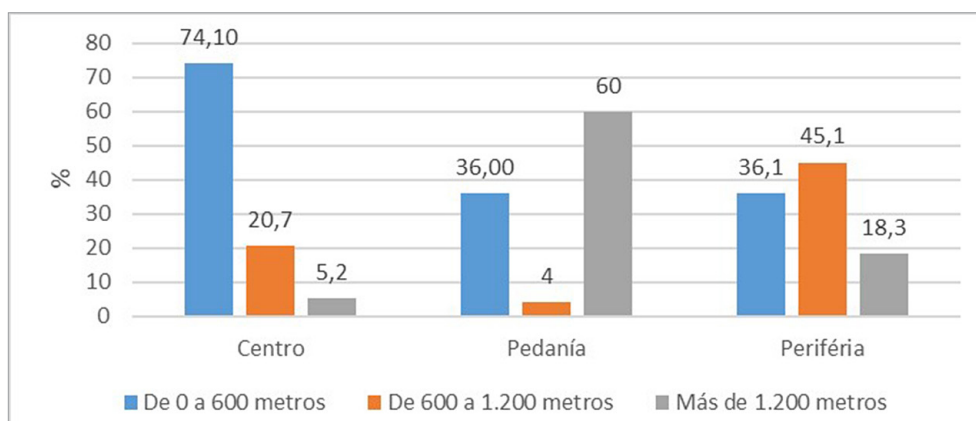
pese a ser todavía muy importante, va perdiendo peso relativo frente a otros ítems como las características del centro y, sobretudo, la calidad percibida de la enseñanza. La disminución de la importancia del criterio de proximidad hace que aumente el tiempo que se está dispuesto a emplear en realizar el trayecto escolar, hecho que se traduce en un descenso de la movilidad peatonal en aras de otros medios como el vehículo privado, dado que la distancia recorrida y, por tanto, la duración del trayecto, aumenta.

3.3. Patrones de segregación residencial y elección de centro escolar

El principal factor que influye en la accesibilidad y en la elección de centro escolar es la cercanía entre el colegio y el hogar de los menores. Es posible encontrar diferencias significativas en cuanto a la distancia existente entre el hogar y el centro escolar en función de la morfología urbana de los barrios en la que se ubican los centros escolares.

Los encuestados que acuden a centros escolares ubicados en los barrios centrales del municipio residen más cerca del centro escolar que las personas que acuden a los centros localizados en los barrios periféricos y, sobretudo, que las que acuden a colegios emplazados en las pedanías (Figura 12). De este modo, un 74,10 % de los encuestados que acuden a un centro escolar ubicado en un barrio central residen a menos de 600 metros del colegio, mientras que en el caso de los barrios periféricos y de las pedanías este porcentaje decae hasta el 36 %. Conforme crece la distancia al centro de la ciudad, aumenta también el porcentaje de niños que viven a más distancia de su colegio. En el caso de los barrios periféricos, destaca el porcentaje de encuestados que residen a una distancia de entre 600 y 1.200 metros del centro escolar (45,1 %), mientras que en el caso de las pedanías la mayoría de los encuestados (60 %) reside a más de 1.200 metros del centro escolar al que acuden. Además, en el caso de las pedanías destaca el escaso porcentaje de gente que reside a una distancia de entre 600 y 1.200 metros (4 %), muy inferior al de personas que viven a una distancia menor de 600 metros (36 %). Este hecho se explica por la morfología urbana de estas demarcaciones. En las pedanías existe un núcleo compacto de población en el que, normalmente, se ubican los servicios esenciales como los centros educativos. En este pequeño núcleo urbano las distancias a recorrer son muy reducidas, hecho que explica que el porcentaje de encuestados que residen a menos de 600 metros sea relativamente elevado. No obstante, también existen muchas viviendas dispersas que se encuentran separadas de los núcleos poblacionales por distancias considerables. Por tanto, en estos enclaves poblacionales existen básicamente dos situaciones contrapuestas respecto a la distancia entre el hogar y el centro escolar: distancias inferiores a los 600 metros para los residentes en el núcleo urbano de la pedanía (36 % de los encuestados), frente a distancias superiores a los 1.200 metros para los residentes en viviendas dispersas por la huerta (60 % de los encuestados).

Figura 12. Distancia entre el hogar y el centro escolar en función del tipo de trama urbana



Resultado de la prueba Chi Cuadrado: $X^2(4) = 65,517$; $p = 0,000$.

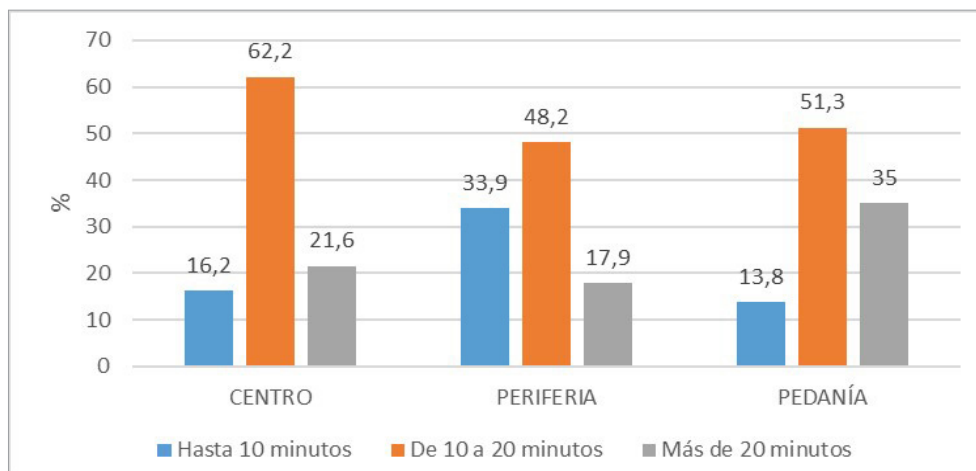
Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Asimismo, el tiempo máximo que se está dispuesto a invertir en realizar el trayecto escolar también guarda relación con la trama urbana del barrio en la que se ubica del centro educativo. El tiempo máximo es mayor en las pedanías (Figura 13). Como ya se ha comentado, estos enclaves están desconectados del continuo urbano de la ciudad y tienen núcleos de población dispersa y viviendas aisladas por toda la

huerta. Este hecho, junto a la existencia de una menor combinación de transporte público disponible y de un menor número de equipamientos escolares cercanos, obliga a sus habitantes a asumir tiempos de desplazamientos mayores a los del resto de los encuestados.

Cabe mencionar que los encuestados que acuden a centros ubicados en las periferias son los que menos tiempo están dispuestos a invertir en el trayecto escolar. En parte, este hecho puede quedar explicado por el nivel de ingresos del hogar. En la periferia existe un volumen importante de hogares con ingresos inferiores a los 1.000 euros y, como se ha visto anteriormente, estos hogares son los que menos tiempo máximo están dispuestos a invertir en el desplazamiento escolar.

Figura 13. Tiempo máximo que se está dispuesto a utilizar para realizar el trayecto escolar en función de la trama urbana del barrio donde se ubica el centro educativo

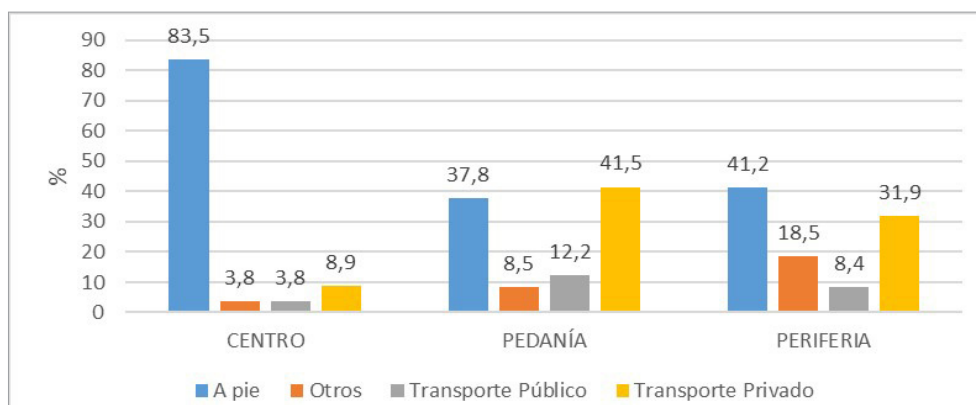


Resultado de la prueba Chi Cuadrado: $X^2(4) = 17,958$; $p = 0,001$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

En los barrios céntricos existe un claro predominio de la movilidad peatonal (83,5 %), ya que la red viaria favorece los desplazamientos andando y penaliza la utilización de otros medios de transporte como los vehículos privados, especialmente durante las horas punta del día (Figura 14). Por otra parte, en los barrios periféricos también predomina la movilidad peatonal (41,2 %), aunque el uso del vehículo privado adquiere una mayor relevancia (31,9 %). En los barrios periféricos se incrementa el uso de otros medios de transporte como la bicicleta o el patinete. Por último, en las pedanías la movilidad peatonal (37,8 %) se ve superada por el uso del vehículo privado (41,5 %). Como ya se ha comentado, en estas zonas existen viviendas aisladas de los núcleos poblacionales y sin acceso a medios de transporte público, motivo por el que se incrementa el uso de vehículos privados a motor.

Figura 14. Medios de transporte utilizados para realizar el trayecto escolar en función del nivel de ingresos del hogar



Resultado de la prueba Chi Cuadrado: $X^2(6) = 64,493$; $p < 0,000$

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

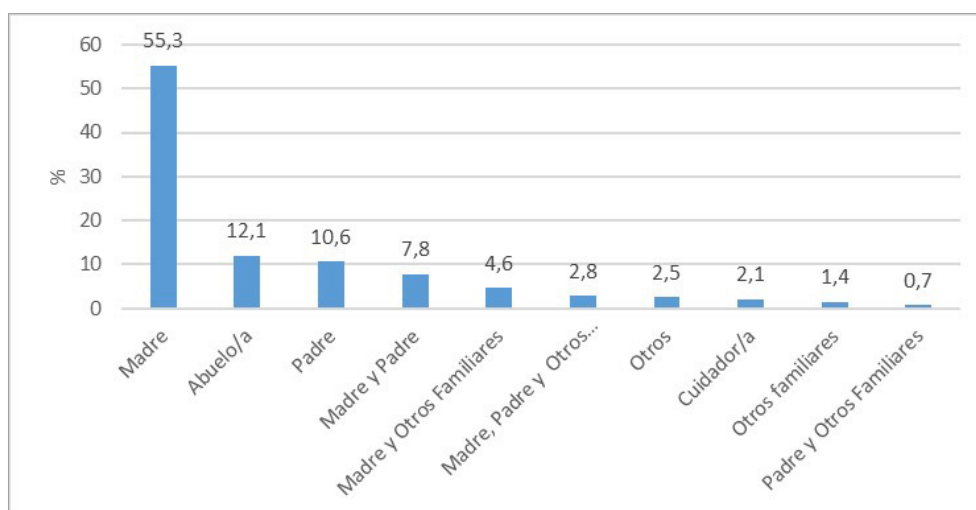
Por tanto, la trama urbana del lugar de residencia del menor y/o de ubicación del colegio condiciona la accesibilidad a los centros escolares. Además, como se ha visto en los apartados anteriores, existen diferencias significativas en cuanto a la nacionalidad de la población. La población extranjera tiende a concentrarse en los barrios periféricos, donde el parque de viviendas tiene un precio inferior al de los barrios centrales, mientras que rehúyen instalarse en las pedanías, ya que son zonas alejadas de los principales servicios y nichos de trabajo de la ciudad y requieren de un mayor gasto de dinero y tiempo en desplazamientos cotidianos, que, a menudo, deben realizarse en vehículo privado. Por todo ello, la tipología de trama urbana de los barrios en los que se ubican los centros escolares y/o residen los menores puede ser uno de los factores explicativos de los procesos de segregación escolar vinculados a situaciones previas de segregación residencial.

3.4. Accesibilidad escolar y brecha de género

La actividad educativa se presta en un espacio y en un horario determinado, y requiere de un desplazamiento previo del menor que, generalmente, transcurre desde su hogar hasta el centro educativo donde se va a desarrollar la jornada escolar. En el caso de los alumnos de Educación Infantil y Primaria, dada su corta edad, el trayecto escolar precisa del acompañamiento de una persona adulta. Así pues, el acceso de un menor a un centro escolar está condicionado, además de por la presencia de centros escolares con plazas disponibles, por la existencia de centros educativos que posean un horario compatible con las actividades obligatorias del responsable de acompañar al menor. Por tanto, en el análisis de la accesibilidad a los centros educativos resulta fundamental estudiar las características sociodemográficas y las preferencias y disponibilidades horarias de las personas encargadas de realizar el acompañamiento escolar.

El estudio de las características sociodemográficas de estas personas evidencia la presencia de diferencias significativas en función del género. El análisis de las frecuencias indica que la madre es la única responsable de acompañar al menor en un 55,3 % de los casos, mientras que el padre solamente es el único responsable de realizar dicha tarea en un 10,6 % de los casos, situándose, incluso, por detrás de los abuelos y de las abuelas (12,1 %) (Figura 15). Esta diferencia entre padres y madres se incrementa todavía más si se tienen en cuenta las combinaciones de acompañamiento en las que interviene cada uno de los progenitores. Además, la tarea de acompañar al menor únicamente es compartida entre el padre y la madre en un 7,8 % de los casos. Por tanto, estos datos reflejan un claro desequilibrio en las tareas que atañen al cuidado y a la educación de los menores, hecho que, como se verá más adelante, afecta a la conciliación familiar y laboral de las mujeres.

Figura 15. Responsables de acompañar al menor al centro escolar

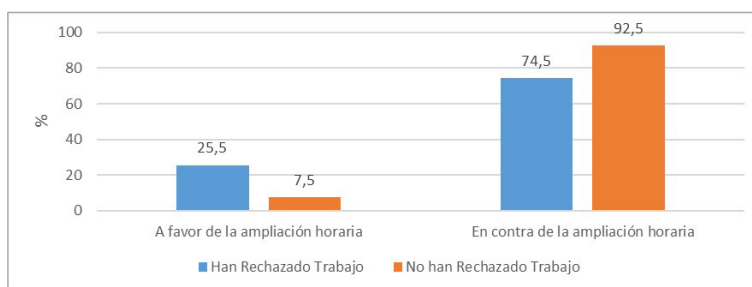


Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

La accesibilidad escolar, tiene implicaciones directas sobre las actividades obligatorias de las personas que realizan la tarea de acompañamiento escolar. Un claro ejemplo de ello es que un 19,1 % de los encuestados han tenido que rechazar algún trabajo por incompatibilidad de horarios laborales y escolares.

Este elevado porcentaje pone de manifiesto la necesidad de implementar políticas de conciliación de la vida familiar y laboral. Una de las líneas de actuación de estas políticas debería consistir en la búsqueda de medidas que permitan compatibilizar los horarios laborales y escolares de los trabajadores con hijos en edad escolar. Algunas de las medidas podrían consistir en la flexibilidad del horario de entrada y salida al lugar del trabajo o en la ampliación del horario de apertura de los centros escolares. No obstante, cabe mencionar, que únicamente un 11 % de los encuestados desearían que el horario del centro educativo fuera más amplio, aunque existen diferencias significativas en función de si han tenido que rechazar o no una oferta laboral por incompatibilidad de horarios. Así pues, esta opción es apoyada por un 25,5 % de los encuestados que han tenido que rechazar algún trabajo por incompatibilidad de horarios, frente al 7,5 % de los encuestados que no han tenido que rechazar ninguna oferta laboral por este motivo (Figura 16).

Figura 16. Encuestados a favor y en contra de la ampliación del horario escolar en función de si han tenido que rechazar o no alguna oferta laboral por motivos de incompatibilidad horaria

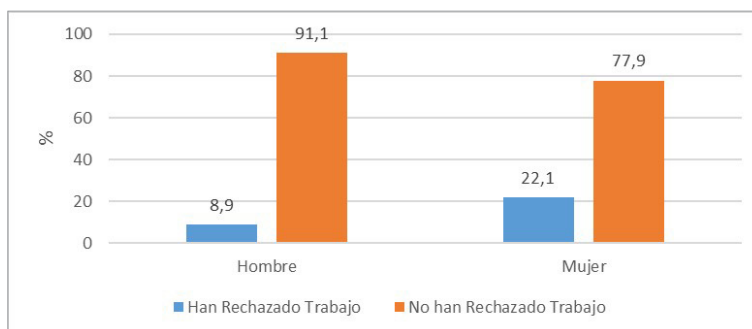


Resultado de la prueba Chi Cuadrado: $X^2(1) = 13,602$; $p < 0,000$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Además, existen diferencias significativas entre los encuestados que han tenido que rechazar algún puesto de trabajo por razones de incompatibilidad horaria en función del sexo. El porcentaje de mujeres es más del doble (22,1 %) que el de hombres (8,9 %) (Figura 17). Este dato pone de manifiesto las desigualdades de género que existen en el acceso al ámbito laboral y en el reparto de las tareas domésticas, ya que, como se ha visto anteriormente, las mujeres siguen siendo, en la mayoría de los casos, las principales responsables de acompañar a los menores al centro escolar.

Figura 17. Encuestados que han tenido que rechazar o no alguna oferta laboral por motivos de incompatibilidad de horarios en función del sexo



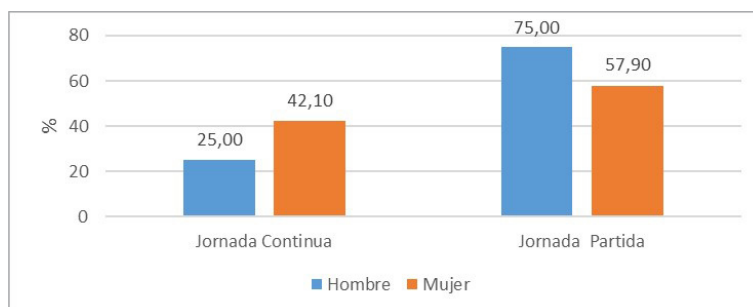
Resultado de la prueba Chi Cuadrado: $X^2(1) = 4,936$; $p = 0,026$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

Finalmente, en relación con las preferencias horarias de la jornada escolar, se observa cómo la mayor parte de los encuestados prefieren la jornada lectiva partida (59,6 %) frente a la jornada continua (37,6 %). No obstante, cabe mencionar la existencia de diferencias significativas en función del sexo (Figura 18). Aunque tanto la mayoría de los hombres como de las mujeres prefieren la jornada partida (75 % y 57,90 % respectivamente), las mujeres muestran una mayor predilección que los hombres por la jornada escolar continua. Este hecho puede explicarse por el tipo de jornada laboral que predomina en cada sexo. En los hombres existe un claro predominio del trabajo a jornada completa (83,64 % frente al 51,36 % de

las mujeres) respecto a otras situaciones como el trabajo a tiempo parcial o el desempleo, de modo que disponen de menos tiempo para hacerse cargo de los menores. Por el contrario, un elevado porcentaje de mujeres presenta situaciones distintas a las del trabajo a tiempo completo, como son el trabajo a tiempo parcial (21,36 %) o la búsqueda de empleo (17,73 %), o son población inactiva, hecho que les permite disponer de más tiempo discrecional que pueden emplear en el cuidado y la educación de los menores.

Figura 18. Tipo de jornada escolar preferida en función del sexo



Resultado de la prueba Chi Cuadrado: $X^2(1) = 5,506$; $p = 0,019$.

Fuente: Encuesta de pautas de movilidad y de elección de centro escolar. Elaboración propia

4. Discusión de resultados

Los resultados de la encuesta señalan que el principal criterio que rige la elección del centro escolar por parte de los progenitores es el de proximidad entre el hogar y el centro escolar. Este resultado es consistente con la investigación llevada a cabo por Burgess, Greaves, Vignoles y Wilson (2015) en Inglaterra, ya que dicho estudio concluye que, en el caso de los menores de edades tempranas, la proximidad entre el hogar y el colegio, es un factor determinante en la elección de centro escolar. Respecto a la movilidad escolar, cabe señalar que el modo de desplazamiento que más se utiliza para realizar este trayecto es el peatonal. Por tanto, y, en primer lugar, desde la planificación urbana en general y desde la planificación educativa en particular se debe apostar firmemente por una distribución espacial de los servicios y de los equipamientos basada en los principios de la proximidad y que fomenten una movilidad peatonal segura. La estructura urbana, es decir, el modelo espacial urbano, contribuye sin duda a mejorar la accesibilidad a los servicios y permite promover formas de movilidad más igualitarias y sostenibles que ayuden a paliar las externalidades negativas derivadas de la ciudad dispersa y de la movilidad motorizada.

En segundo lugar, y de acuerdo con diversos estudios empíricos realizados por varios autores (Millington *et al.*, 2014; Andersson *et al.*, 2012; François, 2002) en países como Inglaterra, Suecia o Francia, se ha podido constatar que las preferencias en la elección de centro, así como los costes y medios de desplazamiento derivados están directamente relacionados con las características socioeconómicas de las familias. La segregación escolar puede venir derivada de factores como la renta de las familias, la nacionalidad de los padres y el sexo de la persona que acompaña habitualmente al menor y se hace cargo de su cuidado. Los resultados de la encuesta permiten afirmar que las familias con mayor renta, y mayor nivel educativo, valoran otros factores, además de la proximidad, a la hora de seleccionar el centro escolar, destacando la calidad percibida de la enseñanza. Estos resultados coinciden con el estudio realizado por Hastings, Kane, y Staiger (2009) en la ciudad estadounidense de Charlotte, en Carolina del Norte, donde las familias con bajo nivel socioeconómico mostraban una menor predilección por el criterio de calidad de la enseñanza que aquellas que poseían un status socioeconómico elevado. Como se ha señalado al principio de esta investigación, ello es debido a que la oferta de los centros difiere claramente, a pesar de ser todos ellos de titularidad pública, facilitando, por una parte, la vida laboral de los padres, por ejemplo, con servicios como comedor o admisión temprana, y por otra, reforzando la calidad percibida con servicios añadidos como actividades extraescolares, bilingüismo, etc., que atraen a aquellas familias con un nivel económico más elevado, bien por su valoración personal o bien porque pueden asumir el gasto extra que ello conlleva (por ejemplo, pagar un cuidador/a que acompañe al menor). Así pue, tal y como afirman diversos investigadores (Barthón y Monfroy, 2010; Östh, *et al.*, 2013; Murillo *et al.*, 2018), la implantación del sistema de elección de distrito único puede, por tanto, favorecer la segregación escolar debido a la concentración de familias en función de los ingresos del hogar.

Finalmente, la encuesta también ha permitido detectar la existencia de diferencias de género en el cuidado de los menores, corroborándose así lo expuesto en estudios de género realizados por otros investigadores (Prados y Lara, 2015). En la mayoría de los casos la tarea del acompañamiento escolar es asumida de manera exclusiva por las madres, hecho que supone un obstáculo para la incorporación de la mujer al mercado laboral. Un ejemplo de ello es que un 22,21 % de las mujeres encuestadas ha afirmado haber rechazado alguna oferta de trabajo por razones de incompatibilidad entre el horario laboral y escolar (frente a un 8,9 % de los hombres). Por tanto, para avanzar en materia de conciliación familiar y laboral, además de adoptar medidas que faciliten la compatibilidad de los horarios escolares y laborales, hay que seguir fomentando medidas que permitan reducir la brecha de género en las tareas relacionadas con el cuidado de los menores, ya que tal y como apuntan distintos autores (Caballo, Gradaílle y Merelas, 2012) la incorporación de la mujeres al mercado laboral debe ir acompañada de la ruptura de los viejos patrones organizacionales del ámbito familiar y laboral.

5. Conclusiones

Los resultados obtenidos en la investigación han permitido corroborar las dos hipótesis planteadas al inicio del artículo: (1) la proximidad entre el hogar y el centro escolar es el principal criterio de elección escolar para la mayoría de los padres y madres, y (2) existen diferencias en los criterios de elección en función del nivel socioeconómico de los progenitores. Estos resultados coinciden con las aportaciones teóricas y con los resultados empíricos de diversos autores citados en el texto, y apuntan hacia la posible vinculación entre la segregación escolar y la libre elección de centro educativo.

La distribución espacial de la oferta pública de educación infantil y primaria de la ciudad de Valencia, presenta una situación bastante equilibrada. El modelo de distrito escolar imperante en el municipio explica en gran parte esta situación. Sin embargo, aunque existe un claro predominio del criterio de proximidad a la hora de elegir el centro escolar, existen algunos elementos que pueden generar ciertas diferencias, dentro del mismo distrito, por parte de las familias y que pueden desencadenar procesos de segregación escolar.

