

Spatial dynamics of Mediterranean coastal regions

Cori, Berardo

*Department of Geography, University of Pisa, Via S. Giuseppe 22, Pisa 56126 (PI), Italy;
Fax +3950566222; E-mail b.cori@geog.unipi.it*

Abstract. During recent decades the northern shores of the Mediterranean have experienced a rapid transformation; mainly due to touristic development. At present, more than 25 % of the world's hotel accommodation is found in the Mediterranean. This paper presents some figures illustrating the related growth of different sectors of coastal economy, such as housing, tourism, industry and traffic. A better control of these developments is urgently needed. To this end a spatial planning policy should be elaborated which fully incorporates environmental issues. The concept of integrated coastal (zone) management has only recently been introduced in regional and national policies. A classification of spatial dynamics including settlement-environment relationships can stimulate the implementation of integrated planning policies in the coastal belt of the Mediterranean region.

Keywords: Blue Plan; Land use; Tourism; Traffic; Urbanization.

Introduction

This paper deals with a series of phenomena of growth, change and pressure which have characterized the spatial evolution of the coastal belt of both developed and developing Mediterranean countries over the last few decades. It summarises both the first results achieved (Cortesi 1995; Cori & Vallega 1996) and the research still in progress led by a group of geographers mainly from Italy but also from other Mediterranean countries. These researchers have been working within the framework of the Human Dimensions of Global Environmental Change Programme, and also partly within the scientific framework provided by the IGU-Commission on Coastal Systems, the IGBP Land-Ocean Interactions in the Coastal Zone Programme and the UN Coastal Area Management Programmes. They have received considerable financial support from the Italian National Research Council (Mediterranean Section).

The paper considers as coastal regions those areas included in the maritime mid-level administrative units of the Mediterranean countries as defined by the Blue Plan (Grenon & Batisse 1988, Fig. 11; see also Voiron-Cancio 1992 and Reiffers 1997), the well-known first systematic study of the development impact of the whole Mediterranean region. Clearly, coastal regions represent

here a wider and more terrestrial concept with respect to coastal areas or coastal zones as defined by current literature.

These regions possess a coastline of no less than 45 000 km: Greece, with its indentations and islands, and Italy together account for more than half of this length, followed by Croatia and Turkey. Agenda 21 recognizes all coastal areas of regional seas (Vallega 1998) and compares them with the rest of the countries to which they belong. Whether highly industrialized (as in the northwest) or developing (as in the south), these areas seem to be more sensitive to the consequences of and more effective to the causes of human-induced global change processes from industrial pollution to sea-level rise than other regions.

Human pressure

More than 60 % of the world's population resides in coastal regions, in this case defined as a 40-mile wide belt from the coastline (Vallega 1998, p. 39); these regions are attractive and have specific natural resources and economic activities. Research carried out within the framework of the Blue Plan (Grenon & Batisse 1988, Fig.22), shows that, in Mediterranean countries, the coastal population accounts for 10% of the total population in countries such as France and former Yugoslavia, but up to 100 % in island states such as Malta, and small coastal states such as Albania, Lebanon and Israel. Very high figures are also found in larger states such as Italy, Tunisia, Libya, Algeria and especially Greece, where most main urban agglomerations are situated at, or near, the coast. The Mediterranean coastal population density is more than twice as high as the density of the Mediterranean population as a whole.

Projections for 2025 A.D. show that the Mediterranean coastal population will most probably grow and, depending on the various scenarios, might amount to 160 to 210 million inhabitants: 40 - 45 million in Italy, 30-35 million in Egypt, 20- 25 million in Algeria. etc. Coastal population density will probably not grow much further in France, Italy and Greece, but dramatic growth is predicted to take place in the coastal regions of southern

and eastern Mediterranean countries: over 300 inhabitants/km² in 2025 in Israel as a whole and for the Algerian and Egyptian coastal belts, and over 500 for Lebanon and coastal Syria (Grenon & Batisse 1988, Fig. 66). In Libya density figures will remain much lower, but even there the environmental context favours concentration along the Mediterranean coast (Kezeiri 1986). Since the late 1980s Turkey has shown a strong demographic increase and a positive migratory balance in the provinces along its western and southern coasts (Reiffers 1997, pp. 311-312). All this implies a growing demand on coastal resources and a need for urgent local development (Pavasovic 1996), with possible serious environmental effects.

