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URBAN CHANGE AND ENVIRONMENT IN THE NORTH-WESTERN MEDITERRANEAN

The urban change process. – The Mediterranean town has developed over the ages: it preserves, in its monuments and its structure, traces of its origins – as a Greek colony, as a Roman *castrum*, as a medieval village – and of the historical layers which have marked its growth. The symbiotic relationship between town and site, that is the «harmony» between town and environment, characterized urban development until the end of the last century. The growth of industries, the opportunity for exchanges and service availability have attracted population flows which have gathered around the privileged towns.

This migration towards the towns and the very high demographic growth would not have reached such an extent without «freedom of movement» (Gottmann, 1991) both at a legal (abolition of serfdom) and a pragmatic level. The progress of transport and the growth of incomes have increased this freedom and encouraged population mobility over larger areas and in less time, giving rise to more and more frequent seasonal and daily movements.

Moreover, processes of urban concentration and expansion have led the town to take possession of the bordering space, and to use it for its own aims, taking it away from agricultural activities. While agricultural use has meant an evident «manipulation» of space (land reclamation, terraces, etc.)

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and a growing environmental change (pollution from fertilizer or other hydrogeologic damage), other uses by agriculture have implied an irreversible process of environment «artificialization» especially on the coast, whose potentialities have attracted different – and generally competitive – activities (industries, ports, tourism, etc.).

The relationship with the environment reached a critical point: the environment has sometimes been a barrier, or an opportunity for growth, but always a resource to be «used». Only recently the awareness of the «limitedness» of space and the fragility of the environmental equilibrium has led to a shift in the town-environment relationship and has required closer attention to the environmental issues induced by uncontrolled urban development (congestion, pollution, land damage). Space management and urban planning must take care of the quality of life of the population and at the same time plan the development process.

The study of the dynamics of habitat in the Mediterranean is defined as «capital» in the *Plan Bleu*, which outlines the future developments in the area (Grenon and Batisse, 1988, p. 17): urban development is particularly representative in this area because of the close relations established between demographic concentration, type of settlement and activity, and the make-up of the environment.

Urban change is the result of some very complex socio-economic processes and spatial dynamics, so much so that it is easier to perceive its obvious external manifestations than to analyse it, looking for synergic or consequential relations between the individual phenomena which it includes. The very concept of global change, even when limited to the human dimension, implies a complex «systemic» vision of which the urban phenomenon represents a considerable part, but only one of the possible parts to be analysed.

In areas of older urban culture, urbanization clearly reaches levels of such intensity and complexity that relations with the environment become particularly problematic. The growth and diffusion of the urban phenomenon (Cortesi, Marengo and Spinelli, 1991) can alter and compromise the environment's equilibrium, leading to a rapid transformation of the landscape (deforestation, indiscriminate building, etc.) and in some cases causing significant alterations (climatic changes, air and water pollution, etc.).

Such transformations can be studied on various geographical scales; however, a pragmatic approach on a local scale allows for the concrete identification of the ways in which urban change takes place, and of the possible environmental consequences. Working on a local scale also means that we are able to record the reactions of the population and public organisations to environmental change and the consequent action taken or planned to deal with it. Change can also be analysed and verified on various time scales; however, the most recent changes (in the last two decades) allow a deeper and more detailed analysis because of the various different sources available, making it possible to identify trends which condition the immediate future.

The area chosen was the North-western Mediterranean: the arc which extends from the Strait of Gibraltar to the Sicilian Channel and includes the most important islands of the Mediterranean (Sicily, Sardinia, Corsica and the Balearics), an area of great economic, cultural and strategic importance (Cottrell and Theberge, 1974). The European regions situated in this part of the Mediterranean have much in common in terms of heritage, development patterns, challenges and problems facing them (Voiron Canicio, 1994), as well as in terms of environmental characteristics. These common features can be brought together in a «cultural unit» – recently referred to as the *Arc Latin* to indicate the area (Daviet, 1994) – and also serve to distinguish this area from the other regions bordering on the Mediterranean. The North-western sector is the part of Mediterranean where the most economically advanced countries are situated, where, historically, most towns are concentrated, the intensity of land occupation and use is greatest, and the heaviest flows of goods and people are established (there are numerous ports, including the two most important commercial ports in the Mediterranean); it is the area with the greatest demographic pressure due to new residential choices (transfer from inland areas to the coast), tourist attraction (from Central and Northern Europe), and immigration from the opposite shores of the Mediterranean.

For the analysis of urban change, it was found convenient to base the studies on coastal administrative units – the Spanish *provincias*, the French *départements*, and the Italian *province* – which gave us the benefit of statistical data and allowed for the comparison of situations and results.

The relations between urban change and environment. – According to the conceptual ideas underlying the HDGEC Programme (Jacobson, 1992; Turner, Moss and Skole, 1993) and as can be read in the Italian HDGEC Programme (Corna Pellegrini, 1992, pp. 42-43), in the relation between urban change and environmental transformation the accent is placed on the dynamic aspects of this relation and, in this way, three interconnected aspects are identified: the change in the structure and use of urban areas, the evolution of material relations and thus of urban flows, and the ability of planning to manage and influence the first two aspects with the aim of improving the quality of the urban environment.

Following this approach, urban change can be schematically interpreted (fig. 1) as the result of new housing choices on the one hand, according to the population's spatial concentration and the «physical» expansion of the town, and of new urban functions of individual towns or parts of them on the other, which imply a growing demand for accessibility and a greater mobility of the population.

The level of economic, social and cultural development, the needs, expectations and aspirations of the population, or simply the housing market, all manifest themselves in new housing or production choices which can take on various forms, such as the development of peripheral areas, subur-

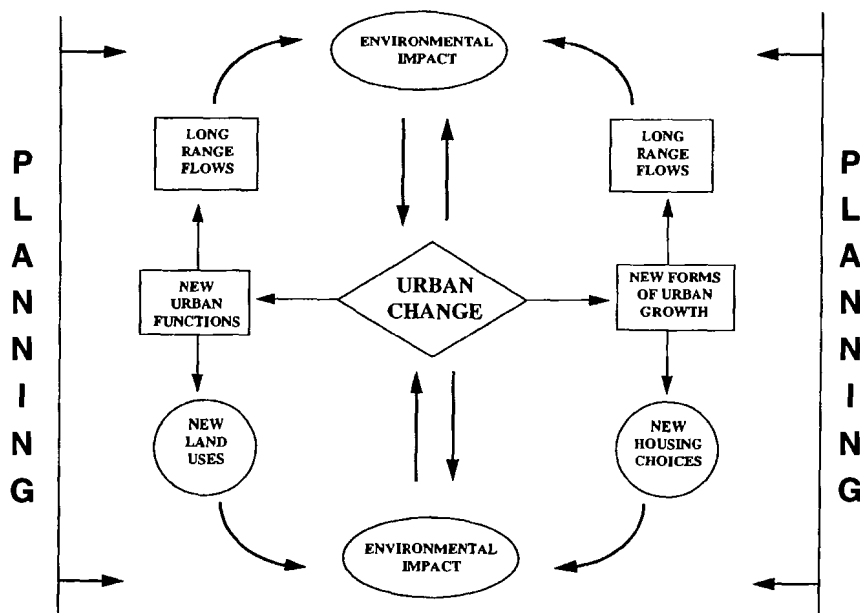


FIG. 1 – RELATIONS BETWEEN URBAN CHANGE AND ENVIRONMENTAL IMPACT.