Concretamente, en la presente investigación se han detectado comportamientos diferenciados en los criterios de elección de centro y en la movilidad escolar en función del estatus socioeconómico, del lugar de residencia y/o del sexo de la persona que acompaña al menor a la escuela, que pueden explicar la existencia de procesos de segregación escolar en el ámbito urbano. En primer lugar, cabe señalar la existencia de diferencias significativas en cuanto al criterio de elección de centro en función del nivel de estudios y de los ingresos del hogar de las personas encuestadas. Como se ha visto en apartados anteriores, a medida que aumenta el nivel de estudios y el nivel de ingresos de los hogares el porcentaje de encuestados que priorizan el criterio de proximidad, disminuye en favor de otros criterios como los equipamientos y servicios que ofrecen los centros escolares y la calidad percibida de la enseñanza. Por tanto, la implantación de un mapa escolar de distrito único podría suponer un aumento de la segregación escolar debido a la existencia de pautas diferenciadas en la movilidad y en los criterios de elección de centro educativo ligadas a factores económicos y culturales. En segundo lugar, también se han detectado diferencias significativas en cuanto al medio de transporte utilizado para realizar el trayecto escolar en función de la morfología de los barrios donde se ubica el colegio o el domicilio del menor. En los barrios céntricos del compacto urbano el principal medio de transporte para realizar el trayecto escolar es el peatonal, ya que se recorren distancias menores que en los barrios periféricos y en las pedanías. Tanto en los barrios periféricos como en las pedanías las distancias y los tiempos del trayecto escolar se incrementan, hecho que propicia un aumento del uso de los medios de transporte motorizados. Estas diferencias de accesibilidad vinculadas al lugar de residencia deben ser consideradas por los planificadores de la red escolar, pues podrían contribuir a generar procesos de segregación escolar vinculados a situaciones previas de segregación residencial. Finalmente, la investigación también ha permitido detectar la existencia de diferencias de género en el cuidado de los menores y en la realización de la tarea de acompañamiento escolar. El conocimiento de todos estos patrones por parte de los planificadores de la red escolar es fundamental para el diseño de políticas educativas que contribuyan a mitigar la segregación escolar y a garantizar un acceso más equitativo a los servicios educativos.

Por último, por lo que respecta a futuras investigaciones, se considera interesante seguir trabajando en la línea apuntada por la actual investigación, con el fin de analizar cuáles son las características

socioeconómicas y los patrones de movilidad y de elección de centro escolar de los usuarios de los centros educativos privados y concertados. Ello permitirá realizar un análisis comparativo con la información obtenida en los centros públicos, y contribuirá a enriquecer el conocimiento sobre el comportamiento de la demanda en cuanto a los patrones de movilidad y de elección de centro escolar, pudiendo así establecer recomendaciones que contribuyan a crear una oferta educativa más justa e inclusiva que la existente en la actualidad.

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Anexo I. Encuesta de Pautas de Movilidad y de Elección de Centro Escolar

La Universitat de València y la Concejalía de Educación del Ayuntamiento de Valencia están realizando un estudio sobre el estado del sistema educativo en el municipio. Esta encuesta trata de averiguar los motivos por los que se ha decidido matricular a los menores en el centro, así como aspectos relativos a los modos de movilidad empleados para llegar al centro. La información proporcionada será tratada de manera confidencial y anonimizada. Los resultados obtenidos pueden contribuir a la mejora de la planificación escolar municipal y a la mejora del funcionamiento de su centro escolar.

Destinatario de la encuesta: La encuesta debe ser rellenada por la persona mayor de edad encargada de dejar y recoger al menor en el colegio y que resida en el mismo domicilio que el menor. En caso de que el menor acuda al centro escolar acompañado de otro menor (por ejemplo, un hermano o hermana) o de que acuda al colegio acompañado por un adulto no residente en el domicilio del menor, la encuesta la rellenará el padre, la madre o el tutor que resida en el mismo domicilio que el menor.

Nombre del Centro en el que se realiza la encuesta:

Relación con el Menor

1. Parentesco o relación con el niño/a:

- | | | | |
|--------------|--------------------------|---------------------|--------------------------|
| a) Madre | <input type="checkbox"/> | e) Otros familiares | <input type="checkbox"/> |
| b) Padre | <input type="checkbox"/> | f) Vecino/a | <input type="checkbox"/> |
| c) Hermano/a | <input type="checkbox"/> | g) Cuidador/a | <input type="checkbox"/> |
| d) Abuelo/a | <input type="checkbox"/> | h) Otros (indicar) | <input type="checkbox"/> |

2. ¿Quién es el responsable habitual de dejar y recoger al menor en el centro?

- | | | | |
|---------------------|--------------------------|--------------------------|--------------------------|
| a) Madre | <input type="checkbox"/> | f) Vecino/a | <input type="checkbox"/> |
| b) Padre | <input type="checkbox"/> | g) Cuidador/a | <input type="checkbox"/> |
| c) Hermano/a | <input type="checkbox"/> | h) Acude solo/a | <input type="checkbox"/> |
| d) Abuelo/a | <input type="checkbox"/> | i) Otros (indicar) _____ | <input type="checkbox"/> |
| e) Otros familiares | <input type="checkbox"/> | | |

En caso de que la persona habitual de dejar y recoger al menor en el centro escolar no sea el padre o la madre:

3. ¿Cuál es el motivo?

- | | | | |
|-----------------------|--------------------------|-----------------------------------|--------------------------|
| a) Motivos laborales | <input type="checkbox"/> | d) Acude solo/a | <input type="checkbox"/> |
| b) Motivos familiares | <input type="checkbox"/> | e) Otros motivos (indicar): _____ | |
| c) Motivos físicos | <input type="checkbox"/> | | |

Pautas o Criterios Empleados en la Elección de Centro

4. La proximidad o buena comunicación ha sido el principal motivo para la elección del centro
- Sí ... en concreto a nuestra casa
 a mi lugar de trabajo
 a otros lugares de uso común; ¿cuál/es? _____
- No ... el/los motivos principal/es ha/n sido (señale hasta 3 en orden de importancia: 1,2,3)
- Horario del centro
 Servicios generales (comedor, transporte, "Escola Matinera")
 Programa/s o línea/s lingüística/s
 Actividades de apoyo y extraescolares
 Instalaciones (deportivas, aulas de informática, laboratorios)
 Calidad percibida de la enseñanza y el aprendizaje
 Orientación religiosa / ideológica del centro
 Posibilidad de completar aquí la educación obligatoria
 Otros: _____
5. ¿Tuvo en cuenta alguna característica del barrio o entorno en el que se encuentra el centro (accesibilidad, seguridad, limpieza, zonas verdes, nivel de renta, etc.) a la hora de elegirlo?
- Sí ¿Cuál? _____
No
6. ¿Es éste el centro que se eligió en primer lugar?
- Sí
No ... ¿Cuál fue el centro que eligió en primer lugar? _____
... ¿Qué puesto ocupaba este centro en el orden de preferencias? ____
7. Para concluir este apartado, ¿le pediría algún elemento de mejora al centro?
- Sí ¿Cuál? _____
No

Horarios y Desplazamientos

8. Respecto al horario escolar, usted prefiere:
- Jornada lectiva continua (9 – 14h)
Jornada lectiva de mañana y tarde
9. ¿Desearía que el horario de apertura del centro fuera más amplio?
- Sí ... ¿por qué?
No ... el horario actual es suficiente

10. ¿Ha tenido que rechazar alguna oferta de trabajo por incompatibilidad de horarios?
- Sí
- No
11. ¿Cuánto tiempo tarda en llegar desde su casa al centro escolar? _____ minutos.
12. ¿Qué medio de transporte utiliza para dejar y recoger al niño/a en el centro escolar?
- a) A pie e) Metro/Tranvía
- b) En coche (conductor) f) Bicicleta
- c) En coche (pasajero) g) Moto
- d) Bus h) Otros _____
13. ¿Qué medio de transporte utiliza habitualmente para desplazarse por la ciudad?
- a) A pie e) Metro/Tranvía
- b) En coche (conductor) f) Bicicleta
- c) En coche (pasajero) g) Moto
- d) Bus h) Otros _____
14. De manera ideal, ¿cuál es el tiempo al que todas las familias deberían tener un centro escolar con las características deseadas? _____ minutos.
15. ¿Cuál es el tiempo máximo que estaría dispuesto a emplear en llevar a su hijo/a a un centro escolar con las características deseadas? _____ minutos.
16. Rellene la siguiente tabla indicando aquellas actividades que usted realiza cotidianamente en un día laborable (en el día de ayer, por ejemplo) que tienen un horario de entrada y salida prefijado. Además del trabajo (si fuese el caso), en esta categoría podrían encontrarse asistir a curso de formación, acompañar a los hijos a su clase de natación, ir al gimnasio, ...

	Actividad	Lugar (Dirección)
<i>Ejemplo:</i> De 9_ a 13_h.	Asistencia a curso de formación	Calle ... (si es en la ciudad) Municipio ... (si es fuera de Valencia)
De ____ a ____ h.		
De ____ a ____ h.		
De ____ a ____ h.		
De ____ a ____ h.		
De ____ a ____ h.		
De ____ a ____ h.		

Datos Personales

17. Sexo:

Hombre

Mujer

18. Edad ____ años

19. País de Origen ____

20. Domicilio:

Calle _____ N° portal: _____

Municipio _____

21. Curso en el que se encuentra escolarizado el menor (indicar tantos cursos como menores escolarizados).

22. Hogar monoparental (El hogar está constituido por un solo adulto y al menos un menor).

Sí

No

23. Nivel de estudios alcanzado (estudios completados):

a) Ninguno

b) Primaria /EGB

c) ESO/BUP

d) Secundaria (Bachiller o FP)/COU

e) Universitarios

f) Otros

24. Situación personal:

a) Trabajando a jornada completa

b) Trabajando a media jornada

c) Busca trabajo

d) No trabaja y no busca trabajo

e) Estudiante

f) Jubilado/Pensionista

g) Otros

25. Ingresos netos mensuales aproximados del hogar:

a) Menos de 499 euros

b) De 500 a 999 euros

c) De 1.000 a 1.499 euros

d) De 1.500 a 1.999 euros

e) De 2.000 a 2.499 euros

f) De 2.500 a 2.999 euros

g) De 3.000 a 4.999 euros

h) Más de 5.000 euros

26. Otras observaciones o sugerencias que quiera hacer constar:

¡Muchas gracias por su colaboración!

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How to guarantee food supply during pandemics? Rethinking local food systems from peri-urban strategic agents' behaviour: The case study of the Barcelona Metropolitan Region

*¿Cómo garantizar el suministro de alimentos durante las pandemias?
Repensar los sistemas alimentarios locales desde el comportamiento
de los actores estratégicos peri-urbanos: El caso de estudio de la Región
Metropolitana de Barcelona*

Sònia Callau-Berenguer¹
Anna Roca-Torrent²
Josep Montasell-Dorda³
Sandra Ricart^{4*} 

Abstract

The Covid-19 pandemic has acted as a warning for the world's current food system, especially in urban contexts with global food dependence. This article aims to analyse the food system behaviour of the Barcelona Metropolitan Region (in the northeast of Spain) during the first stage of the pandemic by deepening the behaviour of different peri-urban agricultural areas in which local food supply is promoted. Semi-structured interviews to 11 entities and institutions located in the peri-urban area of the BMR based on its productive and management profile have been carried out from March to May 2020. The results obtained highlight the socio-economic, environmental, and health perspective of food supply during the pandemic. Main results show 1) shortcomings in the operation and logistics of the metropolitan food system; 2) the complicity between the local producer and the urban consumer through new sales and distribution initiatives, 3) the role of peri-urban agricultural areas for ensuring food supply and land preservation, and 4) the need to initiate cooperation and mutual aid activities between the different agents involved in the food system. Furthermore, agents underlined the need for rethinking the agro-economic model to strengthening the producer-consumer nexus and promoting local food policy based on food sustainability, sovereignty, and governance.

Keywords: pandemic; local food supply; behaviour; food governance; Barcelona Metropolitan Region; Spain.

Resumen

La pandemia del Covid-19 ha supuesto una advertencia para el sistema alimentario actual a nivel mundial, especialmente en contextos urbanos con dependencia alimentaria global. Este artículo tiene como objetivo analizar el comportamiento del sistema alimentario de la Región Metropolitana de Barcelona (en el noreste de España) durante la primera etapa de la pandemia, profundizando en el comportamiento de

1 Territorial Agricultural Directorate, Barcelona Provincial Council, Barcelona, Spain. callaubs@diba.cat

2 Geography Department, University of Girona, Girona, Spain. anna.roca@udg.edu

3 Catalan Institution of Agricultural Studies, Barcelona, Spain. montaselldj@gmail.com

4 Interuniversity Institute of Geography, University of Alicante, Alicante, Spain. sandra.ricart@ua.es. * Corresponding author

diferentes áreas agrícolas periurbanas en las que se promueve el suministro local de alimentos. Entre marzo y mayo de 2020 se realizaron entrevistas semiestructuradas a 11 entidades e instituciones ubicadas en el área peri-urbana de la BMR en base a su perfil productivo y de gestión. Los resultados obtenidos destacan la perspectiva socioeconómica, ambiental y de salud del suministro de alimentos durante la pandemia. Los principales resultados muestran 1) deficiencias en la operación y logística del sistema alimentario metropolitano; 2) la complicidad entre el productor local y el consumidor urbano a través de nuevas iniciativas de venta y distribución, 3) el papel de las áreas agrícolas periurbanas para asegurar el suministro de alimentos y la preservación de la tierra, y 4) la necesidad de iniciar actividades de cooperación y ayuda mutua entre los diferentes agentes implicados en el sistema alimentario. Así mismo, los agentes subrayaron la necesidad de repensar el modelo agro-económico para fortalecer el nexo productor-consumidor y promover con ello la política alimentaria local basada en la sostenibilidad, la soberanía y la gobernanza alimentarias.

Palabras clave: pandemia; suministro local de alimentos; comportamiento; gobernanza alimentaria; Región Metropolitana de Barcelona; España.

1. Introduction

The impact of the Covid-19 pandemic is not limited to the direct threat that the virus imposes on health, but to food supply through the disruptions affecting local and national food systems and economies (Bené *et al.*, 2019). Most countries have limited their economic activity exclusively to meeting citizens' basic needs, which can be summarized in three main sections: healthcare, essential utilities, and services (such as electricity, water, waste management, and food supply). How to guarantee these essential utilities and services when facing future crises affecting the food supply? In this context, some proposals about designing new models of food production and consumption that are less dependent on distribution and logistics networks at a global level have been discussed. Furthermore, strengthening the resilience of local food systems in the face of multiple emergencies that may occur, whether health or climate type, appears necessary and opportune (Amjath-Babu, Krupnik, Thilsted and McDonald, 2020; Pareek, Dhankher and Foyer, 2020). Some expert voices consider that a direct relationship exists between the current health crises and the agro-industrial model based on the dispersion of new pathogens initially confined in ecosystems that are nearly sealed off to humans (Andersen, 2020). Whether or not this is the cause of epidemics like the current one, the prevailing food production model, distribution, and consumption seems in crisis and has been put to the test on ensuring food supply.

Food systems have been experiencing transformations due to their increased orientation towards globalized markets and changes in consumption patterns (Arnalte-Mur *et al.*, 2020). In recent decades, several cities worldwide have committed themselves to improve food systems (understood as the set of activities of the agri-food chain that begins with food production, continues with processing, distribution, sale, and consumption, and ends with waste disposal). The commitment has also included introducing food in terms of health and around urban policies to strengthening the proximity of consumption and reorient farmer-citizen relationships around agriculture and food. For many local governments, the 2015 Milan Urban Food Policy Pact (<http://www.milanurbanfoodpolicypact.org/>), which advocates an international protocol for staging new urban planning based on the principles of sustainability and social justice, represents the push and the final drive to achieve more sustainable food systems (IPES Food, 2018). With the horizon set in the coordination of initiatives aimed at ecological transition and the struggle against climate change, as well as meeting the Sustainable Development Goals for 2030 and the New Green Deal, urban food policies must be able to ensure the right to food that calls for the mobilization of local and regional players and the collaboration and participation of public bodies and citizens.

Although food systems face socio-economic, environmental, and health challenges, public policies and government institutions present fragmented and stagnant initiatives (Candel and Biesbroek, 2018). Ensuring food sovereignty requires all local and regional stakeholders' mobilisation and involvement and close collaboration between the public and private sectors (Kahiluoto, 2020). However, the food sector also needs to embrace awareness, have the will, and make agreements between government institutions and organised civil society (López and Álvarez, 2018). This complexity is palpable in multifunctional urban and peri-urban agriculture that can supply the public with fresh products and guarantee socio-environmental services such as biodiversity, landscape, or the support of culture and leisure. Consequently, urban and peri-urban agriculture are at risk of disappearing due to the growing and intense competition for land uses in

which is difficult to explore food supply alternatives or implement strategies and tools capable of increasing society's resilience based on cross-sectional (along the food chain) and inclusive (adding the demands of society to the public-private binomial) approaches. This article aims to analyse the food system behaviour of the Barcelona Metropolitan Region, BMR (in the northeast of Spain) during the first stage of the pandemic by deepening the behaviour of different peri-urban agricultural areas in which local food supply is promoted.

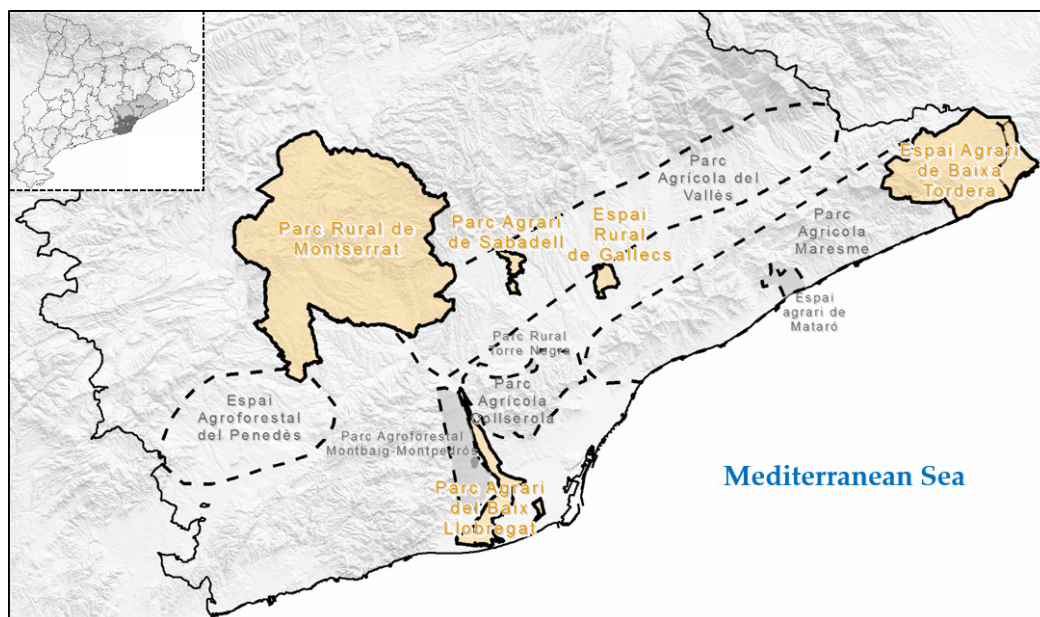
2. Methodology

2.1. Case study

The BMR is located on the Catalan Mediterranean coast (northeast of Spain, 41°23'16" N 2°10'12" E) as one of the ten most significant metropolitan areas in Europe. It has an area of 2,348.36 km², which represents 7.3% of Catalonia's surface and concentrates a population of 4.89 million inhabitants (64% of the total population). Administratively and according to the Statistical Institute of Catalonia, it comprises 131 municipalities in the Barcelonès, Baix Llobregat, Vallès Occidental, Vallès Oriental, and Maresme counties. The nuclear area of the BMR is formed by the city of Barcelona and four municipalities: L'Hospitalet de Llobregat, Santa Coloma de Gramenet, Sant Adrià del Besos, and Badalona, constituting an urban conurbation of 2.27 million inhabitants in 146 km² and an average population density of 15,636 people/km² (ahead of cities such as New York, Tokyo, and London) (Verdaguer, 2010). The city of Barcelona, one of the 209 signatory cities of the Milan Urban Food Policy Pact, has been chosen as the World Capital of Sustainable Food for the year 2021 to promote healthy food as an economic opportunity for local trade and farming and to highlight the strategic nature and struggle against the climate emergency.

There are different entities in charge of management of the BMR's agricultural area: the Sabadell Agricultural Park (1993), the Baix Llobregat Agricultural Park (1998), the Gallecs Natural Interest Area (2009), the Montserrat Rural Park (2018) and the Pla de Palou Agricultural Area (2015). The Baix Tordera Agricultural Area and the Mataró Agricultural Area (Cinc Sènies-Mata-Valldeix) are also being created. In addition, several agrarian revitalization movements ensure the protection of agricultural space and consolidation of a model of agroecological transition (Espelt, Peña-López, Miralbell, Martín and Vega, 2019). Some examples are the Vallès agricultural area, which groups the agricultural soil of the Plana del Vallès and Baix Montseny; the *Alimentem Collserola* movement, which supports farmers and livestock farmers in promoting their products; the programme for the Agroecological Social Revitalization of Sant Cugat del Vallès, which aims to encourage the reactivation of urban organic farming to promote food sovereignty; and the Cardedeu Agroecological Area, to strengthen and expand the agroecological sector (Figure 1) (Table 1).

Figure 1. Proposals and initiatives for preserving and managing the BMR's agricultural spaces



Own elaboration

Table 1. Characterization of the peri-urban agricultural areas

Peri-urban areas	Surface (ha)	Promoted by	Planning and projects	Main crops
Baix Llobregat Agricultural Park, 1998	3,473 ha	Barcelona Provincial Council; Baix Llobregat County Council, Farmers' Union and 14 city councils	<ul style="list-style-type: none"> - Life Project (1996) - Management and development plan, (2002) - Special protection plan (2004 and 2015) 	Orchard and sweet fruit
Montserrat Rural Park, 2018	34,789 ha	Barcelona Provincial Council and 16 municipalities	<ul style="list-style-type: none"> - Charter for preservation and management (2005) - Framework agreement between the Barcelona Provincial Council and 16 municipalities (2018) - Management and development plan (2019) 	Olive oil, milk and dairy products, cereal, vine crops, honey, and range livestock (cattle, sheep, and goats)
Pla de Palou Agricultural Area, 2015	350 ha	Granollers City Council and Cardedeu Business and Technology Support Centre (CSETC)	<ul style="list-style-type: none"> - Agreement with the city council (2011) - Participative process (2015) - Palou Strategic Plan (2025) 	Cereals and orchard
Baixa Tordera Agricultural Area, 2017	3,222 ha	Agricultural cooperatives, farm unions and five municipalities.	<ul style="list-style-type: none"> - Framework agreement Barcelona Provincial Council (2017) - Charter for preservation and management (2017) - Management and development plan (2020) 	Orchard and range livestock
Mataró Agricultural Area, 2019	233 ha	Mataró City Council and Cinc Sènies-Mata-Valldeix Agricultural Association	<ul style="list-style-type: none"> - Charter for the preservation, improvement, development, and management of the agricultural area of the Cinc Sènies-Mata-Valldeix (2019) 	Orchard
Cardedeu Agroecological Area, 1999	To be set	Cardedeu City Council	<ul style="list-style-type: none"> - Protection project proposal (2015) - Agroecological producers' study (2015) 	Cereals, orchard, milk, and range livestock
Vallès Agricultural Area, 2004	17,555 ha	20 entities: county and ecological entities and hiking and touring platforms	<ul style="list-style-type: none"> - Collective protection project (2005) - Support manifest (2006) 	Cereals and livestock production

Own elaboration

In addition to a diversified agricultural mosaic (Table 2), the BMR also includes sheep, goats, cattle, and chickens. This is confirmed by the quality designation at the regional level available to some agro-livestock products: Denomination of Origin of Alella wine, since 1954; Protected Denomination of Origin of the *ganxet* bean, in 2011; and the Protected Geographical Indication of chickens and capons, as from 1996. Despite not having specific quality seals, other agricultural productions also enjoy social recognition, such as the oil from Olesa de Montserrat, Baix Llobregat cherries, Prat de Llobregat artichokes, Maresme strawberries or Llavaneres peas. The area also has agri-food transformation and processing centres, mostly aimed at production and export. The BMR acts as the headquarters of national and international agri-food companies and holds a leading position as an agri-food cluster in southwestern Europe (after Lombardy).