Even in the first group of countries, however, a 'sunbelt factor' will produce some effects (Charrier 1994). The very dynamic French Cote d'Azur shows the combined outcomes of coastalization, sunbelt factor, agglomeration economies and 'frontier effect' (Renucci 1986; Dauphin 1994). On a more detailed scale, specific studies on single regions such as Calabria in Italy (Mura 1995), Corsica in France (Varani 1997) and the urban agglomerations of Athinaï and Thessaloniki in Greece (Petsimeris & Tsoulouvis 1997) have shown that population dynamics are stronger along the coasts if measured at the micro-level of smaller administrative units. Moreover, migratory movements from southern Mediterranean countries to northern and particularly northwestern countries also tend to concentrate in the provinces bordering the Mediterranean coastline (Brunetta & Rotondi 1996): indeed, these provinces seem to offer a good synthesis of modern development and traditional quality of life which is also shown by the parallel (permanent or temporary) European north-south migration.

The percentage of Italian population living in the coastal communes grew at a regular rate from ca. 20 % to ca. 30 % between 1861 and 1961, but since then it has remained largely unchanged. In certain regions, for example Toscana, a 'counter-coastalization' has occurred since the 1980s, with a flow of population away from the coast, which was encouraged by specific regional development policies (Cori & Lazzeroni 1995). Signs of this tendency also seem to emerge on Sicily where 70 % of the population, accounting for 80% of the regional income, lives in coastal areas (30 % of the island's surface area), but during the 1990s population density increased in inland- rather than in coastal communes (Famoso 1995).

Finally, a special case is that of the smaller coastal islands of Croatia, where (with the exception of a few northern islands where tourism has developed) population has been dwindling over the past 70 years, and the government gives incentives for young people to return there and contribute to a demographical revival (Anon. 1997c).

Touristic pressure

A substantial part of human pressure on Mediterranean coasts is caused by tourism: high coastal population densities are frequently linked to the presence of seaside resorts; a growing population from the hinterland demands leisure services and activities along most of the Mediterranean coastline and 'exploits' the Mediterranean itself as a big tourist lake, full of both natural and cultural attractions (Lozato-Giotart 1990). As stressed by Keckes (1996, p. 2), these people are 'a mixed blessing: while they provide an essential part of host countries' income, they also significantly add to the environmental woes of already stressed coastal zones and exert a further pressure on scarce resources'. The total number of temporary coastal dwellers is estimated to be 100 - 150 million each year and which is more than 30% of the world figure and this figure is expected to have doubled by the year 2025.

In Spain, special names for coastal regions have been coined since the 1950s in order to launch the country's Mediterranean coast on the international tourist market, for example: Costa Dorada, Costa Blanca, Costa del Sol, Costa de la Luz (Salgaro 1995). In addition, Balearic Islands such as Majorca, Menorca and Ibiza are popular amongst millions of people from northern and northwestern Europe and have been largely transformed as a result of tourism.

In France, the traditionally well-known Cote d'Azur is now accompanied by the Cote Vermeille: tourist pressure on the French Mediterranean coast has been clearly demonstrated by a study of the density of accommodation, with reference to surface area and population. To quote just some of the figures: ca. 50 % of the country's second homes, 60% of the hotel facilities and 80 % of the holiday villages and camping sites are concentrated here (Capineri et al. 1995). Undoubtedly, the seasonal population during the summer has reached saturation point.

In some Italian (and coastal Spanish) regions, which were affected by the wave of tourism during the second half of this century, the increase in human pressure on the coast has not been stopped. Human pressure on the middle Adriatic coast (Marche and Abruzzo) followed an exponential curve (Fig. 1) up to the end of the 1970s, which became a logistic curve in the 1980s (Fabbri 1997). Along many stretches of the Italian coastline, hotels and other tourist settlements are found in such high density that there is more than one bed available for every 2m of coastline (Montanari 1996). Along the above-mentioned Adriatic coast, tourist pressure is by far the main driving force of the systematic occupation of the whole coastal space available under the 50-m contour and an

