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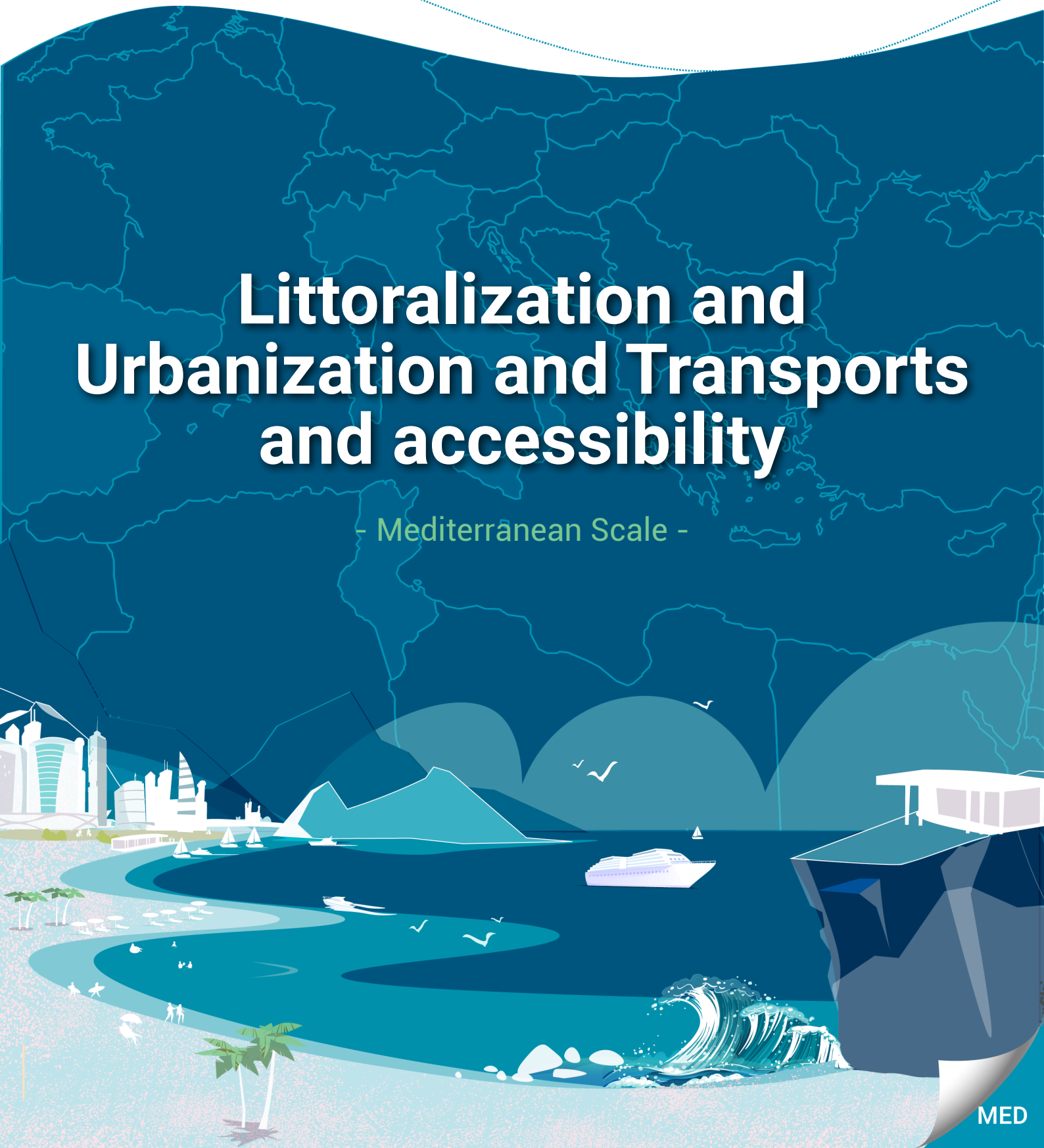
Co-Evolve4BG

Littoralization and Urbanization and Transports and accessibility

- Mediterranean Scale -



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OVERVIEW

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REVIEW

Authors

Ghada Ben AHMED, Master's degree
Faculty of Humanities and Social Sciences of Tunis

Azza GHRAM, PhD in GIS
Faculty of Humanities and Social Sciences of Tunis

Reviewers

Martina BOCCI, PhD
t-ELIKA, Venice – Italy

Harry COCOSSIS, PhD
International consultant

Hatem KANFOUDI, PhD
National Engineering School of Tunis

Editor

Béchir BEJAOUI, PhD

National Institute of Marine Sciences and Technologies
http://www.instm.agrinet.tn/index.php/fr/

Arnaldo Marin ATUCHA, PhD Biology

University of Murcia
https://www.um.es/

Contributors to the report

Béchir Béjaoui, Khouloud Athimen, Mohamed Hellal, Giuliano Tallone, Erica Peroni, Francesca Marconcini, Valentina Cherubini, Paraskevi Chouridou, Maria Chamitidou, Savvas Chrysoulidis, Giorgos Gkiouzepas, Ioanna Papaioannou, Nuria GARCÍA-BUENO, Arnaldo Marin Atucha, Nuria Garcia-Bueno, Pedro Martinez-Banos, Sana Abi Dib, Talal Darwish, Amin Shaban, Rima Chebil, Malek Ghandour.

LAYOUT

Houaida BOUALI, Engineer
National Institute of Marine Sciences and Technologies

Mohamed Ali BRIKI, Engineer
Coastal Protection and Planning Agency, Tunisia

Laura PÉREZ, Graphic Designer
Fundación Valenciaport

Emma CASANOVA, Technician
Fundación Valenciaport

Carolina NAVARRO, Engineer
Fundación Valenciaport

Index

Index

List of figures

List of tables

Abstract

This report aims to identify the main process of coastal zone development of the Mediterranean and in particular in the countries of Tunisia, Greece, Italy, Spain and Lebanon. It is developed as a result of a review of existing data at the Mediterranean level. The document is structured as follows:

First a presentation of the geographic situation of the countries under study, as well as their history.

Secondly, an overview of the natural environment in order to understand the landscape and natural characteristics of the study areas.

Thirdly, a presentation of the demographic characteristics of the countries under study, and their evolution over time in order to understand the origins of coastalization since settlement is one of the first factors imposing this phenomenon.

Fourthly an overview of the state and evolution of land use in relation to tourism.

And finally, a description of accessibility and transport in the cities under study and their characteristics in relation to transport.

I. Introduction

Mediterranean regions have traditionally been based on the opportunities offered by the coastline (SoED, 2020). Since the first civilizations, cities are mostly located by the sea, as well as the majority of the population. These trends have not changed in recent years, but other economic, demographic and social changes have influenced the trajectory of the spatial and urban organization of coastal areas, while neglecting the consideration of coastal protection.

Mediterranean cities and in particular Tunisia, Greece, Italy, Spain and Lebanon are now experiencing intense urban concentration and development of transport in advanced stages, as well as a vulnerability of coastlines, where multiple hazards converge.

The objective of this research is to understand the trends, forms and intensity of the development of urbanization and the evolution of the transport system in the coastal areas of the Mediterranean by situating the phenomenon in time and space.

II.
Overview of the study area

II. Overview of the study area

II.1. Introduction

Coastal urbanization is singular for a simple and obvious geographical reason: it develops near the sea (Euclidean distance, time distance, visibility), or even in direct contact with it. The sea, which is the subject of a very strong valorization in contemporary societies, is therefore the determining element of the originality of coastal urban systems and coastal urbanization. While coastal cities experience forms of development comparable to other cities far from the coast, they remain deeply characterized by their location on the coast.

II.2. Tourism in the Mediterranean countries

The Mediterranean area is an important tourist area. Tourism is a vital sector for the Mediterranean economy and is a very important source of jobs and foreign exchange for all the countries of the Mediterranean coast. Some 68% of the profits derived from Mediterranean marine and coastal ecosystems are linked to recreational activities and equipment and these ecosystems account for 17% of total international tourist spending (UNEP/MAP/2014).

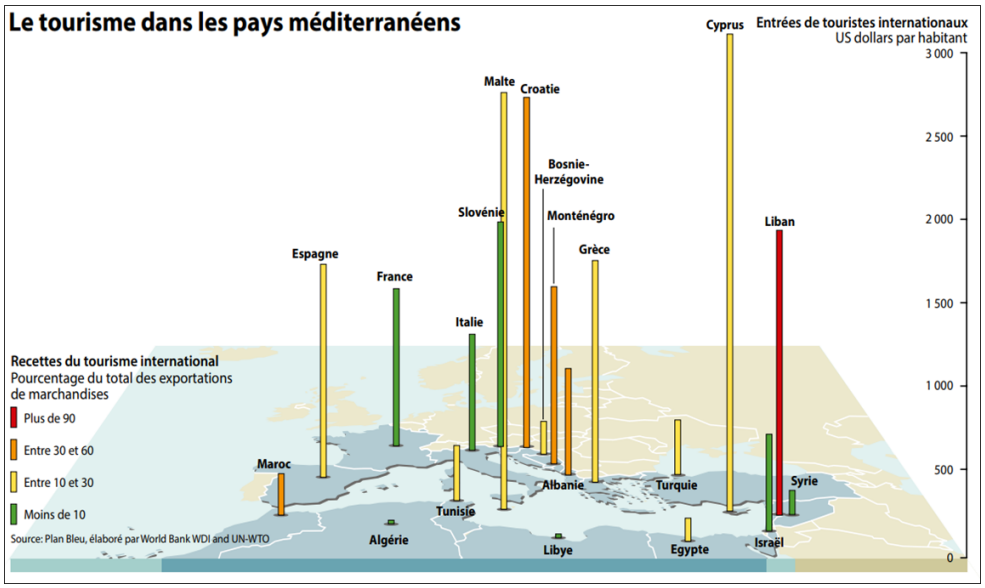

Figure 1. Tourism in the Mediterranean countries

II.3. Geographical location

The Mediterranean Sea is an almost entirely enclosed intercontinental sea, bordered by the coasts of Southern Europe, North Africa and West Asia. It covers an area of approximately 2.5 million square kilometers. During antiquity, the Mediterranean was an important maritime transport route allowing commercial and cultural exchange. At the level of these countries (Tunisia, Greece, Italy, Spain and Lebanon), the Mediterranean is the place of accentuated processes of littoralization and urbanization more or less spontaneous.

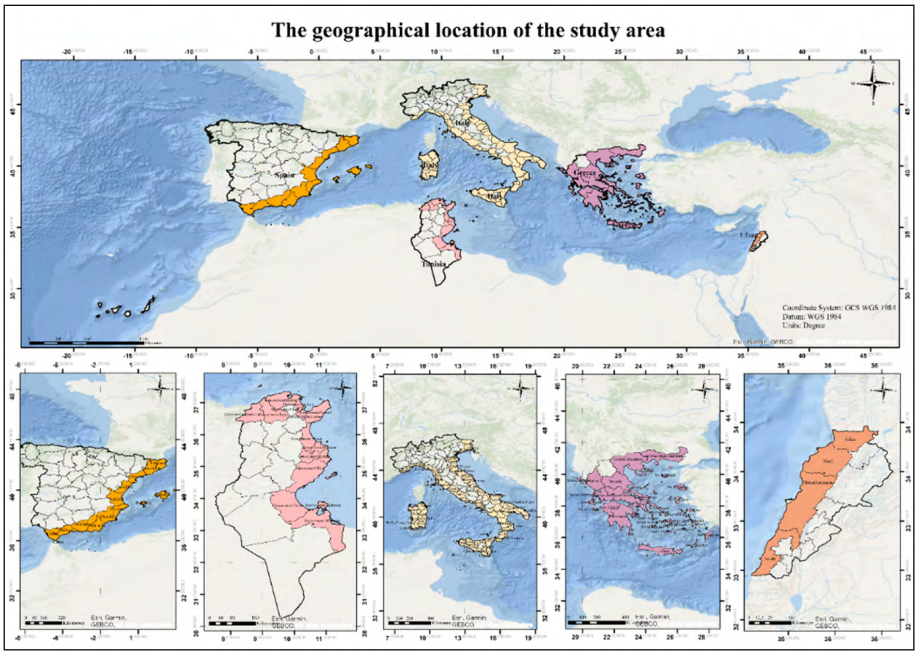

Figure 2. Location of the study areas in the Mediterranean

Table 1. Main geographical features of the case study countries

The country	Location
Tunisia	Tunisia, the smallest of the Maghreb states, is located in the north of the African continent. It is separated from Europe by a distance of 140 km at the level of the Sicilian Canal. With an area of 163,610 km218, the country is bounded to the west by Algeria with 965 km of common border, to the south - southeast by Libya with 459 km of border and to the north and east by the Mediterranean Sea with 1,566 km of coastline (2,290 km if we take into account the linear islands, islets, archipelagos and artificial shelves)
Greece	Greece is located at the end of the Balkans; it has an area of 131,957 km2. Its coastline is 15,000 km long. Its territory comprises three geographical units: mainland Greece, the Peloponnese peninsula and the islands that represent one fifth of the country's total area. The Greek coasts are bordered to the west by the Ionian Sea and to the east by the Aegean Sea where the majority of the Greek islands are located. The country has maritime borders with Albania, Italy, Libya, Egypt and Turkey.
Italy	Italy is a peninsula of southern Europe located in the center of the Mediterranean basin. With an area of 301 300 km2, it is 1 360 km long from north to south and covers 92% of the area of the Italian geographical region.
Spain	Located in southern Europe, Spain occupies most of the Iberian Peninsula, which it shares with Portugal. Bordered to the southeast the Mediterranean Sea; to the south the Alboran Sea; to the south-southwest the Strait of Gibraltar, which separates it from Africa (Morocco).
Lebanon	Lebanon, a country in the Levant (Near East), is a narrow strip of land bordered by the Mediterranean Sea on 240 km of coastline. 250 km long and 25 to 60 km wide. Its area is officially 10,452 km2.

III.
The characteristics of the natural environment

III. The characteristics of the natural environment

III.1. Introduction

To analyze the different environmental problems and issues related to littoralization, that impact marine and coastal ecosystems in the Mediterranean region, it is important to know the natural characteristics of the Mediterranean basin as well as the main driving forces of the region, including the economic sector and in particular tourism and particularly those aimed at the exploitation of marine and coastal natural resources. This allows for a better understanding of the general interactions between Mediterranean ecosystems and human factors.

III.2. Topography

A global presentation of the physical geography of the Mediterranean region highlights an irregular and very indented coastline, particularly in the north where the Iberian, Italian and Balkan peninsulas draw projections to the south. the coasts are mainly bordered by mountain ranges. Only the coastal plains from eastern Tunisia to the Sinai Peninsula, surrounded by a low-lying desert, do not contain mountain ranges.