Table 2. Distribution of the agricultural production by types of crops (2019)

Production	Surface area cultivated (ha)					
	Counties					
	Barcelonès	Baix Llobregat	Vallès Occidental	Vallès Oriental	Maresme	Total BMR
Cereals, fodders, and legumes	42.4	3,015.9	5,318.3	9,781	2,227.7	20,385.3
Vegetables	7.6	396.1	214.6	255.4	1,734.5	2,608.2
Fresh fruit	2.3	1,659.6	410.9	334.3	268.2	2,675.4
Nuts	0	20.8	33.2	106.4	5.9	166.3
Vine crops	3.9	281.5	36.7	153.7	218.7	694.4
Olives	0.4	622.2	240.3	315.6	24.9	1,203.4
TOTAL	57.9	6,004.8	6,264.1	10,966.7	4,481	27,774.6

Note: The following are not shown on the graph but are included in the total summary: citrus fruits (1.9 ha) and mixed crops defined as the association of vineyards and olive groves with fruit (39.7 ha). Fallow land, unrepresentative, is included in cereals, fodder, and legumes.

Source: SIGPAC 2019. Own elaboration

The BMR has two wholesale markets for fresh food. On the one hand, the Mercabarna (located in Barcelona municipality), devoted to export food commodities and an annual sale of about 1.2 million tons of fruits and vegetables, which constitutes a Food Hub for the Mediterranean. On the other hand, Mercavallès (located in Vallès Occidental county) sells 65,000 tons of fruits and vegetables and devoted to supplying the metropolitan area. Besides, many municipalities have municipal markets for the sale of fresh produce at retail prices: 39 fixed markets in the city of Barcelona and farmers' markets with direct sales by producers and food processors (e.g., the Mataró market with "Harvested at home" points of sale, the Cardedeu market or the Sant Cugat del Vallès market).

However, the constant loss of fertile agricultural land has conditioned agriculture's viability, which suffers great difficulties in being competitive (Roca, Moix and Arellano, 2012; Garcia-Coll and López-Villanueva, 2018). Between 1990 and 2012, the agricultural surface area was reduced by between 30% and 50% causing a loss of production capacity of the metropolitan region's agri-food systems (Cattaneo, Marrull and Tello, 2018). Furthermore, only 12% of the surface is cultivated permanently, in which the dominant crops are garden vegetables, fruit, vine crops, flower, and ornamental plants in areas close to the coast (northern and southern areas), whereas cereals (nearly 75% of the agricultural area and intended for preparation of feed for cattle) and livestock operations are in the hinterland. Consequently, the BMR could only meet 16% of its food self-sufficiency goal, and this situation will get worst considering that about 345 hectares/year have disappeared, which means that almost one hectare is lost every day (Paül, 2009).

The study is focused on 11 entities which include agricultural parks, agricultural areas, councils, and a foundation to highlight the nexus between food supply and land preservation. The two well established agricultural or rural parks are the Baix Llobregat Agricultural Park and the Montserrat Rural Park. The five initiatives to protect agricultural areas currently in process are Pla de Palou Agricultural Area, Baixa Tordera Agricultural Area, Mataró Agricultural Area, Cardedeu Agroecological Area, and Vallès Agricultural Area. Finally, three county councils of the leading agricultural areas (Baix Llobregat, Vallès Oriental, and Maresme counties) and an agricultural research foundation (Selmar Plant Defense Group), the last one acting as a meeting point between the producer (farmer) and the consumer (citizen).

2.2. Data sources

An initial literature review regarding principal regulations, initiatives, and reports about the agri-food producing sector on different regional scales (including the BMR) has been carried out. Consequently, regional databases have been consulted to characterize the agricultural and socio-economic profile of the case study. Among the documents consulted, it is worth highlighting the Barcelona Metropolitan Strategic Plan (PEMB) (2020), the Promotion strategy for Barcelona's food policy (2016-2019), and the Economic dimension of the food system of the Barcelona Metropolitan Area. Furthermore, recent initiatives oriented

mainly to encouraging consumption of local products have been considered, such as digital marketing platforms with different forms of sale (e.g., ‘The farm at your door’, from the Catalanian Farmers’ Union; ‘The Land’s Products Network’, from the Barcelona Provincial Council; or the ‘We are your farmer’, from the Cardedeu town council). Regarding the databases, the focus has been put on the BCN Smart Rural Observatory (Barcelona Provincial Council) and both the Hermes statistical tool (Barcelona region) and Statistical Institute of Catalonia.

In addition, 11 semi-structured interviews were conducted with different stakeholders representing entities and institutions located in the peri-urban area of the BMR selected for their agricultural-productive connotation. For this reason, the interviews focused on a peri-urban combining the nexus between the agricultural sector (from the agrarian revitalization) and the agrarian space itself (planning and management of the territory): three figures of consolidated agrarian-rural protection (Baix Llobregat agricultural park, Montserrat rural park, and Baix Tordera agricultural area), three figures of agrarian revitalization and dynamization (which are in the process of becoming protected figures at the municipal level (Pla de Palou agricultural area, Mataró agricultural area, and Cardedeu agro-ecological area), the three supra-municipal administrations (city council) working in the promotion and management of the peri-urban and rural area (Baix Llobregat, Vallès Oriental, and Maresme), a supra-local cooperative acting as a driving force for local food consumption (Vallès), and a supra-local research foundation working on the food production and food supply nexus in peri-urban areas (Selmar Plant) (Table 3). An interview script structured in four thematic blocks was used: 1) impacts on the supply and acquisition of food during confinement, 2) changes detected in the ways of marketing food products, 3) development of network support strategies, and 4) coordination of mechanisms of collaboration between farmers to strengthen marketing. Information from the literature review has been used as a database to be discussed during the interviews.

Table 3. Semi-structured interviews

Stakeholder	Date	Tool	Time (minutes)	Interviewee	ID code
Baix Llobregat Agricultural Park	12/04/2020	By phone	69'	Organic vegetable producer and member of the Catalanian Farmers' Union	Interview1
Montserrat Rural Park	30/03/2020	Videoconference	65'	Head technician of the Rural Park	Interview2
Pla de Palou Agricultural Area	12/05/2020	By phone	49'	Technician of the Granollers' City Council	Interview3
Baixa Tordera Agricultural Area	12/05/2020	Videoconference	45'	Tutor training cycle agroecological production	Interview4
Mataró Agricultural Area	18/05/2020	By phone	55'	Conventional vegetable producer (Farmers' Association)	Interview5
Cardedeu Agro-ecological Area	24/04/2020	Videoconference	75'	Cardedeu City Council technician	Interview6
Vallès Agricultural Area (cooperative)	30/04/2020	By phone	57'	Technical director of the Franqueses Vallès Cooperative	Interview7
Baix Llobregat County Council	12/04/2020	By e-mail		Head of agro-territorial revitalization	Interview8
Vallès Oriental County Council	04/05/2020	By e-mail		Head technician	Interview9
Maresme County Council	18/05/2020	By phone	69'	Organic vegetable producer and member of the Farmers' Union	Interview10
Selmar Plant Defense Group (agricultural research foundation)	18/05/2020	By phone	45'	Head technician and investigator	Interview11

Own elaboration

The interviews were conducted between March and May 2020 by telephone or online, depending on each interviewee's needs and availability. The sessions lasted between 45 and 75 minutes. They were audio-recorded and transcribed.

2.3. Data analysis

Thematic analysis has been used to qualitatively analyse and evaluate non-empirical data (such as the semi-structured interview transcripts that formed our dataset), and to identify and organise the discrete ideas within the transcripts and outlining patterns in the data, but also indicating their relative frequency and relevance (Ricart, Arahuetes, Villar, Rico and Berenguer, 2019). A SWOT analysis (Phadermrod, Crowder and Wills, 2019) has been applied to evaluate the BMR food system's capabilities and draw up strategies and actions to capture the benefits and opportunities of the local food process. Strengths and Weaknesses refer to those characteristics of the food system that give it an advantage or disadvantage at internal level, while Opportunities and Threats refer to those external elements (from socioeconomic and environmental nature) that could cause troubles or challenges for the food system.

3. Results

3.1. Role, organization, sales systems and collaboration between stakeholders

Participants emphasized the importance of public administrations' direct actions to support producers and provide information (e.g., web portals and documentation informing consumers about local production). Furthermore, some actions have been focused on providing institutional support (driving economic promotion and campaigns for fostering consumption of local products) or identifying systems of management of points of sale of local products (in markets) or collective sale (distribution and logistics platforms). As a result, it has been possible to decide on the functions of the already consolidated private initiatives for agricultural management and revitalization in terms of proximity. In contrast, the interviewees with profiles closest to farmers (Interview 1, 10) attach little value to institutional initiatives to provide timely assistance in this crisis. Before the compulsory confinement policies, there were already difficulties in selling in street markets, despite being a municipal area of the domain (Interviews 4 and 5). In this sense, many councils decided to close them to take on the (new) safety measures, while privately run supermarkets became the primary source of food supply for most of the population. This situation has made it difficult for fresh and local produce to find outlets at the peak of production (causing severe damage in some agricultural subsectors). It has also brought to light the high level of knowledge of the food system that stakeholders have and their ability to interrelate, organize and, although only in some cases, associate to place agri-food products where they can be more valued and a better price attained. Furthermore, all the agents interviewed are aware of consumers' growing interest in purchasing healthy foods. In that regard, it highlights the need to seek permanent solutions that, beyond the need to address crises such as that produced by Covid-19, which require social distancing, enable expansion of existing marketing options to distribute locally grown food to the entire population.

Representatives from production areas (Interview 1, 10 and 5) focused on their business, producing quality products and placing little or no value on help from the government. They are critical of the financial support offered by public administrations and the innovation and research sector that they consider an interested party and at the agro-industrial model's service. Despite the similarities between agricultural producers, some differences have been observed. Agro-ecological producers (Interviews 1 and 10) are accustomed to networking, helping each other and aiming to complement and diversify the supply for consumption (Calori and Federici, 2020). In contrast, the conventional farmer (Interview 5) tends to work alone and, if he does not sell the product directly, he does so through an intermediary who will place it according to demand and market (usually at a lower price than that which would be achieved via direct sales).

The group of technicians interviewed, regardless of their origin or area of action (education, cooperatives, local council, or association), are a more homogeneous group than the producers. The technicians or managers who represent county-level entities belong to the Land's Products Network of the Barcelona Provincial Council, highlighting the food grown and/or processed within Barcelona's geographical limits. Regardless of the administrative level to which they belong, their functions are agrarian and territorial revitalization, insofar as they comprise part of specific territorial projects. They are usually committed

and aware of the aim of pursuing the purpose set by the entity. They have developed a high degree of complicity with the people operating in the territory and have become benchmarks within their institutions.

Although both public and private players advocate the same goals, there is no high degree of collaboration and joint work. Producers do not feel involved as a community and have little participatory awareness. They are accustomed to working individually and consider themselves victims of a food system that has excluded and abandoned them. On the other hand, technicians strive to build links with producers via collaboration on shared projects and initiatives. Both producers and technicians recognize the need for more collaboration, so farmers recognize the current collaboration weakness while the technicians try to promote collaboration. What is not considered is who is more responsible for this weakness: producers who do not want to share experiences with other farmers and refuse technicians' role, or technicians who cannot convince or stimulate the producers. However, some examples of collaboration currently exist in the BMR through an already consolidated figure, the "Agricultural Parks", through which bridges of collaboration have been established between farmers and the public administration for over two decades. They are examples of public-private consultation to achieve and implement previously agreed actions requested by much civil society as a source of local food products.

3.2. Local food as first reaction

The demand for local food production and the support of digital distribution and local marketing networks that have been established or consolidated during the lockdown has brought to light initiatives and have sought immediate solutions beyond the leading agri-food distributors, the only suppliers to commercial sites during the most critical period of the Covid-19 pandemic. Meanwhile, most of the agents interviewed agreed in highlighting how fast they move to find alternative ways to distribute their products when the usual distribution channels have failed. Accordingly, many of the interviewees agreed in highlighting the opportunities that the Covid-19 pandemic can strengthen the bonds between producers and consumers while showing some scepticism about how to make permanent this nexus. Farmers' markets or baskets at home have been beneficial local strategies during the pandemic as the only possible sales channel for those producers who have had their usual sales network cancelled because of the decree of a state of alarm (sales in restaurants or school canteens) or have suffered a drastic drop in output to the wholesale market (sale via Mercabarna).

Furthermore, most of the interviewees agree in stating that consumers are increasingly demanding local products, as one of the interviewees states: "The Covid-19 crisis has accelerated a change in the pattern of consumption that existed previously but was incipient; now the culture that defends the consumption of local products as a way to contribute to the preservation of the territory and farmers and to ensure a healthy diet has been intensified" (Interview 7). Digital platforms for the distribution of local products have also been promoted, often collectively and supported by municipal and county administrations, as showcases for local products, assuming a part of their distribution (e.g., *Productors de Catalunya*, [Producers from Catalonia], *Arran de terra* [near to land], *Cistella contra la Covid-19* [basket against the Covid-19]). According to Interview 6, "it is in times of crisis when citizens discover the importance of farming and local products". In the same line, a wide range of factors justifying the importance of encouraging local and 0 km consumption in the BMR in an emergency context have been identified. The set of proposals have been classified into three main blocks: 1) Actions to prioritize the socio-economic framework (Interviews 2 and 10), 2) Actions focused on the environmental-territorial benefit (Interviews 3 and 4), and 3) Actions in which healthy food justifies the increase in direct sales by the producer, whatever their form of acquisition (Interview 2).

Likewise, most interviewees emphasised the contribution of pre-pandemic direct actions implemented by public administrations when addressing the first months of the lockdown and the compulsory citizen confinement. These actions included 1) information provision (web portals and documentation informing consumers about local production), 2) institutional support (driving economic promotion and campaigns for fostering consumption of local products), or 3) points of sale of local products (in markets and distribution and logistics platforms). However, some interviewees (Interviews 1 and 10) considered that there were already difficulties in selling in street markets before the pandemic, despite some measures at a municipal scale that could be promoted by the city councils (Interviews 4 and 5). In this sense, it should be noted how many councils decided to close the markets during the lockdown based on (new) safety measures, while privately run supermarkets became the main food supply source

for most of the population. This action motivated the criticism of some agents (Interviews 1, 5 and 10) regarding the insufficient help and the lack of financial support from both the public administration and the innovation and research food sector, considering that both prioritise the expansion of the agro-industrial model in the region.

3.3. Dimensions of food production

3.3.1. The socio-economic dimension: learning from uncertainty

Overall, agents agree that the Covid-19 crisis has revolutionized how food is supplied in qualitative (interest in healthy products) and quantitative (increased demand) terms. An unprecedented mobilization affects both agricultural professionals and the public and is expressed in new forms of organization, action, and solidarity (Interviews 7 and 10). This increase in demand has been very favourable for agroecological producers, who, although they already had their direct sales channels organized, have increased their sales volume in an extraordinary way (Interview 7). However, conventional producers, who sold their products to large retailers or the wholesale market, have not been favoured by this change in trend that the Covid-19 pandemic has motivated; on the contrary, this production model has had severe difficulties surviving, especially during the first weeks of confinement (March-April 2020). Similarly, those for whom street markets were their primary sales channel were forced to search for new sales strategies that have paradoxically led to access to a new customer profile (Interviews 8 and 9). In the case of producers and/or processors who distributed their fresh and local products to restaurants or school canteens, the health alert seriously affects their traditional sales channels. In parallel, producers who have sought the end consumer and who have had a minimum logistics structure (their shop, consumer groups or cooperatives, face-to-face or online distribution channels, including the use of social networks) have been favoured by the increase in sales.

In general, the need to improve the logistics linked to the product's sale to the consumers has been recognized as a critical point to ensure a better local response to food insecurity scenarios such as those generated by the pandemic (Interviews 3 and 6). Consequently, cooperatives of consumers, cooperative supermarkets or agro-shops have been considered positive options to respond to situations such as that generated by the Covid-19 pandemic. Although much of these initiatives have meant a more remarkable dedication (especially in time and training on new sales channels) by the farmer, it should be noted how agents did not mention this issue. An explanation could be that the Covid-19 pandemic has overturned many standardized patterns in which social networks were not considered an investment but rather a waste of time. However, in a context in which consumers have had limited mobility, and schools and restaurants have not been opened, so the primary source of income and distribution of products disappeared, digital frameworks have been promoted as the only way for the food production sector to survive, increasing the acceptance of this type of tools.

In addition to the concern for the sales channels for local products, most interviewees acknowledged that consumers have had more time to reflect on the origin and quality of agri-food products before choosing from a wide range of products from supermarkets. Consumers have also returned to cooking for themselves, an activity that had been placed on the back burner, in most cases due to lack of time-related to job responsibilities and commuting (Interviews 10 and 11). In any case, the operational actions that have been sketched in this scenario are eloquent: a) Local food acquisition increased, even for those who before the pandemic were little known and difficult to find; b) Consumers have been open to direct purchase from online platforms that have facilitated distribution at home; c) Individual (agricultural producers) or collective initiatives (associations, consumer groups, unions, networks with institutional support, agricultural cooperatives, etc.) to sell the product has been established to be permanent while generated indirect employment to deal with the tasks of food distribution (despite having to assume costs), and d) Informal and voluntary human capital have been established through digital platforms to collect food to be distributed to those most vulnerable or those with mobility restrictions within the metropolitan area.

Concerning structural difficulties and deficits, it should be borne in mind to overcome administrative and regulatory obstacles and to keep markets and other agri-food equipment and services open. Some interviewees (Interviews 2, 3 and 6) agreed on the need to initiate cooperation and mutual aid activities between the different agents involved in the food system, especially those who have support from social

and solidarity movements that, in large part, have led the marketing process and distribution of local products during the pandemic. Along the same lines, 1) the lack of organization and strategic points for the supply and distribution of local food products (Interviews 1, 4 and 10), 2) the lack of ease of procedures and regulations for mobility (Interviews 1, 4 and 10), and 3) the revitalization of new employment niches (Interviews 7 and 11) stands out. There is also a permanent bias with the other echelons of the agri-food chain and the administration regarding strengthening collaboration agreements with the local socio-economic layout. On the other hand, the emphasis is placed on the collapse suffered of some producers and/or distributors (Interview 7) to deal with the new and growing demand at the beginning of the pandemic. Luckily, this was offset by the formulation of a battery of actions to support farmers. Some actions came from cities (Som la teva pagesia [We are your farmers] –located in Cardedeu. Other initiatives came from associations and consumer groups that voluntarily took on the tasks of collection and distribution, or from public entities that prioritized specific actions and social assistance, such as a call for solidarity for artichokes in El Prat de Llobregat, “calçots” (a type of green onion) in the Baix Llobregat, flowers and ornamental plants in the northern Maresme, milk from the Vallès Oriental county “Som la llet” [We are the milk] or the geolocation map of points of sale of foods of proximity in the Vallès county.

3.3.2. *The environmental-territorial dimension: awareness and action*

The main operational actions identified by the agents are a) The diversity of food production systems (organic, agro-ecological, integrated production, conventional) that facilitates a broad and plural range of consumers, b) Saving of environmental costs arising from the transportation, storage, refrigeration, packaging of local products, and c) The consumer’s awareness regarding the need to buy local products. Overall, agents considered that this last point (consumer awareness of local products) has changed according to the phases of confinement established during the first months of the pandemic (a total of 4 phases). At first (phase 0) and for fear of running out of the commodity, there was a tendency to hoard, for example, potatoes; later and because of a deeper reflection on self-consumption of food, seedlings are acquired, and part of the garden is devoted to orchards and self-consumption of vegetables (Interview 7).

Most of the interviewees (Interviews 2, 3, 4, 6, 7, 10 and 11) also recognized society’s ability to respond to the food insecurity generated by the pandemic by a) Supporting small and mid-size family farms that, in addition to assuming the productive function, preserve the territory, manage the landscape, and develop an essential environmental role, b) Recovering balconies, terraces, and gardens as spaces for more immediate self-consumption, or c) Conserving agricultural spaces around cities to ensure local food under the criteria of food sovereignty and farmers’ resilience. Reactions are plural and embrace different forms that have in common the improvement of food production via a local urban sustainability policy (Interviews 8 and 9). Lastly, the synthesis of the difficulties and structural deficits highlighted by the agents makes it possible to identify: a) The absence of stable political decisions beyond one-off subsidies and support to boost more fair, supportive, and sustainable forms of trade (Interviews 1 and 2), b) The social impetus needed to strengthen the protection of agricultural land on the outskirts of cities as a guarantee of food supply within the framework of urban and territorial planning (Interviews 4, 5 and 6), and c) The coordination of a richly diverse local and regional food culture is resilient to environmental and public health risks, and with a cohesive and cross-sectional profile (Interviews 10 and 11).

3.3.3. *The healthy dimension: the ‘proximity’ benefits*

All interviewees emphasized how the pandemic has promoted a reflection by both producers and consumers about food quality and food supply in crisis times (Interviews 1, 5, 7, 10 and 11). The Covid-19 pandemic scenario has made people aware of the importance of the quality of life in cities and their dependence on local food (Interviews 8 and 9) and, in return, verified the existence of problems and difficulties in accessing food or situations of risk due to the excessive pollution generated by the mobility of urban life (Interviews 1, 7 and 10). Therefore, in a compulsory and non-consensual way, food has been valued, and home cooking has been re-evaluated. Decisions have been taken to consume more local products, either by purchasing them online or from cooperatives or local markets, which have, so far, been under-used but which have proved successful for both producers and consumers. In any case, most of the interviewees point out that all this can be due to a reaction of fear to the contagion, the anxiety of leaving home, and the attempt to avoid population concentrations, without considering that after this reaction, a permanent

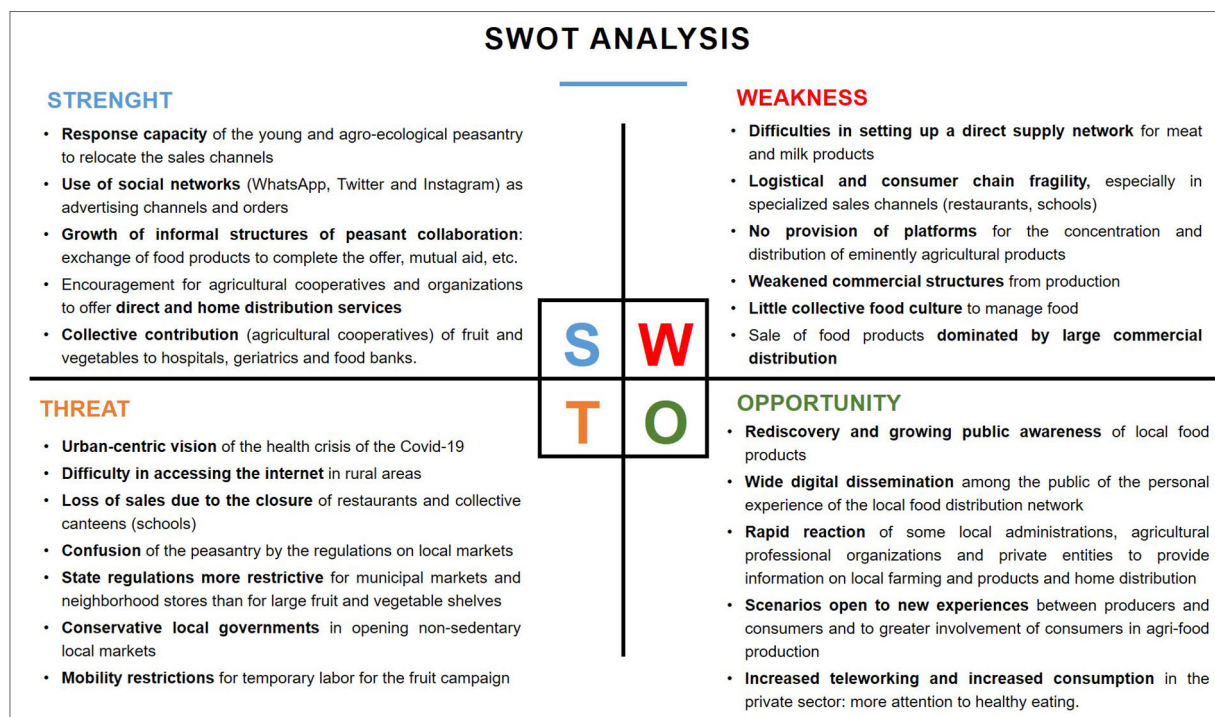
attitude in the same line could be ensured (Interviews 7, 10 and 11). Lastly, the alert for the consequences of the Covid-19 pandemic has also opened a debate about the validity of the urban organisation's forms about how citizens get around, how they work, and how they eat. Once again, the concept of "proximity" is imposed as the critical aspect of urban planning and sustainable planning, facilitating access to the various social functions of the congested city and draws new maps of daily life for eating (Interview 7).