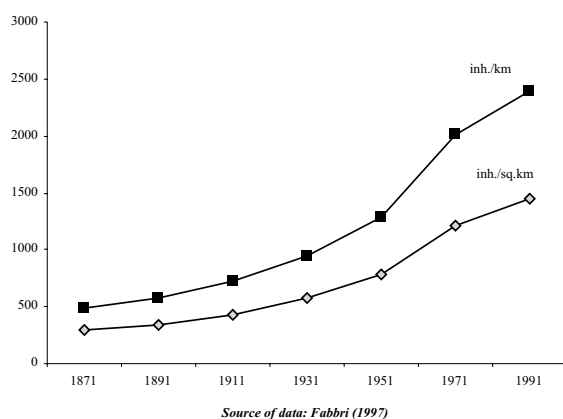


Fig. 1. Population density in the Middle Adriatic Coast, Italy (Fabbri 1997). ◇ = inhabitants/km²; ■ = inhabitants/coastal stretch of 1 km (width ca. 2 km).

occupation which even affects the fragile amphibious lands close to the Po Delta and the Lagoon of Venice.

But even away from the three traditional *Ô*tourist powers^Ô of the northwestern Mediterranean, we can find examples of coastal regions with recent urbanization, numerous service activities and infrastructures due to the rapid development of local tourism, frequently brought about by external forces. This is the case on the Turkish Riviera (Sprengel 1998), the Lebanese coast, Cyprus, Mediterranean Morocco and particularly Tunisia.

The case of the northeastern Mediterranean is special and needs further research. Greece and Croatia are the leading countries in a possible process of west-east shifting of international tourism within the Mediterranean area. In the eastern Adriatic, the undeniable opportunities of the indented and picturesque Croatian coast have only been limited by the political and military situation of the 1990s (Crkvencic 1996). Greece simply has to coordinate the potentialities of its archaeological and artistic heritage with the traditional sea-sun-shore appeal (Lemmi 1997). Both Croatia and Greece have to consider the crucial issue of the sustainable development of their respective small islands, as recommended by Agenda 21, as regards both the integrity of their ecosystems and the efficient development of their economies.

As a whole, Mediterranean countries provide at least 25% of the world's hotel accommodation, and an even larger share of other tourist structures. This refers to a situation in which 90% of accommodation is provided by northern shores: both this concentration and prospects of *Ô*southern^Ô decentralization are going to produce considerable challenges for the future.

Settlement system change

A significant and growing portion of the Mediterranean coastal population can be characterized as urban: 538 urban settlements with more than 10000 inhabitants each are at present found along the Mediterranean shores; of these, 45 exceed a population of 200000. By 2025 the urban population might represent 75 to 85% of the total. Contrary to eastern and especially southern Mediterranean countries such a dramatic growth is not expected for France and Italy where one can already speak of a series of coastal belts of urban settlements. In Algeria, Egypt and Turkey coastal urban areas may, according to the Blue Plan (Grenon & Batisse 1988, Fig. 65), soon have more than 20 million inhabitants.

This represents a substantial trend of change in the Mediterranean coastal settlement system, even though it is consistent with an old-established metropolitan tradition. However, an even more dramatic change is clearly foreseeable in terms of the physical housing system, given the new forms of urbanization (development of peripheral areas, processes of suburbanization and counter-urbanization) that imply the systematic increase in the number of homes especially second homes frequently along a narrow strip of coastline, in more and more countries.

A comparison between the 1991 and 1971 national population censuses clearly shows this phenomenon. In Spain, the number of houses along the Mediterranean coast grew by 77% over 20 years, while the national figure was also rather high and was 61%. Along the whole northwestern Mediterranean Arc, the housing stock grew by 57% over the same period (while the population was edging up by 13%) and second homes by 171%.

In two Italian regions, Calabria (Mura 1995) and Sardinia (Banini et al. 1995), a growth of more than 100% in their building stock occurred in a narrow strip of coastal communes, which is a much faster growth than in inland communes. Through the expansion of scattered urbanization and often illegal and corresponding to a specific *Ô*seasonal^Ô lifestyle, the number of second homes along peninsular and insular Greek coasts has multiplied (Lemmi 1997). Even on smaller islands, for instance Malta, the coastline has proved to be very attractive to households (Zammit 1986). These new forms of settlement growth which are frequently underestimated, since they are partly due to unauthorized building and lead to new land uses, which have such a marked environmental impact (*Ô*cementification^Ô, production of liquid urban waste, loss of biodiversity) that it has even been stated that today the settlement question must be considered the most important of all environmental problems (Della Pergola 1994, p. 67).

