

## **Ecological landscape design, planning and connectivity in the Mediterranean and in Italy**

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### **Introduction and historical background**

The Mediterranean landscape is the outcome of a long history of interaction between land resources and civilisation; therefore a glance to the past is crucial in order to understand its diverse environment. This is indeed a place where man started to imprint the land with artefacts from as far back as 3000 years ago and thus lived in a sort of landscape mosaic composed not only of natural but also of cultural elements.

During the industrial revolution, technology and intensified land use produced the first large landscape change in the Mediterranean. From that period the rural cultural landscapes of the Mediterranean have increasingly been eroded by development. Economy, communications and socio-cultural changes are not only degrading the ecological values of these landscapes, but also their scenic and cultural attributes.

Since the Second World War the traditional land use, such as the terraced landscape, has declined. The consequence is nowadays visible in the disappearance of the cultural landscape and accordingly in the reduction of landscape and biological diversity. The human impact, with infrastructure development, urbanisation, tourism and intensive agriculture, has furthermore produced barriers, which have caused landscape fragmentation and reduced the ecological connectivity. This is evident if we look at a map of the European Mediterranean, observing the spread of urbanisation and the intricate network of roads and infrastructures, especially along river catchments and plains. As a result, the highest concentration of nature has been confined to particular areas, such as

on the mountains that are now among the biggest and most valuable ecological corridors in the Mediterranean basin, together with the rivers.

## **The current Mediterranean rural cultural landscape**

Surely the Mediterranean, more than any other region of the world, illustrates in a variety of ways the interaction between man and nature. The rural cultural landscape, for example, integrates agricultural, pastoral and silvicultural activities. The traditional agricultural techniques, in addition, have been able to limit erosion and water shortage by the construction of retaining terraces along the slopes and the use of indigenous plant species such as vine, olive and carob trees. The result is a versatile and thus more stable landscape, that clearly shows the limits of development within the constraints of semi-arid ecosystems.

Rural cultural landscapes in semi-arid regions differ from those in temperate regions. If in the latter the effort is towards the advance of the forest, in the former it is toward the halt of desertification (Makhzoumi, 1997). Accordingly, the Mediterranean rural cultural landscape has a fundamental role as it conserves natural resources and maintains the ecological balance.

The fragility of the Mediterranean landscape is more critical going from semi-arid to arid regions, not only for the higher degree of aridity, but also for increase of population and tourist activity. Tourism has been one of the main critical avenues for development in an area with fast growing economies and scarcity of natural resources (Leontidou *et al.*, 1997). Accordingly, high consumption of primary resources, like land and water, has resulted in increased pollution and has irreversibly damaged natural and cultural ecosystems (Grenon and Batisse, 1989; Tangi, 1977). This was one of our major concerns in the search for alternative approaches to landscape development, as described in previous research (Makhzoumi and Pungetti, 1999) and in this paper.

## **Man and nature in the Mediterranean**

In the Mediterranean, nature and culture are fundamental issues in environmental sciences but are often in conflict. Cultural heritage is diffused all over the basin, sometimes as an element of landscape enrichment and

quality, other times as a barrier to the environmental structure, for example when it leads to intensive tourism disturbing the ecological setting (Pungetti, 1995, 1996b).

The Mediterranean cultural heritage counts, apart from the cultural landscape, other elements of historical importance and visual value, such as historical centres, isolated monuments and ancient tracks. Some of these do not interfere with ecological connectivity, but some could become a barrier if misused.

Since almost the whole Mediterranean landscape has been deeply marked by man, it is necessary here to take into account the cultural heritage in both environmental policy and connectivity restoration. Accordingly, future land use and land disuse cannot avoid considering landscape evolution. Historical analysis, culturally and ecologically oriented, becomes thus an essential element for decisions on either future development or re-naturalisation (Makhzoumi and Pungetti, 1999).

Environmental perception is another fundamental tool for decision-making. In the Mediterranean people are used to living close to natural habitats that present a high level of biodiversity and vary greatly from the North to the South of the basin. People however also fear this beautiful nature because of the numerous natural hazards that are continuously occurring, like volcano eruptions, earthquakes and river flooding.