3.4. Local food security and new producer-consumer relationship

According to the interviewees, the lessons learned from the Covid-19 pandemic confinement lead to a range of responses and propose an exercise in discussion and public awareness to assess current policy at the local and regional level and on different fronts open to discussion and action: a) Coordinate food education strategies in schools (Interview 7), b) Promote a common and supportive framework for expanding and retaining local, sustainable and ethical food consumption (Interviews 2 and 10), c) Promote agroecological culture (less waste and dietary change, essential elements for supporting the new food model) to make the management of the production-consumption nexus more robust (Interviews 4 and 5), or d) To design stable groups of stakeholders in food systems that promote mechanisms of collaboration and resilience in an equitable manner (Interview 1, 7 and 9).

The interviews' analysis has made it possible to set up a matrix of relationships between internal and external factors that portrays the existing interrelationships between the agents interviewed (alliances and conflicts) and their assessment of future challenges such as those generated by the Covid-19 pandemic. On the one hand, the SWOT analysis shows the territorial components of food that are moved by an atypical and circumstantial context (the pandemic); on the other hand, it highlights the agents' functions representing food production and the scenarios they intuit in the mid- and long-term. The combination of the four variables involved in the SWOT analysis (Figure 2) enables us to glimpse how producers are expectant and tend to respond reactively and convey their fragility and opportunities to seek solutions and outsourcing part of the process of food distribution to the final consumer unhindered. Moreover, and always according to the interviewed agent's profile, the consumer (who is not directly represented in the sample) receives random and often confusing information. However, they show some awareness of the agri-food supply, so they can study the range of consumption possibilities and act accordingly.

Figure 2. SWOT analysis of the urban food system during the Covid-19 from the producer' perspective



Own elaboration

4. Discussion

The analysis carried out in this paper has highlighted some relevant issues about local food systems and the management of emergencies, such as that generated by the Covid-19 pandemic. Firstly, the Covid-19 pandemic has highlighted the vulnerability and inefficiency of some BMR's food system activities, exposing shortcomings in operations and logistics. Secondly, the public's awareness has been stirred by promoting new and diverse spaces of complicity between the producer and the consumer and by revaluing often-unknown local and 0 km products, and that needs to be retained. Finally, the importance of agricultural space preservation entities for revitalising of structures that help to reconfigure food production, distribution, and consumption systems at urban and metropolitan scale has been highlighted. The results obtained lead us to consider whether some significant changes in the social model and food purchasing habits can be identified and whether these changes will eventually materialise in society and extend over time (Giocoli, 2017). Some essential characteristics identified by the interviewees should be highlighted: i) Greater consumer awareness of the intangible values of food (health, education, territory, climate change), ii) More interest in organic and local products, or additional purchase of organic and local products that would be attributed to greater availability of time to buy and cook, iii) The impetus towards interpersonal relationships between producer and consumer, iv) New access and consolidated availability to local food systems to evaluate their strong points and benefits, v) Collaboration and support between producers –mainly in those cases with previous collaborations– in the preparation and distribution of the baskets as new forms of co-managed collaboration.

The analysis of each dimension (socio-economic, environmental-territorial, and health) has made it possible to identify the main challenges that will have to be faced in the future around local food production. In this pandemic context, agents underlined the need for rethinking the agro-economic model to strengthening the producer-consumer nexus and promoting local food policy based on food sustainability, sovereignty, and governance. The lockdown has removed the structure and composition of the agri-food sector as a whole, especially that of fresh and seasonal products, which has seen sales conditions altered and disclosed a predisposition by citizens to know more about and get involved food matters (Tusón, 2014). At the same time, it has forced farmers to reorganize and restructure their organizational and management methods to offer quality products, with health guarantees, quality of service, and with enough thereof (Pierr, Zasada, Doernberg, Zoll and Ramme, 2018). However, their ability to respond and strengthen actions to encourage and diversify local production and promote a stable framework for local, sustainable, and fair food has rarely been positively assessed. Several reasons exemplify this: 1) the lack of collaboration and public-private partnerships (such as those recognized by Interviews 1 and 7), 2) society's lack of involvement in food production (what we eat, how it is supplied, who participates in the food process, etc.) and 3) the weakness of participation and interaction between food producers (Montasell, 2020).

Regarding the last point, it is necessary to position food as an aspect of public policy, opt for collaboration (administration-producers/consumers) and work with the economic sector to look for innovative formulas for the supply-demand organization. Consequently, it would be necessary to move towards food governance and encourage an associative and sharing management style to deal with food logistics on a regional and local scale. Agricultural cooperatives and their associated services may be structures of interest for innovating in the configuration of a food system in terms of proximity, as recognized by most interviewees. The opportunity also invites local food systems to prepare for other warning episodes that could once again shake up an agri-food structure dominated by the distribution sector considered by many to be robust and stable. Therefore, it seems appropriate to intervene, from public policy, to promote healthy, sustainable, and resilient diets while promoting the diversification of agricultural production in terms of health, access, availability, justice and ecology (IPES Food 2019, 2020). The Declaration of Valladolid for the promotion of local agri-food systems to address global risks, gathered in Valladolid on October 1, 2020, was an example of direct action in the face of crises such as Covid-19, considering that the production and distribution of local and sustainable food must be essential for supplying cities and towns, of equal importance to those of water or energy, while promoting territorial planning to protect agricultural soils and good governance between different public policies for the management of global risks. Likewise, other initiatives such as the guide *Sistemas alimentarios locales frente a riesgos globales: de la crisis climática a la Covid-19* [Local food systems versus global risks: From the climate crisis to Covid-19] published in September 2020 by Entretantos Foundation and the Network for Cities for Agroecology (Carracosa-García, López-García and Molero-Cortés, 2020). The guide evidencing the impacts generated

by the lockdown and that need to react in a coordinated way to reduce environmental, socioeconomic and agri-food vulnerability by implementing actions to adapt local food systems to the impacts of global emergencies, while mitigating their causes. Furthermore, the report *Xarxes alimentàries locals en temps de Covid-19. Impactes i reptes en un escenari de post-confinament* [Local food networks in covid times. Impacts and challenges in a post-confinement] (Batalla *et al.* 2020) aimed to capture the effects of Covid-19 on local food networks (including production, distribution and consumption) and the challenges that this new scenario poses for each of the poles of the agri-food chain. Proposals focused on diversifying the channels and platforms and include more agents to capture the needs of the local food consumers.

The results of the interviews have shown how, during the period of confinement and within the framework of a Covid-19 pandemic, some decision and actions have been improvised. The public administration (regional and local) has established measures and activated protocols to avoid conflicts over access to food distribution. Local markets have been mainly focusing the controversy. The lack of coordination between the different stakeholders involved in the food system and institutions has been staged in the closure of these essential, closest-to-citizens food services for more than two and a half months, and this has motivated the feeling that the administration, once again, has not considered local food as an essential service, or even as a citizen's right (Malhi *et al.*, 2009). In this regard, it should be recalled that while the state of alarm was declared (France Urbaine Resolis and Terres en Villes, 2020) and to ensure the food supply, many towns and cities closed their weekly outdoor markets (street markets, and among them, farmers' markets). They argued that there was a lack of security measures for both products and access by people. The response of the food production sector was not long in coming from an immediate reaction in the form of initiatives from various groups and informal networks (Calori and Federici, 2020): agricultural entities in the territory (agricultural organizations, cooperatives, NGOs, or universities) join the clamour of agricultural producers, again separated from the decision-making that affects the food system. Some alternatives have been proposed to ensure access to local food systems. One of the most representative examples was the letter of support from 150 organizations addressed to the Spanish government's ministry of agriculture, calling for the reopening of street markets. However, similar examples can be found internationally. According to a Global Partnership report on Sustainable Urban Agriculture and Food Systems (El Salto, 2020), unprecedented interest has been unleashed in short-circuit direct sales, home-grown gardens, and solidarity initiatives to facilitate access to food for vulnerable groups. Examples are Agroecopolis in Greece (via campaigns to promote their products), Reko in Finland (which sponsors proximity through Facebook), OpenFoodNetwork in Australia (where civil society has capitalized on the food issue), or the Ecological Transition Plan for Agriculture and Food in France. The common denominator of these experiences is the desire to develop a collection of recommendations for the improvement of agricultural management in the face of the Covid-19 pandemic, emphasizing the rural nature of agri-food production and claim a regional supply of food products in the city to strengthen nearby agriculture that, at the same time, protects the environment and ensures basic health standards. However, societies that value their food potential the most have led food planning during the Covid-19 pandemic without contradicting the needs of the agroecological transition and the resilience of food systems. In general, and as has been partially demonstrated in the case of the BMR, the local food production sector has been able to react to an extreme situation (pandemic) by position itself while identifying food dependencies in which the consumers are closer and more attentive to local food production (RUAf, 2020). This fact suggests the generation of a new awareness towards the transformation of local food systems by addressing sustainability and food supply, two of the biggest challenges to be faced in the future (Ramonet, 2020).

The analysis of the BMR has enabled stakeholders to recognize the interconnection between food and other strategic sectors, such as transport, digital services, education, health, and urban planning, asking for new strategies and challenges: a) Strengthening the neighbourhood trade network and municipal markets, on a daily and weekly basis as short circuit distribution channels for local products, and b) Diversifying sales platforms and systems to comply with social distancing, avoid crowds and respect confinements. Along this line, in terms of food supply and proximity, Landabasso (2020) proposes the creation of self-sufficient and less vulnerable food production centres, as well as health assurances to rethink and reorganize a territory of inclusion in terms of food. There has also been a growing interest in the value of rural areas and intermediate-sized cities in which food, mobility and health issues are mutually conceived (Gómez-Orea, 2019). Initiatives have emerged such as Moreno's (2020) "la ville du quart d'heure", the

“20 minutes-20 km Counties” of the Smart Villages project, the agro-urban system as a space to reconnect the city with its metropolitan area (Red Española de Desarrollo Rural, 2016) or the adaptation of Rueda’s model of urban ecological planning (Montasell and Callau, 2015). Along this same line, Callau *et al.* (2017) propose a model for integrating agriculture and food into cities based on the concentration of food products in urban platforms (or food nodes) as an operational and strategic structure. This fits well with the key issues fixed by the Promotion strategy for Barcelona’s food policy (2016-2019): 1) specific regulations (and municipal and metropolitan ordinances) to collectively manage food (purchasing food centres, promoting short marketing circuits and direct sales markets); 2) tax breaks and funding support for local food producers; 3) creation of Food Councils as spaces for participation and interaction between public and private stakeholders; and 4) encouraging collaboration and cooperation from municipal actors and networks. The last two points require a review of the concept of food governance as one of the basic principles needed to move towards an ecosystemic view of the agro-urban area able to address food and health risks and uncertainties such as those generated by the Covid-19 pandemic from a participatory way so that the consumer becomes a key player in the construction of the new local food model (Rueda, de Cáceres, Cuchí and Brau, 2012). Food governance calls for commitment and cooperation between every one of the players in the food chain, to generate alliances on different scales, addressing inefficiencies, and promoting consensus, as well as fostering citizen participation in a sustainable and fair food process, as set out in the Milan Urban Food Policy Pact of 2015 (Renting and Wiskerke, 2010). Food governance, therefore, formulates future scenarios that include new forms of usage of productive agricultural space, and distribution and consumption of food, without losing sight of a participatory process based on coordination and cooperation between the different stakeholders involved, from producers to consumers, both vertically and horizontally (Hernández, Ocón and Vicente, 2009; Vidal and Fleury, 2009; Prové, De Krom, and Dessein, 2019).

5. Conclusions

THE TURNING POINT: The Covid-19 pandemic has acted as an accelerator for a process of social awareness of the need to ensure food supply. Even as societies become more urbanized, they want to feel closer to their food. As stated by some respondents, consumers are increasingly demanding local products, changing the pattern of consumption that existed previously but was incipient; even as a way to contribute to the preservation of the territory, ensure farmers’ activity and promote a healthy diet. They want food that is fresh, less processed, and sustainably sourced. Accordingly, a call for shorter supply chains has intensified during the Covid-19 pandemic. That is, the (in)discriminate mobility of people and goods could be interpreted as a threat: first, because it can favour the expansion of new outbreaks and/or health effects of equal or greater virulence, and second, because mobility and transport contribute to the environmental impact of CO₂ emissions which, in turn, puts at risk the supply of imported commodities.

WINDOWS OF OPPORTUNITY: The Covid-19 pandemic has underlined the importance of a robust and resilient food system that functions in all circumstances and can ensure access to a sufficient supply of affordable food for citizens. It has also made us acutely aware of the interrelations between health, ecosystems, supply chains, consumption patterns and planetary boundaries. The Farm to Fork Strategy (European Green Deal) calls for reinforcing local food production by empowering the consumers to choose a sustainable food system in which all actors in the food chain should see this as their responsibility and opportunity. Faced with this scenario and with an eye on the primary and essential resource that food is, this study has focused its analysis on the impact of the Covid-19 pandemic on local food systems and future strategies adapted to emergency contexts. Because of the analysis within the framework of the BMR, it has been claimed that the concern for the health situation has led the public to demand closer (and well-known) food products (especially fresh foods) and organic (safer). Besides, these products should be produced and sold locally, either in (neighbourhood) small shops, buying them online directly from the producer (safer and with a personal, non-branded guarantee) or on local markets as meeting places for social and cultural exchange and food proximity. Most interviewees emphasised the contribution of direct actions implemented by public administrations in the first months of the lockdown: web portals and documentation informing consumers about local production, economic promotion and campaigns for fostering consumption of local products, or promoting points of sale of local products in markets and distribution and logistics platforms. However, some interviewees highlighted how many city councils decided to close the markets during the lockdown based on updated safety measures, while privately

run supermarkets became the main food supply source for most of the population. All this suggests that in a context of uncertainty, a niche of opportunities can be opened for local food production, sale and consumption structures close to the citizenry. A new consumption pattern that introduces and raises consumers' awareness and makes them part of the food process via the organization and management of distribution and logistics in a sustainable, healthy, and efficient way.

FOOD: A PRIVATE AND GLOBAL BUSINESS OR A PUBLIC AND LOCAL POLICY? The pandemic crisis has been a wake-up call to the globalized model of food production and consumption, in which citizens have been limited in movement due to confinement and fear of contagion while governments have acted on the provision of essential resources, including food. While some municipal governments closed, the outlets of small producers (such as municipal street markets), regional and some municipal governments campaigned to promote and support local products and farming that feeds the population and manages territories. As a result, the weakness of current local production models, and the lack of structures for collaboration in local food production and processing, have been highlighted. Against this backdrop, food governance should be promoted to provide local public policy strategies based on collaboration between public and private actors in the production, processing, and distribution of food sectors. Some examples of collaboration currently exist in the BMR through an already consolidated figure, the "Agricultural Parks", through which bridges of collaboration have been established between farmers and the public administration for over two decades. They are examples of public-private consultation to achieve and implement previously agreed actions requested by citizens as a source of local food products. Following this example, the aim is to move decisively and safely towards local, sustainable, resilient, healthy, safe, and fair food systems improving the production-consumption nexus and being capable of dealing with emergency contexts such as those generated by the Covid-19 pandemic. In this regard, the scope of the BMR is a suitable scenario to test this transition, as it forms a context with a) diversified agricultural production that could provide nearly all the staple foods for daily intake (vegetable garden, fruit, cereals, milk, oil, meat); b) the presence of collaborative structures organized between the economic sector (farming) and public administrations (by way of agricultural parks) and c) a citizenry predisposed to consume local food products. Future works should address some of the limitations of this study, such as the short time period of analysis or the lack of policy review, by extending the research to individual food producers through a survey sample to identify and deepen main concerns and challenges, while using this feedback to check and discuss the SWOT analysis and the agents' perspectives.

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Pandemia, gobernanza y municipalismo en las coronas metropolitanas a partir de su estudio en Riba-roja de Túria (València)

Pandemic, governance, and municipalism in the metropolitan crowns based on its study in Riba-roja de Turia (Valencia)

Sandra Mayordomo Maya^{1*} 

Jorge Hermosilla Pla² 

Mónica Fernández Villarejo³ 

Resumen

La crisis del COVID-19 ha impactado en el sistema sanitario de los territorios, pero también en sus ámbitos socioeconómicos, lo que ha requerido una respuesta eficaz por las autoridades. El objetivo de esta investigación es la identificación de las dinámicas generales derivadas de la pandemia en las áreas metropolitanas, a partir de un estudio local realizado en el municipio valenciano de Riba-roja de Túria. Se ha aplicado una metodología que combina el tratamiento de estadísticas y documentación técnica municipal, con información cualitativa obtenida mediante entrevistas con agentes locales. La crisis ha incidido en la totalidad de sectores, con un aumento de las desigualdades y la vulnerabilidad. El Ayuntamiento ha tenido un papel relevante en la gestión de la emergencia del coronavirus, con la implementación de medidas y la adopción de nuevos mecanismos de gobernanza. El carácter sistémico de la pandemia ha permitido detectar dinámicas y procesos comunes con otras áreas urbanas. En base a estos resultados, es posible proponer estrategias destinadas a conseguir modelos territoriales más resilientes.

Palabras clave: COVID-19; pandemia; Riba-roja de Túria; gobernanza; resiliencia territorial; áreas urbanas.

Abstract

The COVID-19 crisis has impacted on the regional health systems and their socioeconomic environments, and this has required an effective response by the authorities. This research identifies the general dynamics derived from the pandemic in metropolitan areas, based on a local study conducted in the Valencian municipality of Riba-roja de Túria. The methodology combines the processing of municipal statistics and technical documentation with qualitative information obtained through interviews with local agents. The crisis has affected all sectors and increased inequalities and vulnerability. The city council has played a role in the management of the coronavirus emergency with the implementation of new governance mechanisms. The systemic nature of the pandemic has made it possible to detect common dynamics and processes with other urban areas. Based on these results, it is possible to propose strategies for achieving more resilient territorial models.

Keywords: COVID-19; pandemic; Riba-roja de Túria; governance; territorial resilience; urban areas.

1 ESTEPA. Estudios del Territorio, Paisaje y Patrimonio. Departamento de Geografía, Universitat de València, España. sandra.mayordomo@uv.es. * Autora para correspondencia

2 ESTEPA. Estudios del Territorio, Paisaje y Patrimonio. Departamento de Geografía, Universitat de València, España. jorge.hermosilla@uv.es

3 ESTEPA. Estudios del Territorio, Paisaje y Patrimonio. Departamento de Geografía, Universitat de València, España. monica.fernandez-villarejo@uv.es

1. Introducción

El COVID-19 es una enfermedad infecciosa viral causada por el síndrome respiratorio agudo grave 2 o SARS-CoV-2, el séptimo coronavirus que puede propagarse entre los humanos (Andersen, Rambaut, Lipkin, Holmes y Garry, 2020). Se identificó por primera vez en el mes de diciembre de 2019 en la ciudad de Wuhan, en la provincia china de Hubei (Hui, *et al.*, 2020). El 30 de enero de 2020, en base a la evolución de la situación de la enfermedad, y por recomendación del Comité de Emergencias del Reglamento Sanitario Internacional, el Director General de la Organización Mundial de la Salud (OMS) declaró el brote del nuevo coronavirus COVID-19 como una Emergencia de Salud Pública de Importancia Internacional (ESPII). Posteriormente, el 11 de marzo de 2020, este organismo lo calificó como pandemia debido a los alarmantes niveles de propagación registrados (Organización Mundial de la Salud [OMS], 2021). La rápida transmisión de la enfermedad y sus graves efectos sobre la salud de los seres humanos exigieron la adopción de estrictas y urgentes medidas de contención y aislamiento por parte de las autoridades. De este modo, las restricciones de movilidad y de uso del espacio público, el confinamiento y el distanciamiento social, se han configurado como disposiciones esenciales a nivel mundial para reducir la propagación del COVID-19 y proteger la salud pública (Honey-Rosés, *et al.*, 2020).

El primer positivo de COVID-19 en España fue diagnosticado el 31 de enero de 2020. Ante la rápida expansión del virus y el acusado incremento de los contagios, el Gobierno español aprobó, mediante el Real Decreto 463/2020, de 14 de marzo, el estado de alarma para la gestión de la situación de crisis sanitaria ocasionada por el COVID-19 en la totalidad del territorio nacional, con un confinamiento de la población en sus lugares de residencia, y la implementación de medidas restrictivas de movilidad y actividad económica. Otros países también instauraron el confinamiento entre sus habitantes ante la incidencia de la crisis sanitaria, ya que el distanciamiento social es una eficaz medida no clínica para frenar el avance de la pandemia (Prem, *et al.*, 2020). En este contexto, el Gobierno español aprobó el Real Decreto-ley 10/2020, de 29 de marzo, en el que se establece el cese de las actividades laborales presenciales consideradas no esenciales entre el 30 de marzo y el 9 de abril.

El estado de alarma se instauró inicialmente por un periodo de quince días naturales, pero debido a la situación epidemiológica, se efectuaron seis prórrogas. El 28 de abril, el Consejo de Ministros aprobó un plan de desescalada con el objetivo de recuperar el bienestar socioeconómico y abordar la transición hacia una nueva normalidad. El plan constaba de cuatro fases que posibilitarían la reducción gradual de las restricciones y el confinamiento. El 21 de junio finalizó el estado de alarma y comenzó la etapa denominada como “nueva normalidad”, en la que terminaron las restricciones, pero continuó la vigilancia de la evolución epidemiológica, las medidas de autoprotección ciudadana, y el refuerzo del sistema y la asistencia sanitaria (Presidencia del Gobierno de España, 2020a).

En el periodo estival se produjeron numerosos rebrotes en España, por lo que algunos territorios establecieron restricciones para mitigar el impacto de la pandemia. Se registró una tendencia ascendente en el número de contagios y a finales de octubre se contabilizaron elevadas cifras de incidencia. En este contexto, el Gobierno aprobó, mediante el Real Decreto 926/2020, de 25 de octubre, el estado de alarma para contener la propagación de infecciones causadas por el SARS-CoV-2 en la totalidad del territorio nacional. Este estado finalizó el 9 de noviembre de 2020, pero el Consejo de Ministros aprobó una prórroga hasta el 9 de mayo de 2021, mediante el Real Decreto 956/2020. En este periodo no se estableció un confinamiento general de la ciudadanía, pero se implementó toque de queda nocturno y se determinaron otras limitaciones. Además, cada comunidad o ciudad autónoma podía modificar las medidas en función de la evolución del COVID-19 en su ámbito territorial. El 27 de diciembre comenzó la campaña de vacunación en España.

La pandemia del COVID-19 supone un significativo impacto en la sociedad y conlleva múltiples disrupciones en la totalidad de sectores. La propagación de los contagios y la afectación de la enfermedad provocan una profunda crisis en el sistema sanitario y en la salud pública, pero también en el ámbito económico y el social. No obstante, sus efectos se manifiestan de manera desigual en función de diferentes factores. Las áreas urbanas son las principales afectadas por el COVID-19 (Maza y Villarreal, 2020). Estos espacios concentran el 90% de los contagios registrados a nivel mundial (Naciones Unidas, 2020). La elevada densidad poblacional, los fluidos intercambios socioeconómicos, los modelos culturales y de relación social, o los sistemas de movilidad que caracterizan a las urbes, se convierten en la actualidad en aspectos facilitadores de la expansión del virus (Paisaje Transversal, 2020). De este modo, la crisis sanitaria

es fundamentalmente urbana (González y Piñeira, 2020) y ha puesto de manifiesto las debilidades y vulnerabilidades de las ciudades, así como de sus modelos de desarrollo territorial. En este escenario de incertidumbre, la contingencia conforma un nuevo marco de descripción en las sociedades, donde los conceptos y teorías de desarrollo local deberán considerar y analizar conceptos emergentes, como el riesgo y el peligro (Pont-Vidal, 2020). Asimismo, la incidencia del COVID-19 muestra la importancia de adaptar las urbes del futuro hacia el modelo *smart city*. Actualmente, la tecnología se configura como una herramienta esencial para el diseño y desarrollo de las ciudades, así como para la consecución de espacios urbanos más resilientes. La transición digital se ha convertido en una prioridad mundial, y las políticas públicas deben incorporar estrategias *smart*, con objeto de mejorar el funcionamiento de las ciudades y aumentar la calidad de vida de sus habitantes (Rozga y Hernández, 2019). En este sentido, la pandemia motiva a cuestionar y replantear la planificación urbana y territorial desde nuevas perspectivas y estrategias, con el propósito de responder a las necesidades del COVID-19, y así disponer en el futuro de ciudades más resilientes, responsables y preparadas.