Industrial growth

As we know, significant industrial activities characterize Mediterranean coastal regions. Steel and metal plants, not to mention shipyards, are traditionally located near the sea, along industrial coastal axes from Marseille to Taranto and from Athinai to Tunis. More recently, coastal industry has expanded along the Mediterranean coastline, especially on southern and southeastern shores (Grenon & Batisse 1988, Figs. 41, 42, 48). Oil processing plants, already established everywhere with the sole exception of the eastern Adriatic coast have been growing along the central and western African Mediterranean coastline. The same holds, to an even larger extent, for thermal power stations which need water locations. They are now evenly located along the coasts from western Algeria to the Turkish gulf of Iskenderun. This is the same area which houses 25 oil tanker leaving points, while a corresponding line of 22 landing points exists along the northwestern coastline, from Gibraltar to northern Croatia.

The northeastern Mediterranean, from southern Croatia to southern Turkey (with some exceptions in Albania and Greece) has escaped coastal industrial development as have many islands, notably Corsica, the Balearic Archipelago, Crete and most Greek islands, because of the predominance of tourism; on the other hand Cyprus and some northern Croatian islands (Krk) are slightly affected by industrial developments and Sardegna and Sicilia are heavily industrialized (Rota 1997).

So, while many processes of industrial eco-restructuring and the introduction of high-tech and clean industrial settlements (e.g. Cote d'Azur) are being undertaken by Mediterranean industrialized countries, there are also some signs of a planned dirty decentralization of factories. Many of these factories pollute the marine environment, especially close to big harbours, the large coastal settlements and the coastal industrial complexes. In less industrialized countries, where development has been uncontrolled, waste treatment technologies are often poor and ecological norms do not exist or are applied tolerantly (Pavasovic 1996). Development of offshore oil and gas exploitation, which concerns coastal seas rather than coastal regions are a further threat to the coast. Around Italy 925 wells have been drilled, 821 of which are productive, feeding more than 100 plants through 530 km of seabed pipelines (Lucia 1996).

Traffic growth

Growth of motor vehicle traffic is another source of pollution in the Mediterranean area, clearly connected with urban, tourist and industrial developments. In

1963, 15 million cars were registered in Mediterranean countries (in this case the whole of each country has been considered, not only coastal provinces). This number increased to 40 million in 1972, 65 million in 1981 and 99 million in 1994. More than one hundred million cars are now on the road, together with the vast number of motorcycles and heavily polluting motorini (mopeds) they are a source of tremendous pollution. The figures for the northwestern Mediterranean where Italy has recently overtaken France (Fig. 2) are much higher than in the other regions, but growth trends are certainly more impressive in the southeastern Mediterranean.

The impact of traffic (in terms of the number of cars, accidents etc.) are much higher in coastal administrative units than in inland ones, especially in Italy. For example, the most crowded communes (> 100 vehicles/km²) in Calabria are located mainly along the coastline, while the majority of inland communes have figures of < 50 vehicles/km² (Mura 1995, p. 249).

In Spain, data from 1990 show a lower ratio of number of inhabitants / number of vehicles in coastal provinces than the national average: 1.6 on the Balearic Islands, 1.7 in the province of Girona, as compared with the national average of 2.3 (Salgaro 1995).

The transient position of Mediterranean France between coastal Italy and coastal Spain is emphasized by coastal road traffic, which has almost tripled since the 1970s; heavy traffic now accounts for 20% of the total movements (Capineri et al. 1995). Spatial consequences of this transit role were already evident in

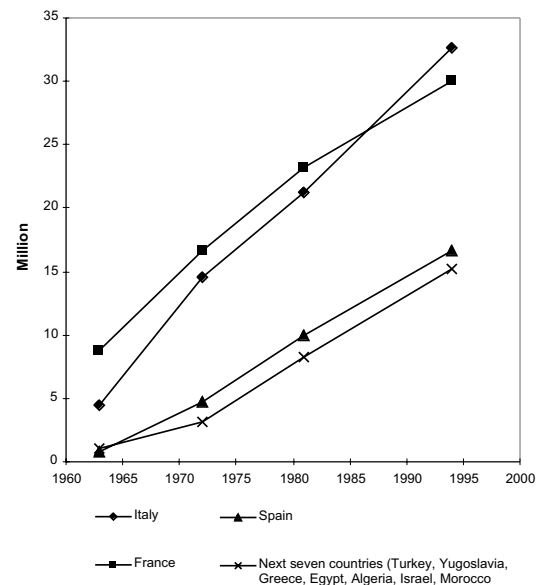


Fig. 2. Increase in the number of cars in the Mediterranean area.

the 1980s, when Renucci spoke of a traffic network *ÔdevouringÔ* space in Provence-Alpes-Cote d'Azur as early as 1986 (p. 77).