banization or «peri-urbanization», or counter-urbanization. All these phenomena involve the development or re-evaluation of the urban centres. Greater financial capacity and technological development, on the other hand, have increased the availability of leisure time and the demand for leisure activities. Both in the case of short distance transfers and long distance ones, the most obvious phenomenon is increased mobility. Although it is difficult to fully assess the extent of this change, it can be explained by the «synchronic dynamism» which is added to the usual diachronic evolution.

The impact on the environment can be seen in the space occupied by the town (housing, manufacturing plants, infrastructure), the changed use of this land, and the relations and flows corresponding to vehicle mobility: in their turn, these vehicles also contribute to the occupation of space and the changed use of it, as well as to the emission of pollutants into the atmosphere. It is only through a knowledge of these mechanisms and the resulting planned intervention that each or all of these elements can be modified, and this is why planning must be given ample opportunity to keep a check on the instruments and methods used to control and guide urban and environmental change.

As far as change in land use is concerned, of particular importance are the settlement patterns, the changes in urban structure and the ways in which the town has developed. In the study of land use, much attention is

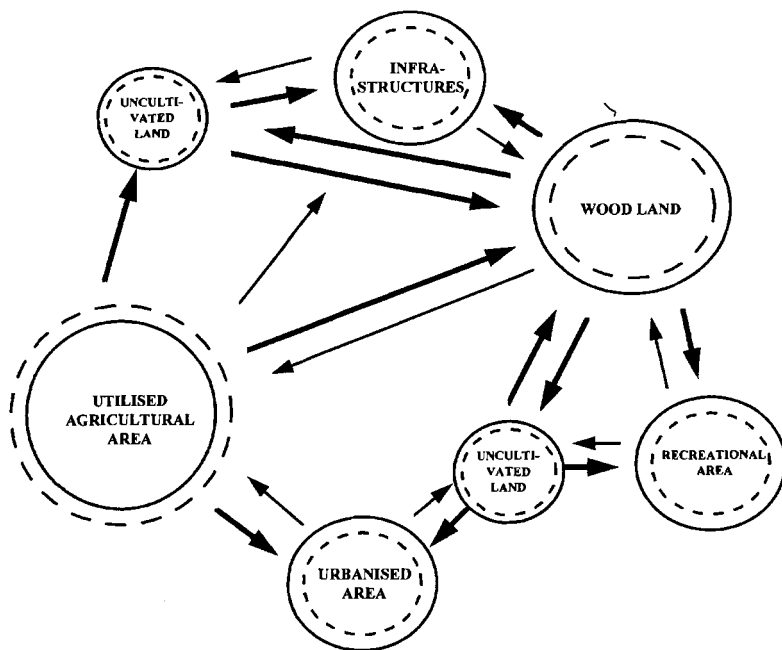


FIG. 2 – CHANGES IN LAND USE.

given in general (Brouwer, Thomas and Chadwick, 1991) to changes in types of agriculture, the consequences of climatic transformations and alterations in the soil (erosion, salinisation, degradation), and to transformations sparked off, or directly caused, by man.

The recent change in land use can be summarized as a progressive transfer from agricultural land use to other uses, either through a process of «degradation» (increase in uncultivated land) or reclamation/reestablishment of woodland following the abandonment of the less productive agricultural areas, or one of land «invasion» and «occupation» by the built-up areas and infrastructure of urbanization (1) (fig. 2). Contrary to the situation in the past, almost all land uses other than agriculture are on the increase, with a consequent decrease in utilized agricultural area; however, in suburban areas it is not unusual to find cases of reconversion to traditional agriculture and product specialization. It needs to be emphasized that a reduction in utilized agricultural areas does not necessarily lead to a decrease in agricultural production or its value since profits are increased and, above all, the type of farming is modified (intensively).

(1) The representation of the areas in the diagram is not proportional to the real extent of the various uses, but the intention is to give a symbolic picture of the situation; the circles represented with a dotted line refer to the past (twenty years ago) and those with a continuous line to the present.

The flows between the various land uses, shown by arrows, are in theory bi-directional; in practice, however, they become uni-directional in the case of urbanized areas and infrastructure (it is rare for built-up areas to be re-used). In the case of variations in land use, utilized agricultural areas contract to a much greater extent than woodland or uncultivated areas. This is because the latter two uses undergo reciprocal reconversion through deforestation or reforestation (woodland becomes attractive for leisure). Among the various land uses mentioned here we have included areas given over to leisure activities; this kind of land use is on the increase, though not quite as much as might seem here. It is however of considerable importance since it can manifest itself as the re-use of agricultural space, uncultivated or wooded areas (areas equipped for sport and leisure activities, parks), and as the «new» use of space: this therefore increases in value because of new parameters no longer regarding agricultural productivity or location patterns, but instead scenic beauty and unspoilt nature, and so forth.

The relations hypothesized up to now involve exchanges (losses or acquisitions) of a purely quantitative nature. Although urban land use and other non-agricultural uses are becoming more significant, they are not only important in terms of the extent of area affected, but also from a qualitative point of view, both when the environment is irreversibly compromised and when the incessant use of space leads to the «consumption» and «using up» of the environment. The successive or discontinuous use of space could be represented by a three-dimensional model and superimposed onto the other uses, especially the use of urbanized land, at different times.

The increase in built-up areas is the most obvious phenomenon and the one which has had the greatest impact on the coastal area of the North-western Mediterranean. It is a direct consequence of population increase and demographic concentration in the coastal belt, but is also linked to other factors, such as cultural evolution, economic growth, changes in space-time relations and, not least, morphological, climatic and environmental characteristics. The rise in the number of homes and the decrease in their size, for example, are due both to changes in the needs of the local population (evolution of family size, increase in the number of single people, high housing costs) and to the increase in the number of second homes aimed at an additional, seasonal population, and of particular interest in an area of considerable tourist attraction like the one we are dealing with here.