La gravedad de la crisis ha precisado una respuesta inmediata y eficaz por parte de la totalidad de los actores territoriales, en particular de las administraciones públicas. En este sentido, el Gobierno estatal español ha desarrollado medidas económicas extraordinarias y una amplia diversidad de ayudas, subvenciones y moratorias para gestionar las incidencias acontecidas. Según el estudio de Calviño (2020), la intervención de las autoridades, tanto nacionales como europeas, ha sido fundamental para el sostenimiento del tejido productivo durante la fase álgida de la pandemia en España, así como para la posterior recuperación. La referida publicación destaca algunas de las medidas implementadas por el Gobierno, como son la adopción del programa de avales públicos para garantizar la liquidez a las empresas, la flexibilización y apoyo a los Expedientes de Regulación Temporal de Empleo (ERTE), la prestación por cese de actividad para los trabajadores autónomos, así como otras acciones orientadas a ayudar a colectivos vulnerables, entre las que sobresale el establecimiento del Ingreso Mínimo Vital. Asimismo, el 7 de octubre de 2020 el Gobierno presentó el Plan de Recuperación, Transformación y Resiliencia. Este proyecto de país movilizará en los próximos tres años la mitad de los recursos con los que cuenta España merced al Fondo de Recuperación *NextGeneration EU*, un instrumento europeo temporal para hacer frente a las consecuencias socioeconómicas del COVID-19 (Presidencia del Gobierno de España, 2020b).

La reacción institucional y legal sobre la gestión del COVID-19 en España muestra el significativo esfuerzo realizado por la Administración central. Sin embargo, durante esta crisis se han observado relevantes carencias de gobernanza (Carnicero, 2020). Según Farinós (2005), el concepto de gobernanza presenta cuatro dimensiones principales: la participación pública (nivel local), la coordinación horizontal (entre políticas y entre territorios), el desarrollo económico, y la gobernanza multinivel. Se trata de una forma participativa de gobierno, que promulga una mayor coordinación entre actores y niveles, enfocándose en la búsqueda de alternativas a la organización jerárquica (Bao y Delgado, 2020). La singularidad de la gobernanza “territorial” radica en que su objeto es el desarrollo del territorio, entendido como construcción social, soporte y resultado de las diferentes actuaciones y políticas (Farinós y González, 2020). Es un proceso de organización de las relaciones entre actores e intereses presentes en el territorio, cuyo resultado es la visión territorial compartida, necesaria para alcanzar la cohesión sostenible en la totalidad de niveles (Farinós, 2008).

La pandemia se ha convertido en un indicativo de que las capacidades de gobernanza en los diferentes niveles de gobierno no responden adecuadamente a emergencias globales complejas (United Cities and Local Governments [UCLG], Metropolis y LSE Cities, 2020). En este sentido, y de acuerdo con Romero (2020), la gestión de la pandemia en España no ha sido suficiente para comprender que los procesos de toma de decisiones deben fundamentarse en la gobernanza compartida. Por ejemplo, el funcionamiento de las Conferencias de Presidentes se ha basado en dar a conocer los anuncios efectuados por el presidente del Gobierno a los representantes autonómicos, sin discutir previamente con ellos las acciones que debían establecerse. Los estilos de gobierno y el diseño de políticas públicas, pese a la crisis, continúan estando muy alejados de la idea federal, y el modelo de gobernanza multinivel sigue siendo desordenado. El actual estado autonómico español presenta problemas de cooperación y coordinación institucional (Romero, 2006). Por ello, en la nueva normalidad socioeconómica es esencial avanzar en materia de coherencia, cohesión y gobernanza territorial. Igualmente, Alburquerque (2020) señala la necesidad de mejorar la participación efectiva de los actores territoriales clave. La colaboración entre estos agentes resulta imprescindible para hacer frente a la pandemia. El liderazgo no debe ser resultado de un mando

unilateral o vertical, por lo que es fundamental una mayor coordinación entre los componentes del proceso de gobierno, promover la coherencia de las medidas en la totalidad de los niveles de la gobernanza, así como progresar en la conformación de instituciones de gobernanza participativa.

Las administraciones públicas autonómicas y locales han desarrollado, en sus respectivos ámbitos competenciales, medidas complementarias a las establecidas por el Gobierno central para paliar las repercusiones de la crisis. Las entidades municipales, como administraciones más próximas a la ciudadanía, implementan actuaciones concretas y adaptadas a la realidad territorial de cada localidad, con objeto de gestionar de manera eficiente las problemáticas derivadas de la pandemia. Estas autoridades poseen atribuciones de gobernanza y formulación normativa, y realizan una significativa labor en el ciclo de gestión de las emergencias, desde la preparación para la respuesta al COVID-19 hasta su recuperación (OMS, 2020). Los gobiernos locales tienen un papel cada vez más relevante en la toma de decisiones para la gestión de las emergencias globales, y presentan características clave para dar respuesta a este tipo de situaciones de riesgo: la proximidad con la sociedad civil, el conocimiento del territorio, y una mayor facilidad para adoptar perspectivas transversales y a diferentes escalas (Martí-Costa, Barres y Termes, 2020). Sin embargo, la interacción de los gobiernos locales con las administraciones superiores es mejorable. Es necesario reforzar el municipalismo frente a la pandemia, así como poner en valor su trascendental función en la gestión de la actual coyuntura, pues es un aspecto esencial para la vertebración territorial.

Las administraciones locales han aumentado el número y frecuencia de sus servicios como consecuencia del COVID-19, lo que conlleva la necesidad de disponer de mayores recursos para su financiación (López, 2020). El 2 de abril de 2020, la Federación Española de Municipios y Provincias (FEMP) propuso al Gobierno la aprobación de 19 medidas extraordinarias para asegurar una reactivación económica y laboral local (Federación Española de Municipios y Provincias [FEMP], 2020). La propuesta pretende involucrar a las entidades municipales y fomentar su participación activa en la actual coyuntura. Entre las medidas sugeridas destacan el uso de los superávits presupuestarios, la flexibilización de la regla de gasto, o el aumento del ámbito competencial (Analistas Financieros Internacionales, 2020). En este sentido, el 3 de agosto de 2020, la FEMP y el Ministerio de Hacienda aprobaron un acuerdo para que los ayuntamientos puedan disponer de sus superávits acumulados en los últimos años. Asimismo, el Gobierno acordó la suspensión de las reglas fiscales para los años 2020 y 2021, así como la elevación del techo de gasto.

A partir de estas reflexiones y antecedentes, la hipótesis de esta investigación se centra en que las administraciones públicas locales, como entidades más próximas a la sociedad, son agentes esenciales en la respuesta a la crisis, por lo que las acciones y servicios municipales resultan fundamentales para la mitigación de las incidencias acontecidas. En este estudio se analiza el impacto de la pandemia en la localidad valenciana de Riba-roja de Túria. Se trata de un municipio situado en un enclave estratégico de la segunda corona del Área Metropolitana de Valencia (AMV), caracterizado por un potente sector logístico y la presencia de significativos recursos territoriales. El Ayuntamiento ha impulsado la actualización de su Plan Estratégico Participado (Hermsilla, Morales, González y Mayordomo, 2018), con el propósito de adaptarlo a las nuevas circunstancias derivadas del COVID-19 y conocer sus efectos en la gestión municipal. En este sentido, se efectúa un análisis de la gobernanza del Consistorio ante la crisis, así como de las medidas y cambios organizativos y relacionales que ha implementado para afrontarla.

En el territorio valenciano existen diversas investigaciones que analizan las incidencias socioeconómicas ocasionadas por la pandemia en ámbitos determinados, tanto a nivel local como supramunicipal. En este sentido destaca el trabajo de Espí (2020), que expone los impactos registrados del COVID-19 entre los meses de marzo y junio en la localidad alicantina de Los Montesinos; o el de Hermsilla (2021), en el que los Pactos y Acuerdos por el Empleo de la Comunitat Valenciana estudian los efectos de la actual situación en sus respectivos territorios. Sin embargo, no se tiene constancia de ningún municipio valenciano, con excepción de Riba-roja de Túria, que disponga de un Plan Estratégico y haya decidido actualizar su diagnóstico y estrategias para realizar un seguimiento adaptado al contexto de la crisis sanitaria.

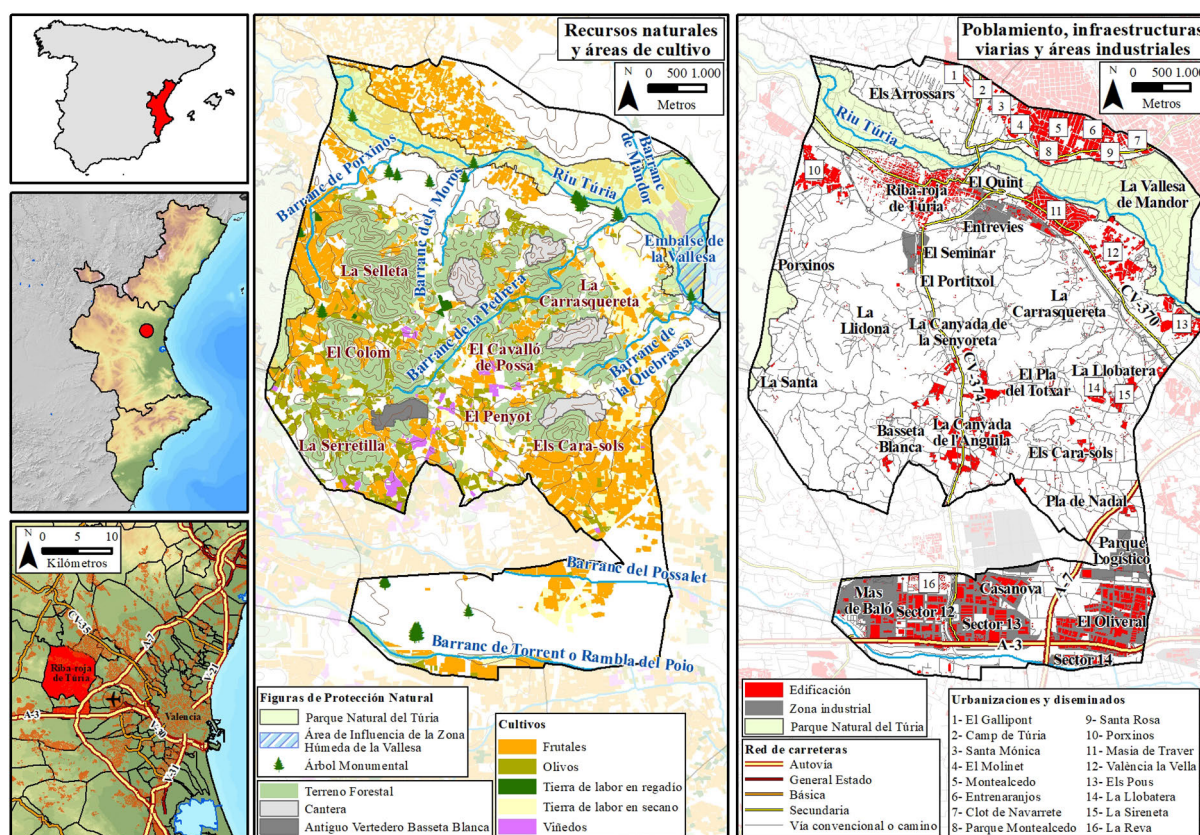
En consecuencia, el objetivo de esta investigación es identificar los procesos socioeconómicos generales derivados de la pandemia a partir del mencionado caso de estudio y, de esta manera, poder plantear acciones dirigidas a paliar sus incidencias y conseguir territorios más resilientes. De este modo, aunque el impacto del COVID-19 varía en función de distintos factores y ámbitos, la crisis actúa de manera global y sistémica, por lo que el análisis de las principales dinámicas acontecidas en Riba-roja de Túria permite detectar procesos compartidos con territorios de características semejantes.

2. Metodología

2.1. Área de estudio

El municipio de Riba-roja de Túria se localiza en el sector meridional de la comarca valenciana del Camp de Túria, unos 20 kilómetros al oeste de la ciudad de Valencia. Esta región ha registrado relevantes transformaciones socioeconómicas en las últimas décadas, derivadas de la descentralización y expansión de la capital provincial y su entorno urbano. Los procesos económicos y demográficos se han dispersado sobre el territorio, de modo que Riba-roja de Túria y su comarca están integradas actualmente en la segunda corona de desarrollo del AMV. En este sentido, el municipio ha perdido progresivamente su tradicional fisonomía agraria y se ha convertido en un espacio dinámico y atractivo, con una significativa industrialización y terciarización de su economía (Hermosilla, *et al.*, 2018). La Figura 1 muestra la localización del área de estudio, en la que se representa además la ubicación de sus principales recursos naturales y agrarios, así como su poblamiento, infraestructuras viarias y áreas industriales.

Figura 1. Localización del área de estudio



Fuente: Instituto Geográfico Nacional (IGN) e Institut Cartogràfic Valencià (ICV). Elaboración propia

El término posee una altitud media de 125 metros y está dividido por un suave anticlinal conformado por diversos cerros. Al norte de esta alineación se extiende la vega del río Túria. Este curso fluvial recorre el sector septentrional del municipio y sus aportes han conformado una fértil llanura sobre la que se extiende la huerta tradicional y el núcleo poblacional. En el año 2007 se aprobó la declaración del Parque Natural del Túria, que se centra especialmente en el cauce y riberas del río Túria, y constituye un interesante atractivo turístico. Otros espacios naturales protegidos son la Zona Húmeda del Embalse de la Vallesa y el arbolado monumental, con 46 ejemplares catalogados (Morales, Morales, Barberá y Herreros, 2020). Los terrenos forestales representan una quinta parte del territorio, en los que destacan los bosques de coníferas (Hermosilla y Membrado, 2018). La superficie cultivada ha experimentado un significativo retroceso, con un descenso del 45,2% entre los años 2002 (3.254 hectáreas) y 2019 (1.783 hectáreas) (Conselleria d'Economia Sostenible, Sectors Productius, Comerç i Treball, 2021). Las tierras de secano han tenido una acentuada regresión, mientras que se ha producido la expansión de los regadíos. Los

cultivos más numerosos son los cítricos, en particular el naranjo y el mandarino. También resulta reseñable el algarrobo (Conselleria d'Agricultura, Desenvolupament Rural, Emergència Climàtica i Transició Ecològica, 2021).

La localidad ha registrado un incremento demográfico desde los años 70 del siglo XX debido a la desconcentración urbana del AMV, y se ha producido una relevante expansión de entidades residenciales, algunas asociadas a segundas residencias. En el año 1970 la población de Riba-roja de Túria ascendía a 7.058 habitantes (Jordán y Sorribes, 1994) y en la actualidad el municipio cuenta con 23.941 habitantes, de los que el 61% residen en el núcleo poblacional (Ayuntamiento de Riba-roja de Túria, 2021b). El casco urbano y las principales urbanizaciones se localizan en el sector septentrional del término, en las proximidades del río Túria. En el aspecto social sobresale la presencia de más de un centenar de asociaciones. Asimismo, el término posee interesantes recursos patrimoniales y una adecuada dotación de servicios y equipamientos.

En el último medio siglo se ha producido un significativo proceso de terciarización de la economía. El municipio está situado en una localización estratégica. En su sector meridional se emplaza la confluencia de la autovía A-3 y el By-Pass, tramo de la A-7 que circunvala la primera corona del AMV. En esta área se encuentran los principales polígonos industriales de Riba-roja de Túria, con 6,5 millones de metros cuadrados de suelo industrial. Constituye una zona muy atractiva para las empresas, con la presencia de excelentes comunicaciones viarias, y próxima al aeropuerto y puerto de Valencia. La logística es la actividad más destacada, aunque hay empresas de distinta tipología. El pequeño comercio se localiza fundamentalmente en el casco urbano.

2.2. Método de trabajo

El proceso de investigación desarrollado para la identificación de los procesos socioeconómicos derivados de la pandemia en Riba-roja de Túria está basado en la metodología utilizada en la citada publicación de Hermosilla (2021). Este trabajo expone el método implementado por los Pactos y Acuerdos por el Empleo valencianos con la finalidad de incorporar los efectos de la crisis en sus respectivos informes de Estrategias Territoriales. Las tareas propuestas en el referido estudio se fundamentan en la recogida de información estadística y en el desarrollo de procesos participativos mediante la realización de entrevistas a actores territoriales. En este sentido, y como consecuencia de los satisfactorios resultados de la mencionada publicación, en esta investigación se combina el tratamiento de datos estadísticos con información cualitativa obtenida a través de la participación de agentes locales clave.

Asimismo, con objeto de obtener una información pormenorizada de la gestión municipal ante la incidencia de la pandemia, y como documentación de apoyo a las entrevistas, se solicitaron informes técnicos a las concejalías y delegaciones del Ayuntamiento de Riba-roja de Túria. Esta tarea se ha inspirado en el estudio de Espí (2020), en el que se recopilan datos e informaciones proporcionadas por el equipo de gobierno y el personal del Ayuntamiento de Los Montesinos, para analizar los efectos de la pandemia en este territorio. Por tanto, el método de trabajo implementado se fundamenta en las metodologías utilizadas en las referidas publicaciones, pero de manera adaptada a las singularidades y particularidades de Riba-roja de Túria. Las acciones se detallan seguidamente, para las que se señalan las fuentes, criterios y procedimientos de análisis empleados.

a) Tratamiento de información estadística y consulta de fuentes bibliográficas. Se analizan datos y documentación disponible actualizada en materia sanitaria, económica, laboral, social o medioambiental, así como de otros sectores, que permiten identificar los procesos y dinámicas generadas por el COVID-19 en el municipio de estudio. Las principales fuentes consultadas son las estadísticas del Servei Valencià d'Ocupació i Formació (LABORA) (Servei Valencià d'Ocupació i Formació [LABORA], 2021a, 2021b); los datos sobre coronavirus ofrecidos por el portal de la Conselleria de Sanitat Universal i Salut Pública (Conselleria de Sanitat Universal i Salut Pública, 2021); así como la página web del Ayuntamiento de Riba-roja de Túria, en particular la información ofrecida en la sección de noticias (Ayuntamiento de Riba-roja de Túria, 2021a).

b) Obtención de información cualitativa mediante la realización de entrevistas semiestructuradas a actores clave del municipio. La participación y la interacción con los principales agentes implicados resulta esencial en la identificación de las dinámicas derivadas de la pandemia en Riba-roja de Túria. Se efectuaron 32 reuniones en las que se entrevistaron a 49 actores territoriales durante los meses de

noviembre y diciembre de 2020, y en enero de 2021. Se trata de agentes que han sido seleccionados por sus amplios conocimientos sobre la realidad territorial, especialistas en distintos sectores socioeconómicos en la localidad. En este sentido, se han efectuado reuniones con los responsables políticos de cada área municipal y su personal técnico, dada la relevancia de la actuación de la Administración Pública local ante la pandemia. Asimismo, se ha consultado a actores representativos de los ámbitos económico, social, formativo y medioambiental de Riba-roja de Túria. La Tabla 1 detalla la relación de entidades entrevistadas agrupadas según el sector considerado, y el número de asistentes para cada conjunto. Se ha asignado un código a cada reunión mantenida, para su posterior identificación.

Tabla 1. Organismos y entidades entrevistadas

Códigos reuniones	Tipología de organismos y entidades entrevistadas	Número de entrevistados
A) Acción de gobierno: responsables políticos y personal técnico		
A1	Concejalía de Planificación Urbanística, Obras Públicas y Servicios Municipales	1
A2	Concejalía de Comercio, Sostenibilidad, Transición Ecológica, Economía Circular y Agricultura	4
A3	Concejalía de Educación, Cultura, Infancia y Adolescencia	1
A4	Concejalía de Hacienda, Contratación Pública, Patrimonio e Inventario, Edificios Públicos e Infraestructuras, Actividades y Fomento Económico	1
A5	Concejalía de Recursos Humanos, Seguridad Pública y Policía Local, Servicios Generales, Régimen Jurídico, Innovación Tecnológica y Administración Electrónica, Comunicación y Bienestar Animal	1
A6	Concejalía de Igualdad, Políticas Inclusivas y Derechos Sociales y Mayores	1
A7	Concejalía de Fiestas, Fallas y Juventud	3
A8	Concejalía de Barrios y Urbanizaciones, Parques y Jardines, Servicios Públicos y Transporte y Movilidad	3
A9	Concejalía de Transparencia, Gobierno Abierto, Participación Ciudadana, Turismo y Patrimonio Histórico	2
A10	Concejalía de Promoción de la Salud y Deportes	4
A11-A13	Restantes partidos de la Corporación Municipal	3
B) Dimensión económica		
B1-B2	Asociaciones locales empresariales industriales	2
B3	Asociación comercio local	1
B4	Asociación hostelería local	2
B5	Centro de Empleo LABORA	1
C) Dimensión social		
C1-C3	Sindicatos	3
C4	Cáritas Riba-roja	1
D) Formación y educación		
D1-D8	Centros educativos: públicos y concertados	9
E) Medioambiente		
E1	AVA Consell Agrari y Comunidad de regantes	2
E2	Coordinadora en Defensa de los Bosques del Turia	4
Total		49

Elaboración propia

Las entrevistas se realizaron mediante videoconferencia debido a las restricciones establecidas. La duración aproximada de cada reunión osciló entre una y dos horas. La entrevista comprende una decena de cuestiones abiertas, referidas a los siguientes aspectos: impactos generados por la crisis en el municipio, y específicamente en el sector del que es especialista cada entrevistado, medidas desarrolladas por la Administración pública y otras entidades locales para paliar la incidencia de la pandemia, valoración de las acciones implementadas, planteamientos previstos, y otras actuaciones que el agente entrevistado considera necesarias para resolver o paliar los efectos del COVID-19 en el futuro. Asimismo, en las entrevistas se plantearon cuestiones específicas de diferentes temáticas en función de la especialidad de cada informante. La realización de encuestas se ha desestimado en este estudio como consecuencia de las limitaciones derivadas de las actuales circunstancias.

c) Análisis de los informes técnicos proporcionados por el Ayuntamiento de Riba-roja de Túria. Con el propósito de conocer el impacto de la crisis en la gestión municipal y en los diferentes ámbitos del municipio, se solicitaron informes técnicos a cada concejalía y delegación del Consistorio. La información que se requirió para cada informe fue la siguiente: efectos y procesos generados por la crisis en el área correspondiente, principales cambios detectados, valoración técnica de la situación, y las medidas y acciones adoptadas ante las circunstancias sobrevenidas. En la medida de lo posible, la información aportada debía estar avalada por datos estadísticos. El personal técnico del Ayuntamiento mostró una significativa participación, ya que se elaboraron 26 informes municipales. No obstante, algunas áreas no remitieron ningún documento. Los contenidos aportados se clasificaron según los sectores y temáticas a los que hacen referencia (sanitaria, social o económica), y se integraron con el resto de información cuantitativa y cualitativa analizada. La Tabla 2 muestra la relación de los informes técnicos proporcionados y la delegación o concejalía que los ha efectuado. Se ha asignado un código a cada una de estas áreas municipales para su posterior identificación en este estudio.