An increase in the number of vehicles denotes increased daily and seasonal mobility, which is logically encouraged by the new settlement models discussed above. But it also means more pollution and more land consumption for roads and parking space. This happens throughout the Mediterranean region, but more markedly along the coastline. Road development projects in Israel and Lebanon are currently planned along the coastline (Reiffers 1997, p. 264), which are considered the most *ÔnaturalÔ* setting. Coastal planners should pay special attention to this trend, which will have a major impact on the environmental quality in coastal zones (Belfiore et al. 1998, p. 81). One cannot help thinking of the impact of parallel roads on the coastal landscape, for example, the newly planned Croatian coastal highway from Dubrovnik to Rijeka (Crkvencic 1996, pp. 465-466) in the unique context of the Eastern Adriatic coastal environment.

Another type of pressure which should not be underestimated is maritime traffic. About 220 000 vessels of different size enter or cross the Mediterranean Sea each year (Keckes 1996). The number of Mediterranean ports is also impressive. In Croatia, for example, trade, fishing and tourism have generated, along its particularly long and indented Adriatic coast, ca. 250 ports and boat harbours of different types and sizes (Crkvencic 1996, p. 449; Anon. 1997c, pp. 48-55). Many of these, of course, are simple tourist harbours or *ÔmarinasÔ*; but even these can exert a certain *ÔpressureÔ* on coastal life, for example the 11 marinas along the southwestern coast of Mallorca with their 18000 moorings (Lucia 1997).

Change in land use and cover

The transformations described above, if translated into terms of physical appearance of the Mediterranean coastal regions, produce substantial changes in land use *Ð* i.e. the way in, and the purpose for, which land is used *Ð* and land cover *Ð* i.e. the biophysical state of the land surface (Turner et al. 1995).

In Spanish, French and Italian Mediterranean regions, which have been preliminarily investigated from this point of view, verified cover changes include a reduction of utilized agricultural land, an expansion of uncultivated land and built-up areas, and, on a more positive note, a slight increase in woodland. These changes can be summarized as a progressive transfer from agricultural use to other uses. The trend is reinforced dramatically to meet both the new settlement patterns and radical changes in urban structure and the

growing demand of tourism and traffic infrastructures. It must be added that the agricultural areas mostly affected by the spread of new housing are frequently the best ones, i.e. flat, fertile and easily cultivatable (Cortesi et al. 1996).

Changes in land use and cover are still to be investigated in other Mediterranean areas. In many of them, a similar scenario of increasing competition for space, of settlement and infrastructure expansion and of reduction in agricultural area, can be imagined *Ð* with subsequent increases in water- and wind erosion and, at least locally, salinization and desertification (Conti & Segre 1998, p. 7). There are some cases of an opposite development, for instance in Albania, where agriculture has, so far, continued to gain space at the expense of woodland (Ziu 1994).

The consequences of these changes upon the Earth's biogeochemical cycles are still to be studied. Such consequences primarily imply long-term effects. However, this is not a task for geographers, who should improve their contribution to the development of a good coastal management system which is consistent in terms of legend and scale of land use mapping, both historical and present.

Spatial planning

It is clear that the series of processes considered so far, and which are now being investigated by geographers, represents a challenge to the human capacity of controlling *ÔspontaneousÔ* spatial processes and making them *ÔsustainableÔ*: in short, to the human capacity of achieving true and reasonable spatial planning.

Apparently, spatial planning, at least in most Mediterranean countries, has only discovered coastal areas very recently: and now such planning is urgently called for. Indeed, as we well know, the environmental issue has only recently been acknowledged by planning in general, and by local planning in particular: planners accepted and encouraged, with a *Ôlaissez-faireÔ* behaviour, uncontrolled urban and infrastructural expansion, the diffusion of industry into coastal areas and the sprawl of mass tourism towards the sea. Spatial planning became aware of the environmental problem long after profound changes had already affected the Mediterranean.