There is no doubt that in the Mediterranean the interaction between the natural and cultural systems is very complex. This is certainly due to the strong historical and anthropic presence, but also in several areas to a lack of awareness on environmental matters. The latter can be partly related to the problem of natural hazards illustrated before, but mainly to the dilemma of 'microcosm vs macrocosm', i.e. individuality vs community, based on a culture that gives priority to private over public issues and has more concern for the built environment than the natural one.

Moreover, some populations are hostile towards nature protection, which is interpreted more as a present restriction rather than an advantage for the future. This hostility has sometimes reached the extreme, for example with poach hunting of endangered species, and lighting of intentional fires in parks where local populations are still adverse to their institution.

Furthermore, there is lack of control on the environment and disregard of regulations, such as constructions built in ecologically sensitive areas without permission or in areas exposed to natural hazards without the necessary legal requirements (Pungetti, 2001). Paradoxically, however, this illegal setting has sometimes been turned into authorised and legalised abuses by particular national legislation, such as in Italy the building conditional amnesty for unlicensed houses. Last but not least there is the activity of organised crime, in Italy the so-called Ecomafia, which is controlling several illegal disposal sites including those with heavily contaminated waste.

All these considerations are evidence for cultural barriers, that added to the more apparent urban and infrastructure barriers constitutes a 'concrete' obstacle, in all meanings of the word, to the improvement of ecological connectivity in the Mediterranean.

### **Ecological landscape design and planning in the Mediterranean**

The Mediterranean landscape, as one of the world's oldest inhabited regions, has evolved to reach unique richness and heterogeneity. The long man-nature relationships discussed before have suddenly changed in the last century, with the result of a fragile ecosystem that can be easily disturbed and fragmented. Although the local biotypes have here a great adaptive resistance to the constant human pressure, they cannot afford isolation and fragmentation.

Alternative types of environmental development are urgently needed. One can be indicated in ecological connectivity, another in ecological landscape design and planning that hence should be ecologically and culturally founded. Indeed the fragility of the Mediterranean environment calls for the holistic outlook offered by ecology. The latter should then be integrated into landscape design, in turn guided by landscape planning, to conceive future landscapes that are better suited to both the ecological and cultural context of the Mediterranean region (Makhzoumi and Pungetti, 1999).

Landscape design and planning relate human attitudes with the analysis of landscape features, processes and systems. Ecological landscape design and planning add to the above the function of understanding the pattern of natural habitat at the landscape scale.

If ecology is considered as the study of the relationship of all living organisms, including people, to their biological and physical environments, then the ecological planning method can be defined as a procedure to study the biophysical and socio-cultural systems of a place to indicate the best location for specific land uses (Steiner, 1991). From here, ecological landscape design is geared to connect the physical data of the entire ecosystem to cultural information, in order to suggest opportunities in the decision making process for the future landscapes (Pungetti, 1996a). Lastly, ecological design is the effort to respond to the ecological and cultural conditions of the environment, with the aim to impose order to a certain landscape using the tools of art and science.

### **From ecological landscape design and planning to connectivity**

As observed by Opdam (1991) the main elements in the landscape are:

- a) the sites of biotope concentration;
- b) the corridors to connect them;
- c) the other areas;
- d) the barriers between them.

These elements can simply be translated into:

- a) core areas;
- b) corridors;
- c) buffer zones;
- d) barriers;

Namely the basic elements of an ecological network.

From this point of view, landscape is conceived as a web of patches connected by fluxes (e.g. energy, nutrients, organisms) which in turn define the interaction between habitats.

Core areas like parks and protected areas, but also other biotope concentrations, function as source and refuge for species. They are thus located in the wider landscape and form a useful support to ecological landscape planning. Core areas, however, cannot stand alone but must be connected and considered in the framework of an ecological network.

In this context, it becomes essential to analyse the ecological elements of the landscape, including its connectivity. The steps can be:

- a) to assess biological and landscape diversity and
- b) to check whether the landscape functions and the ecological needs of an area, including movement, dispersal, migration and genetic exchange, are able to fulfil the requirements for nature conservation.

Yet, fragmentation of the territory is one of the major threats to nature conservation. Connectivity and ecological network principles should be pursued not only in the wider landscape but also in the wider public framework. Strategies for nature conservation can be alternatives if addressed to both landscape and the public, and will succeed if they integrate environmental goals into public development needs. Such integration can however be achieved only with a real cooperation between the involved actors, and interchange between all the parts, including nature.