Tabla 2. Relación de informes técnicos remitidos por el Ayuntamiento de Riba-roja de Túria

Código I1. Área de Educación y Cultura
- Informe sobre identificación de los efectos generados en los servicios y proyectos vinculados con el área de educación y cultura por la pandemia COVID-19 - Informe sobre el estado de las obras de ampliación y mejora en los centros escolares incluidos en el Plan Edificant
Código I2. Área de Fomento Económico y Empleo
- Evolución del mercado laboral por COVID-19 en Riba-roja de Túria
Código I3. Área de Parques y Jardines
- Cambios y causas detectadas en el comportamiento de los usuarios de los parques y en la utilización de las vías y carril bici, y principales medidas adoptadas
Código I4. Área de Transición Ecológica
- Informe EcoRiba sobre la incidencia de la COVID-19 en el Paisaje de Riba-roja - Informe de Medio Ambiente para la actualización del Plan Estratégico - Candidatura Hoja Verde 2020-2021 - Documento Inicial Estratégico para la aprobación del PMUS de Riba-roja de Túria
Código I5. Área de Transparencia, Gobierno Abierto y Participación Ciudadana
- Consecuencias del COVID-19 y medidas adoptadas en el Área de Transparencia, Gobierno Abierto y Participación Ciudadana
Código I6. Área de Transportes
- Cambios de comportamiento de los usuarios de transporte público y medidas adoptadas
Código I7. Área de Turismo y Patrimonio
- Informe Técnico: efectos generados por la crisis sanitaria COVID-19
Código I8. Área de Urbanismo
- Afectación del COVID-19 al Área de Urbanismo en el estado de alarma y periodo posterior - Incidencia de la crisis sanitaria a causa del COVID sobre el Departamento de Urbanismo

Código I9. Área Políticas Inclusivas, Derechos Sociales y Mayores
- Informe de competencias y actuaciones del área de políticas inclusivas y derechos sociales
Código I10. Concejalía de Juventud
- Principales impactos del COVID-19 y medidas adoptadas en el Área de Juventud
Código I11. Concejalía de la Mujer e Igualdad
- Consecuencias de la pandemia en los casos de violencia de género y medidas adoptadas - Información sobre atención psicológica durante el Estado de Alarma
Código I12. Oficina Municipal de Información al Consumidor y Servicios Públicos
- Procesos y medidas generadas por el impacto del COVID-19 en la Oficina Municipal de Información al Consumidor
Código I13. Padrón Municipal
- Estadística de la distribución de la población según su edad y sexo, agrupados por entidades, núcleos, distritos, secciones y total de municipio Tres informes diferenciados para los meses de marzo y julio de 2020, y enero de 2021 - Movimientos demográficos anuales: nacimientos y defunciones. Datos: desde 1996 a 2020
Código I14. Policía Local
- Mejoras en las plazas de estacionamiento para personas con movilidad reducida, según orden VIV/561/2010, de 1 de febrero del Ministerio de Vivienda - Plano de localización de las zonas de aparcamiento del casco urbano - Previsión de plazas de estacionamientos en casco urbano - Cuestionarios y datos estadísticos de la Policía Local 2019 y 2020

Elaboración propia

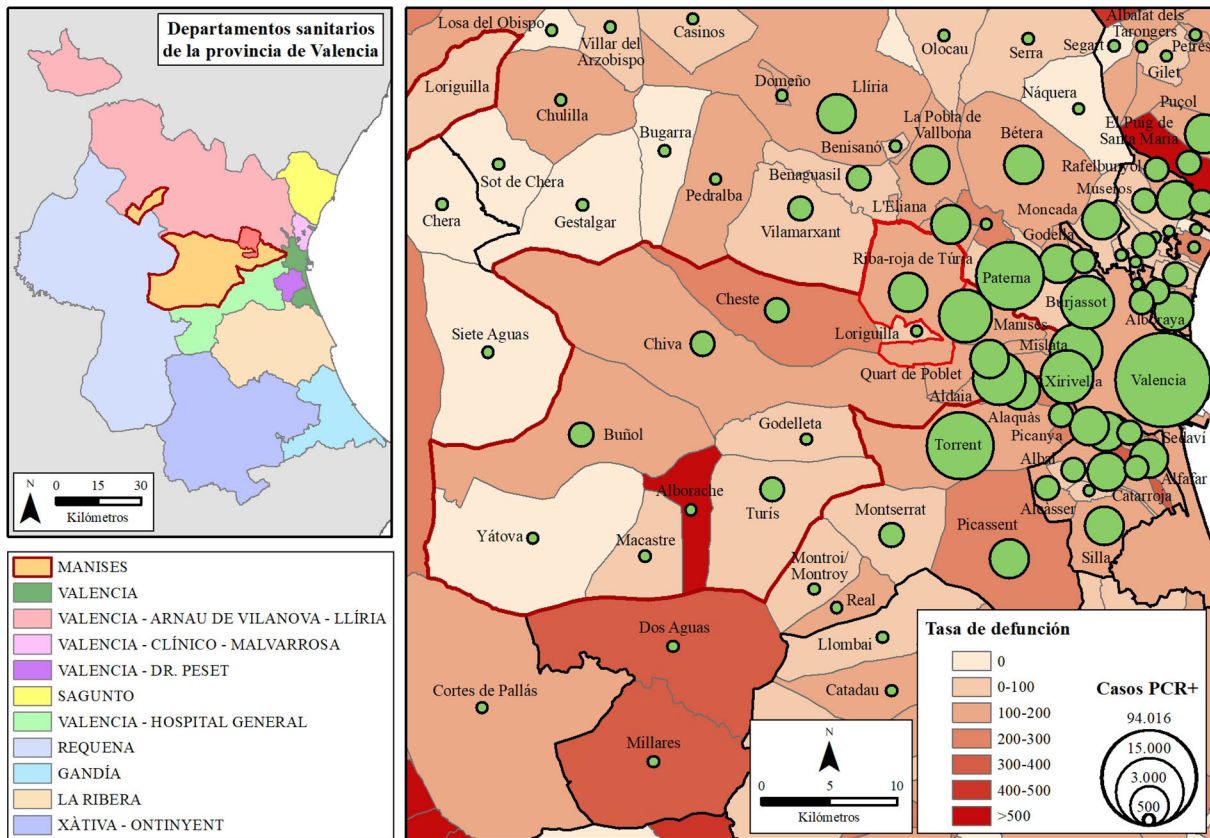
3. Resultados

La pandemia del COVID-19 supone efectos devastadores en la totalidad de sectores, y ha provocado una profunda crisis a nivel mundial en los ámbitos sanitario, social y económico. El proceso de investigación desarrollado ha permitido identificar y analizar los procesos e impactos derivados de la pandemia en Riba-roja de Túria. En los siguientes apartados se abordan los principales efectos de la crisis y se exponen las reacciones surgidas para hacer frente a esta situación, tanto desde el punto de vista institucional por parte del Ayuntamiento, como desde la sociedad local. Con el propósito de refrendar aquellos resultados obtenidos a partir de la consulta de los informes técnicos y/o de las entrevistas efectuadas, en el presente apartado se indican los respectivos códigos asignados en las tablas previas. La Figura 7, situada al final del epígrafe, plasma en un diagrama de conjunto los principales procesos derivados de la pandemia en Riba-roja de Túria y las interconexiones existentes.

3.1. Crisis sanitaria

El municipio de Riba-roja de Túria está adscrito al Departamento de Salud de Manises. Este ente cubre la demanda sanitaria de 207.000 personas residentes en 14 localidades valencianas. La Figura 2 representa la tasa de defunción y el número de PCR positivos registrados en los municipios del referido Departamento y otras áreas colindantes, según los datos de la Conselleria de Sanitat Universal i Salut Pública (2021), desde el inicio de la pandemia hasta el 30 de septiembre de 2021. Se observa un elevado número de contagios en ciudades del AMV, principalmente en la capital provincial (94.016) y en las cabeceras comarcales de l'Horta Nord (Paterna, con 8.619) y l'Horta Sud (Torrent, con 6.396). En el término de Riba-roja de Túria se han contabilizado 1.766 contagios y 29 fallecidos, lo que representa una tasa de defunción por 100.000 habitantes de 127,41. Esta tasa es inferior a la de su Departamento Sanitario, que se sitúa en 144,99, con 19.197 PCR+ y 298 fallecidos. Otros municipios de la segunda corona metropolitana valenciana con similares características socioeconómicas son Bétera, Cheste, L'Elia, o Llíria, que registran mayores tasas de defunción que Riba-roja (166,64; 217,52; 185,17; y 187,38 respectivamente). La campaña de vacunación aporta esperanza a la ciudadanía. Sin embargo, la sensación de incertidumbre continúa presente (A10).

Figura 2. Tasa de defunción por COVID-19 y número de PCR positivos en los municipios del Departamento Sanitario de Manises y áreas colindantes hasta el 30 de septiembre de 2021



Fuente: Conselleria de Sanitat Universal i Salut Pública e Institut Cartogràfic Valencià (ICV). Elaboración propia

3.1.1. Cierre del centro de salud

El municipio posee un centro de salud edificado en 2002. El Gobierno local reclama desde hace diversos años su ampliación y una mayor dotación de recursos humanos sanitarios, debido a las crecientes demandas y el progresivo aumento poblacional producido en las últimas décadas (A1, A10, I8). Estas carencias se han acentuado como consecuencia de la incidencia del COVID-19 en la localidad. Durante los primeros meses de la pandemia se produce el cierre del centro de salud y la cancelación de la atención médica presencial por exigencia del protocolo de la Generalitat Valenciana. En consecuencia, en este periodo únicamente se atendía a la ciudadanía mediante consulta telefónica, lo que generó colapsos de llamadas, un significativo malestar entre la población, así como una sobrecarga de trabajo para los sanitarios (A10). Con el propósito de solventar estas problemáticas y mejorar la atención a los usuarios, el Departamento de Salud de Manises asignó cinco nuevos profesionales sanitarios al centro. Además, habilitó un “Call Center” desde el Hospital de Manises, con objeto de responder a las necesidades de los habitantes (Ayuntamiento de Riba-roja de Túria, 2021a).

3.1.2. Medidas sanitarias

El Área de Sanidad del Ayuntamiento ha desarrollado diversas actuaciones para paliar la incidencia de la pandemia, tal y como se ha señalado en la entrevista mantenida con esta delegación (A10). La actividad del centro de salud depende de la Conselleria, por lo que las acciones del Consistorio en el sector sanitario ante la crisis se han focalizado en ofrecer una labor informativa y de respuesta a peticiones. La transversalidad de este ámbito conllevó una coordinación continua con el resto de delegaciones municipales. Durante el confinamiento, las medidas implementadas por el Ayuntamiento se fundamentaron en la realización de campañas informativas sobre las novedades relacionadas con la pandemia, la donación de diversos pulsioxímetros al centro de salud, la habilitación de nuevas líneas

telefónicas para permitir una mayor atención a los usuarios, la instalación de carpas para la atención a pacientes, así como la puesta en marcha de un servicio de recogida y entrega a domicilio de medicamentos y mascarillas a colectivos dependientes (A10).

3.2. Crisis social

La incidencia de la pandemia ha supuesto la pérdida de numerosos puestos de trabajo y la caída de los ingresos, lo que ha conllevado un incremento de la pobreza, de las desigualdades existentes, y del grado de dependencia de numerosas familias de Riba-roja de Túria (A6, B5, C1-C4, I2, I9). En el periodo de confinamiento se cerraron los centros educativos y se suspendieron las clases presenciales, de manera que diversos escolares tuvieron dificultades para continuar el curso al no disponer de los pertinentes medios tecnológicos. El cierre de las escuelas conllevó además que los alumnos becados con comedor perdieran inicialmente este beneficio (A3, D1-D8, I1). Otros efectos destacados durante este periodo han sido el cierre del Centro de Día de Mayores y del Programa del Mayor, la paralización de las actividades formativas y de ocio dirigidas a la población joven, así como la cancelación de las actividades destinadas a personas con diversidad funcional (A6, A7, I9, I10).

3.2.1. Colectivos vulnerables y brecha social

La brecha económica derivada de la crisis, y la intensificación por el confinamiento establecido, han evidenciado en el municipio una mayor vulnerabilidad en ciertos colectivos poblacionales, entre los que destacan las personas mayores y dependientes, las mujeres víctimas de violencia de género, los menores sin los medios necesarios para continuar el curso académico a distancia, las personas con diversidad funcional, así como los ciudadanos que han perdido sus empleos (A6, C1-C4, D1-D8, I9, I11). Además, se ha detectado la aparición de nuevos colectivos vulnerables, principalmente referidos a los habitantes dedicados a la economía informal o actividades no declaradas, como las relacionadas con el cuidado de mayores o la limpieza doméstica. El confinamiento supuso la paralización de estas tareas, por lo que las personas implicadas perdieron sus ingresos económicos y no pudieron acceder a ninguna prestación por desempleo (A4, B5, C1-C4). Asimismo, el informe técnico elaborado por el Área de Igualdad (I11) señala que en esta etapa se ha registrado un aumento de los casos de violencia de género, con un incremento de las denuncias presentadas y de las llamadas telefónicas recibidas. También es relevante el impacto psicológico que supone una pandemia de esta virulencia.

Las desigualdades en el acceso y uso de las nuevas tecnologías en la sociedad han incidido en los diferentes colectivos poblacionales, tanto a nivel personal como profesional. En este sentido, los grupos sociales más afectados son las personas mayores y los habitantes con menores recursos económicos y/o con un bajo nivel sociocultural (A4, A5, A6, C1-C3).

3.2.2. Medidas sociales

El Área de Servicios Sociales ha implementado diversas medidas dirigidas a mitigar los impactos de la crisis. Desde el estado de alarma se han registrado numerosas solicitudes de ayuda por parte de personas necesitadas, por lo que el Ayuntamiento destinó partidas económicas específicas a colectivos vulnerables (A4, A6). La cantidad de ayudas de emergencia social concedidas en el año 2020 se ha incrementado un 33% respecto a la anterior anualidad. De este modo, en 2019 se concedieron prestaciones por un valor de 191.386 euros, y en 2020 ascendieron a 254.231 euros. Estas subvenciones están destinadas a sufragar gastos de comida, luz, alquiler, transporte, agua o préstamos, de las que se han beneficiado unas 800 personas (Ayuntamiento de Riba-roja de Túria, 2021a).

Según la información ofrecida en la página web municipal (Ayuntamiento de Riba-roja de Túria, 2021a), el Ayuntamiento implantó, a finales del mes de marzo de 2020, un servicio de Apoyo Psicológico COVID-19 en coordinación con el centro de salud, con el objeto de atender telefónicamente a personas que mostraban dificultades para afrontar la nueva situación. Además, se habilitó un teléfono municipal de Asesoramiento Legal, y a principios del mes de abril entró en funcionamiento un “*Call Center*”, en el que se ha atendido y asesorado a la ciudadanía sobre diferentes temáticas desde las distintas áreas municipales.

Durante el estado de alarma se atendieron dos centenares de personas en el catering social de Riba-roja de Túria, el doble que en la anualidad precedente. Del mismo modo, en este periodo se

proporcionó alojamiento a diversas familias que habían perdido su vivienda, y se facilitó la conexión a Internet a personas vulnerables (A6, I9). Asimismo, al Ayuntamiento ofreció atención específica a aquellos ciudadanos que mostraban dificultades para la realización de trámites administrativos telemáticos (A5, I12).

En relación al colectivo de mayores, el Área de Servicios Sociales repartió material sanitario en centros de día y residencias durante el confinamiento, y entregó en préstamo una quincena de tabletas con conexión a Internet. Después del estado de alarma, el Ayuntamiento ha retomado las actividades dirigidas a este colectivo con las pertinentes adaptaciones a la nueva normalidad, y ha reactivado el programa de atención a personas con diversidad funcional (A6, I9).

La coordinación del Área de Servicios Sociales y el Área de Educación ha sido fundamental para cubrir las necesidades de los menores. Durante el confinamiento se repartieron dispositivos con Internet para seguir las clases a distancia, y se estableció un servicio de entrega y recogida de deberes a domicilio (D1-D8, I1). Durante los meses estivales, el Ayuntamiento garantizó el comedor a la totalidad de menores en situación de vulnerabilidad (I9).

Está prevista la creación de una Agencia Municipal para el acceso a la Vivienda Social con la finalidad de ayudar a diversos colectivos. Asimismo, se prevé la formación de una bolsa de viviendas vacías (Ayuntamiento de Riba-roja de Túria, 2021a).

Desde el Área de Mujer e Igualdad se han realizado acciones relacionadas con la violencia de género. Durante el estado de alarma se atendió telefónicamente a diversas mujeres víctimas de maltrato, y se proporcionó información sobre aplicaciones dirigidas a alertar sobre este tipo de situaciones. De la misma manera, se expusieron carteles con información y números telefónicos de atención a la violencia de género en diferentes lugares del municipio, y se informó en redes sociales sobre el agravamiento de estas situaciones (A6, I11).

3.3. Crisis económica

El estado de alarma, la paralización de las actividades económicas no esenciales, y el confinamiento de la población, conllevaron un impacto destacado en los niveles de actividad y empleo del municipio, así como una sensación de incertidumbre en el sector empresarial (B1-B5, C1-C3, I2). La pandemia ha incidido fundamentalmente en las actividades no consideradas esenciales y que dependen de la presencialidad. Además, el teletrabajo ha permitido a determinadas empresas mantener su actividad (A2, A4).

3.3.1. Evolución de las actividades económicas

En referencia al sector agrario, los representantes municipales del Área de Agricultura, de AVA Consell Agrari y de la Comunidad de regantes, consideran que la crisis no ha tenido un impacto económico relevante en esta actividad. Estos agentes afirman que el COVID-19 ha generado beneficios entre los agricultores profesionales, principalmente los dedicados a la citricultura. Durante el confinamiento se registró un incremento de los precios de determinados cultivos, sobre todo la naranja, debido a la implementación de restricciones en los mercados exteriores y a un mayor consumo en el mercado de proximidad. No obstante, la pandemia ha afectado a la agricultura familiar y a los agricultores dedicados a los huertos de autoconsumo (A2, E1).

En las áreas industriales, la incidencia de la crisis ha dependido fundamentalmente de la actividad considerada (A4, B1-B2, B5, C1-C3). Durante las primeras semanas de confinamiento, el COVID-19 impactó de manera destacada en el sector industrial, con descensos generales en la facturación de las empresas. Sin embargo, posteriormente se ha producido una progresiva recuperación económica, principalmente en ámbitos esenciales, como la alimentación y el transporte, así como en la logística, principal actividad de Riba-roja de Túria. En consecuencia, el impacto de la crisis en las áreas industriales no ha sido tan acusado como el acontecido en otros ámbitos territoriales valencianos. Asimismo, según las encuestas realizadas por diversas asociaciones empresariales de la localidad, la crisis ha tenido una repercusión menor que la que prevista inicialmente. No obstante, en algunas actividades como la automoción, la incidencia de la pandemia ha sido más destacada y prolongada. En la actualidad, las previsiones entre los empresarios son en general optimistas (B1-B2).

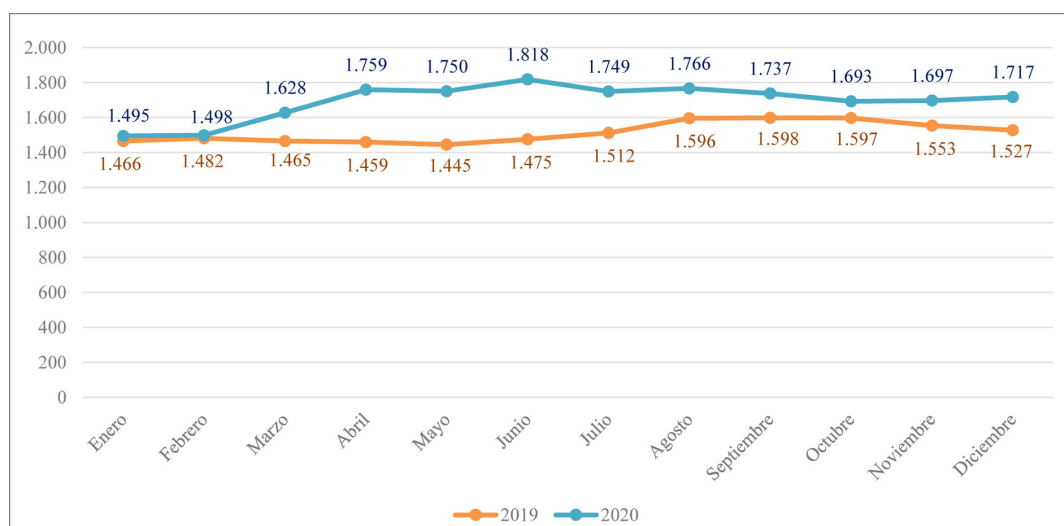
En el sector de los servicios, el comercio local ha sido una de las actividades más perjudicadas por el impacto de la crisis, tal y como han señalado los representantes de la Concejalía de Comercio y la Asociación de comercio local en sus respectivas entrevistas (A2, B3). No obstante, en estas reuniones se indicó que la incidencia de la pandemia ha dependido de la tipología del establecimiento. Los comercios de productos esenciales, como los de alimentación o droguería, no tuvieron que paralizar su actividad, por lo que su evolución ha sido favorable y positiva. Otros ámbitos como los de la restauración, la hostelería o el textil, han sufrido un mayor impacto, con una reducción de su facturación. En las fases de desescalada la totalidad de comercios reiniciaron su actividad. En este periodo los habitantes no podían desplazarse a realizar compras a otros municipios, por lo que aumentaron las ventas en los establecimientos locales, y se constató una mayor valoración y sensibilización social hacia el pequeño comercio. La crisis ha evidenciado la necesidad de potenciar la digitalización y adaptación a las nuevas tecnologías de los comercios locales, ya que los establecimientos con venta *online* han amortiguado mejor los efectos de la pandemia (A2, B3).

La hostelería continúa siendo actualmente uno de los ámbitos más damnificados. De hecho, como consecuencia del impacto de la pandemia en el sector, se ha constituido recientemente una asociación de hostelería en el municipio (B4). En relación al turismo, las limitaciones de movilidad también han afectado a su habitual dinamismo, con una disminución significativa del número de visitantes y turistas (A9, I7).

3.3.2. Mercado laboral: desempleo y contratación

La crisis del COVID-19 ha repercutido de manera considerable en el mercado de trabajo. La Figura 3 muestra la evolución mensual del número de demandantes de empleo en la localidad en los años 2019 y 2020. Como se observa, durante el estado de alarma se produce un incremento relevante del número de desempleados, de manera que las cifras analizadas son superiores a las contabilizadas en las mismas mensualidades del año 2019. El desempleo ha tenido una especial virulencia en las personas con menores cualificaciones profesionales y académicas (I2). A partir de junio, y durante los meses posteriores, se observa un progresivo descenso del número de parados, merced a la recuperación económica desarrollada tras el confinamiento y a la eficacia de las medidas implantadas por los actores del territorio. En este periodo las cifras se aproximan a las registradas en la anualidad precedente y las previsiones son en general positivas (A4, B5). Las personas sujetas a ERTE no se contemplan como demandantes de empleo, por lo que es conveniente analizar en el futuro su repercusión en la estructura laboral local.

Figura 3. Evolución mensual del número de desempleados en Riba-roja de Túria durante los años 2019 y 2020

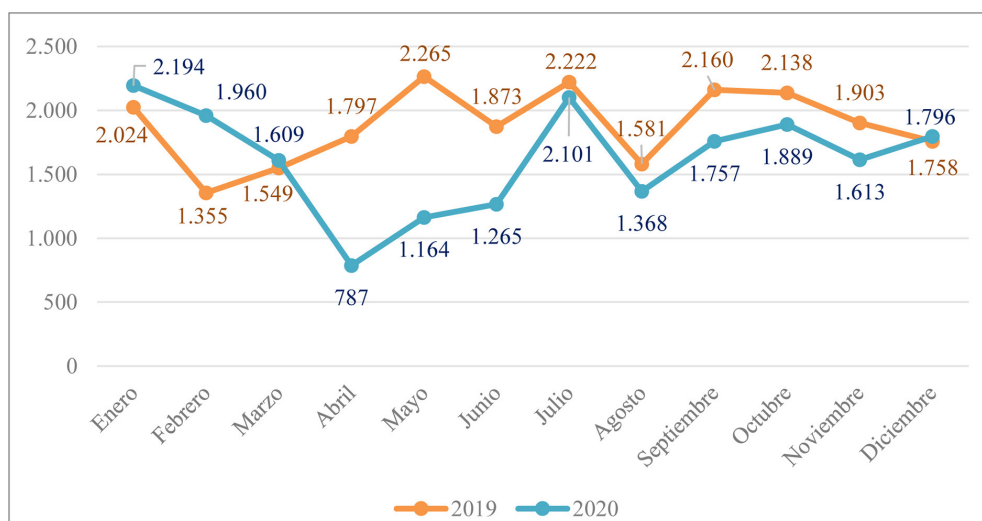


Fuente: LABORA, 2021b. Elaboración propia

En referencia a la contratación, la Figura 4 recoge la evolución mensual del número de contratos efectuados en Riba-roja de Túria durante los años 2019 y 2020. En el periodo de confinamiento se constata

un acusado descenso de la contratación como consecuencia de la paralización de diversas actividades y la incertidumbre. De hecho, en el segundo trimestre del año, las cifras son muy inferiores a las contabilizadas en la anualidad precedente. A partir de julio mejora la situación económica y se produce un elevado incremento en la contratación. Las cifras del tercer y cuarto trimestre son similares a las de 2019, incluso en diciembre las contrataciones son superiores a las efectuadas en este mismo mes durante el pasado año.