Urban flows concern the material input and output of water, energy, products and, above all, people: all that which enters, circulates in, and leaves the town (Deelstra, 1993). Urban traffic is the phenomenon which most clearly reflects the human dimension of these flows as well as the consequences of population increase, spatial organization, and economic and technological development (fig. 3). New housing choices and the fact that the home and the place of work are often far apart, in addition to new needs which can only be met by a certain affluence (several cars per family, demand for leisure time, the holiday market) contribute to an increase in mo-

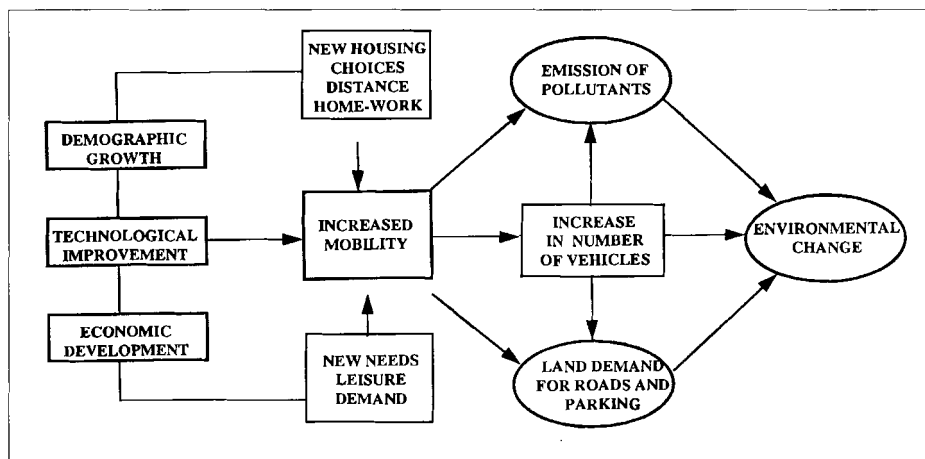


FIG. 3 – ENVIRONMENTAL EFFECTS OF URBAN TRAFFIC.

bility. The interaction between urban structure and flows conditions the urban environment: the quality of the atmosphere, land and water, the perception of the town, and the way of life and the health of its inhabitants.

Technological development has, for now, perhaps resulted in more free time, but it has not yet eliminated the distance between home and work which industrial civilization usually imposes. We have not yet seen the results of a «cable» society in which it is possible to establish relationships from our armchair and revive the spatial agreement between home and work, even though this might be the picture in the future. For now, though, relations are only established through physical mobility. In the North-western Mediterranean, the transformations which have occurred in the last twenty years concern means of communication more than structures. The networks have not so much been lengthened, but improved in terms of quality and inter-connections: roads have been widened, new links between main routes have been installed, and the routes heading inland have been expanded. Still difficult to solve are those problems regarding road conditions in the historic centres of towns and in the areas of steep coast. However, the construction of underground road systems is providing the answer to many of these difficulties (as in Barcelona and Genoa). The real change regards the number of vehicles in circulation and the intensity of traffic flows: in 1990 there were approximately 20 million cars, representing nearly one for every two inhabitants, plus the numerous motorcycles which are typical of the Mediterranean, especially in Spain and Italy. This increase in the number of vehicles, in itself a positive change if taken to represent higher incomes and improved mobility, has an unquestionable effect on the environment and therefore on the quality of life (Cori, 1988; Cori et alii, 1988). Leaving aside the analysis of stress caused by traffic, the survey examined road accidents, noise pollution, and above all air pollution

caused by substances emitted from car exhausts. The technological innovations applied to both engines and fuel have greatly reduced the rate of pollution; however, the increase in the number of cars, their considerable age, and the lack of controls cancel out most of benefits brought about by these innovations. The increasing number of vehicles also means increased occupation and consumption of land, traffic circulation demands, new wider roads, and parking spaces.

The flows and their intensity allow us to determine the axes of mobility. According to the geographical scale adopted, the importance of the temporal scale changes: in this way it is possible to determine the short distance flows which the town entertains with the surrounding area (particularly significant in the metropolitan areas); we can also determine the long distance flows (whose intensity varies according to the day of the week and, above all, the month or season) which indicate those inland areas that centre around the coastal belt.

As far as the traffic is concerned, the crucial areas are the junctions between the various routes heading inland and the main coastal axis where heavy local flows are added to by considerable long distance flows which affect the Mediterranean coastal environment and make the already critical situations of the most densely urbanized and populated areas worse. While the relationship between traffic and pollution has been widely proved, it is still difficult to measure the extent to which traffic influences pollution levels. The figures for the parameters examined (SO_2 , NO_2 , CO and CO_2 , O_3 and dust for air pollution, and decibels for noise pollution) can vary greatly even within one urban area, depending on the urban structure, climatic conditions, type of roads, and so forth. One factor which, if examined fully, could offer useful indications of the air pollution caused by traffic is fuel consumption (2), seeing as pollution is caused by the emission of substances following combustion: this consumption could be a useful guide to the extent of mobility in an area, and to its environmental consequences.

Finally, as far as planning is concerned, it is a useful instrument for understanding how environmental problems were received on a national, regional or local level, what was done or attempted to be done about them, what the outcome of certain town-planning decisions or non-decisions was, and what initiatives were taken or planned with regard to means of transport, traffic and the population it causes.

The task of spatial planning, as we know, is to plan the use of space through the utilization and modification of the resources it has to offer. This is realized through town-planning and spatial projects which represent the basis for interventions on the town and the environment. The bodies appointed to decide and apply the regulatory plans and mechanisms of the

(2) Objections that the sources indicate the quantity of fuel sold and not the amount actually used are unfounded, since a detailed survey (in the area of Genoa) has shown that fuel sales correspond approximately (with a difference of less than 10%) to consumption in that area.

town and surrounding areas are the administrative authorities: the State, the Regions and the Communes. Therefore, different instruments will be used on different scales.

By establishing the intended purpose of land, town-planning schemes can plan the area on the basis of the population's real and predicted requirements (in terms of housing, for example) and limit the risks deriving from an unbalanced exploitation of environmental resources. Moreover, planning can influence the size and quality of urban flows by organizing and guiding urban traffic. The result achieved varies depending on the chosen course of action, which may be to expand the public transport system or the private system; to construct motorways or fast roads inside or outside the town; to prohibit traffic in some parts of the town; or to merely recommend the use of clean fuel in cars.