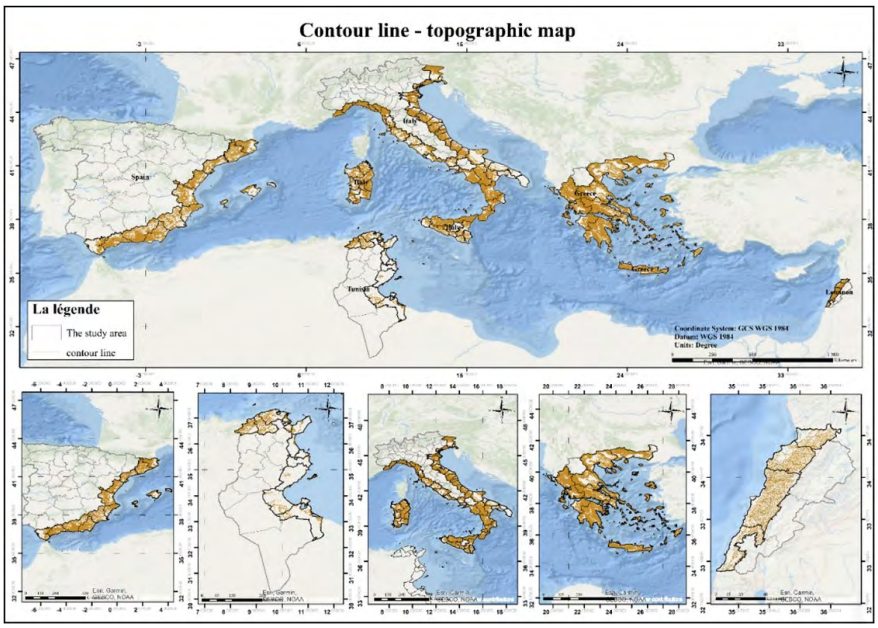

Figure 3. Contour of the coastal zones of the study areas in the Mediterranean

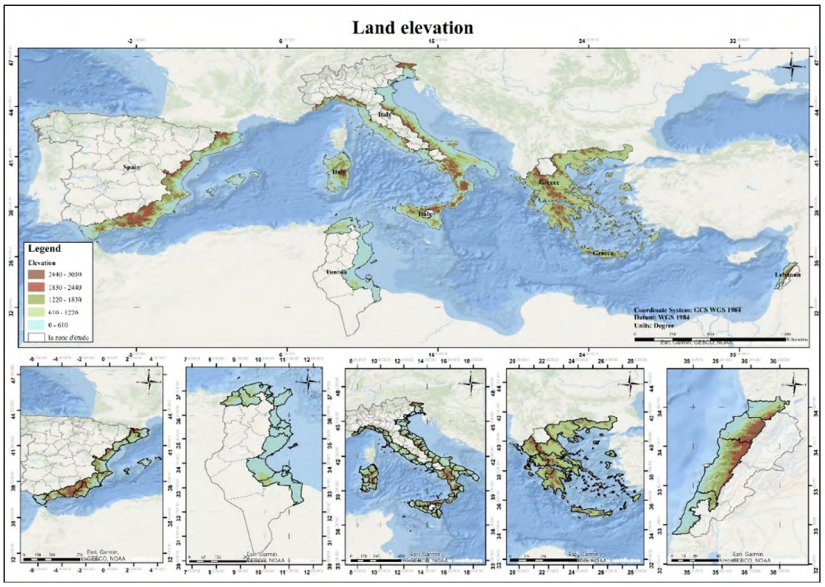

Figure 4. Land elevation

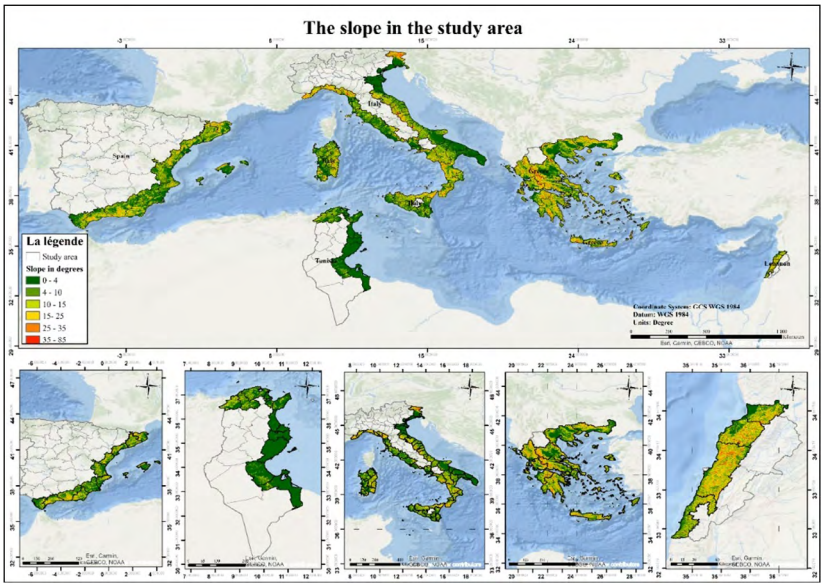

Figure 5. The slope in the study area

Table 2. Topographic characteristics of countries

The country	Topographic feature
Tunisia	Tunisia has a contrasting relief, between a mountainous northern and western part, a flat eastern part and a desert southern part. The North-West of Tunisia is located in the extension of the Atlas Mountain range that originates in Morocco in two large alignments oriented west east: the Tellien Atlas which follows the Mediterranean coast and the Saharan Atlas which lowers towards Cape Bon and the Gulf of Hammamet. The Tunisian ridge, a limestone chain, extends from the Mountains of Tébessa (Algeria) to the Peninsula of Cap Bon. It consists of mountain groups alternating with steep plateaus and depressions: the mountains of Tébessa (1,385 m), Jebel Chambi (1,544 m), Jebel Semmama (1,314 m5), Jebel Serj (1,357 m), Jebel Zaghouan (1,295 m) and Jebel Sidi Abd er-Rahman in Cape Bon (637 m). To the south, the Atlas is reduced to mountainous islets (cherb) scattered above high plains: Jebel Mrhila (1,378 m) and Jebel Salloum (1,373 m). A flat region of high steppes to the west and low steppes to the east intersect with the desert south and is crisscrossed by a few residual mountainous alignments (oriented ouest_ east): Jebel Majoura (874 m), Jebel Bou Hedma (790 m), Jebel Orbata (1,165 m) and Jebel Asker (608 m).
Greece	Greece is a mountainous country with a territory covered 80% by more or less high reliefs. The altitudes are rather average (around 1,500 meters) but 40% of Greek cities and villages are perched more than 800 meters above sea level. The highest point of the country is Mount Olympus which reaches at its highest point 2,917 meters above sea level. One of the craziest charms of Greece lies in the fact that no geographical point is more than 100 kilometers away from the sea, which means that even in the mountains, on the panoramic heights, the maritime blue draws the horizon!
Italy	Stretched over more than ten degrees of latitude, Italy presents varied landscapes, with the predominance of hills (42% of the territory), ahead of the mountains (35%) and the plain (23%). Three sets emerge. To the north, Italy has the southern slope of the Alpine arc, high but cut off from many valleys. It dominates the Po plain (50,000 km2), which widens towards the Adriatic. Finally, in the south, from Liguria to Calabria, the Apennines form the backbone of the country: in central Italy, it is bordered by hills, plateaus, and alluvial plains. The climate is warm everywhere in summer, but cold in winter in the North (Po plain and Alpine arc from the Mediterranean to Friuli) and particularly dry in summer in the peninsular and island part (Sicily and Sardinia).

Spain	The relief of Spain is known to be quite high, with an average altitude of 660 meters, quite mountainous compared to other European countries. Only Switzerland and Austria, as well as the micro-states of Andorra and Liechtenstein have a higher middle relief. In mainland Spain, the relief is organized around the central Meseta (central plateau) which occupies most of the center of the Iberian Peninsula and has an average altitude of 660 meters. Beyond the meseta, we find in the southwest the depression of the Guadalquivir and in the northeast that of the Ebro. The mountain ranges are numerous and occupy almost half of the territory.
Lebanon	The general arrangement of the relief, which consists of four large ensembles, is quite simple. A narrow coastal plain, discontinuous, and interspersed with rocky headlands, stretches for about 250 km. It widens only to the north into the Akkar Plain and to the south from Sayda (formerly Sidon). Dominating the coast, Mount Lebanon is a powerful limestone wall culminating at 3,083 m in Qurnat al-Sawda. The peaks, made up of high plateaus on a karst zone, are strongly interspersed with gorges sometimes sinking for more than 1,000 m, such as those of the Qadicha or nahr Ibrahim. These coastal mountains have extremely heavy and massive shapes. The average altitudes are high (1,414 m for northern Lebanon; 922 m for southern Lebanon).

III.3. The hydrographic network

Rivers play a key role in the water circulation and geochemistry of the Mediterranean region. As the Mediterranean is a semi-enclosed ocean basin receiving relatively large amounts of drainage water, rivers also play a role in maintaining marine productivity. When freshwater inputs change due to natural variability or regulation of major rivers, the salinity of Mediterranean surface waters also varies. These variations can alter the vertical circulation and mixing of water bodies throughout the basin, which will affect surface water productivity and the characteristics and ventilation of deep-water bodies (Rohling and Bryden 1992). The discharge of pollutants through the river system will inevitably raise the levels of these contaminants in the marine basin. Finally, due to the oligotrophic – low-nutrient nature – of the Mediterranean, changes in river nutrient inputs, whether natural or man-made, are factors that can in the long term alter coastal and offshore marine productivity, as well as marine ecosystems (Ludwig et al. 2009).

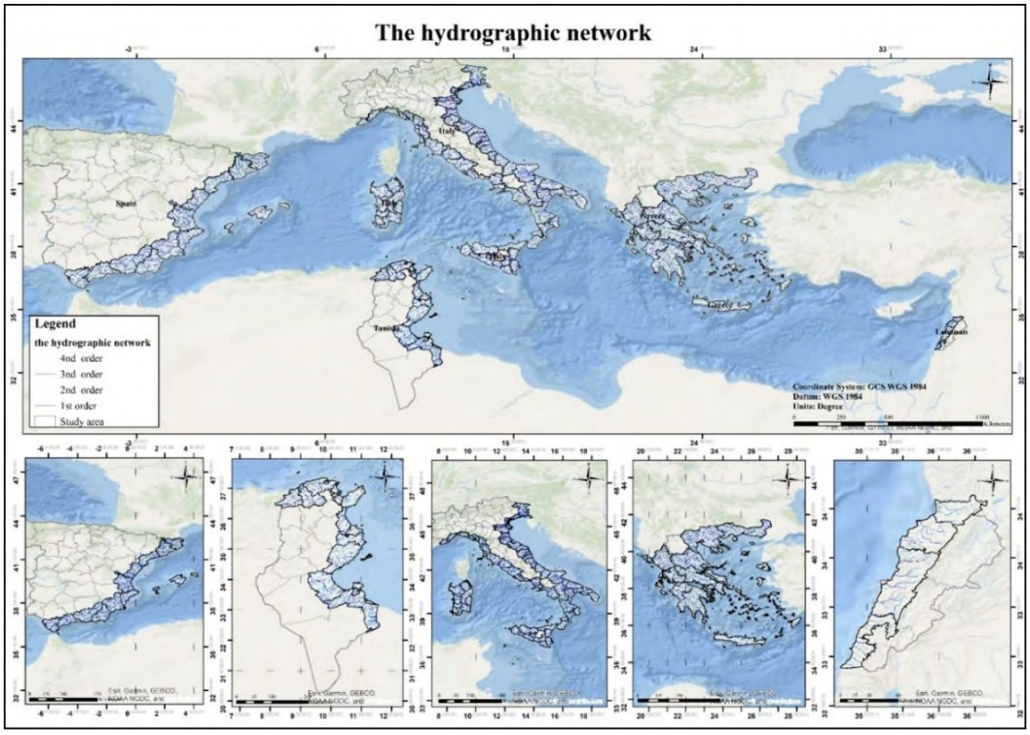

Figure 6. The hydrographic network

Table 3. Hydrographic characteristics of countries

The country	Topographic feature
Tunisia	Tunisia's hydrographic network reflects at the same time the sedimentary nature of the soil, the distribution of rainfall and the role of reliefs in the modulation of runoff. It is structured according to the orography and climatic zones with an influence of the sea that is felt with more intensity, on the north coast of the country and in the main gulfs of the eastern façade (Gulfs of Tunis, Hammamet and Gabes). The majority of the country's wadis are temporarily drained during major thunderstorms. Their inputs vary according to the area of the watershed and the extent of the downpour (intensity and duration). Tunisia's wadis are the seat of the generation of the country's surface water resource.
Greece	Greece has a really very complex river system compared to other countries around. The longest river in Greece, that is, the Aliakmonas, begins in the Pindus Massif and descends east to 298 kilometers further to head into the Aegean Sea. Subsequently, there are also several small rivers that flow west of the Pindus and fall into the Ionian Sea. Other rivers such as the Peloponnese rivers pass through the coast of Greece and then drain to the central mountains. Greece also has an important underground hydrographic network.

The country	Topographic feature
Italy	The short Italian rivers have a regime modeled on that of the rains. Floods occur in spring and autumn in central Italy, in winter in southern Italy; the low water level is always at the end of summer. Many rivers are simple torrents, the fiumare, with a bed cluttered with stones. A river like the Tiber (405 km) has a very modest average flow of 290 m3s, oscillating between a minimum of 61 m3s and a maximum of 2,730 m3s. Once again, it is the North that is fortunate to have rivers with a more balanced regime and the only major watershed, the Po River. Alpine rivers have winter lows, and high water occurs in spring with melting glaciers and rains. Their regime remains strong in the autumn.
Spain	Spain is a country with several rivers. Mainly, in the south of the country is the Strait of Gibraltar which is located in front of Morocco. Then it counts the Alboran Sea, western part of the Mediterranean Sea. However, in the country there are different rivers overflowing inti the Atlantic ocean as the case of the Guadalquivir with 680 km of distance. There is also the Guadiana River with 780 km and a basin of 61,000 km2, where water accumulates in the lagoons of the Central Channel. Another river flowing in Spain is the Tagus. It is considered "the longest river of the Iberian Peninsula [thanks to] that it crosses from East to West; 1,120 km, including 275 km in Portugal (basin of 80,947 km2). This river is important because it is one of the first water resources in Spain. Then in Spain is also the Douro River. It is the river that crosses the north of the Meseta and joins the Atlantic. It has a distance of 900 km with a basin of 100,000 km2. Another important river in Spanish Hydrography is the Ebro. "Its length is 928 km and its watershed has an area of 85,550 km2." It is a river that provides electricity. There is also the Minho River, where its length is 310 km with a basin of 12,486 km2, which faces the border between Portugal and Spain, from Melgaço to Caminha. Spain also includes the Canary Islands and Balearic Islands.
Lebanon	Hydrological resources are essentially linked to the mountainous reliefs of the Mediterranean bead. The rivers of the Mediterranean coast of Lebanon are, on the whole, regularly fed, due to the structural conditions that involve powerful limestone masses at altitude, where the waters infiltrate before reappearing in large resurgent springs. The result is a type of river that is neither subdesert nor even normal Mediterranean.