Figura 4. Evolución mensual de la contratación en Riba-roja de Túria durante los años 2019 y 2020

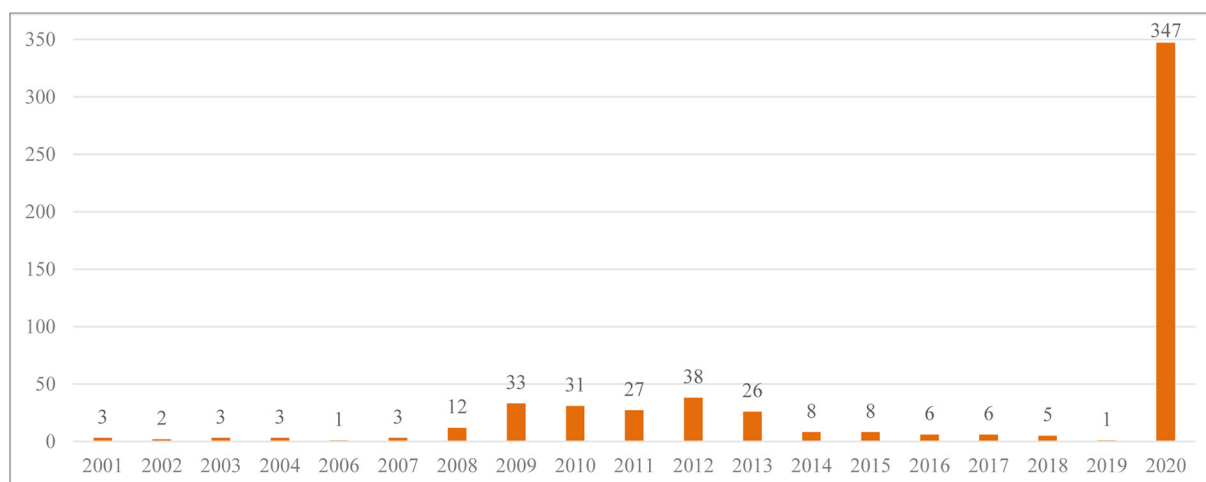


Fuente: LABORA, 2021a. Elaboración propia

3.3.3. Expedientes de Regulación Temporal de Empleo

Los Expedientes de Regulación Temporal de Empleo (ERTE) han sido utilizados por numerosas empresas. Las Figuras 5 y 6 muestran la evolución del número de ERTE y de trabajadores afectados entre los años 2001 y 2020 en Riba-roja de Túria. La incidencia del COVID-19 ha provocado un aumento extraordinario de las estadísticas analizadas. De esta manera, en la localidad se han registrado 347 ERTE y 4.245 trabajadores perjudicados en el año 2020, mientras que en las anualidades anteriores los máximos se produjeron durante la crisis económica inmobiliaria, con cifras muy inferiores a las actuales. Según su causa, el 78,4% de los ERTE y el 56,7% de los empleados afectados de 2020 son de fuerza mayor, de modo que se relacionan directamente con el impacto de la pandemia.

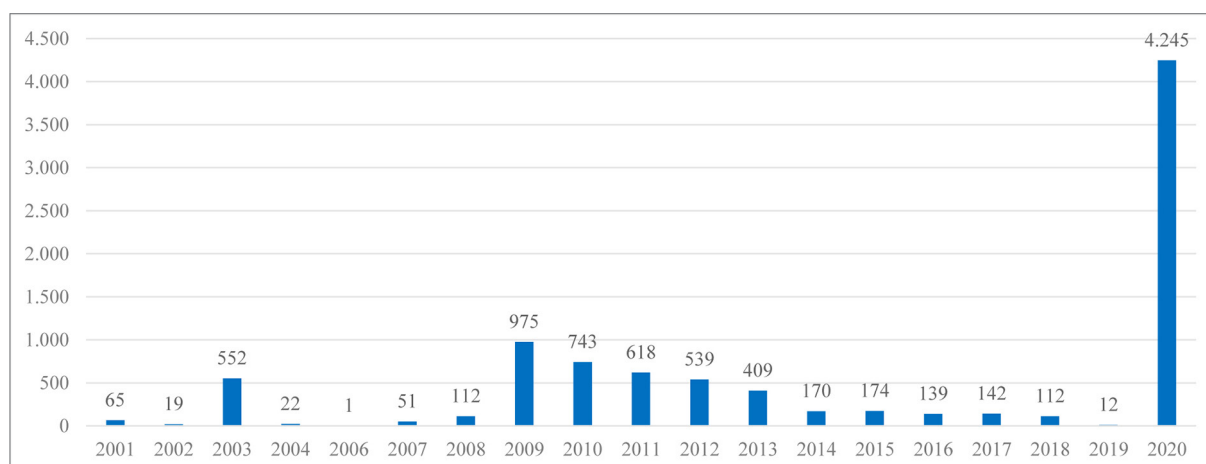
Figura 5. Evolución del número de ERTE en Riba-roja de Túria entre los años 2001 y 2020



* Los datos de 2020 comprenden hasta el 30 de junio

Fuente: Información proporcionada por LABORA. Elaboración propia

Figura 6. Evolución del número de trabajadores afectados por ERTE en Riba-roja de Túria entre los años 2001 y 2020



* Los datos de 2020 comprenden hasta el 30 de junio

Fuente: Información proporcionada por LABORA. Elaboración propia

3.3.4. Medidas económicas

La Administración pública local ha desarrollado diferentes acciones destinadas a mitigar o resolver las dificultades surgidas en el ámbito económico y laboral. En este sentido, se realizó una significativa redistribución del presupuesto municipal, y se priorizaron partidas de mayor urgencia y necesidad, con modificaciones que ascendieron a 3 millones de euros. Destaca la puesta en marcha de una partida de 670.000 euros destinada a la concesión de ayudas directas municipales dirigidas a autónomos, comercios, profesionales y microempresas perjudicadas por la incidencia de la pandemia (A4). Además, durante el estado de alarma, el Ayuntamiento paralizó varias tasas y aplazó el pago de diversos impuestos.

En el mes de abril de 2020, el equipo de gobierno creó una comisión de seguimiento económico del COVID-19. Su función es la implementación de actuaciones para afrontar incidencias socioeconómicas y laborales vinculadas con la pandemia. Además, constituyó un área municipal específica de Economía y Hacienda, y habilitó un servicio telefónico de asesoramiento laboral. En el mes de mayo, el pleno aprobó la elaboración de un plan municipal con la finalidad de potenciar la participación de las pequeñas y medianas empresas (pymes) y los profesionales o autónomos de Riba-roja de Túria en la licitación de los contratos públicos (Ayuntamiento de Riba-roja de Túria, 2021a).

El “Plan RibActiva” es un programa municipal destinado al fomento de la economía y el empleo en Riba-roja de Túria (A4). Comprende las siguientes líneas de ayudas económicas directas: “RibActiva Impulsat”, enfocada a autónomos y microempresas que tuvieron que cerrar sus negocios como consecuencia del estado de alarma; “RibActiva Consolida’t”, dirigida a establecimientos comerciales minoristas y otros pequeños negocios que redujeron su facturación en marzo y abril; “RibActiva Emprén”, destinada a autónomos y profesionales del comercio minorista que iniciaron su actividad entre enero y octubre de 2020; y “RibActiva Col·labora”, para autónomos colaboradores de comercios minoristas que presentan servicios al consumidor final. La cuantía de las ayudas por beneficiario oscila entre los 500 y 2.000 euros.

Finalmente, los entrevistados del Área de Comercio (A2), destacaron el desarrollo de las siguientes campañas municipales de incentivos al consumo en el comercio local: “Col·le Xec”, mediante la concesión de ayudas económicas destinadas a la adquisición de material y accesorios escolares en comercios minoristas de Riba-roja de Túria; “Cheque Bebé +”, que otorga incentivos a las familias con hijos nacidos entre el 14 y 30 de junio de 2020, destinados a la compra de enseres para el cuidado del menor en negocios locales; y “Rasca&Guanya”, donde se reparten rascas con premios económicos entre los clientes que adquieran productos en los establecimientos adheridos a esta campaña, para su posterior canjeo en otros comercios locales participantes.

3.4. La reacción institucional: el Ayuntamiento

La Administración pública local ha implementado diferentes medidas con el objeto de mitigar y resolver los efectos de la pandemia. El Ayuntamiento constituyó el 12 de marzo de 2020 un Comité

de Seguimiento del COVID-19, integrado por las autoridades municipales y sanitarias, así como por el personal técnico concernido en la materia. Sus propósitos son gestionar de manera eficaz esta situación extraordinaria, y establecer actuaciones adaptadas a las indicaciones que dictaminan las autoridades competentes. De la misma manera, en el inicio de la crisis, el Consistorio puso en marcha el programa “El teu Ajuntament amb tu”, en el que se enmarcan las numerosas actuaciones adoptadas por el Ayuntamiento complementarias a las establecidas por otras administraciones (Ayuntamiento de Riba-roja de Túria, 2021a). Las diferentes áreas municipales han implantado planes de contingencia y proyectos para mejorar la actual situación, y se han efectuado obras en los edificios públicos para su adaptación a los protocolos establecidos (A1, I8).

El Ayuntamiento ha ejecutado planes y programas de carácter transversal. Destaca el “*Plan de Choque Desinfecta*”, destinado a la desinfección integral del municipio (A8). Este plan comprende la limpieza de espacios públicos, principalmente los entornos urbanos con mayores concentraciones de población, las calles y plazas, los edificios y vehículos municipales, así como el transporte público. Estas actuaciones se han complementado con la colaboración voluntaria de tractoristas y agricultores de la localidad, que han contribuido en las desinfecciones de viales (E1). Del mismo modo, la Policía Local se ha adaptado a las dinámicas derivadas de la pandemia. Se ha aumentado la presencia y vigilancia en determinados espacios, con el objeto de controlar el cumplimiento de las restricciones y normativas establecidas (A5, I14). La función de los medios de comunicación locales, como la radio o televisión municipales, ha sido esencial para la transmisión de contenidos a la población durante el confinamiento. Las redes sociales han adquirido una relevante importancia como medio de información actualizado y de participación ciudadana (A9, I5).

Según recoge la página web del Consistorio (Ayuntamiento de Riba-roja de Túria, 2021a), el presupuesto municipal del año 2021 se sitúa en 32 millones de euros, de los que 1,4 se destinan a actuaciones de carácter transversal dirigidas específicamente a la lucha contra el COVID-19, enfocadas en áreas como Educación, Sanidad, Limpieza o Comercio. Otras partidas destacadas se centran en el fortalecimiento de las políticas sociales para mitigar la situación de las personas de mayor vulnerabilidad, así como en el fomento económico, el empleo y la formación. Además, se ha aprobado una congelación de los impuestos y las tasas municipales.

3.5. La reacción de la sociedad local

Las limitaciones y restricciones de movilidad establecidas, principalmente durante el periodo de confinamiento, han conllevado en la actualidad una mayor concienciación medioambiental y sensibilidad por la población hacia los espacios abiertos y los entornos naturales próximos, entre los que destaca el Parque Natural del Túria (A2, E2, I4). Numerosos habitantes han desarrollado hábitos y prácticas saludables, de manera que, en la desescalada y los meses posteriores, se ha detectado un aumento del uso de los carriles bici municipales, de los paseos y senderos peatonales o senderistas, así como de la realización de actividades deportivas y otras prácticas al aire libre (A8, I3). La ciudadanía valora en mayor medida el estado y el mantenimiento del viario y mobiliario urbano, de las áreas verdes municipales, y de las instalaciones y los espacios de uso público (A1). Asimismo, se ha detectado un descenso del número de usuarios del transporte público a favor del vehículo particular y carril bici. Según la información proporcionada por el Ayuntamiento (I6), en septiembre de 2020 se ha registrado una reducción de 5.530 viajeros de los autobuses municipales en relación a la misma mensualidad del año anterior. La principal causa que se contempla es el temor al contagio, ya que los usuarios en ocasiones optan por utilizar vehículos particulares y otros medios de transporte individual.

El municipio ha registrado, tras el estado de alarma, un aumento poblacional en áreas de urbanizaciones y segundas residencias, así como en ámbitos rurales, núcleos diseminados y casas de campo (A1, A8, A11-13, I13). Este incremento es debido a los desplazamientos de habitantes provenientes de áreas urbanas a estos espacios de menor aglomeración de la localidad, dada la cercanía de la ciudad de Valencia y su área metropolitana a Riba-roja de Túria. Estos sectores del término, que anteriormente se utilizaban de manera discontinua en periodos vacacionales o fines de semana, en la actualidad se han convertido en ámbitos a los que se han trasladado numerosos habitantes para residir en búsqueda de espacios al aire libre, una mayor proximidad a áreas naturales, y una mejora de la calidad de vida (A2, A8). Además, se advierte un interés promocional por nuevas zonas residenciales y la construcción de unifamiliares (I8).

Los agentes sociales han emprendido acciones dirigidas a paliar el impacto de la crisis. Las asociaciones y entidades locales han focalizado sus esfuerzos en reducir la incidencia de la pandemia y ayudar a la sociedad (A9). La crisis ha hecho aflorar la solidaridad de los habitantes y colectivos municipales. De este modo, durante el estado de alarma, numerosos vecinos y empresas elaboraron y repartieron material de protección y ayudaron a los colectivos poblacionales de mayor vulnerabilidad (A6). También se realizaron donaciones de alimentos por parte de los comercios locales (A2, B3), se efectuaron recaudaciones por los clubes deportivos (A10), y se ofreció alojamiento a personas en riesgo de exclusión (I9). En definitiva, se constata el surgimiento de multitud de iniciativas voluntarias en la sociedad, destinadas a apoyar a los habitantes más vulnerables, a la creación de redes de colaboración, y a mitigar las desigualdades existentes.

Figura 7. Procesos y dinámicas derivadas del COVID-19 en Riba-roja de Túria



Elaboración propia

4. Discusión de resultados

El impacto de la pandemia y la efectividad de las acciones implementadas varían en función de las particularidades de cada ámbito territorial. Sin embargo, la magnitud del COVID-19 es global, por lo que es posible identificar dinámicas comunes en las áreas urbanas de las coronas metropolitanas a partir de su estudio en Riba-roja de Túria, y de este modo, plantear estrategias conjuntas dirigidas a conseguir modelos territoriales más resilientes y equilibrados.

La crisis ha agravado y evidenciado diversas problemáticas y debilidades de los modelos de desarrollo territorial y de los sistemas sanitario, económico y social de las ciudades. El actual escenario motiva a reflexionar sobre las formas de vida de la población y a plantear estrategias dirigidas a responder a la realidad del COVID-19, con objeto de conseguir espacios urbanos más resilientes, inclusivos, sostenibles y habitables. En este sentido, la crisis representa una oportunidad para analizar los vínculos entre la planificación urbana, el espacio público y el bienestar (Giglia, 2020), y debe abordarse desde la coordinación de múltiples disciplinas y con la participación de las diferentes administraciones públicas.

La pandemia ha impactado en la percepción y usos de los espacios públicos. Los habitantes muestran una mayor sensibilidad hacia los lugares peatonales y abiertos, el estado del viario y mobiliario urbano, y las instalaciones públicas. En consecuencia, la planificación urbana se focaliza actualmente en la mejora de la calidad formal y salubridad de estos lugares, con objeto de conformar ciudades sostenibles, saludables e inclusivas. De la misma manera, el distanciamiento social comporta la necesidad de ampliar los espacios y senderos peatonales o ciclistas, y dotarlos de los elementos de accesibilidad necesarios para su uso por la totalidad de los ciudadanos. De hecho, en la localidad de estudio se han realizado en los últimos meses diversas actuaciones municipales centradas en el aumento de lugares lúdicos al aire libre y de los espacios peatonales.

Asimismo, la crisis conlleva un aumento de los desplazamientos de habitantes provenientes de espacios urbanos hacia áreas de urbanizaciones, diseminados y ámbitos rurales. Se producen movimientos desde las grandes ciudades y áreas metropolitanas a municipios de menor densidad poblacional en búsqueda de lugares al aire libre, espacios naturales y mayor bienestar. Los estudios de Llorente-Adán y Ruíz-Tricio (2020) y Molina, de Pablo, Milán y Caparrós (2020) señalan que la pandemia y el confinamiento han conllevado una mayor apreciación y valoración de la calidad de vida que ofrecen los pequeños núcleos de población y las áreas rurales. Este proceso se constata en el municipio de Riba-roja de Túria, con un incremento poblacional en urbanizaciones, áreas de segundas residencias y núcleos diseminados.

La crisis incide en el tejido productivo y las economías locales. Durante el confinamiento, un considerable número de empresas redujeron su actividad o cesaron de manera definitiva, con la consecuente reducción del empleo y la contracción de la economía. La paralización de las actividades no esenciales generó una sensación de incertidumbre entre las empresas, con un aumento del desempleo y los ERTE, así como un descenso de la contratación, tal y como se ha verificado en la localidad de estudio. El impacto más destacado se detecta en las actividades no esenciales y dependientes de la presencialidad, con una significativa virulencia en el sector laboral más precario y en la economía informal. Además, afectó con más intensidad a sectores con mayor cantidad de pequeñas y medianas empresas y trabajadores autónomos (Garamendi, 2020).

Las administraciones han impulsado diferentes actuaciones dirigidas a las mejoras del mercado laboral. Es necesario activar la economía local y establecer estrategias a medio y largo plazo. Algunas posibles acciones se focalizan en el impulso a las pymes y a sectores como el pequeño comercio, así como en la adopción de herramientas de protección social para los habitantes dedicados a la economía informal. Además, es esencial fomentar un modelo de producción sostenible y responsable, y alcanzar economías diversificadas y resilientes.

En referencia al sector agrario, las políticas públicas anti-COVID en España favorecieron la agroindustria en detrimento de la agricultura familiar (Gascón, 2020). Las principales restricciones que afectaron a este ámbito durante el confinamiento fueron el cierre de los mercados no sedentarios de venta directa, la prohibición de los desplazamientos a los huertos de autoconsumo, y la pérdida de dos de sus vías de comercialización: los comedores escolares y los servicios HORECA (Hoteles, Restaurantes y Cafeterías). En el análisis del caso de estudio se confirma la generación de beneficios entre los agricultores profesionales durante el confinamiento, mientras que la agricultura de autoconsumo registró pérdidas en este periodo.

En el sector industrial, el mayor impacto económico ocurrió en las primeras semanas desde la declaración del estado de alarma. La incidencia de la pandemia ha dependido en gran medida de la actividad industrial considerada. En sectores esenciales como la alimentación, el transporte o la logística, el impacto es menor, tal y como se ha refrendado en Riba-roja de Túria. Sin embargo, en otros ámbitos como la automoción, los efectos han sido más destacados y prolongados. Actualmente las previsiones son positivas.

El comercio local es uno de los sectores más perjudicados, aunque se constatan diferencias en función de la tipología del establecimiento y el periodo considerado. Durante el confinamiento, los comercios

esenciales registraron un aumento de sus ingresos, mientras que el resto de ámbitos disminuyeron su facturación. En la desescalada se produce un aumento generalizado de las ventas en el comercio local (García, 2020). En la actualidad se detecta una mayor concienciación hacia el pequeño comercio. La hostelería y el turismo también han sufrido un impacto significativo. Estas dinámicas se han identificado en la localidad de estudio. Diversos estudios afirman que los sectores económicos afectados en mayor medida por la crisis son el comercio, la restauración, la hostelería, el turismo o la cultura (González, Armesto, Sánchez y Lago, 2020; López y Durán, 2020).

La crisis supone un incremento de la pobreza y de las desigualdades existentes, y, por tanto, del riesgo de exclusión. Se ha producido un aumento de la brecha social y se evidencia una mayor vulnerabilidad en diversos colectivos poblacionales, como los mayores, desempleados, dependientes, personas sin hogar, mujeres víctimas de violencia de género, migrantes, menores sin acceso a Internet, personas con diversidad funcional, y habitantes dedicados a la economía informal. De hecho, la pandemia en Riba-roja de Túria ha incidido con mayor virulencia en los mencionados colectivos. Según el informe anual de desigualdad que publica Oxfam Intermón (2020), el COVID conlleva un aumento de la pobreza severa en España.

La población que reside en áreas de mayor vulnerabilidad tiene dificultades para acceder a los bienes y servicios públicos esenciales. Por ello, es conveniente que las administraciones competentes inviertan en la mejora de los espacios marginales y faciliten la cobertura de las necesidades básicas a la totalidad de la ciudadanía durante la crisis, en aspectos como el abastecimiento de agua, el alojamiento o el suministro eléctrico. Asimismo, la pandemia visibiliza los problemas de habitabilidad que padecen numerosas personas. El hacinamiento en hogares de escasa calidad, la infravivienda o el tamaño de las propias casas, complican el distanciamiento social e incrementan el riesgo de contagio. La inestabilidad residencial, las dificultades para adquirir una vivienda o los precios abusivos del mercado empeoran la situación. En consecuencia, sería interesante el diseño de hogares con espacios abiertos, y establecer mecanismos que faciliten el acceso a viviendas públicas y asequibles a la población más vulnerable.

Durante el confinamiento y el periodo posterior, la población ha desarrollado hábitos saludables, con un aumento del uso de los carriles bici, de los senderos peatonales, y de la realización de prácticas al aire libre y deportivas. Además, la pandemia conlleva un cambio de los hábitos de movilidad, con un descenso del número de usuarios de transporte público a favor del vehículo privado o particular. El artículo de Medina (2020) analiza la evolución de viajeros de transporte público durante el año 2020 en diversas ciudades españolas, en las que se constata un acusado descenso respecto a la anterior anualidad. Las principales causas que se contemplan son el temor al contagio, la implantación del teletrabajo, la educación a distancia, las pérdidas de empleo, o el cierre ocasional de los establecimientos de ocio. Estas dinámicas se verifican en la localidad de estudio. Por ello, es esencial plantear la futura movilidad sostenible de las áreas urbanas, mediante el impulso de los recorridos a pie y en bicicleta, así como el uso del transporte público. Los sistemas de transporte sostenibles se configuran como elementos fundamentales en los actuales espacios urbanos.

Las limitaciones de movilidad establecidas durante el estado de la alarma conllevaron una mayor sensibilización y preocupación social hacia el medioambiente y la sostenibilidad. La ciudadanía valora en mayor medida los entornos naturales y los espacios abiertos. La investigación de Venter *et al.* (2020) constata un aumento del número de caminantes, senderistas y ciclistas en los espacios verdes durante la crisis, así como de la actividad peatonal en los parques urbanos y áreas protegidas. El estudio de Grima *et al.* (2020) señala que las visitas a las áreas naturales y espacios verdes urbanos y periurbanos aumentan como consecuencia de las restricciones derivadas de la pandemia. En el caso de Riba-roja se observa un mayor disfrute y valoración hacia el Parque Natural del Túria por parte de los habitantes. En este sentido, el trabajo de Venter, Barton, Gundersen, Figari y Nowell (2020) destaca el valor de la naturaleza urbana como una infraestructura de resiliencia durante la crisis. Por ello, es recomendable el aumento de las áreas verdes y zonas naturales en las ciudades, ya que aportan beneficios para la salud física y mental de los habitantes, y contribuyen a la preservación de la biodiversidad.

La pandemia incide en la dinámica habitual de los centros de enseñanza. En el confinamiento se produce el cierre obligatorio de los colegios y otras entidades educativas, que tuvieron que realizar significativos esfuerzos para adaptarse a la situación y coordinarse con las familias y la Administración. La adaptación realizada por el profesorado y el personal de los centros educativos durante este periodo se analiza en diversos estudios, como el de Díez y Gajardo (2020), el de Aznar (2020) o el de Joshi, Vinay y Bhaskar (2021). En las entrevistas mantenidas con los directores de los centros educativos de Riba-roja de

Túria se constataron estos procesos. En el confinamiento se detectaron problemáticas relacionadas con la brecha digital y formativa. Diversos alumnos, principalmente en las familias de menor capital sociocultural y socioeconómico, mostraron dificultades para continuar las clases de modo virtual al no disponer de recursos digitales, herramientas culturales, o condiciones materiales, personales o emocionales propicias (Cabrera, 2020; Cabrera, Pérez y Santana, 2020; García, Rivero y Guerra, 2020). En el presente curso se ha producido la vuelta a la presencialidad, lo que supone un esfuerzo conjunto para el cumplimiento de las restricciones establecidas.

La crisis requiere un mayor uso de las herramientas tecnológicas, tanto en el ámbito personal como profesional. Se consolidan elementos como el teletrabajo, el comercio electrónico, la educación *online*, la teleasistencia, o las relaciones sociales a distancia. De este modo, la digitalización es una aliada contra la pandemia y ofrece una amplia diversidad de oportunidades, pero también genera desequilibrios (Colom, 2020). En este sentido, el COVID-19 incrementa las desigualdades socioeconómicas, y acentúa la brecha digital, entendida no únicamente como el acceso y uso desigual a las nuevas tecnologías, sino también como la exclusión digital de ciertos colectivos. Los grupos más afectados son los mayores y los habitantes con mínimos recursos económicos y/o con un bajo nivel sociocultural. Estos procesos se corroboran en la localidad de análisis. Ante la diversidad de brechas generadas por el distinto uso de las nuevas tecnologías, las autoridades competentes deben potenciar la cobertura y accesibilidad a las herramientas tecnológicas y a Internet, así como fomentar la alfabetización, la formación y la inclusión digitales.

De la misma manera, la pandemia acelera la implantación de nuevas tecnologías y el proceso de digitalización en el ámbito empresarial, debido a la necesidad de flexibilización laboral y el auge del teletrabajo (Oubiña, 2020). El empleo a distancia permitió a determinadas empresas mantener su actividad. Diversos estudios señalan que las entidades que han implementado el teletrabajo o el comercio *online* han amortiguado mejor los efectos de la pandemia (Izquierdo y Vicente, 2020). Sin embargo, aquellas entidades que no disponen de las infraestructuras necesarias se han visto notablemente perjudicadas. Este proceso es patente en el ámbito del comercio electrónico en Riba-roja de Túria, donde el uso de medios digitales supone un elemento diferenciador para afrontar la crisis.