It is true that from the 1970s onwards protected areas began to spread out around the Mediterranean basin. But, as noted by Schmidt (1994), a map of the distribution of national parks in the Mediterranean shows that very few of them are coastal or marine parks; protected environments are more often located in mountainous areas, where tourist demands are not as heavy.

The inappropriate management of the coastal regions is largely due to a lack of adequate coastal planning (Belfiore et al. 1998, p. 77). The concept of integrated coastal zone management, in the present context indicated as integrated coastal management, (including both coastal regions and coastal sea) has only recently been developed and it is only now becoming generally accepted. Its implementation in most Mediterranean states is in its initial phase only, and in some it has not yet started at all (Pavasovic 1996, p. 135).

In this respect, the northwestern section of the Mediterranean is in the most favourable situation. Cortesi et al. (1996) presented a classification of 10 national and 40 regional parks from Gibraltar to Sicily. They make up an area of 1.8 million ha which includes marshlands, woodlands, maquis and areas whose fauna is of special interest; attempts have also been made to set up marine parks.

However, these areas are not equally distributed over the three northwestern Mediterranean countries. In Spain, the Doñana coastal park should be mentioned, but generally, coastal planning has almost totally been disregarded even on the Balearic Islands (Salgaro 1995). Some places have recently been declared tourist centres of national interest and are, therefore, protected to some extent by restrictions on construction, others have frequently expanded in a way that contradicts any serious town-planning rule. Lucia (1997) appears to be more optimistic, reckoning that 38 % of the surface area of Majorca will be considered a protected area.

In Mediterranean France several initiatives have been undertaken which are aimed at the protection of coastal areas (Capineri et al. 1995; see also Pergent 1997). Some of these are located close to densely populated spaces and their main function is that of protecting nature from human intrusion and guaranteeing green space to citizens. Others are located in fragile environments, often isolated but exposed to strong touristic pressure. Three out of the seven French national parks are included in the Mediterranean coastal region. In addition, a number of regional parks and many nature reserves, both terrestrial and marine, can be mentioned.

In Italy, despite a long-standing tradition regarding parks, natural reserves and protected areas (Barbieri & Canigiani 1989), mountainous areas were considered and defended against human pressure much more strongly and much earlier than coastal ones, particularly in Adriatic and southern regions. On the other hand, there are several reserves along the Tyrrhenian coast, i.e. the national park of Circeo (Lazio), the natural parks of S. Rossore and Maremma (Toscana) and various protected areas on Sicilia.

Regarding other Mediterranean countries, it should be noticed that the Croatian islands, considered a great treasure and of special value for the country, are subject to special state protection according to the Constitution,

(Anon. 1997c). Together with continental coasts, they host a number of parks, reserves and protected landscapes. Greek spatial planning also seems to have considered both coasts and islands, as shown for example by carrying capacity assessments undertaken by the Priority Actions Programme (Anon. 1997b). In Libya and Tunisia, urban planning aims at limiting coastal settlement developments and, where possible, directing urban expansion towards inland locations (Kezeiri 1986; Kantouche 1986).

During the last 10 years, planning initiatives have shifted into Coastal Area Management Programmes organized within the international framework of the Mediterranean Action Plan, and conceived as a special case of regional development programmes (Vallega 1998, p. 89). These programmes try to extend coastal planning practice to countries such as Albania, Turkey, Syria, Lebanon, Israel, Malta and Morocco (Pavasovic 1996). Coastal managers and planners should be convinced that coastal management is not only concerned with a narrow zone consisting of the foreshore, inshore and offshore; it should also include littoral cities, seaports and manufacturing areas (Vallega 1998, pp. 41-43). Coastal management should thus be substantially extended landward, in a measure to be defined according to various criteria possibly consistent with administrative boundaries.

Classification of coastal areas according to degree of urbanization and environmental quality

A tentative classification of areas with different recent spatial dynamics along Mediterranean coasts has been devised, with special reference to relationships between settlement density and environment. For the moment, it is limited to the northwestern part of the Mediterranean and has eight categories which are ranked according to decreasing degree of urbanization and increasing degree of naturalness (Fig. 3, from Cortesi et al. 1996):

1. *Metropolitan areas in a critical phase*, characterized by a demographic standstill or decrease, high housing density, heavy traffic flows and an environment which is degraded or at risk; they are subject to restructuring processes (Marseille, Genova, Roma, Napoli).