IV.
The characteristics of the human environment

IV. The characteristics of the human environment

IV.1. Introduction

The Mediterranean is the place of accentuated processes of littoralization and urbanization more or less spontaneous. Over 30 years, from 1970 to 2000, coastal populations increased from 96 million to 145 million, an increase of 51 per cent, of which 17.2 per cent for the north shore and 84 per cent for the east and south shores. Over the same period, the coastal urban population grew by 10 million on the north shore and by 30 million on the south and east shores.

IV.2. The Mediterranean population is concentrated near the coast

More than a third of them live in coastal administrative entities whose area is less than 12% of that of the countries to which they belong. The population of coastal regions increased from 95 million in 1979 to 143 million in 2000. It could reach 174 million by 2025. The concentration of the population along the coasts is particularly high in the western Mediterranean, on the west coast of the Adriatic, along the eastern coast of the Levantine region and the Aegean Sea, and in the Nile Delta. In total, the concentration of population on the coast is greater in the countries of the southern shore. It is also in this region that the differences in population densities of coastal areas are greatest, ranging from more than 1,000 inhabitants/km² in the Nile Delta to less than 20 inhabitants/km² along parts of the Libyan coastline.

IV.3. Population changes between 2004 and 2014

Engaging in a reflection on the urbanization of the coastline implies situating the phenomenon in time and space, measuring its intensity, presenting its forms and identifying the main factors. To initiate the approach, the research conducted in geography on the settlement and development of the world by human societies, at the different scales of analysis of the geographical space, provide a theoretical frame of reference.

It should be noted that most of the countries studied, in particular Tunisia, Greece, Italy, Spain, Lebanon is experiencing an evolution in the number of populations between the years 2004 and 2014, and more precisely, in the most economically attractive cities (where tourist activities, industrial activities, job offers, etc.) are concentrated. shops). The maps below show the difference in population concentration in the different regions between the years 2004 and 2014.

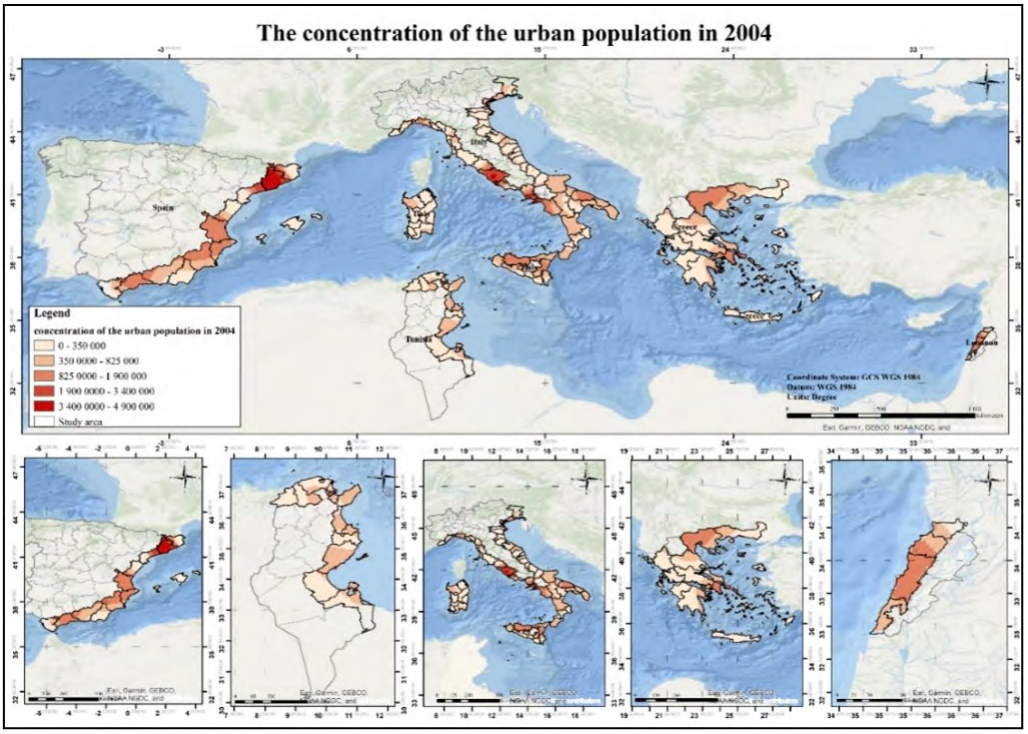

Figure 7. The concentration of the urban population in 2004

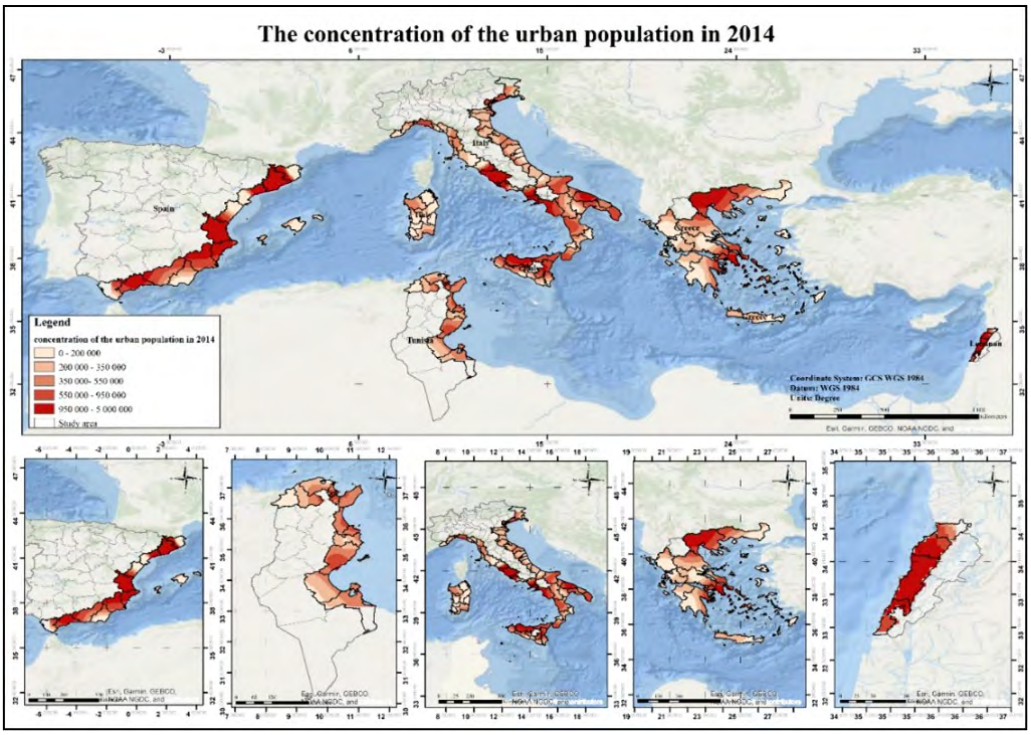

Figure 8. The concentration of the urban population in 2014

Between the years 2004 and 2014, there was stability in the various coastal cities of Greece, maintaining their urban population rates with a slightly lower or higher percentage. But this cannot say that Greece concentrates a significant number of urban populations along its coasts.

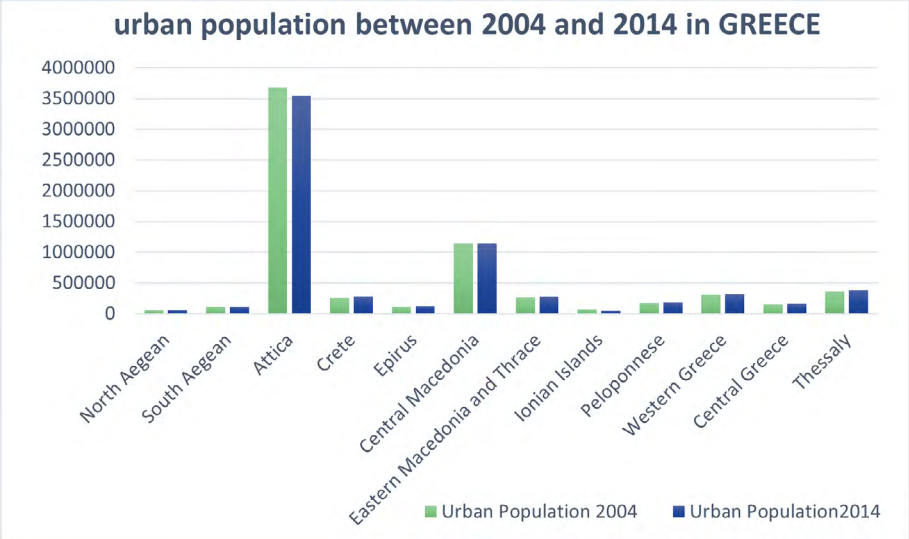

Figure 9. Urban population between 2004 and 2014 in Greece

Between the years 2004 and 2014, coastal cities in Italy experienced an increase in the number of urban populations, although some cities kept a stable percentage of the population rate, but this did not prevent all cities from concentrating a significant number of populations. This is linked to the development of activities and especially tourism on the coasts of Italy.

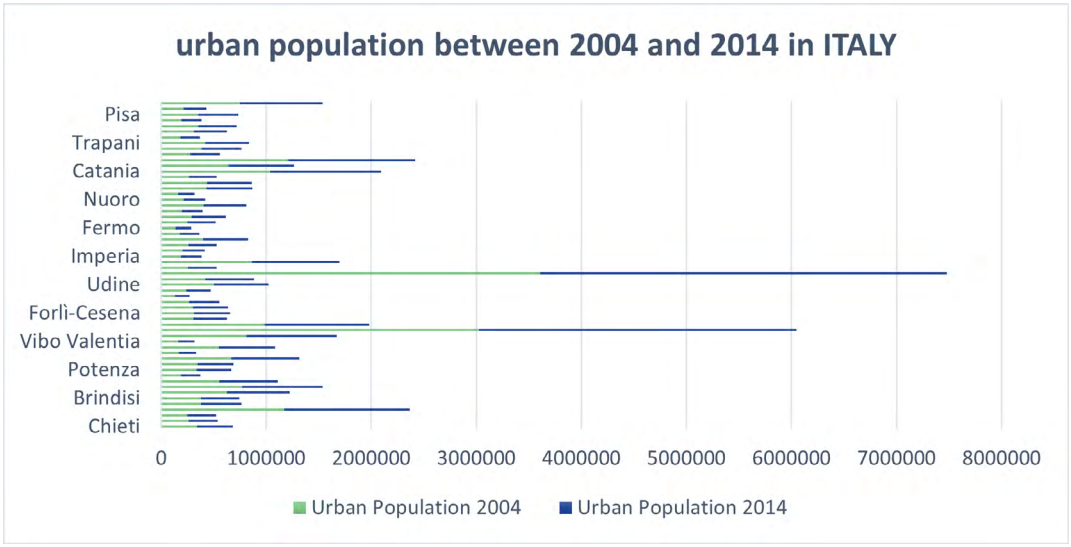

Figure 10. Urban population between 2004 and 2014 in Italy

In Lebanon, after the Syrian refugee crisis, the undeclared population is about 6,500,000. According to UN-Habitat, recent figures show that 87 per cent of this population currently lives in urban areas, with the majority - estimated at 64 per cent - residing in large urban areas; mainly in the metropolitan areas of Beirut and Tripoli. In fact, Lebanon is one of the most urbanized countries in the world and the Arab region. In this respect, the population density at the national level varied significantly between 2004 and 2014, which shows the dominant vertical growth of large cities.

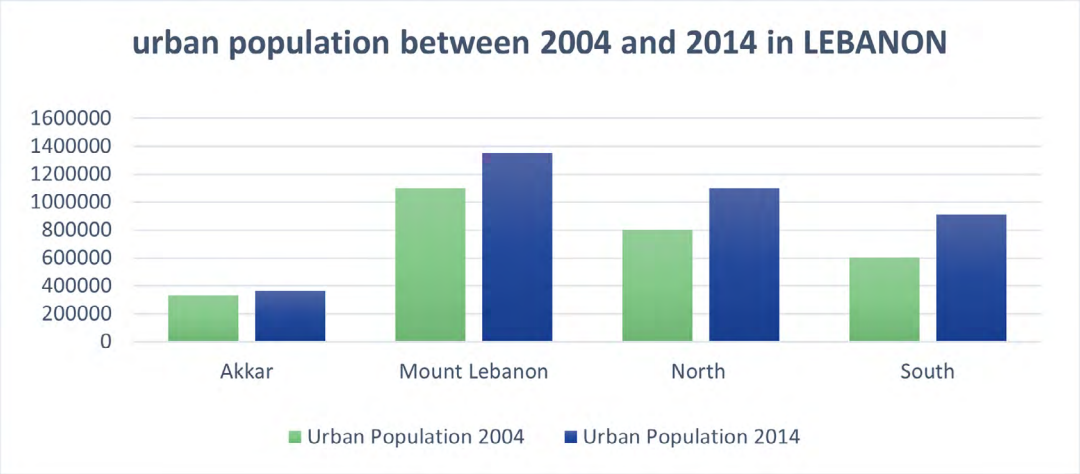

Figure 11. Urban population between 2004 and 2014 in Lebanon

In Spain, during the first two decades of the 21st century, demographic dynamics have shown several contrasting trends (National Institute of Statistics):

- A first period that lasts until 2009 with strong increases.
- A second period from 2009 to 2012 during which the positive momentum continues, although each time with more moderate values.
- From 2012 to 2016, the dynamics reversed its positive trend, and the population volume decreased each year, with a joint loss of more than 700,000 inhabitants.
- For the last period from 2016 to 2018, the momentum is again positive. During the period 2017-2018, the population increased again with an increase of 0.32%. These data are significant because, although growth is very low, they consolidate the change in trend.

However, from the 18th century, the Spanish population underwent a process of "centrifugation", settling in coastal areas, preferred by climates conducive to agriculture (low thermal amplitude, mild temperatures) and by a coastal situation that favored communications and, with this, the development of secondary and tertiary activities.

These conditions highlight that, throughout the 19th and 20th centuries, it is the coastal regions which have recorded a process of industrialization (in the case of Catalonia, Asturias and the Basque Country), accentuating the process of emptying the interior, especially with the massive rural exodus of the years of Franco's "dictatorial developmentalism". The development of tourism has also contributed to this massive rural exodus, which has concentrated on the Mediterranean coast and the archipelagos of the Balearic Islands and the Canary Islands Tunisia surpassed the ten million inhabitants mark in 2005, which corresponds to a tripling of its population since independence in 1956 (3,448,000 inhabitants) and a doubling since the early 1970s. Nevertheless, population growth slowed, as the country accelerated its demographic transition in the 1990s.