### **Landscape design and planning in Italy**

Landscape design and planning in Italy had difficulty being understood and consequently accepted by the public and politicians since the 70s. One of the reasons for this is the inheritance of a particular philosophy from the beginning of the last century, which focussed on the amenity of nature (Croce, 1902). Examples of this philosophy can be found in many plans for both rural and urban environmental areas, where the planning methodology is not based on ecological principles but on functional and visual elements. The consequence was that environmental and landscape planning progressed more as nature conservation rather than nature development, i.e. with a more static rather than dynamic approach (Pungetti, 1991, 1996a).

Landscape planning in Italy produced the first consistent results only in the 80s with the production, among others, of regional landscape plans required by the Galasso Act (L. 431/85), which ensured the landscape protection of a series of territorial categories; with the Hydrological Basin Act (L. 183/89) on soil protection, which required the setting up of river plans; and with the Outline Act on Protected Areas (L. 394/91) aimed at the conservation of the national natural heritage.

Landscape design and planning in Italy, as in other parts of the Mediterranean, has followed three main avenues: urban design, physical planning and nature protection. These avenues, nevertheless, have not been connected with each other and thus environmental planning has been carried out until a decade ago with consideration of the natural components separately from the human ones.

In addition, physical planning and nature protection have been based on theories coming from North-West Europe and North America. Such principles, however, are inappropriate when applied to conditions prevailing in Italy, traditionally diverse from the above areas (Pungetti, 1996a). Lastly, there was lack of support and involvement of local people in landscape and environmental planning implementation, as explained before.

In this context, the Italian contribution to environmental research moved from the analysis of environmental continuity to the development of theories on biodiversity and landscape conservation, then tackling the concept of ecological networks. In the last decade the most successful implementation of issues related to environmental continuity has occurred at the regional and provincial level, i.e. carried out by local authorities. Projects at different scales are presented below to illustrate the framework of landscape planning.

### *Italian initiatives on ecological connectivity at national level*

After an initial debate promoted in seminars and workshops, in 1998 ANPA (National Agency for the Protection of the Environment) outlined the National Ecological Networks Action Plan to support the national environmental connectivity. Its main aim is to define instruments to support local planning through ecological networks (Guccione and Bajo, 2000). To assist in this, the plan has conceived the study of the ecological continuity of Italy, the exploration of methods for ecological network development, and the integration of ecological networks into physical planning instruments. Ten case studies, with working groups made up of academics, local authorities and planners, have been chosen to implement the plan which concluded with guidelines for the production of sustainable management plans to enhance ecological connectivity.

Two other national initiatives are at the moment supporting, like ANPA, the EU Habitat Directive and in particular Natura 2000. The first is the Nature Map by the National Technical Services, as an instrument to individuate the environmental conditions in Italy (Zocchi, 1999). The main goal is to outline the natural values and the vulnerability cases of the Italian territory.

The second is the REN (National Ecological Network) by the Ministry of the Environment, with the aim of forming a national ecological network as an environmental structure extended to the full territory. The REN sees the protected areas as nodes of such a system, interconnected by areas of relevant natural interest, ecological corridors and buffer zones (Agliata and Cingolani, 2000).

### *Italian case studies on ecological connectivity at provincial and inter-regional levels*

One of the programmes of the ANPA Plan consisted in monitoring methods of the ecological networks elements, aiming to provide a basic knowledge useful to advancing proposals for the realisation of ecological networks in Italy. The Reggio Emilia Province and ARPA Reggio Emilia formed a pioneering working group guided by the University of Cambridge. The project has proposed the connection of a wetland of regional natural importance to the potential provincial ecological network. The latter can be improved using reclaimed canals as ecological corridors and very small wetlands as stepping stones, while the big wetland constitutes the core area (Cavalchi and Pungetti, 2000).

After a preliminary analysis of the area with territorial and ecological information, target species have been selected and a GIS has been used applying landscape ecology concepts. This has created the basis to propose a possible ecological network at sub-regional scale. The value of this research lies in the fact that it extends the concept of 'protected area' beyond that of a merely static environmental element. It includes also a consideration of the area's requirements with respect to environmental continuity and the consequent functional and ecological implications.