The policies regarding urban traffic (analyzed in Cori, 1991) are usually put into practice on a municipal scale; however, planning must take into account the town's relations with its hinterland, its role in a wider spatial context (the region), and its position in the national and international transport network. The drama of the situations and the size of the traffic problems change according to the «lens» used to observe them; the various levels of planning must not however limit themselves to looking short-sightedly at the scale they are dealing with, but be able to understand problems on different scales. The environmental issue was late to be acknowledged by spatial and urban planning. Even though there are considerable differences between the national and regional situations in terms of how and when the phenomena take place, it is possible to distinguish various phases of urban policy. The first phase is characterized by uncontrolled urban spatial expansion, large scale migration, and the diffusion of industry and mass tourism in coastal areas; during this phase, much attention was given to economic development, the reinforcement of resources, and the growth of building, while the environmental issue was neglected.

During the second phase, the environmental issue became a central theme of development, although it was not yet completely acknowledged by people. Town and spatial planning policies aimed to control urban expansion and manage the transformation of the area concerned. Greater attention was given to the salvaging of the existing building patrimony, the redevelopment of historical centres and the protection of natural features and the landscape.

It was only during the third phase, thanks to greater awareness of problems connected to the «quality» of life and the environment (following the campaigns carried out by the various ecological movements) that plans and programmes emerged to deal with the protection of the environment which was already greatly «compromised». A new approach was adopted towards non-renewable resources and the value of the environment (Santoro Lezzi, 1991). The decrease in demographic growth in cities and metropolitan areas, the reduced development of the large industrial sites, and the new

needs of a post-industrial society meant it was necessary to rethink the strategies pursued for the town and the national space and to look instead towards recovery, re-use, and the «qualitative» evaluation of use.

It was necessary to achieve a state of co-existence between the terms of urban and spatial development and those of the environment, to know how to use technological innovation to qualitatively modify the management of resources, and to make decisions whose environmental repercussions were at least equally as important as the social and economic ones. It then became important to introduce a further planning instrument, the «evaluation of environmental impact» (Greco, 1989), by introducing new parameters and new ecological variables besides the usual zoning operations.

The phases described took place at varying speeds depending on the historical, economic and social situation: the last phase, however, led to a greater concern for the environment and a growth in the demand for «natural» space. This explains the number and size of protected areas (3), even near heavily-humanized areas, creating pockets of green where urbanization, congestion and pollution seem to put the environment and people's health at risk. The identification of areas to be protected and the subsequent action taken to do this are the most obvious manifestations of the new environmental sensitivity of national, regional and local administrations; it is, however, also a clear sign of a situation of «environmental alert» and for this reason it is necessary to protect those areas under threat.

The results of the urban change process. – The aspects analyzed in the case study (change of land use, urban traffic, planning) show an urban growth with a disharmonious character compared to the already considerable demographic evolution (fig. 4). In 1970 more than 37 million people lived in the area analyzed (the North-western Mediterranean coastal area), which increased to 42 million in 1990. The demographic increase (13.5%) was higher than the other countries of the Mediterranean coast (9.4%) and considerably high if compared to the rest of Europe (4.3%). This shows the strong attraction power of this area on the European population («sunbelt effect») and on that of the southern side of the Mediterranean. Population density of coastal areas is consequently growing (from 149 to 169 inhab./km²) and is higher than the rest of the countries (France 126/102; Italy 201/191): Mediterranean Spain shows a double density if compared to the national value (146 inhab./km² versus 78 inhab./km²).

(3) The list of parks and protected areas is now quite extensive (Gambino, 1994): in the coastal areas of the North-western Mediterranean there are ten national parks and 39 regional ones in a total area of 1.8 million hectares. Protection is given to marshland, woodland, areas of maquis and areas whose fauna is of particular interest. Attempts have also been made to set up marine parks to protect fragile areas like the coasts of the small North-western Mediterranean islands which are, paradoxically, threatened by economic and tourism development.

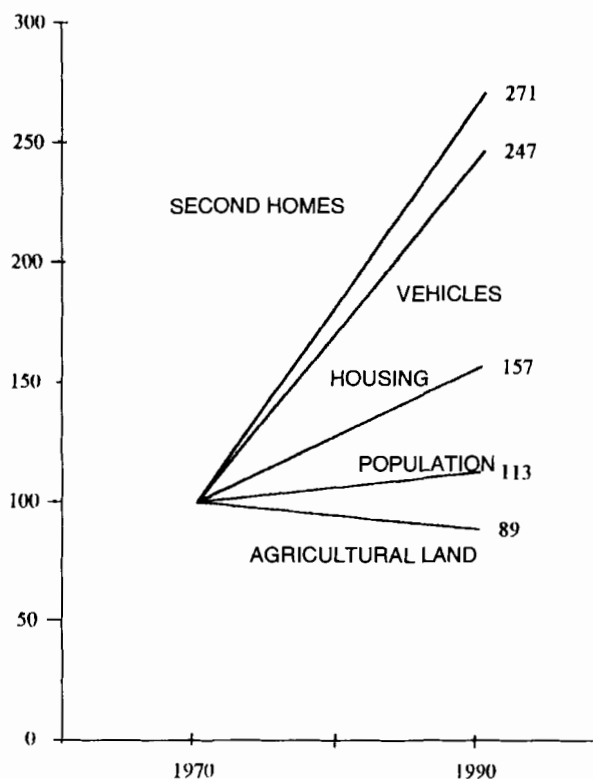


FIG. 4 – EVOLUTION OF SOME VALUES IN THE NORTH-WESTERN MEDITERRANEAN (1970=100).

Nevertheless, another heavy impact agent is the increase in the housing rate – which may be more relevant than population growth, even though the opposite process (population deconcentration) is taking place in other European regions. The housing stock of 1970 has increased by 7.2 million, an increase of 57%. The highest increase took place in Spain, where housing stock doubled, especially in the provinces of Alicante, Gerona, and Malaga. Even more meaningful are the three million houses which increased the Italian stock on the Tyrrhenian side: the rather low demographic increase (6.4% between 1970-1990) was accompanied by an increase in the housing stock of 49%. The Ligurian and Northern Tuscan provinces still show a growth in the number of houses: this means an expansion of the urbanized areas even if some cases of demographic decrease took place. The French departments only show a balance between demographic and housing evolution.

The disagreement between population and housing growth is due to the

emergence of a new type and a new use of the housing stock: second homes. In the timespan considered, the number of second homes, or those not regularly occupied, almost tripled, reaching the highest value in the recently developed tourist areas (Malaga, Northern Sardinia, Calabria) where new housing stock is more consistent. Another «population» then adds to the resident population using a space which is exploited for a limited time only (holiday season, holiday, week-end) (Renucci, 1990).