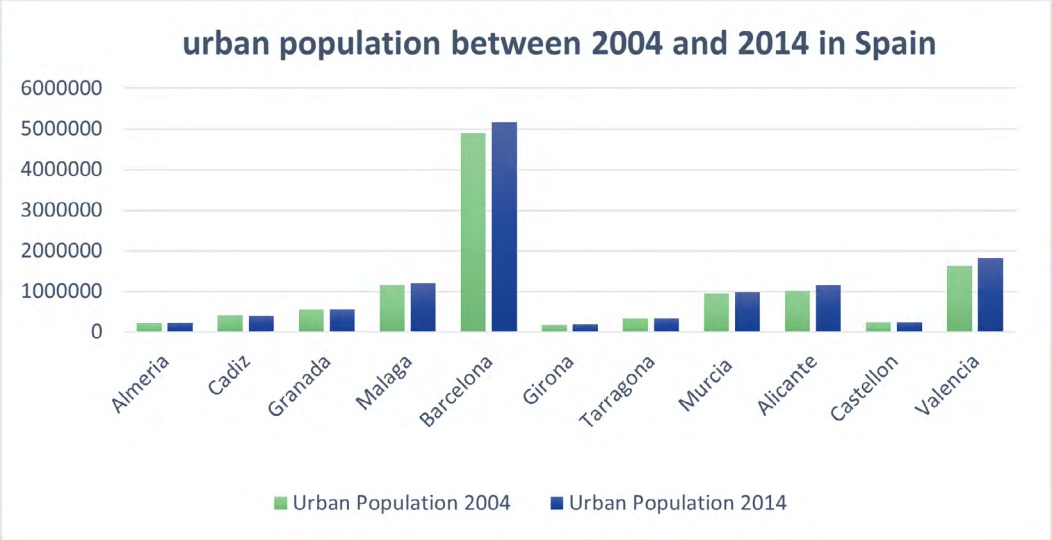

Figure 12. Urban population between 2004 and 2014 in Spain

Tunisia, like many Mediterranean countries, has seen its population grow exponentially in half a century. These demographic changes have had a major impact on land tenure patterns and demographic distribution. The Tunisian population now lives mainly in urban areas on the coastal coast. Demographic changes, new economic activities and rural exodus are factors that have greatly contributed to the modification of natural, agricultural or urbanized landscapes in Tunisia.

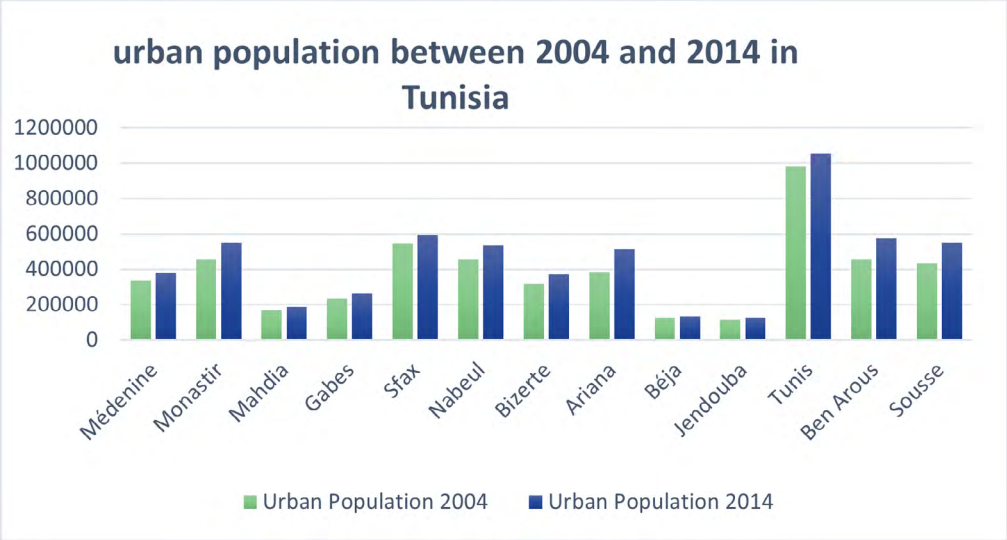

Figure 13. Urban population between 2004 and 2014 in Tunisia

The figure below shows the change in the rate of urban population growth between 2004 and 2014 in the different regions and governorates of the countries under study. the difference in population density is obviously linked to the urbanization of coastal.

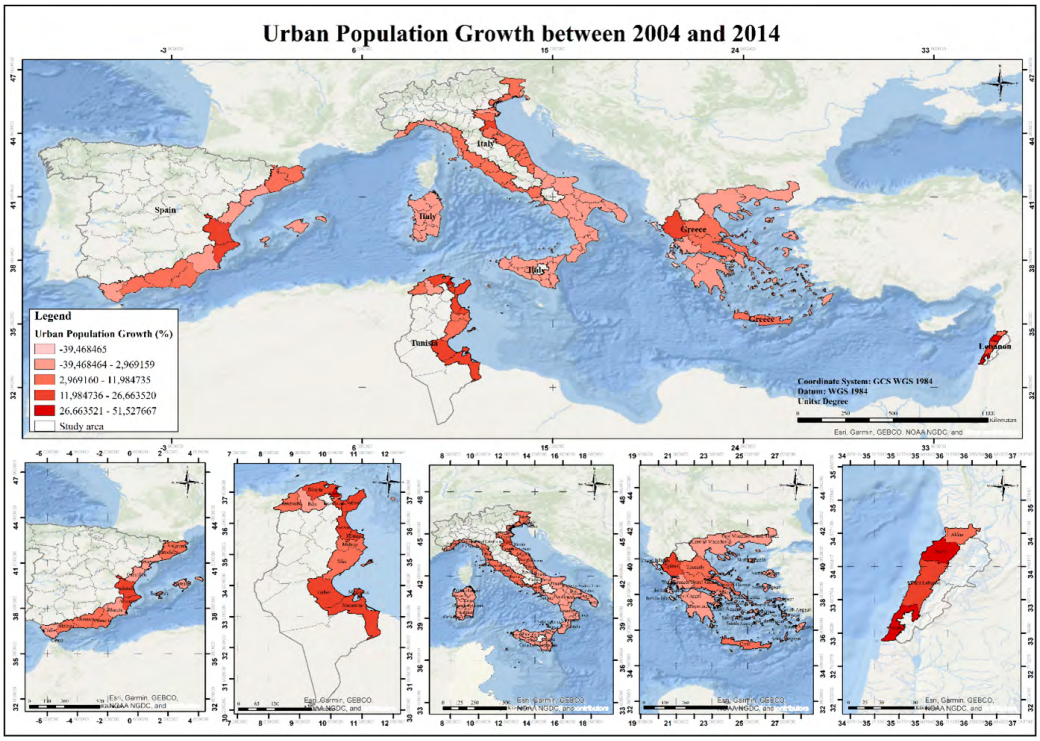

Figure 14. Urban population growth between 2004 and 2014

V.
Urbanization and coastal development

V. Urbanization and coastal development

V.1. Introduction

Urbanization is first considered with a demographic conception, i.e., the share of a population that resides in cities (versus those that live in rural areas) or, in its dynamic sense, the transition of a population from the rural world to the urban world (Polèse, 1995). The extension of this meaning to the concentration and growth of "activities in agglomerations of an urban character" (Moriconi-Ebrard, in Lévy and Lussault, 2003) was then proposed. On the coast, where the concentration of population and activities has been observed and measured, the phenomenon has been called "littoralization".

V.2. Urbanization

The map below shows the concentration of urban areas in the Mediterranean countries and in Tunisia, Italy, Greece, Spain, Lebanon.

In the first place we find Spain, in the second place Greece, in the third place Italy, in the fourth place Tunisia and finally Lebanon in the third place.

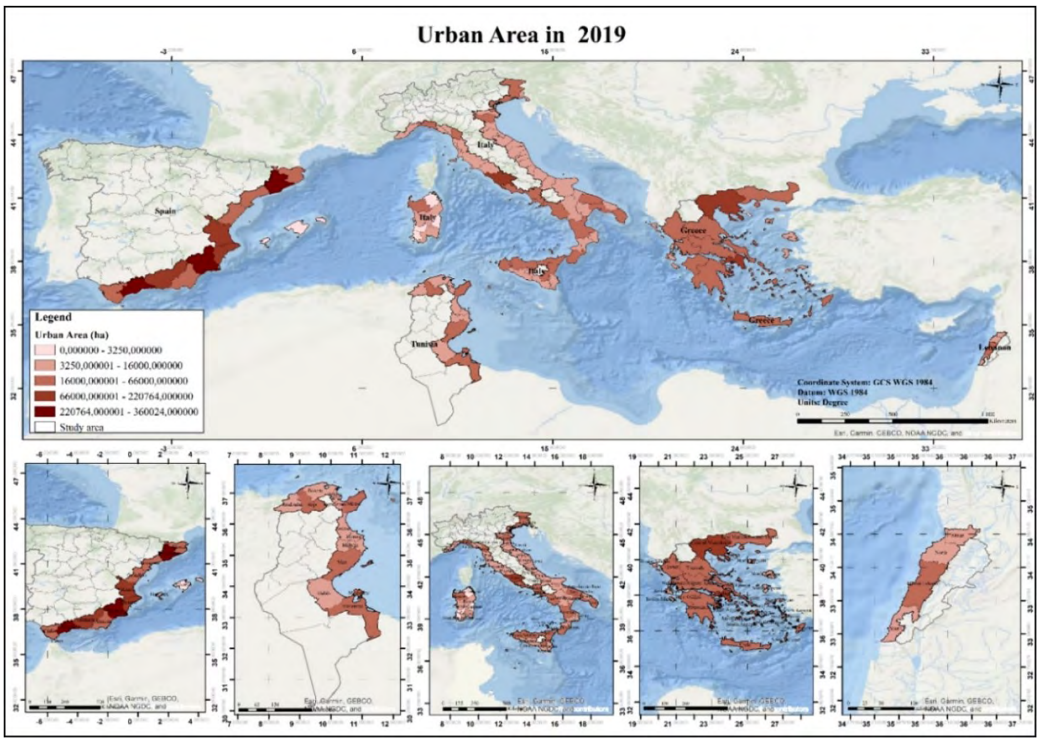

Figure 15. Extension of urban areas in the coastal regions of the case study countries in 2019

In a context marked by financial globalization, the globalization of the economy and the failures of urban planning in its most rigid forms, today's Mediterranean cities, on the north shore as well as on the east and south shores, are confronted with trends that are difficult to control, with specific planning problems, and with the difficulty of preserving an original urban model that has its origins in a history as old as it is rich.

Spatially unbalanced urbanization

The specificity of urbanization in the Mediterranean Basin is to be found in a series of imbalances affecting the urban frameworks of the countries that compose it, between metropolises and small towns, and also between coastal cities and inland cities.

According to the map below showing the urbanization in 2019 of the Mediterranean countries under study, it should be noted that Lebanon is the country that knows the highest rate of urbanization, followed respectively by Spain, Italy, Tunisia and then Greece.

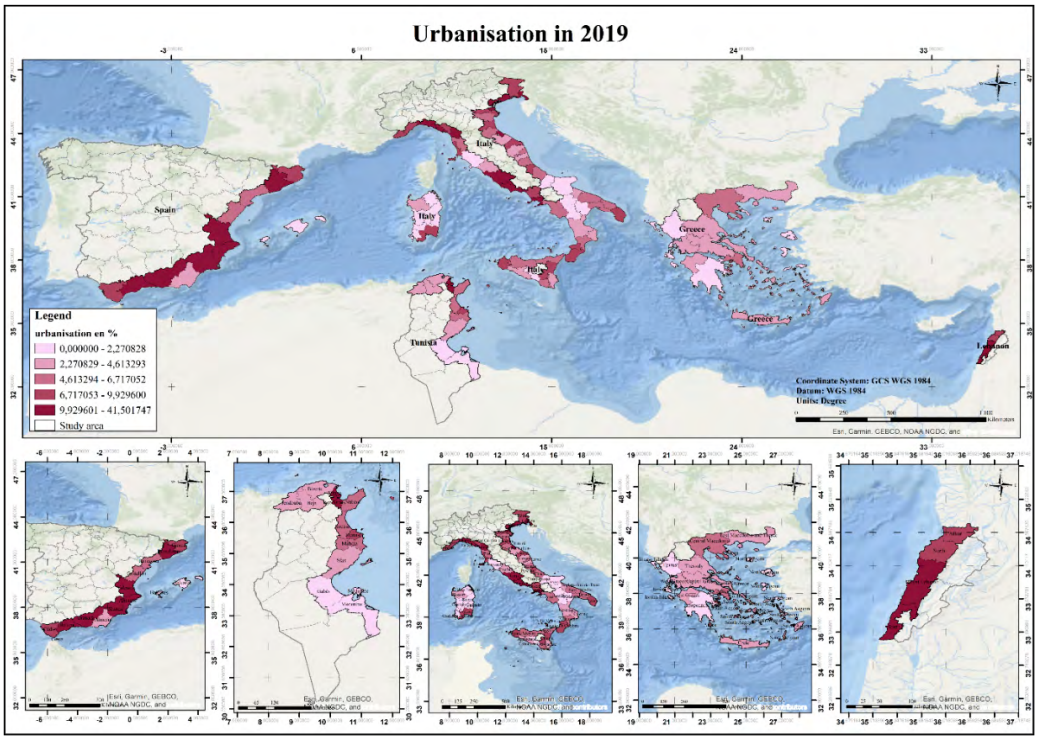

Figure 16. Urbanization in 2019

V.3. Changing soil natures

The analysis of the satellite images corresponding to the countries under study, precisely Tunisia, Greece, Italy, Spain, Lebanon, during the years 2002, 2012, 2022 has made it possible to highlight the differences in the rate of vegetation cover, which is due to the increase in urbanized surfaces or dryness.

The situation in 2002 has changed very much in terms of Normalized Difference Vegetation Index (NDVI) compared to that of 2012. Over the years, between the years 2002, 2012, 2022, the NDVI presents continuous variations for the loss as of the vegetation cover, see the map below which exposes the NDVI Evolution.

Indeed, this decrease in the vegetation index is linked to the disappearance of agricultural areas, green spaces, point vegetation, forest cover over the years while promoting, among other things, the development of urban areas.