2. *Areas approaching urban saturation*: medium-size towns which show a low demographic increase or a slight decrease, high housing density, traditional tourist activities and a complex mixture of industry and tourism, with high competition for land use and environmental stress (e.g. peripheral Ligurian provinces with cities such as Sanremo and Livorno).

3. *Suburbanized areas*, bordering main metropolitan areas, subject to spreading of urban features and characterized by a high demographic increase, medium housing density, a shortage of public transportation

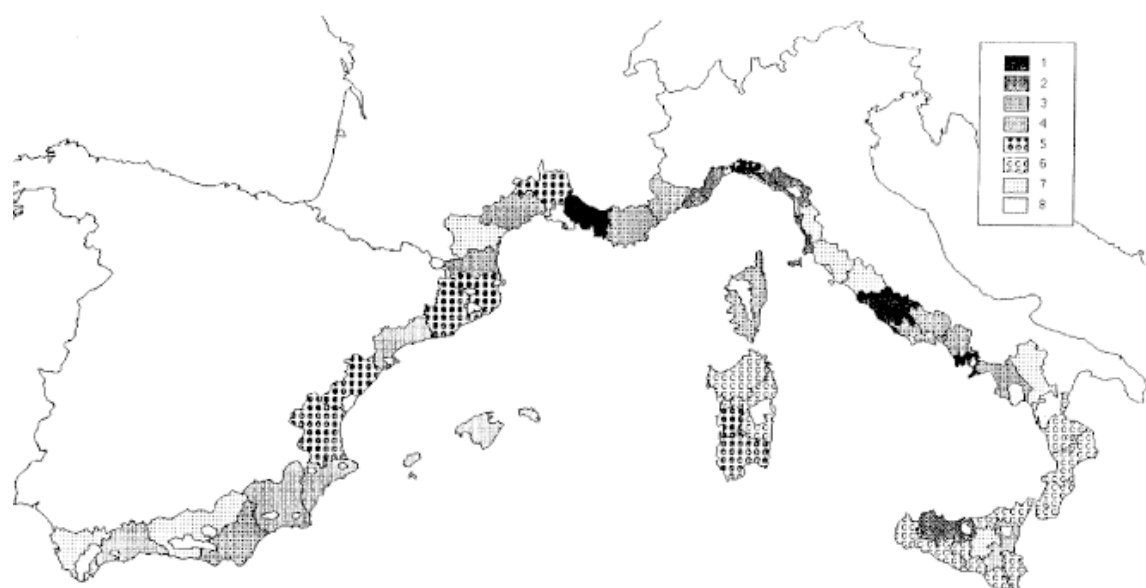


Fig. 3. Classification of coastal areas according to degree of urbanization and environmental quality in the northwestern Mediterranean (Cortesi et al. 1996). The eight categories are explained in the main text.

facilities, and an environment which is not yet degraded but under growing pressure – e.g. provinces bordering Roma and Marseille.

4. *Areas of high expansion and environmental impact*, with a large demographic increase, large increase in second homes, recent industrial and/or tourist developments – most of the southern provinces of Spain and some Italian insular provinces.

5. *Areas under slow urban development* with innovative potential, where processes of specialization and innovation in production are being developed, where the environment is potentially very valuable – most Spanish and certain southern Italian coastal cities, from Alicante to Salerno.

6. *Marginal areas undergoing restructuring processes*, with low demographic increase or even decrease, sprawl of second homes (and illegal housing), low environmental concern, conflict between tourism and residential land consumption – most southern provinces in Italy.

7. *Areas in a 'stationary' phase*, which pivot on medium-sized towns with stable demographic dynamics; their environmental situation is reasonable and there is much concern for protection – most central, insular Italian and some Spanish provinces.

8. *Natural parks and protected areas*. They are usually embedded in areas of categories 6 and 7 and include famous areas such as Doñana and the Ebro Delta in Spain, the Camargue in Mediterranean France and protected areas on Corsica and Sardegna.

Extensions of this classification to other parts of the Mediterranean are in progress, and further research is needed for those areas already included: if the Mediterra-

nean is to be a multinational maritime region and put sustainable development into practice, we are convinced (see also Augustinus 1998) that coastal regional changes are the main challenge to this goal.

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