The population growth and the increase in housing and the consequent change in land uses in the urban areas are the most evident causes of the contraction of agricultural land. The rather low decrease becomes relevant if the entity of the areas considered and the value of the land taken away from agriculture is considered. The advantageous areas for agriculture, which are flat, fertile and easy to cultivate, with high agricultural revenue, are the most affected by the housing sprawl. The competition in land uses is felt particularly in the periurban spaces which are affected by deep changes.

The most evident feature of urban change is linked to population mobility. Income increase, technological development, new labour and free time planning, new housing choices (rururbanization and peripheralization) have been responsible for a considerable flow increase in people and goods in the urban and non-urban areas. The number of circulating vehicles in the the North-western Mediterranean (about 20 millions) more than doubled in twenty years and the ratio of 4.6 inhab. per car grew to 2.1: one vehicle every two people. The number of vehicles is rather significant as they use and occupy space; it becomes an environmental problem when they move in space. In fact, besides other means of transport which have developed recently (air, high speed trains, etc.), road transport showed the highest increase and caused the worst environmental impacts.

«Transport infrastructures require more than 10% of the total town area and in some cases can reach 40%-50%» (Kakumoto and Nakamura, 1991, p. 82); but while a new town with recent urban planning can easily adapt to private cars, in the historical centres of the North-western Mediterranean the intense use of private cars can even lead to a denial of freedom of movement and interaction. This is one of the reasons why urban planning has devoted much care to intraurban traffic control (old centre) in order to give the town back, at least partially if not globally, to its citizens.

The worst environmental impact caused by the increase in the number of vehicles is traffic pollution. Technological innovations have been successful in reducing petrol consumption and thus of polluting substances in the air; nevertheless, the growing local and international flows which are directed to particularly attractive areas such as our Mediterranean region, cancel such benefits and cause a direct pollution process which affects the quality of life of the resident population (Cori, 1988). A small change in atmospheric conditions is enough to seriously worsen the situation in many towns and the risk thresholds are dangerously approached: sometime a complete traffic halt is the only solution.

The analysis of the North-western Mediterranean area globally considered reveals a profound differentiation between the territorial entities which belong to it. Nevertheless, the indices here employed to develop a comparison between the administrative units of the area show some continuity features which only partially coincide with national borders. The comparison has been carried out employing only a few comparable data which refer to French, Italian and Spanish provinces: that is, population, housing stock and number of vehicles. It is evident and obvious that the highest densities refer to areas which include large towns: Barcelona, Genoa and Rome with more than 500 inhab./km²; Marseille, more than 300 inhab./km², despite the wet lands and marshes; and finally Naples, a completely urbanized province, with a record number of 2576 inhab./km². The demographic pressure on the coast is also given by the fact that high densities are accompanied by the presence of seaside resorts or sea towns in the provinces with longer seafronts. For example in Spain, Alicante and Valencia have higher densities than Granada and Murcia, while, in Tuscany, Leghorn shows higher values than Lucca and Pisa which develop more inland.

The development of the density index along the coast shows an alternation of peaks (more than 100 inhab./km²) and falls in more depopulated areas. Thus the coasts of Andalusia and Murcia are situated between the densely populated Malaga and Alicante and Valencia; Barcelona shows higher values if compared to other provinces of Catalonia. The border provinces between France and Spain show lower values, and from Montpellier the density index records uniform high values which characterize the strong core of the Mediterranean Arc. The population density is never lower than 100 inhab./km² from the Rhône Delta to Tuscany and the meaning of the demographic pressure acquires a different relevance if the morphologic configuration is taken into account: most of the administrative units only show favourable settlement conditions on a very thin coastal strip (Alpes Maritimes, Liguria and the province of Leghorn). The provinces of Grosseto and Viterbo are the watershed between the high density area and the more differentiated configurations of Southern Italy. The urban pattern pivots on a few main towns and Rome (the only national capital) and Naples. Between the two metropolitan areas, a process of demographic growth takes place in the provinces of Latina and Caserta. Both represent a case of suburbanization and have been the sites of exogenous interventions (*Cassa per il Mezzogiorno*); they have also witnessed a growth of settlements (i.e. Caserta) and tourism expansion due to an increase in local demand.

Housing densities seem to overlap the configuration of population densities, thus the same comments could be made; nevertheless some areas, where demographic pressure is combined with high land consumption due to tourism, stand out from the others. In fact, housing density represents here the potential of the attraction capacity of these areas, apart from the resident population, and cannot be explained as an index of wealth. The highest differences, if compared to population densities, can be found once

again in the central area, in zones of traditional tourism, nowadays mature and near to saturation, and not – as might be expected – in low density and tourism-oriented areas. This is the case of Liguria and the French coast (east of the Rhône), where the differences are higher, while this does not happen in the Costa Brava (Gerona, Barcelona) nor in Sardinia or the Balearic Islands. The low densities do not highlight the dynamics of some areas which have been affected by tourism exploitation and are still far from saturation: this is the case of Sardinia (Sassari, Nuoro), Sicily (Trapani, Ragusa), and Calabria (Catanzaro, Cosenza).

The number of vehicles only gives some indication: the relationship between the number of inhabitants and the number of vehicles is a measure of economic well-being, while the relationship between vehicle and surface is an approximate measure of environmental impact caused by traffic. As regards car density, the same trend can be observed since the highest values are to be found in large urban areas. The number of people per vehicle shows the smallest values in the area between the provinces of Lucca and Rome, while two lagging regions can be found in the Southern Italian and Spanish provinces. This general trend is disturbed by two factors which can be described as follows: 1) urban factors, characterized by a decrease in values in urban areas (in Spain, Malaga and Alicante, in Italy, Palermo); 2) lack of services, that is the lack of alternative means of transport (i.e. public transport), leading to an increase in the fleet of cars (Balearic Islands and Gerona in Spain, Corsica Island in France, Ragusa in Italy).

The development of car ownership is linked to the development of transport networks and to the increase in links among the coastal areas and between the coastal areas and the inland. The hinterland of the Northwestern Mediterranean Arc mostly consists of densely populated regions which use the coastal belt for free time activities, even daily, and only limited to certain months of the year. The demographic pressure is increased by a «potential» of people which exploits the coast and such a potential increases in relation to the demographic weight of the hinterland. The southern regions of Spain and Italy are still weakly affected by this process; two examples are the tourism exploitation on the coast of Latium which is due to the huge basin of Rome and the growing areas of Latina and Frosinone. The Tuscan and the Ligurian coasts, and the Côte d'Azur, are affected by heavy commuting tourist flows which originate from the densely populated inland regions of Milan and Turin, which increase the saturation process of the coast.