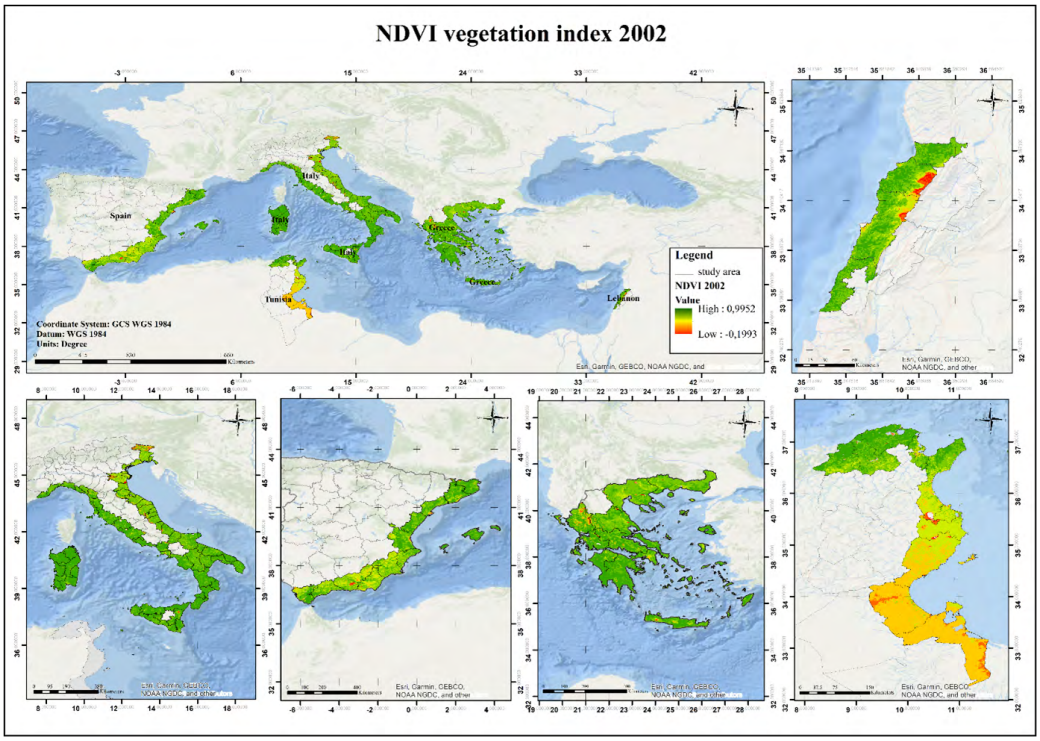

Figure 17. NDVI vegetation index in 2002

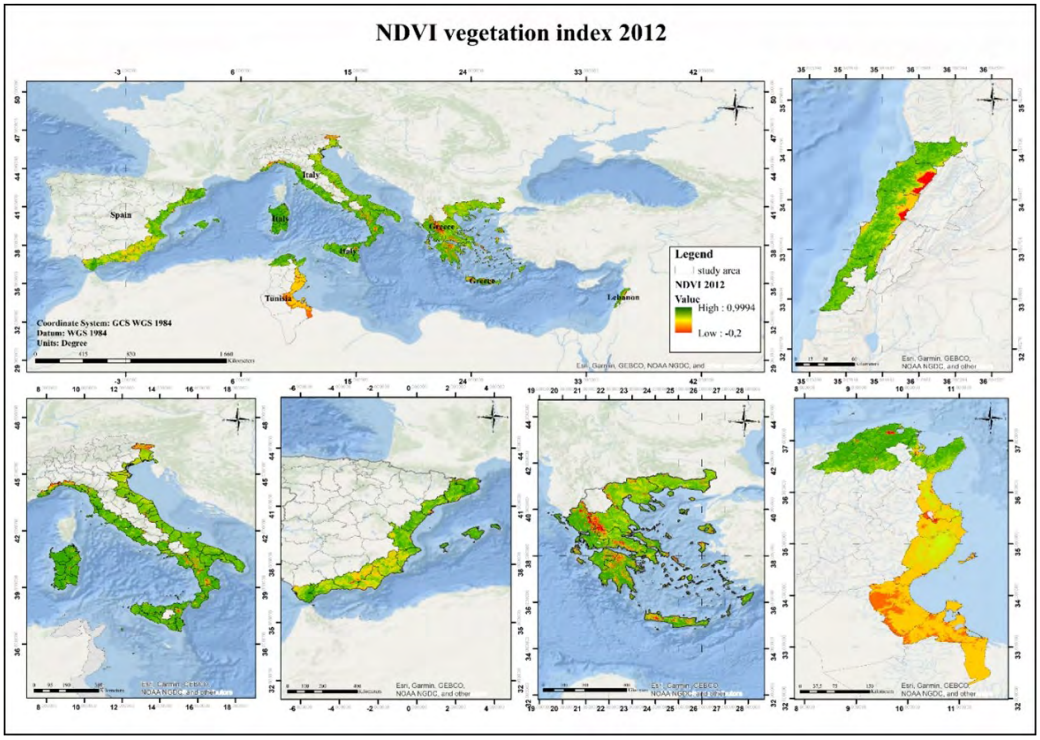

Figure 18. NDVI vegetation index in 2012

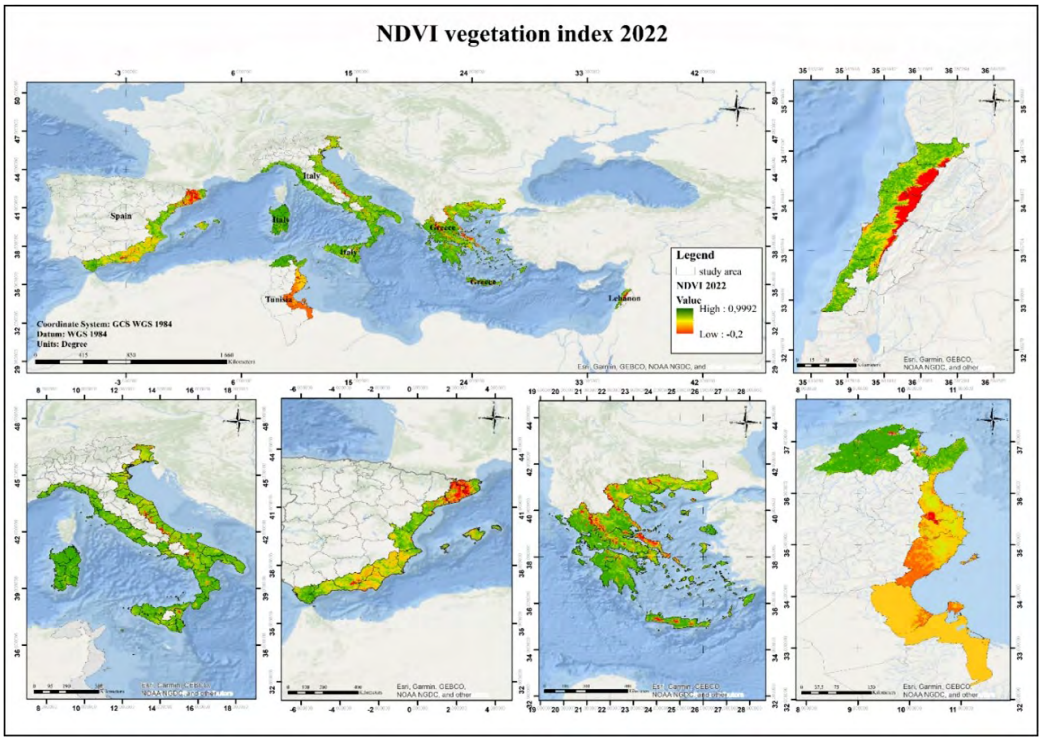

Figure 19. NDVI vegetation index in 2022

V.4. Land use

The model of intensive tourism development with large residential areas is comparable to models of intensive agriculture, which sometimes irreversibly transforms the landscape and condemns it to a single use. The change to be achieved is very complex and profound, since it implies a huge cultural change in tourism planning and marketing from the perspective of countries/destinations, evolving towards a model with a higher endowment and with secondary interventions on the territory. In this area, the more developed destinations of the Mediterranean must share their experiences with the less developed destinations and seek together models that are more compatible with the survival of the landscape and local cultures.

By superimposing the layers corresponding to urban and tourist areas respectively, in case tudy countries, it can be emphasized that tourist areas develop near the areas with high urban density, and near the coasts.

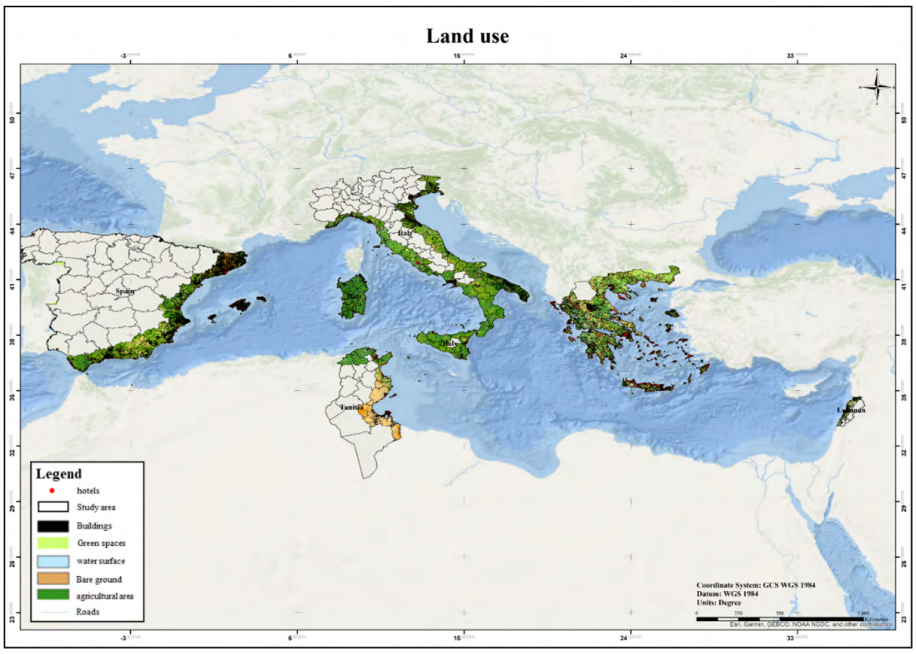

Figure 20. Land use

In Tunisia, the Tunisian state sought to modify the image of Tunis-capital, by infusing it, through architectural and urbanistic productions, a new modernity synonymous with a new urbanity, likely to act both on the representations of the inhabitants of the capital and on those of all Tunisians, at the same time as it was to serve as a vector for marketing operations intended to seduce international economic actors, congress organizers and tourists.

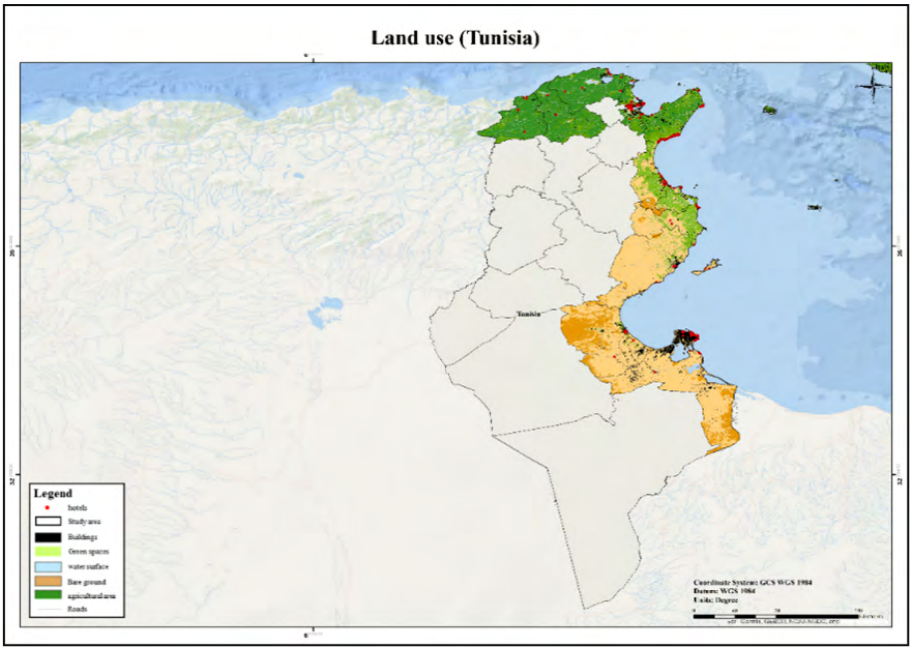

Figure 21. Land use in Tunisia

In Greece, at a time when the agricultural sector was declining, the tourism industry flourished, changing particularly the economy and character of the islands. As example, Coccossis and Constantoglou (2005) reported a rapid development of tourism on Sifnos between 1991 and 2001, containing a boom in the number of leisure houses and other tourist establishments.

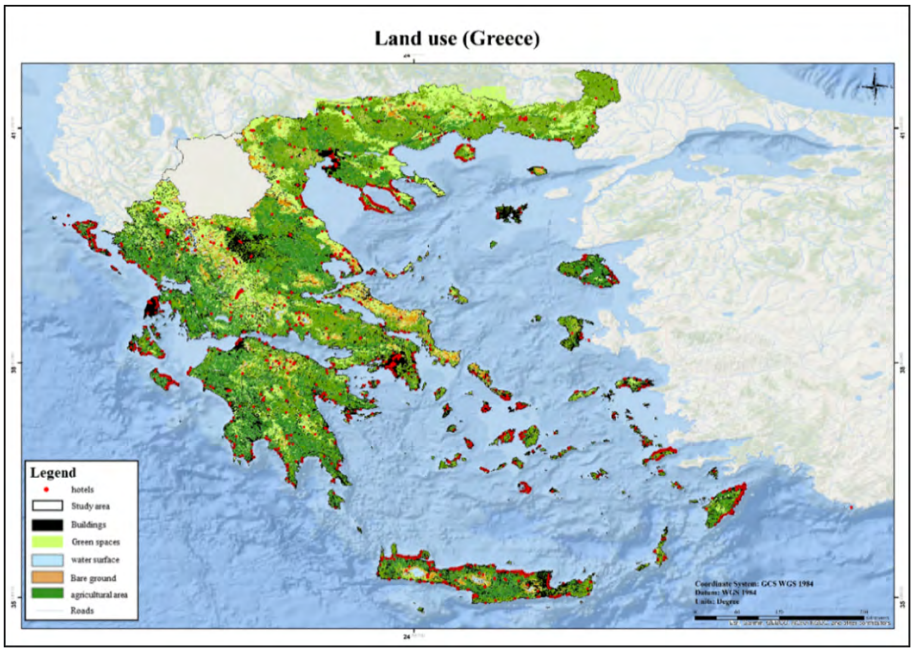

Figure 22. Land use in Greece

In Italy, most of the major cities (Rome, Naples, Genoa, Bari and Venice, as well as most of the seaside tourist facilities and holiday homes, which represent a very important part of the national housing stock), are located near the coast.