Las administraciones públicas implementan medidas y ayudas dirigidas a mitigar y resolver las adversidades, desigualdades y problemáticas derivadas de la pandemia. En concreto, las entidades locales realizan significativos esfuerzos en el desarrollo de acciones para mejorar la actual coyuntura, lo que ha facilitado la potenciación de sinergias y del trabajo colaborativo. Las medidas implementadas por el Ayuntamiento de Riba-roja de Túria han sido esenciales para mitigar los impactos derivados de la pandemia. El análisis efectuado por Analistas Financieros Internacionales (2020), especifica iniciativas desarrolladas por diferentes entidades locales para paliar los efectos de la crisis sanitaria en materia administrativa, financiera y económica. Del mismo modo, el estudio de Kavan (2021) destaca la eficacia de las medidas implementadas por gobiernos regionales y locales para mitigar el impacto de la crisis en los grupos poblacionales más vulnerables.

Finalmente, es necesario señalar la incidencia de la pandemia en el estado emocional de la población. El estudio de Sandín, Valiente, García-Escalera y Chorot (2020) analiza la incidencia psicológica del confinamiento en una muestra de un millar de habitantes, donde se constatan elevados niveles de impacto emocional relacionados con el temor al contagio, el aumento de la preocupación, el estrés o la ansiedad. No obstante, la crisis también ha hecho aflorar la solidaridad de la sociedad, con el surgimiento de multitud de iniciativas voluntarias, y de apoyo y colaboración entre la ciudadanía (Ponce, 2020). En Riba-roja de Túria se producen numerosas acciones solidarias entre la sociedad, dirigidas a paliar los impactos de la pandemia y las desigualdades. En consecuencia, la crisis ha propiciado el auge de iniciativas ciudadanas de colaboración, y ha reforzado los vínculos comunitarios. Por ello, es fundamental mantener estas redes e interrelaciones sociales, y fomentar la participación ciudadana en la planificación del territorio.

5. Conclusiones

La crisis sanitaria del COVID-19 ha supuesto un significativo impacto en la sociedad, y ha incidido de manera destacada en los procesos y dinámicas económicas y sociales de los territorios, principalmente en las áreas urbanas. Las administraciones e instituciones públicas han liderado una respuesta inmediata en el contexto de la crisis, mediante la adopción de medidas para conseguir una rápida recuperación. No obstante, el problema de coordinación y cooperación institucional entre los niveles de administración en

España representa uno de los obstáculos más significativos en el ámbito de la gobernabilidad. Una situación de emergencia compleja como la del COVID-19 requiere la incorporación de cambios organizativos y relacionales en las formas de gestión y gobernanza tradicionales. Por ello, es necesario conseguir una cooperación y acordar una visión compartida entre la totalidad de niveles y agentes territoriales involucrados, donde los procesos de toma de decisiones deben basarse en un modelo de gobernanza compartida. En este sentido, aspectos como la participación y colaboración entre los diferentes actores adquieren cada vez una mayor importancia.

Las administraciones locales tienen un papel destacado y crítico en la gestión de este tipo de emergencias. En esta investigación se ha analizado y se ha sistematizado el impacto de la pandemia en el municipio valenciano de Riba-roja de Túria. Esta localidad constituye uno de los focos de atracción socioeconómica más significativos del AMV. El Ayuntamiento ha requerido la actualización de su Plan Estratégico, con la finalidad de realizar su correcto seguimiento adaptado a la actual coyuntura.

La crisis ha generado efectos inesperados y problemáticas de diferente tipología en el municipio. En relación al sector sanitario se produce el cierre del centro de salud en el confinamiento. No obstante, dada la transversalidad de este sector, el Área de Sanidad del Ayuntamiento interactuó en mayor medida con el resto de departamentos municipales durante este periodo. Del mismo modo, la crisis también ha incidido en el ámbito económico. Durante los primeros meses de la pandemia se registró un aumento del desempleo y de los ERTE en el municipio, así como un descenso de las contrataciones. Las actividades más perjudicadas fueron las no esenciales y las vinculadas con la economía informal. Esta crisis económica generó una sensación de incertidumbre generalizada, con un aumento del riesgo de exclusión, una mayor vulnerabilidad y brecha social, así como la generación de cambios rápidos de retorno complicado.

La pandemia ha supuesto además el incremento de las desigualdades en el territorio y un aumento de la brecha digital, donde actualmente se constata una mayor vulnerabilidad en determinados colectivos poblacionales. Estos desequilibrios en el acceso y uso a las nuevas tecnologías en la sociedad inciden en las diferentes actividades y sectores, como el empresarial, el educativo, o el social.

Los agentes territoriales han efectuado acciones para mitigar la incidencia de la pandemia. Los habitantes y las asociaciones locales han emprendido iniciativas de distinta tipología con objeto de ayudar a las personas más perjudicadas y mejorar los efectos de esta situación extraordinaria. Tras el periodo de confinamiento, la ciudadanía otorga un mayor valor a los entornos naturales y los espacios abiertos, por lo que se constata la llegada de nuevos residentes a áreas de menor densidad. Además, existe una mayor concienciación medioambiental.

Ante estas situaciones y adversidades, la Administración pública local ha realizado un significativo esfuerzo dirigido al correcto diseño e implementación de estrategias, mediante la implementación de restricciones y medidas de prevención, así como la adopción de nuevos mecanismos de gobernanza. En el ámbito de la adaptación organizativa y la gestión de la crisis, es necesario destacar la constitución del Comité de Seguimiento del COVID-19 por parte del Ayuntamiento de Riba-roja, con el propósito de gestionar de forma adecuada y eficaz los impactos sobrevenidos. Asimismo, se puso en marcha un programa municipal en el que se integran las medidas implementadas para proteger el interés general de la ciudadanía, y se desarrollaron planes de contingencia desde las diferentes áreas y dependencias. Otros aspectos clave en la gobernanza de la pandemia en el Consistorio fue la adaptación y ampliación de los servicios esenciales a las nuevas necesidades, la reorganización del personal, la estrategia comunicativa al conjunto de la organización y la ciudadanía, así como la colaboración con otros actores sociales. Además, el impulso de la actualización del Plan Estratégico, a través de la realización de entrevistas a actores locales y la participación de los técnicos municipales, ha contribuido a fortalecer la gobernanza territorial en Riba-roja de Túria. En el ámbito económico, el Ayuntamiento proporcionó ayudas directas a empresas y profesionales perjudicados por la crisis. También destacan las campañas destinadas a incentivar el comercio local, así como la redistribución del presupuesto municipal. Finalmente, en el apartado social se observa una mayor atención hacia los colectivos más vulnerables. En definitiva, la actual coyuntura ha puesto de manifiesto la función primordial de las entidades locales como agentes de primera línea en la respuesta a la pandemia.

La incidencia de la crisis difiere en función de las particularidades de cada territorio. No obstante, el carácter global y sistémico de la pandemia ha permitido detectar dinámicas comunes y compartidas con ámbitos de rasgos similares al municipio de estudio. De esta manera, la presente investigación, desarrollada desde el ámbito local, ha posibilitado conocer los procesos acontecidos en las áreas urbanas como

consecuencia de la crisis. Los resultados obtenidos permiten la identificación y la propuesta de estrategias destinadas a conseguir modelos territoriales más resilientes e inclusivos, y de este modo, hacer frente de manera eficaz a las problemáticas y necesidades derivadas de esta situación. De hecho, se han planteado posibles líneas de acción destinadas a alcanzar modelos urbanos adaptados a la realidad del COVID-19.

En función de la investigación realizada, es posible la definición de futuras líneas de trabajo que son objeto de interés. En primer lugar, sería conveniente la aplicación del mismo estudio en el periodo de un año, con el propósito de valorar la situación de la pandemia en el municipio, y de este modo, identificar los procesos acontecidos. El seguimiento del Plan Estratégico de la localidad facilitará conocer la evolución de las dinámicas detectadas. En segundo lugar, sería necesario analizar en los próximos meses las iniciativas desarrolladas por la Administración de Riba-roja de Túria dirigidas a paliar los efectos de la crisis. De esta manera, será posible compararlas con las estrategias propuestas en este estudio y valorar su grado de eficacia y consecución. Finalmente, sería interesante la implementación del método de trabajo de esta investigación en diferentes ámbitos, principalmente en áreas rurales, con el objetivo de determinar los procesos generales derivados de la pandemia en estos espacios y, en consecuencia, proponer estrategias destinadas a conseguir territorios más resilientes.

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Reseña de *Manual dels hàbitats de Menorca. Hàbitats terrestres*

Review of *Manual dels hàbitats de Menorca. Hàbitats terrestres*

Francesc Xavier Roig-Munar¹ 



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Hàbitat es el espacio concreto de un conjunto de especies adaptadas a su entorno, y donde el conjunto de hàbitats se convierte en un paisaje. Por tanto el hàbitat es el resultado de determinadas características geoambientales, tanto físicas como biológicas, que permiten distinguirlos y clasificarlos como espacios resultado de la suma de comunidades de seres vivos y de sus condiciones abióticas. En el caso de Menorca, el conocido como paisaje mosaico, creado en gran parte por la mano del hombre, se encuentra compuesto por diferentes hàbitats. Para la ciencia es de vital importancia clasificar los hàbitats, a la vez que esta clasificación permite confeccionar un mapa de hàbitats, sus interrelaciones y el cálculo de sus superficies, así como la relación con otros espacios, formas y procesos que permiten su planificación y su correcta gestión. La identificación de estos hàbitats se asocia generalmente a sus coberturas vegetales, ya que estos suponen un buen indicador de las condiciones geoambientales de los diferentes espacios, a diferentes escalas y a diferentes alturas, ya sea relacionados a condiciones geológicas, geomorfológicas, climáticas y/o antrópicas. Las comunidades vegetales integran los parámetros geoambientales

que permiten erigirse como indicadores y darles un valor, siendo su presencia o ausencia una característica de cada hàbitat y de cada lugar.

El libro *Manual de los hàbitats de Menorca* ofrece una aproximación precisa a la diversa realidad geoambiental de la isla, mediante la descripción, interpretación e ilustración detallada de sus hàbitats, organizados según la adaptación de la codificación internacional *CORINE Biotopes Manual*. El manual presenta 31 hàbitats diferentes, todos ellos terrestres, desde la zona litoral hasta las zonas de tierras agrícolas y antrópicas. Destaca entre todos los hàbitats el estuarino, que es una morfología propia de zonas mareales ausente en Baleares.

Metodológicamente la elaboración del manual se ha basado en la descripción y clasificación de los hàbitats, donde cada hàbitat se ha descrito mediante la nomenclatura y con su relación con otros hàbitats. Parte de las descripciones se han basado en la clasificación de las comunidades vegetales, y otros criterios de interacción como la presencia de hàbitats mixtos, y la correspondencia con hàbitats CORINE. Se realiza una descripción detallada del hàbitat y su variabilidad y caracterización ecológica, aportando información de cada hàbitat sobre

¹ Consultor Ambiental. Dr. en Geografía y Dr. en Geología. C/ Carritxaret, 18 - 6, 07749, es Migjorn Gran, Menorca, España. xiscoroig@gmail.com

sus problemas de conservación, planificación, gestión y uso, a la vez que se presentan propuestas de gestión que los autores consideran adecuadas, así como las observaciones más relevantes. Por último de cada hábitat se realiza un exhaustivo listado de la flora característica, y en el caso de las cavidades se realiza un listado de su fauna.

Los tipos de hábitats descritos presentan un grado de detalle elevado, tanto es así que se llegan a describir espacios que hasta el momento eran obviados por investigadores por no adquirir valores ambientales. En este caso se describen ciudades, pueblos y núcleos urbanos (polígonos, entornos urbanos, infraestructuras...), parques urbanos, huertos y jardines..., entre otros. A pesar del nivel de detalle que ofrece, se echan en falta datos relevantes como la geología o la geomorfología aso-

ciada a cada hábitat, y que suponen una variable importante para entender el resultado final del mosaico paisajístico de la isla. También se echa en falta un mapa donde se reflejen los hábitats descritos.

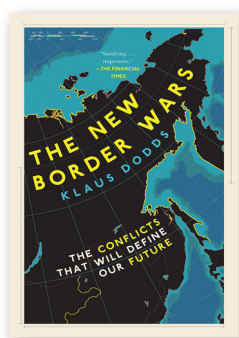
El Manual, con muy buena presentación y diseño, se erige como una magnífica herramienta en el ámbito de Menorca, no solo focalizada en la investigación, sino también en la planificación y gestión del territorio, convirtiéndose en el manual de referencia para la futura planificación y gestión territorial. Este manual, editado por la administración pública, actualmente solo se encuentra editado en papel, y su coste puede resultar excesivo como herramienta de gestión con la que tendrían que contar todos los servicios de urbanismo y medio ambiente de las administraciones locales de la isla.

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Reseña de *Border Wars. The conflicts that will define our future*

Review of *Border Wars. The conflicts that will define our future*

Xavier Ferrer Gallardo¹ 



Autor: Klaus Dodds

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Escrito por Klaus Dodds, profesor de geopolítica de la Universidad Royal Holloway de Londres, este texto es algo así como un manual de instrucciones para viajar al futuro de los conflictos geopolíticos y para empezar a vislumbrar un conjunto de nuevas guerras fronterizas cuyas bases se están gestando en la actualidad. Es, en otras palabras, una suerte de guía para interpretar las luchas de poder sobre el territorio que van a condicionar las relaciones internacionales en los años venideros. Uno de los mensajes centrales del libro y que conviene tener en cuenta es este: en la actualidad, y de la mano del desarrollo tecnológico, el espacio para la disputa potencial se está ensanchando a gran velocidad. En consecuencia, en el futuro cercano las controversias fronterizas podrán desencadenarse en un abanico de puntos cada vez más amplio: desde en las cada vez menos insondables profundidades de las aguas internacionales ricas en minerales, hasta en el espacio ultraterrestre -también fuente potencial de apetitosos recursos estratégicos-, pasando por las zonas del planeta más contundentemente azotadas por el cambio climático (glaciares derretidos, polos en deshielo, regiones inundadas debido al aumento del nivel del mar, etc.).

El libro de Dodds también reserva espacio para visitar el trasfondo histórico de escenarios fronterizos (terrestres y marítimos) que se antojan en eterna disputa, como los de Taiwán o Palestina, o los de la antigua colonia española del Sahara Occidental (p. 145). En relación a este último escenario, Dodds recuerda cómo, mientras (no) llega el referéndum que de acuerdo con los establecido por Naciones Unidas debería desatascar el conflicto, el territorio en disputa se halla dividido en dos partes separadas por una *buffer zone*: la sección occidental controlada por Marruecos con acceso a fosfatos y a recursos pesqueros, y la sección oriental controlada por el Frente Polisario y sin acceso a dichos recursos. En esta tesitura, Dodds argumenta que la Unión Europea – y en especial los dos antiguos colonizadores, España y Francia- ha sido reacia a presionar en favor del referéndum a fin de no agriar su relación con Marruecos, que resulta esencial en el marco de las estrategias de control de las migraciones y el tráfico de drogas (p. 161).

Redactado con un estilo a caballo entre el manuscrito académico y el texto divulgativo, el libro se estructura en torno a nueve capítulos. Estos cubren un amplio espectro de cuestiones concernientes a

1 Departamento de Humanidades, Universidad Pompeu Fabra, España. xavier.ferrer@upf.edu

los nuevos retos de gestión (y fricción) que plantean las líneas de delimitación espacial trazadas sobre mapas: fronteras no reconocidas; fronteras glaciares que se desdibujan en tiempos antropocénicos; tierras de nadie deseadas por muchos; fronteras inteligentes ávidas de datos biométricos; gestión fronteriza en contextos pandémicos; etc. El capítulo que aborda las dinámicas fronterizas en el espacio ultraterrestre resulta particularmente interesante. Se trata de un terreno hasta la fecha poco explorado en el ámbito de los estudios fronterizos.

El libro nos ayuda a recordar hasta qué punto, incluso en la Luna, resulta harto complicado desprenderse de la trampa territorial del Estado-Nación. Es cierto que antes del alunizaje de Armstrong en 1969, los Estados Unidos y la Unión Soviética habían acordado la prohibición de apropiarse de los cuerpos celestes. Efectivamente, el pequeño-gran paso de Armstrong fue realizado en nombre de la humanidad y no en nombre de su país. Sin embargo, seguro que ustedes también recuerdan la icónica imagen de la bandera americana plantada en la Luna. En cualquier caso, el compromiso de no apropiación (de prohibición de reivindicaciones de soberanía) había quedado reflejado en el Tratado del Espacio de 1967 -cuyo clarificador nombre completo es "Tratado sobre los principios que deben regir las actividades de los Estados en la exploración y utilización del espacio ultraterrestre, incluso la Luna y otros cuerpos celestes sobre el espacio ultraterrestre". Debido al contenido de dicho tratado, el estandarte de barras y estrellas clavado en la luna no equivale a un título de propiedad para Washington.

Según el artículo II del Tratado "el espacio ultraterrestre, incluso la Luna y otros cuerpos celestes, no podrá ser objeto de apropiación nacional por reivindicación de soberanía, uso u ocupación, ni de ninguna otra manera". Pero como ironiza Dodds (p. 196), todo era más fácil a finales de los 60, cuando se redactó el tratado y la tecnología era mucho más rudimentaria. Hoy, en plena nueva carrera por la superioridad armamentística en el espacio -y con una rivalidad por el control de los recursos ultraterrestres al alza y con muchos más actores (públicos y privados) participando en el juego-, habrá que ver hasta dónde aguantan las costuras de lo acordado hace seis décadas. La tecnología actual facilita enormemente el acceso y la explotación de recursos mineros situados en cuerpos celestes como la Luna. Y, en este contexto, renunciar a la apropiación (o a la explotación de dichos recursos) representa un ejercicio de contención geopolítica de gran calado. La tentación para reinterpretar lo acordado en el pasado es mayúscula.

Dodds vaticina que, a medida que los estragos de la emergencia climática se vayan acrecentando, las partes de la tierra que sigan siendo habitables -y cuyos recursos sigan siendo explotables- se irán convirtiendo en puntos de creciente presión geopolítica (p.246). En cualquier caso, con independencia de lo que vaya a suceder en aquellos puntos del planeta sobre los que planea la sombra del conflicto fronterizo (Ártico, Antártida, fondos marinos de aguas internacionales, etc.), no debería extrañarnos si alguna de las controversias fronterizas del futuro cercano se libra más allá de los confines de la tierra. El libro de Klaus Dodds ayuda a ponernos en situación.

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Reseña de *Un mar de ciència i coneixement.* *Els seguiments científics del medi marí a Menorca*

Review of *Un mar de ciència i coneixement.*
Els seguiments científics del medi marí a Menorca

Francesc Xavier Roig-Munar¹ 



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El espacio marino y litoral de Menorca ha sido el ámbito menos estudiado y analizado, muy a pesar de ser el más promocionado y reclamado. En este libro, *Un mar de ciència i coneixement. Els seguiments científics del medi marí a Menorca*, se encuentra una extensa y rica recopilación de la información existente sobre los seguimientos del medio marino y litoral. Información que permite conocer mejor el mar que nos rodea y su perímetro terrestre, así como la situación de las diferentes especies y hábitats marinos, y su relación con el hombre para hacer una gestión desde el conocimiento. Tradicionalmente la fauna marina de Menorca había sido estudiada a finales del s. XIX por el botánico Joan Joaquín Rodríguez, con una buena descripción de herbarios de algas. Actualmente se puede decir que en los últimos 120 años la variación ha sido escasa, hecho que informa de la calidad de los fondos marinos de la isla.

A la pregunta, ¿Qué se sabe de la investigación marina de los últimos veinte años en Menorca?, el libro *Un mar de ciència i coneixement. Els seguiments científics del medi marí a Menorca* pretende llenar el vacío de la literatura litoral y marina de la isla. Se ha realizado una importante compila-

ción de los principales estudios y seguimientos realizados en los ecosistemas marinos y litorales. El libro se configura como una base de referencia o indicador para detectar cambios y posibles actuaciones de gestión. La exhaustiva recopilación de la información sobre los seguimientos del medio marino (estudios, informes e investigaciones), permite conocer qué pasa en el medio litoral que nos rodea, la situación de especies y hábitats, sus usos y explotaciones, en aras de hacer una gestión desde el conocimiento. La reciente ampliación de la Reserva de Biosfera hacia el mar, la creación de una nueva reserva marina, y la futura protección marina de la zona del Parque Natural de es Grau, pone en la agenda de Menorca el reto de conservar un mar sin que esto suponga el sacrificio de sus usos y explotación.

El libro expone una situación crítica a corto plazo, donde el desarrollo del modelo litoral de los últimos 50 años está en decadencia, basado en el turismo de sol y playa, y con escasa movilidad de los visitantes. Actualmente el nuevo turismo, con auge de las actividades recreativas marinas, asociadas al turismo residencial, y un incremento de la restauración de proximidad, supone una mayor

¹ Consultor Ambiental. Dr. en Geografía y Dr. en Geología. C/ Carritxaret, 18 - 6, 07749, es Migjorn Gran, Menorca, España. xiscoroig@gmail.com

presión sobre el medio litoral y marino. Medios que hasta ahora no recibían tanta presión y no disponían, ni disponen, de regulación efectiva en toda su extensión. Es por esto que cabe un planteamiento de ordenación y regulación de los usos en el litoral y sus aguas interiores, siendo el libro una buena base de partida. En este libro se permite, a pesar de estar en una isla con un modelo de turismo maduro, no partir del escenario cero, ya que recopila abundante información adquirida en los últimos 25 años. El libro facilita focalizar la gestión basada en la investigación y en el análisis de sus resultados, y no en la simple promoción turística sin evaluación de las consecuencias, como sucede actualmente.

Los capítulos que conforman el libro, 14 en total, abarcan todo el abanico del medio, desde una breve historia de la investigación marina de la isla, como antecedentes de los resultados que sirven de base actual para establecer el punto de partida. Se analiza también la evolución de los espacios naturales marinos de la isla, con una cartografía detallada de cada uno de ellos, pasando de 6.846 Ha protegidas en 1999 a 631.690 Ha en 2019. Otros capítulos exponen el medio físico-químico y la biodiversidad bentónica y de fondos marinos, con su contextualización geológica y morfológica. Destaca el capítulo dedicado a las fanerógamas como ecosistemas estructurantes de diversas comunidades de organismos que presentan elevada biodiversidad. Estas fanerógamas tienen gran trascendencia sedimentológica, básica para el mantenimiento de las morfologías de sistemas playa-duna. Otros capítulos importantes son los dedicados a la fauna; invertebrados, peces, aves marinas, así como tortugas y mamíferos, su relación con el medio y con las presiones. Dentro de esta temática destaca el capítulo dedicado a las especies invasoras del litoral, tratándose de uno de los principales cambios que sufren los ecosistemas, asociado a la interna-

cionalización del transporte marítimo, al cambio climático, o al papel de la suelta incontrolada de estas especies por parte del ser humano, no solo en la isla, sino dentro del ámbito de la cuenca mediterránea. Al capítulo de actividades y presiones, le preceden 12 capítulos básicos para entender el estado actual del medio litoral. Las actividades y presiones son ampliamente analizadas; contaminación de aguas, calidad ecológica, presión náutico-recreativa y presión humana en los sistemas playa-duna. También se analiza su explotación, sus usos turísticos y recreativos, así como la pesca recreativa, mientras que los usos profesionales son analizados mediante apartados de pesca profesional. Dentro de estas presiones destaca el grado de urbanización litoral, como factor de antropización, presión y alteración. Por último, el capítulo 14 realiza una extensa reflexión, basada en los datos recopilados, acerca del futuro del medio litoral de la isla, con una aproximación al crecimiento que han seguido los espacios naturales y sus usos actuales. Así mismo, se reflexiona sobre la relación con el cambio climático, ya que al tratarse de un espacio mediterráneo éste es uno de los mares más amenazados en todos los sentidos.

Por ende, el libro es un buen compendio del estado del litoral de la isla, previo y actual, con buenos datos de evoluciones y tendencias en cada uno de los capítulos tratados. El ejemplar se configura como una base de datos sólida para regular y ordenar los futuros usos ante las más que evidentes amenazas. Aún así este libro, editado por la administración pública, y editado únicamente en soporte papelero, tiene un coste excesivo al ser un compendio de trabajos realizados desde una administración pública o con fondos públicos. A pesar de ello, se trata de una buena herramienta en la futura planificación, gestión y ordenación o reordenación del medio marino y litoral, en incluso en su posible deconstrucción.

Instituto Interuniversitario de Geografía
Universidad de Alicante

Carretera de San Vicente del Raspeig s/n. 03690 - San Vicente del Raspeig - Alicante (España)

Tel.: (34) 965903400 Ext. 3380 - Fax: (34) 965909485

Correo electrónico: investigacionesgeograficas@ua.es

Sitio web: www.investigacionesgeograficas.com