In conclusion, looking at the whole Arc, we can identify certain situations: a central area which corresponds to the French departments and the northern provinces of Italy and Spain, the peripheral regions of Murcia and Andalusia in Spain and the Italian southern coast from Latium. The framework now described is not far from traditional classifications of Western Europe, characterized by a developed North and a lagging Mediterranean region: in other words, according to the image now described, the central

part of the Arc (the French Mediterranean) is connected to continental dynamics, while on the contrary the two lateral wings (most of Italy and Spain) seem to maintain aspects and problems of a typically regional character.

A representation for the synthesis. – The aim of the synthesis is to convert data and information collected and processed during the research cycle into a map, in order to give an interpretation and a representation of the changes in the North-western Mediterranean in the years 1970-1990 (4). The unstructured informations have been combined, and the result is a spatial organization which is differentiated and integrated into areas and networks (links and nodes), run through by flows. This organization has its own structure which shows the meaningful signs of change and a juxtaposition of trends and events, here expressed in the synthesis maps (fig. 5 and 6).

The combination of the selected information, both descriptive and dynamic, led to the identification of some privileged spatial frameworks from which some future trends can be foreshadowed among a wide range of possible directions. It is worthwhile remembering that the Arc is a complex and fragmented area whose wealth rests on the people, climate and trade (Claval, 1996). Nevertheless, regions with similar behaviour can be identified, as defined in the following typology:

i) metropolitan areas in a critical phase, under a restructuring process. The main undergoing features are a demographic standstill or decrease, high housing density, heavy traffic flows, stable car indices, low decrease in accident rates. These areas are subjected to interventions of restructuring and reconversion (such as the most important city-ports and their waterfronts). The environment is degraded and at risk. This class includes different metropolitan areas such as Genoa and Marseille, heavily affected by the changes in port activities; Naples, which represents the area of highest saturation, once the site of industrial decentralization; Rome, the only national capital which pivots on the administration sector and on a lagging industrial texture;

ii) areas leading to saturation. These areas include most medium towns which show a low demographic increase or low decrease, high housing density, low increase in second homes, high car indices. They are characterised by traditional tourist activities and by a tight mixture of industry and tourism. From the environmental point of view, competition for

(4) The chosen variables refer to aspects of different natures and to their trends in the span considered. They can be divided into:

- socio-economic variables (population increase or decrease, density, tertiarization, industrial and tourist activities, etc.)
- environmental variables which deal with impact on land consumption and traffic (housing density, land consumption, car index, accident rate, etc.)
- new territorial «objects» which are the landmarks of the process of change (technopoles, science parks, gateways, etc.).

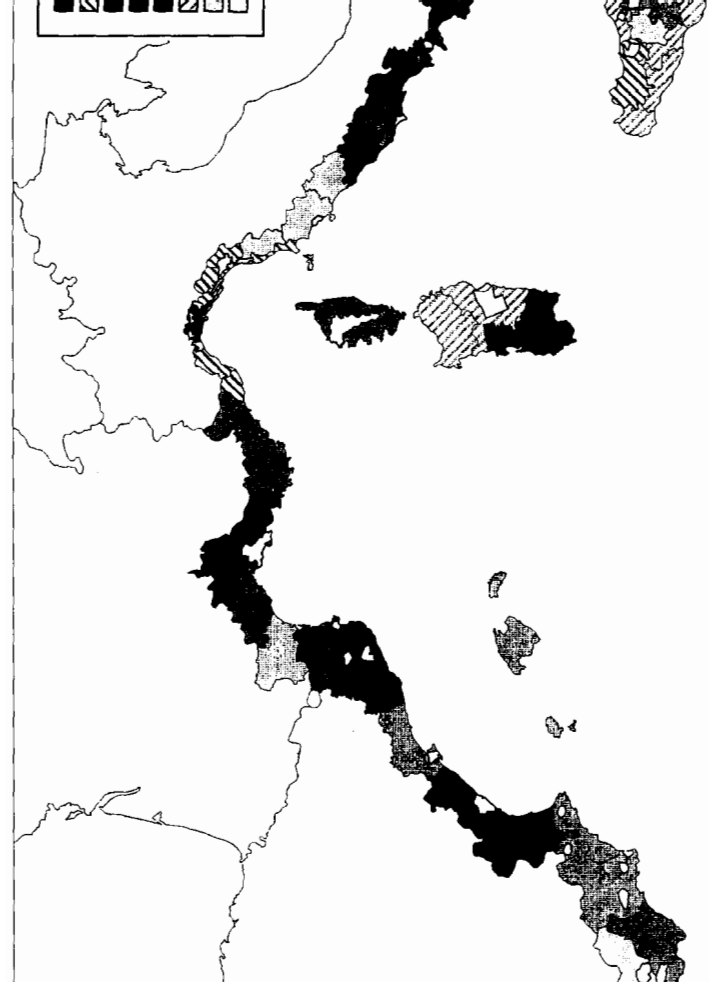


FIG. 5 - SETTLEMENT AND ENVIRONMENTAL RELATIONS.

as in critical phase; 2) Areas leading to saturation; 3) Suburbanization-oriented areas; 4) Areas of high environmental potential; 5) Slow development areas with innovative potential; 6) Marginal areas undergoing restructuring; 7) Protected areas.

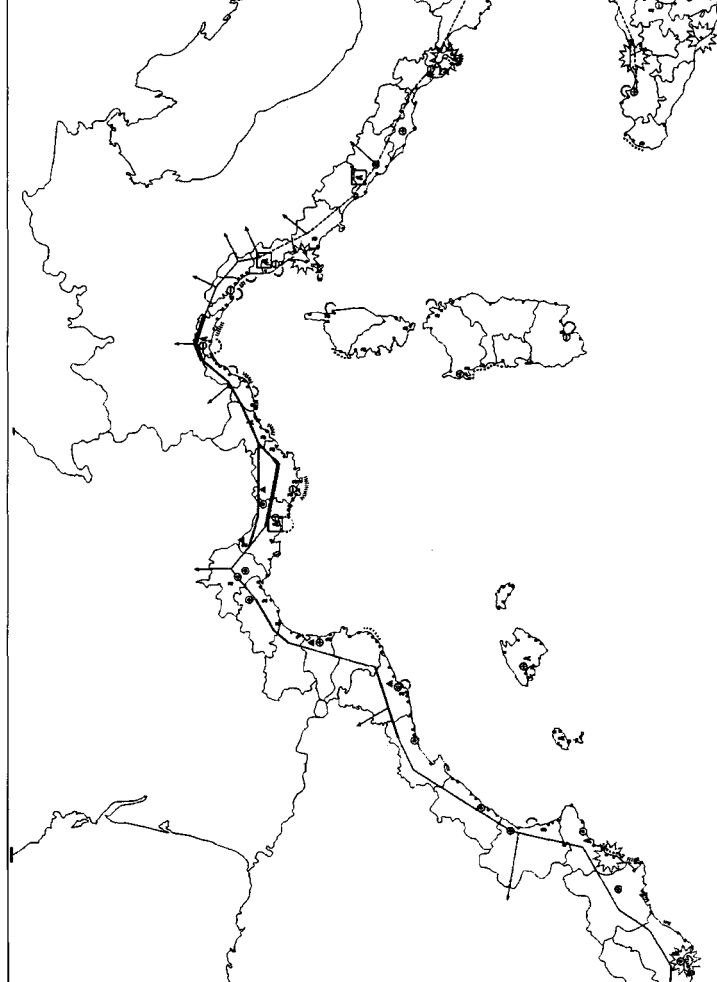


FIG. 6 - THE SIGNS OF CHANGE (1970-90)