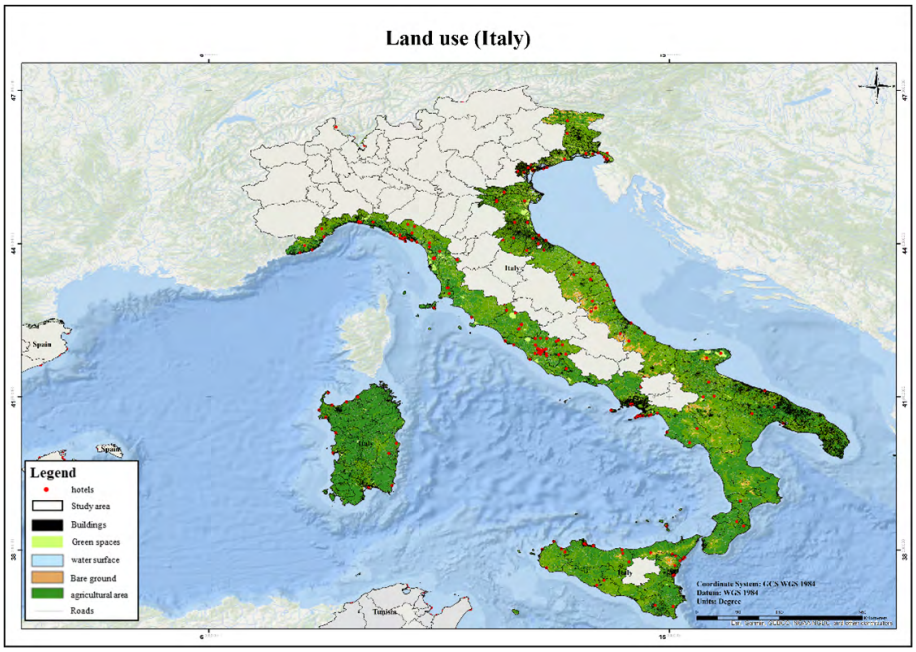

Figure 23. Land use in Italy

In Spain Virtually all the new artificial surfaces were created from other land coverings (agricultural areas and mainly forest areas), while the transformation of other soils took place through internal conversions within the same classes. Artificial surfaces represent a small percentage in Spain as a whole (2.1%). In the internal distribution of this class, 63% are urban areas, followed by industrial areas.

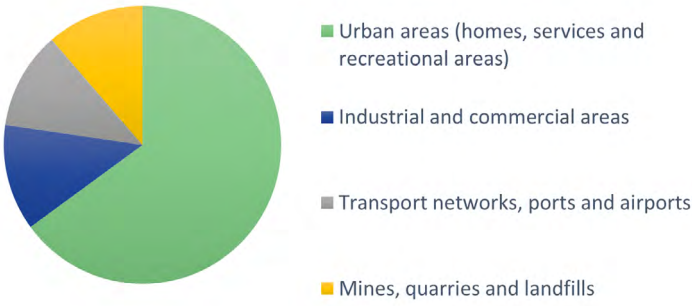

Figure 24. Land covering in Spain

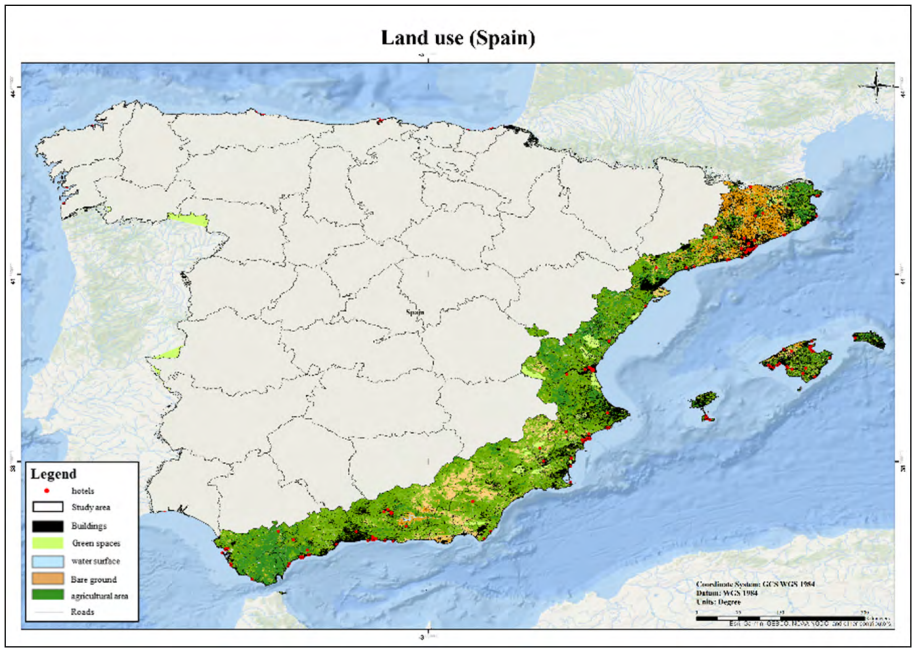

Figure 25. Land use in Spain

In Lebanon, new construction is increasing massively, especially in the coastal area, where most of the Lebanese population resides, contributing to uncontrolled urban expansion due to violations of construction laws. Urban areas cover more and more larger areas, at the same time as urban disparities have emerged significantly.

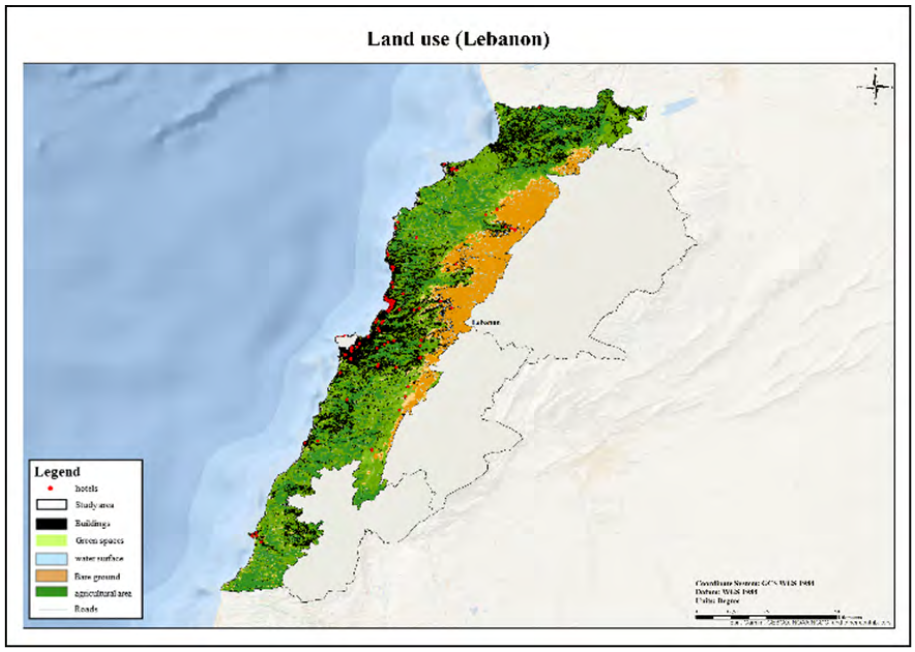

Figure 26. Land use in Lebanon

VI. Transport and coastal development

VI. Transport and coastal development

VI.1. Introduction

The development of the road system is commonly seen as a factor of development. On the one hand, it contributes to opening up territories and offers new economic opportunities through the strengthening of accessibility. On the other hand, it is considered a driver of the economic growth by its weight in terms of investment and consumption.

VI.2. Accessibility

Population growth, urban development and economic growth linked to the development of economic activities, particularly tourism, are reflected in a sharp increase in the number of urban trips. Motorization and increased availability of public transport multiply the opportunities

In addition, the dynamics of littoralization of territories in the countries of the Mediterranean are reflected in a dissociation of employment and housing areas which leads to a significant increase in travel distances. This phenomenon gives the advantage to motorized and flexible modes of transport. Thus, cars and minibuses are imposing themselves in new urban configurations La Rocca, R. A. (2015).

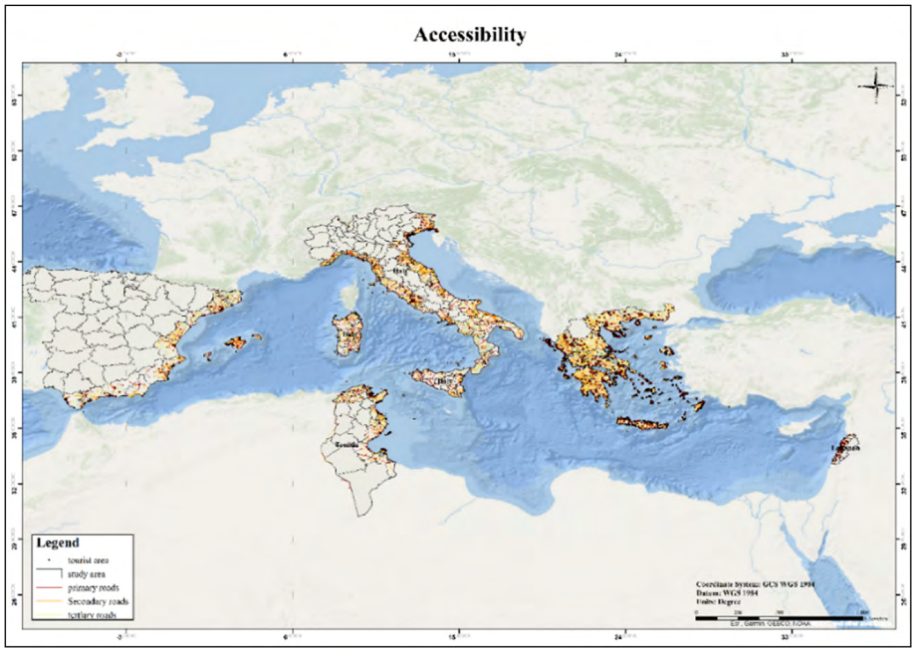

Figure 27. Maps of roads in the study areas

According to the following map, it should be noted, that the more tourist areas develop the more accessibility is strengthened towards these areas. in order to facilitate the access of tourists and visitors.

From the map below, it is confirmed that tourist areas have been equipped with a road infrastructure that allows and facilitates accessibility.

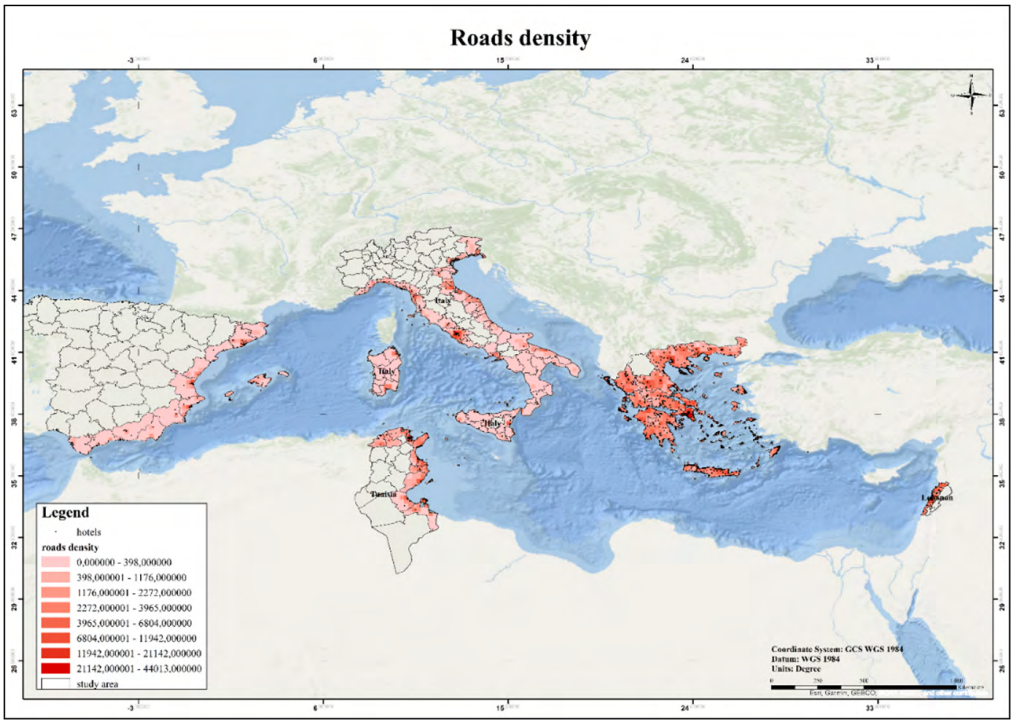

Figure 28. Road density.

To better understand accessibility in relation to tourism for the countries under study, road accessibility for each country in superposition with tourist areas has been identified. **In Tunisia** the State has engaged in urban operations to ensure the modernization of the capital, mainly in the field of infrastructure and equipment (port, airport, expressways), to enable it to face the stakes and challenges of economic globalization and to attract more effectively the representations of large international companies, in the priority orders of production or services.