ange have been summarised in the map by means of: towns which show a (1) strong, (2) moderate decrease; new settlements like (4) technopolis or sciences parks; transport nodes like (5) international traffic > 60% of total traffic) or (6) domestic oriented airports (< 60%); interconnection nodes (7) which are directly linked; ports (8) under functional redefinition or (9) in transition; tourist areas either trial areas (12) with strong environmental impact; transport networks and flows area represented traffic (a), main road network (b), and connections with the inland regions (arrows).

land consumption and environmental stress are high;

iii) «suburbanization» areas. These generally include provinces bordering on main metropolitan areas and are characterized by a high demographic increase, medium housing density, a low increase in car indices and accident rates. They are subjected to a diffusion of urban features (especially the provinces bordering Rome and Marseille, and with the exception of the northern part of Corsica Island where the change is due to the increase in tourism) more than to a real spillover process from the metropolitan areas. These areas require infrastructure adjustment as regards fast transport (high speed train, etc.). The environment is not yet degraded but under growing pressure;

iv) areas of high expansion and environmental impact. These show a high demographic increase, medium housing density, high increase in second homes, high car indices and accident rates. These are the new industrial areas and the emerging tourist areas. Generally subject to planning interventions as regards transport networks (5), they include most of the southern provinces of Spain and some Italian insular provinces;

v) slow development areas with innovative potential. These areas show a moderate demographic increase, medium housing density and increase in second homes, low car indices and decrease in accident rates. They include areas which have already started a process of development and show a potential for further growth (a sort of «condensing» stage). They are subjected to functional redefinition and develop processes of production specialization and innovation. The environment represents a potential spatial wealth. This is the case of most Spanish towns (Barcelona, Castellon, Valencia, Cadiz) and Southern Italian provinces (Salerno, Cagliari);

vi) marginal areas undergoing a restructuring process (very low demographic increase or even decrease, medium housing density and high increase in second homes, increase in car indices and accident rates). Most southern provinces of Italy belong to this group. They show a rather unstable situation and are characterized by illegal housing growth, low environmental concern, conflict between tourism and residential land consumption. Tourist resorts have a fragmented distribution rather than a «riviera-like linear distribution» according to their individual tourist attraction (sea, beach, etc.). There is not much concern about the environment. The car index increases in Italy but it is not accompanied by an increase in the accident rate as it is in Spain. Most of these areas are included in the «lagging regions» identified by the EU for the assignment of special funds (i.e. the Structural Funds);

vii) areas in a «stationary» phase. These are rather stable areas which pivot on medium towns with stable demographic dynamics or a low decrease, medium housing densities, low car and accident indices. The en-

(5) See the recent improvement of circular roads, the establishment of links between port and city centre, in most medium towns of Spain, for example.

vironmental situation is reasonably good and there is much concern about protection (see natural park distribution). Most central, insular Italian and some Spanish provinces are included in this group.

Among the more abstract information that adds colour to the overall background given by the frameworks described above, we have selected a few elements generally referring to settlements of a different nature which modify either their distribution or their functional role in this phase of development.

The towns. The North-western Mediterranean Arc is a densely populated strip which is dotted by towns of different size and rank. The emerging pattern is that of a tight sequence of tourist resorts, which gather and then loosen and then gather again; the sequence is interrupted by major cities: Rome, the only national capital and the only city with an international, cultural and political role, rather than economic power; Marseille and Genoa, undergoing a phase of restructuring; Naples and Valencia, once the site of production decentralization, and now developing their endogenous potential; Barcelona, a dynamic city linked more to the rest of Europe than to inland Spain, and similarly Nice and Cannes. Medium towns range from innovation oriented centres, generally endowed with good transport facilities (i.e. Pisa, Montpellier, Almeria), to centres still hierarchically dependent on major towns (i.e. Savona, Latina, Caserta, Perpignan) or unstable centres where the conflict between different ways of development has not yet been resolved (Italian southern and insular towns, and former agricultural Spanish centres, i.e. Murcia). Most significant are the emerging technopoles (Sophia Antipolis, Montpellier), science parks and high-tech centres which are concentrated in a sort of Mediterranean California on the French coast (*la route des hautes technologies*), with occasional events in Spain (near Barcelona) and Italy (Pisa).

The industrial production. If the wealth of this area rests on people, climate and trade, industrial activities should play a residual role compared to other activities, and thus we can say that the industrialization process has not been homogenous along the coast and that sectorial interventions have been neglected for a long time in many parts (the Spanish East, the islands, Provence – except Marseille –, Southern Tuscany, the Bas Languedoc – still wine production oriented). In other situations, industrialization was slowed down by the lack of innovation diffusion (Liguria), by the strong dependence on State support (i.e. the Cassa per il Mezzogiorno in Italy), by poor entrepreneurial skills (most marginal provinces). The only evident examples have been the iron and steel activities in major ports and the decentralization events (Ford in Valencia and Alfa Romeo in Naples). Today the crisis in heavy industries seems to confirm the small and medium industries a leading role (as in Tuscany, and Valencia where there was a traditional food sector), or rather the emergence of new sectors such as the chemical and service industries and the high tech. Agriculture remains because of its traditional value (i.e. for wine production in France) but it is

subjected to re-organization (emergence of cooperatives).

Tourism, the leading activity for most of the Arc, especially in certain provinces, and sometimes based on a continuity of landscapes – as for example from France to Italy – and traditional activities (i.e. flower growing from Alpes Maritimes to Liguria). New areas emerge in Spain (Costa Blanca and Costa Brava) generally linked with mass tourism from Northern European countries; and in Italy which is more environmentally concerned and perhaps more elitist (Southern Tuscany, Calabria, Sardegna, Corsica). On the islands in particular, tourism is the leading activity due to the natural tourism potential (Balearic Islands, Sicily, etc.). The most interesting aspect is the development of rural tourism, which implies a useful integration instrument between the coast and the inland; of resorts specializing in the Over-60s and congresses, which require adjustments to the existing infrastructures.

The transport nodes. Following the changes in the transport sector or more generally in the communication process, effects can be found in:

- ports, «cult» places of the Mediterranean area, once places of power and control, directly linked to the inland by the management of goods and passengers, they have now lost their traditional role and are more concerned with logistics of the transport cycle or have become industrial incubators of high-tech centres. Most of them have lost the passenger traffic and have been replaced by airports (i.e. Barcelona, Alicante, Almeria). Considerable increases can be found in small tourist ports or on the islands. While traditional gateways are at a standstill, other ports are adapting (La Spezia, Leghorn, Almeria, etc.) by specializing (container traffic, or particular goods) and becoming attractive for SME settlements;

- airports have achieved a new central role in the management of flows, especially in relation to tourism increase. In the last twenty years the increase in traffic has been generally high, and it is interesting to note that among the coastal airports the Spanish nodes show the highest proportions of international traffic (>60% of total passenger traffic) while in Italy and France the rate is much lower (35%-45%): this is clearly due to the strong tourist flows to Spain. New nodes are emerging in dynamic areas (Almeria, Granada, Perpignan, Hyeres, Montpellier, Trapani), especially linked to innovative activities (science parks or high tech sectors);

- interconnection nodes are nodes where two or more transport networks are directly linked: we refer in particular to rail/air connections, which in the past were considered competitive modes and now require synergic agreement (Pisa, Rome and Marseille).

Transport networks. Infrastructure density was once considered the best index to evaluate economic development; today, services may be considered the best criteria for evaluation of the efficiency of the network, so it seems superfluous to say that the density of infrastructure is generally homogenous and rather high – except in peripheral areas (Southern Spain and Italy and the islands). It is therefore more interesting to focus on some performance characteristics of the coastal network. There are still some mis-

sing links, which represent a barrier to integration and are due to technical aspects (different standards) or to border regions (bottlenecks). As regards fast transport, high speed trains are still underdeveloped in Spain and most of Italy, while France is quickly extending the TGV service on the coast. Bottleneck situations emerge at nodes where flows from inland and from the coast converge; this prevents a smooth articulation of the flows.

Traffic flows. Most short or medium distance traffic takes place by private car and this causes a concentration of flows on links bordering the metropolitan areas and especially on motorways which are generally the fastest roads used as orbital roads or bypasses to city centres: this causes congestion as local traffic adds to long distance and heavy traffic on motorways. Long distance flows take place by air, and flows generally have a north – south direction (with the inland) rather than a coast to coast (east – west) direction, which shows that the traditional pattern of flows has not yet been radically modified.

Concluding remarks. The methodology employed to identify development trends for the area requires flexibility and the possibility of combining quantitative and qualitative evaluations (6). From the results obtained – that is the trends of urban change in the North-western Mediterranean coastal belt and the spatial frameworks now described – some structures have been identified: both the local level (expressed by vertical relationship of the *milieu* type) and the superlocal level (expressed by horizontal relationships) from which it is possible to formulate some hypothesis.

The future scenarios emerge from the combination of forces that range, on the one hand, from «closeness» to «openness» of the spatial system (where closeness is the incapability of the system to be linked to global network or to generate interaction and innovation processes, and openness is the interaction at superlocal level); and, on the other, from uncoordinated and contingent policies (aiming at short term solutions in a limited space) to coordinated and integrated policies of a synergic character (more actors are involved and these have a common goal and establish medium or long term solutions in a larger space). This context is the setting for the action of new technological paradigms (i.e. the high tech sector of the French coast), regional planning policies (i.e. the high industrial decentralization on the Italian coast, less marked in France and almost absent in Spain), economic strategies (i.e. the diffusion of MNEs), geopolitical factors (the new relations between Eastern and Western Europe) implying new territorial organizations which cannot ignore the environmental situation.

(6) Thus, the method of scenarios, that is descriptions of development trends based on explicit assumptions, seemed the most appropriate, in this case, to trace future directions among the many possible solutions. In this context, a limited quantity of data have been used – compared to common statistical and mathematical methods – and the information has been collected from recent literature, interviews, other experiences and, last but not least, from the imagination of the researchers.

In the context of the Latin Arc it is possible to envisage:

- the fragmentation scenario, which implies development dynamics based on concentration and growth, and mainly supported by present regional and national policies. This seems to lead to a reinforcement of main urban areas and to a decrease in peripheral areas and small and medium towns which suffer from the concentration of powerful and high rank services (the *intelligentia*) in a few privileged sites. Environment protection is a «residual» aspect in the context of growth, and the pressure will rise especially in metropolitan areas where the risk of increasing consumption of land, traffic congestion and air pollution – and the diffusion of such a model to surrounding area – is high. The result could be a growing impact on the environment (the regions for this scenario are those of frameworks 1, 2, 3 and 4).

- the integration scenario. This scenario is based on a network model of development where centrality is not an attribute of single places but of a network or system of networks which link different functions and relationships, as if they lack a geographically defined main centre and a territorial identity in order to develop a new identity correlated to new spatial elements (Dematteis, 1991). Nevertheless, network integration leads to an equity and an equilibrium scenario and to open spatial systems based on a diffused model of development, endogenous capabilities and functional integration of the nodes (an example could be the French plan to create *des îlots de prospérité spécialisée* on the coast or in the Corsica region; or the *Plans d'urbanisme d'intérêt régional* to develop new tourist resorts). In this context the national borders are more permeable and new links between coast and inland are established bypassing the hierarchical order (that is, with capital cities such as Paris or Madrid, for example); the coast core-ring relationships grow stronger and the environment is a potential to be protected and developed (i.e., the management of the Rhône area, the increasing number and surface area of the natural parks and protected areas).

The environment and its protection are leading approaches of development policies which, even if growth oriented, carry out planning interventions in relation to environmental needs. This dimension of development policies is based on a process of integration and proximity, where geographical closeness becomes a synergic factor (Capineri and Kadmann, 1995). Spatial management is carried out at supranational level (Vallega, 1994; ICCOPS, 1995) by integrated and specialized bodies which identify common problems in the area (for example cooperation on environmental protection, adoption of sustainable development-aimed programmes and action) and aim at medium or long term solutions.

As we have seen in the previous chapters, spatial and urban policies have only recently become aware of the environmental issue and have to face serious problems. Up to now, great attention has been given to the «orientation» of growth and development, and models and general frameworks have been identified in the context of local systems. Environmental problems

require a systemic, complex and «open» approach, and not only solutions to critical or catastrophic situations; they aim at developing both forecasting capabilities and control methods of the events, and the awareness that every human action has an impact on the environment and their consequences have neither a spatial definition nor a time limitation.

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