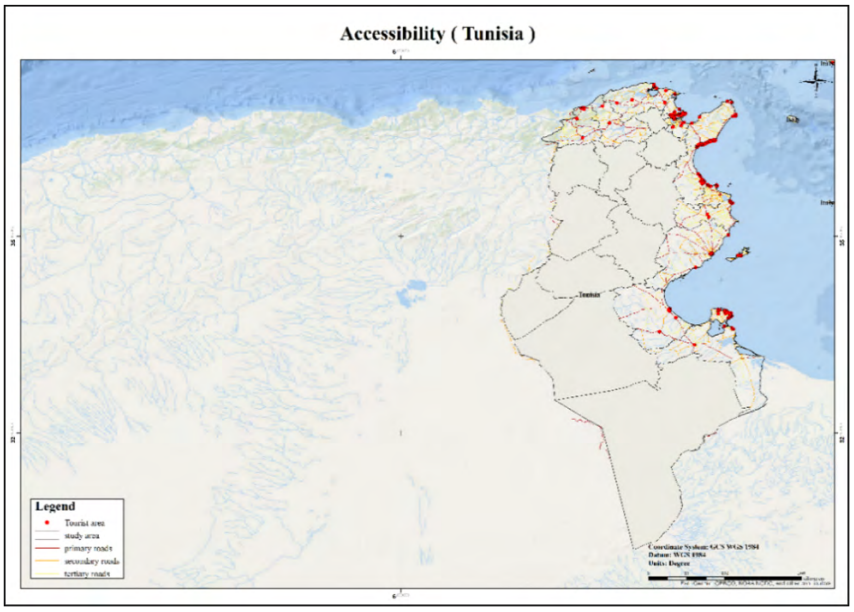

Figure 29. Accessibility in Tunisia

In Greece

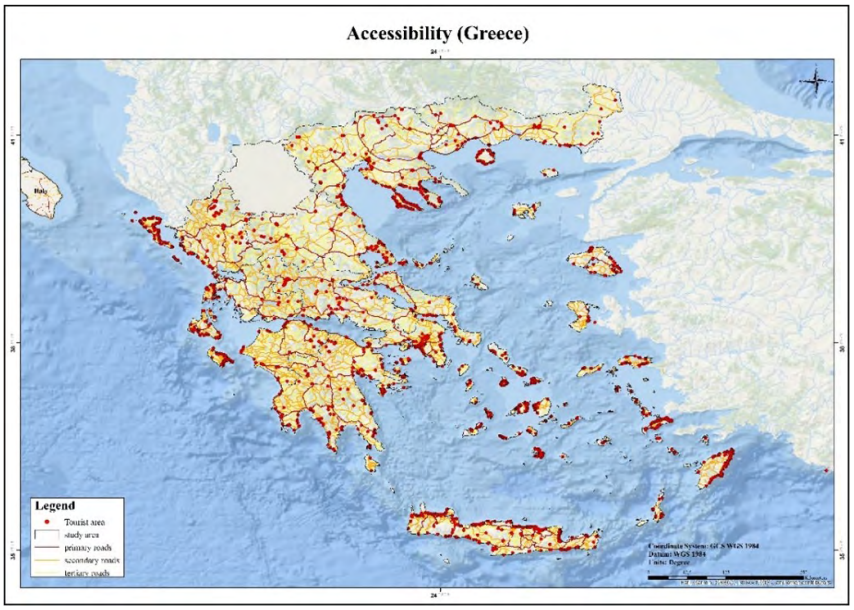

Figure 30. Accessibility in Greece

In Italy

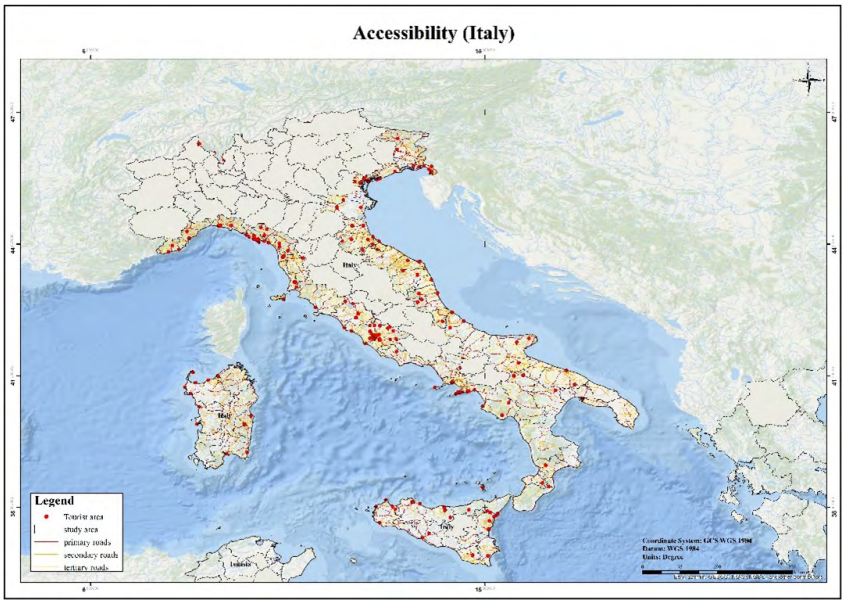

Figure 31. Accessibility in Italy

In Spain the area occupied by transport-related infrastructure (11%) is in the same order as mining areas, landfills, and areas under construction

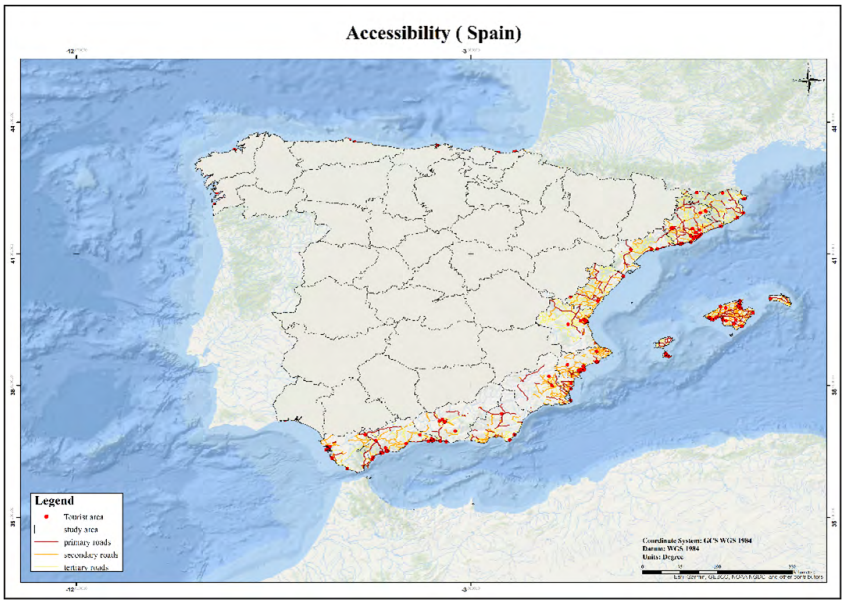

Figure 32. Accessibility in Spain

In Lebanon

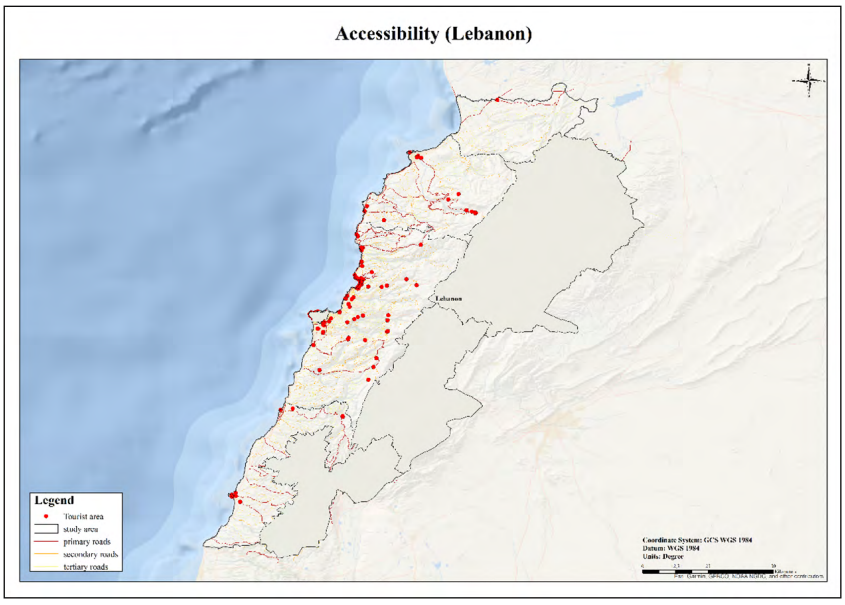

Figure 33. Accessibility in Lebanon

VI.3. Transport in the Mediterranean cities

VI.3.1. Road rail transport

It is by considering the internal structure of transport in each country that the greatest imbalance between north and south appears. European countries have a dense and efficient network, even if great inequalities persist between the north of the Union and the extreme south of Spain or Greece (Europa, 2020). On the contrary, the land network of Mediterranean countries that are not members of the European Union still leaves many regions landlocked. In addition to the investments necessary for its development, there are also the need to maintain existing roads and railways, whether urban or not.

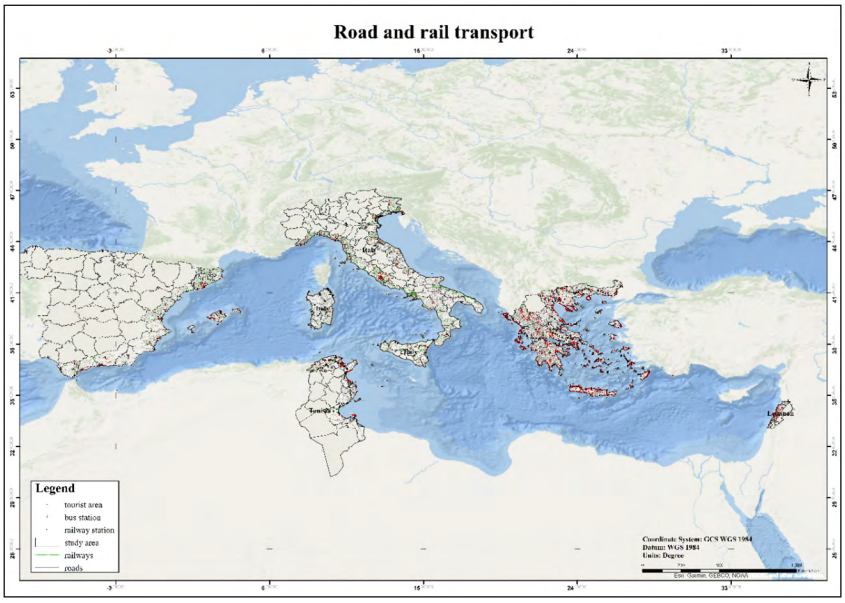

Figure 34. Road and rail transport

In Tunisia on some axes, public transport capacities are insufficient. Overloaded vehicles reduce the attractiveness of these public transport lines, which are usually used by passengers with no other choice. Buses are also very heavily affected by traffic congestion.

In Tunisia, the access to the touristic areas is generally ensured by private transport.

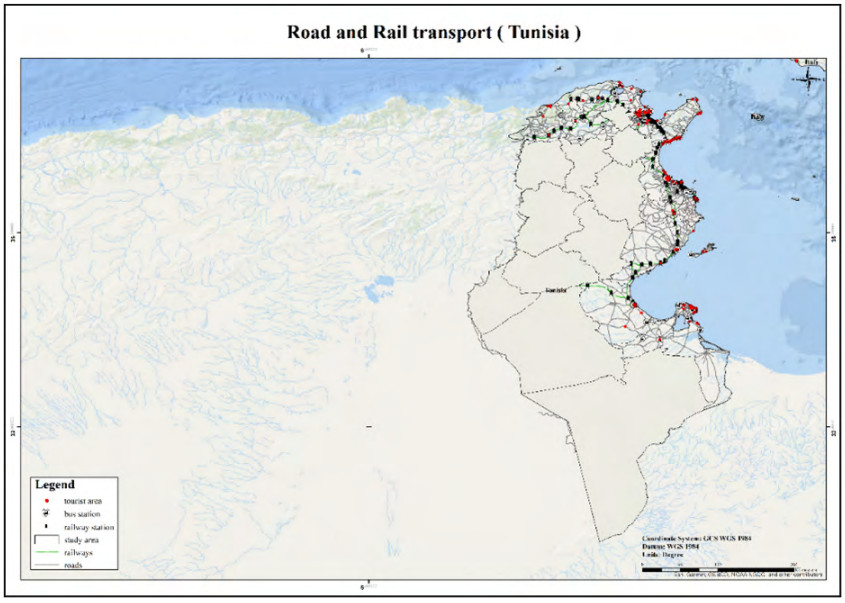

Figure 35. Road and rail transport In Tunisia

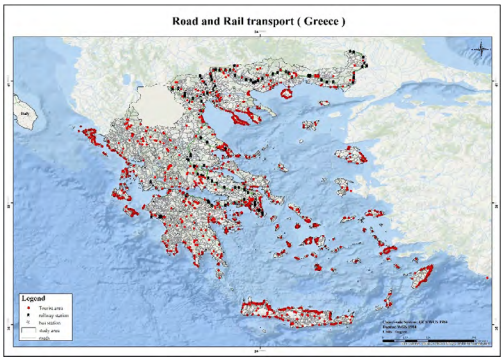

Figure 36. Road and rail transport In Greece

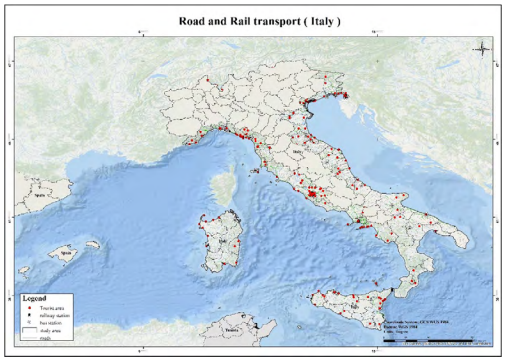

Figure 37. Road and rail transport In Italy

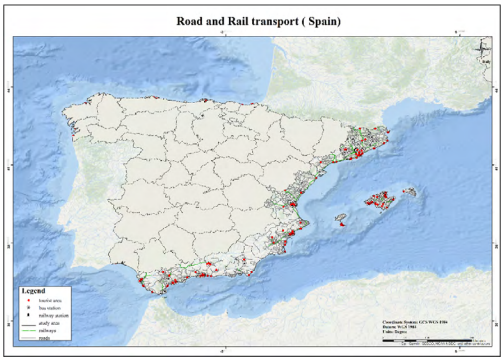

Figure 38. Road and rail transport In Spain

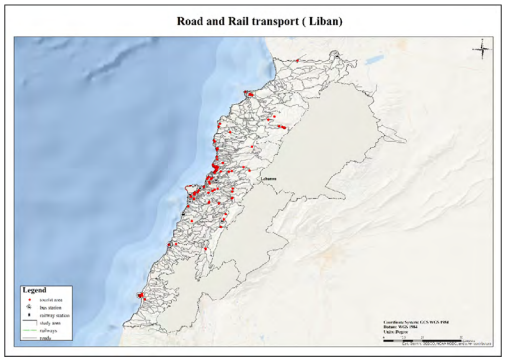

Figure 39. Road and rail transport In Lebanon

VI.3.2. Port and airport dynamics

VI.3.2.1. Port dynamics

Transport is an important economic sector for the Mediterranean basin, in particular maritime transport. The Mediterranean Sea is one of the busiest waterways on the planet, accounting for 15% of the total number of ships and 10% of the tons of DWT (heavy goods vehicles) (Planbleu.,2021). More than 350,000 journeys took place in the Mediterranean Sea in 2020 (Travelpulse, 2020), representing a capacity of 3,800 million tons. Almost two thirds of this traffic corresponded to domestic traffic (Mediterranean to Mediterranean), a quarter to semi-transit traffic, mainly small vessels, while the rest corresponded to transit traffic, consisting of large ships sailing between non-Mediterranean ports via the various Mediterranean straits: the Strait of Gibraltar, the Dardanelles Strait, and the Suez Canal (data transmitted by REMPEC).

Nearly 90% of the world's goods transit by sea. However, with only 1% of the sea surface, the Mediterranean alone accounts for 2% of world fishing, 25% of world maritime traffic and 30% of oil traffic (Blue economy in the Mediterranean, 2016). Thus,Antoine Frémont in his book devoted to maritime relations in the Mediterranean, notes that "maritime transport is an excellent indicator of the pulsations of the world economy.

In the following figures we present the different types of ports (fishing, recreational, cargo)

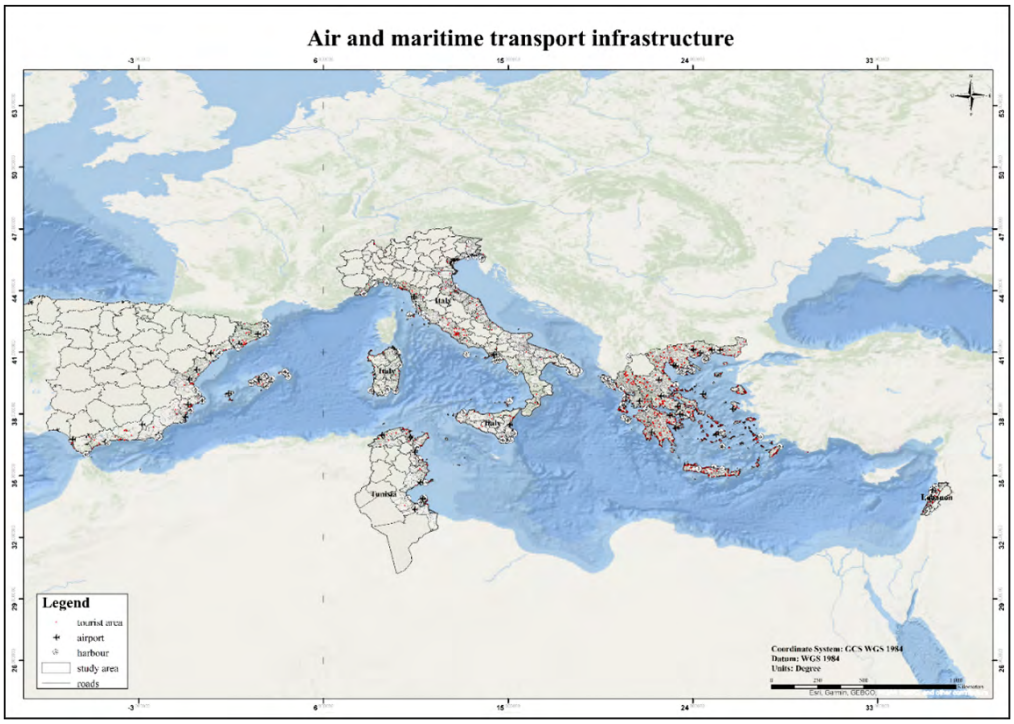

Figure 40. Air and maritime transport infrastructure

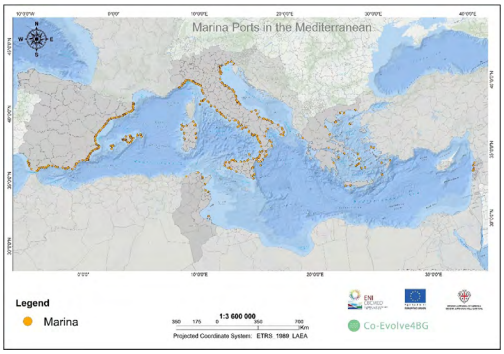

Figure 41. Marina ports

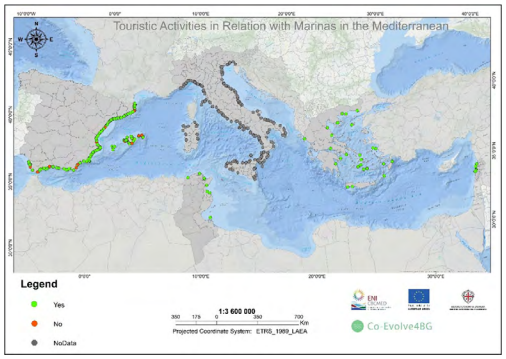

Figure 42. Touristic activities in relation with marinas

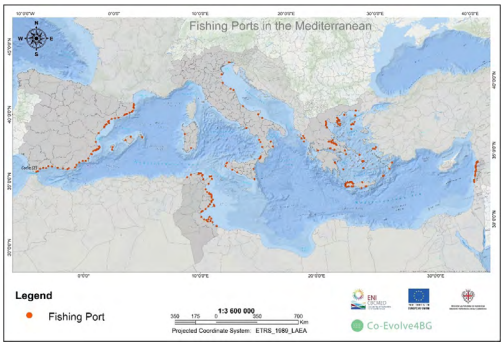

Figure 43. Fishing ports

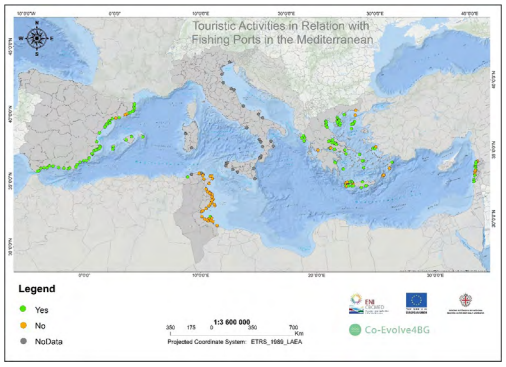

Figure 44. Touristic activities in relation with fishing ports

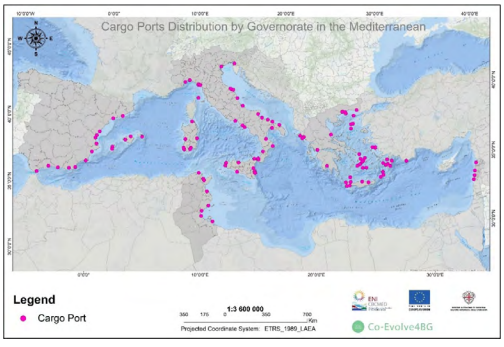

Figure 45. Cargo ports

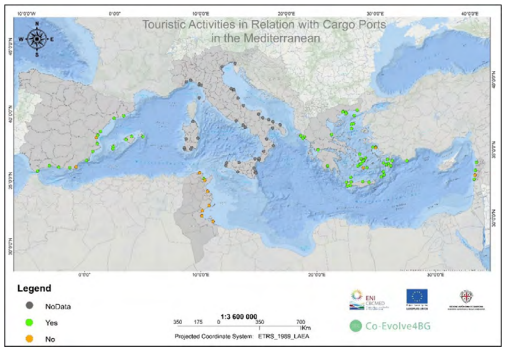

Figure 46. Touristic activities in relation with Cargo ports

The Mediterranean region has seen a significant and rapid increase in cruise ship movements over the past two decades: the number of individual cruise passengers in 2017 was more than 4% higher than the number of passengers who took a cruise the previous year and more than double compared to 2006, when 12 million passengers took a cruise (MedCruise Association, 2018). Today, the region is the second largest cruise region in the world (15.8% of global cruise fleet deployment in 2017), after the Caribbean. As a result of this continued growth, ports face the challenge of providing adequate infrastructure to accommodate large cruise ships and modernizing facilities to accommodate an ever-increasing number of cruise passengers, as well as to collect and dispose of related waste. Ports with more than 120,000 passengers per year are considered major ports. 36 Mediterranean ports fall into this category, of which 25 are located in the Western Mediterranean area, seven in the Adriatic and four in the Eastern Mediterranean area. Ports that welcomed fewer than 120,000 cruise passengers in 2017 include 15 ports in the Western Mediterranean, eleven ports in the Eastern Mediterranean and six ports located in the Adriatic (MedCruise Association, 2018).

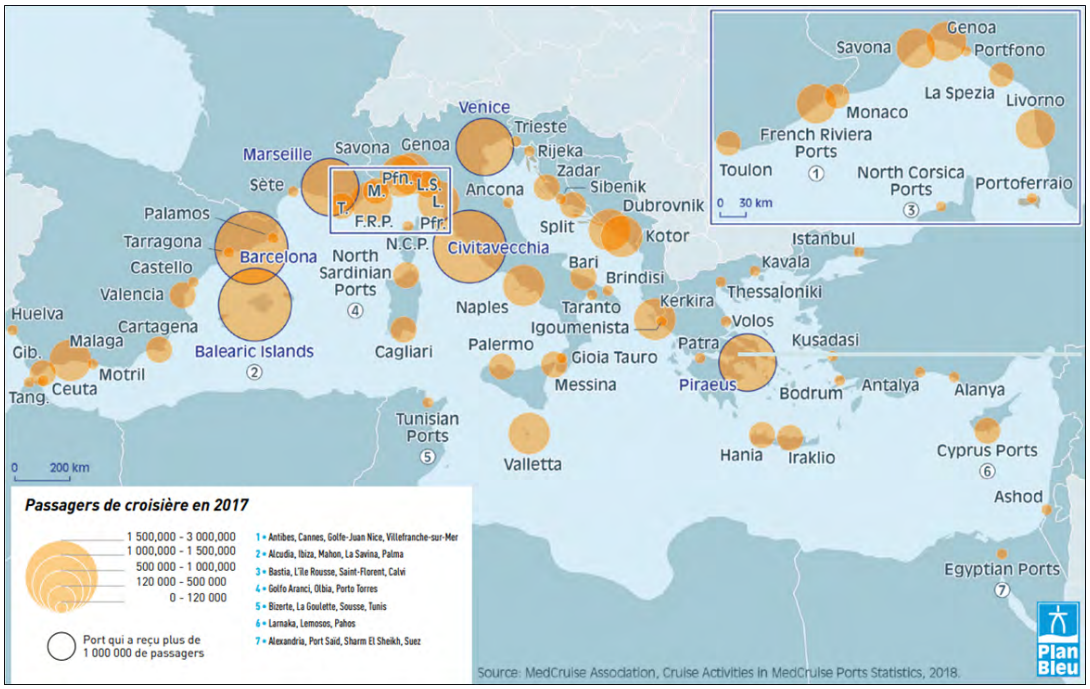

Figure 47. Cruise passengers in 2017

The growth of the cruise sector is particularly strong: it is the most important sector of the tourism economy in terms of gross value added and job creation. In recent years, the number of passengers has increased considerably both globally and in the Mediterranean. Cruises in the Mediterranean increased by 8% between 2017 and 2018, for a total of more than 4 million passengers.

Following global trends (annual passenger growth rate of 6.63% from 1990 to 2020), the number of cruise passengers in Mediterranean ports is increasing. More than 31 million cruise passenger movements were recorded in 2019, with an increase of 11.5% compared to 2018. Since 2011, the total number of cruise passenger movements in Mediterranean ports has never fallen below 25. The Mediterranean is the first destination area for European cruise passengers, and the second largest market.

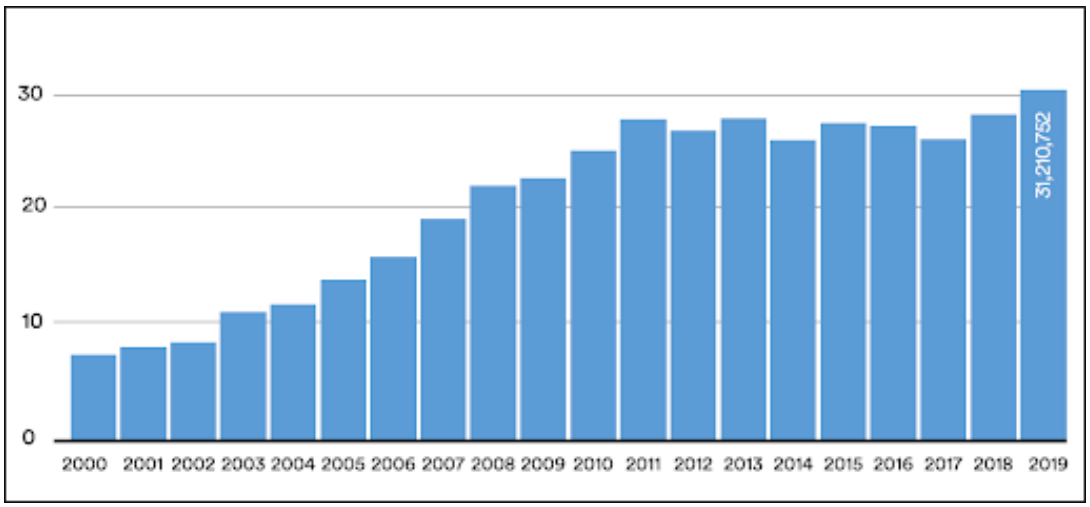

Figure 48. Cruise passengers

VI.3.2.2. Airport dynamics

Airport traffic is particularly intense in the Mediterranean. The largest airports correspond either to very large agglomerations or to medium-sized or even small cities, which are entry points for tourists (Palma, Antalya, Faro). 'Passenger' traffic in the Mediterranean (by air or sea) is therefore either linked to local economic activity or remains highly dependent on both types of migration: the largely seasonal type

of tourist flows, and the much more complex labour migration between poor and rich countries. Air links reproduce the historical bilateral links often maintained by migration (permanent and touristic): Maghreb and France, Libya - Tunisia and Italy, Turkey and Germany.

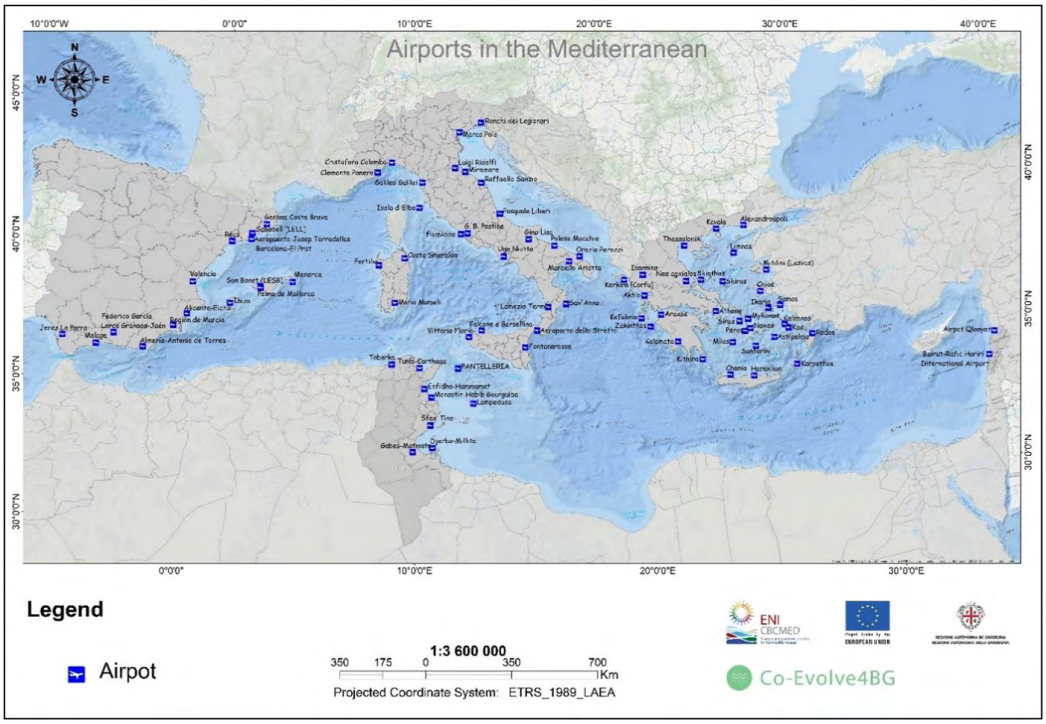

Figure 49. Airports in the Mediterranean

VII. Conclusions

VII. Conclusions

The urbanization of the coasts, their transformation by the development of various activities that affect the coasts, including tourism activities, and the multipolar uses that are developing there, raise questions about the health of the coast and the sea.

Indeed, the purpose of this report is to alert on the factors generated by the development of urbanization and transport on the coast at the Mediterranean scale.

These factors are the following: urban concentration, intense maritime and commercial traffic, waste, overexploitation of resources, expansion of cruises, etc. .... cause, among other things, the exhaustion of the regenerative capacities of the Mediterranean.

Questions of reflection that require answers on the impact of population growth, urbanization, coastalization, loss of green areas on tourism

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