Another significant contribution of the ANPA Plan came from the University of L'Aquila that promoted Planeco, an inter-regional project involving five universities, four regions, several municipalities and parks. Planeco has two main goals:



- a) The definition of planning criteria for a territory which is considered as a system of ecological components, with particular attention given to environmental continuity; and
- b) The definition of planning criteria for protected areas that are not isolated but linked as components of an ecological network (Romano, 2000). The project developed from a scientific analysis based on vegetation and fauna, to a proposition of intents aimed at the environmental continuity of the regions involved.

## **A European project on ecological connectivity**

The Regions Emilia-Romagna and Abruzzo are partners in Life ECONet, a European project to demonstrate sustainability using ecological networks. It aims to promote sustainable development, to halt and reverse the continuing deterioration of the European environment, to integrate environmental issues in land use planning and management, and to demonstrate and disseminate in Europe the transferability of the proven solution. These aims can be achieved by testing the hypothesis that the integration of environmental issues in land use planning and management can be facilitated by the use of an holistic model which focuses on the realisation of regional ecological networks.

It is a four-year project co-funded by the Life Environment Programme 1999, with 18 partners distributed between England, the Netherlands and Italy. It presents an international, multidisciplinary and cross-organisational partnership drawn from universities, research institutes, regional and local authorities, environmental and nature conservation bodies.

Three case studies have been chosen to implement the project: two in Italy (the regions of Emilia-Romagna and Abruzzo) and one in UK (Cheshire). An additional case study in the province of Gelderland, the Netherlands, serves as an advanced example to refer to for the discussion of problems and solutions that emerged from the Dutch experience on ecological networks.

The project has five tasks:

- Technical development of Geographical Information Systems (GIS) and application of landscape ecology principles.

- Assessing and influencing land use policy and instruments.
- Demonstrating integrated land use management.
- Engaging stakeholders.
- Dissemination.

Life ECONet is a project aimed at practical results, such as to further develop and refine ecological networks in the three case studies mentioned above. It helps also to put forward ideas for nature conservation and development policy, as well as to demonstrate an integrated approach to land management through concrete examples. Further goals are to raise awareness and understanding of ecological networks, and to promote the work to the widest audience.

## Conclusions

The above studies have reached results that fully confirm the hypothesis made in previous research (Makhzoumi and Pungetti, 1999; Pungetti 1991, 1996a, 2001; Pungetti and Romano, 2003). First, design and planning reflect the culture of the place where they originated. Second, there are definitely regional differences in the approaches to landscape design and planning and also to ecological connectivity; although the principles are common, the implementation varies according to the areas. Third, there is evidence of different levels of eco-cultural knowledge, caused by different factors like scientific advance, political strategies and social environment including the influence of mass media.

It follows that ecological connectivity and planning call for a stronger integration of sectors and cooperation between scientific experts and socio-political communities. This cooperation has been reinforced in the last decade, with interorganisational and interdisciplinary working groups at different scales and, what is more, with the integration of biodiversity and ecological network concepts into the regional and provincial planning framework. However, there is still disparity among the Mediterranean regions, lack of environmental awareness and sometimes hostility to nature conservation. This certainly arises from a divergence in the political priorities and goals of the different countries and a general weak integration between nature and man.

From all this it emerges that connectivity in the Mediterranean consists not only of ecological elements, but also of cultural components. Therefore we must

tackle also human activity, planning, education and awareness. Without incorporating these aspects connectivity cannot be implemented.

In order to enhance the connectivity of the Mediterranean it is therefore important to consider the interaction between the natural and cultural factors of a region and its landscape. Much work needs to be carried out not just on the nature-scientific side, but also on the socio-cultural side. This can be done by considering, for instance, the cultural trends and the socio-economic functions of an ecological network site, linking ecology to socio-economics. It means balancing nature with sustainable development, through the link between nature conservation and nature development, and between land use planning and local traditions. In other words, we need to connect local traditional wisdom with modern scientific knowledge for the sake of both environmental restoration and human safety. Or perhaps it simply means exploring a different way of the people to relate with their place and their land, ideally in balance with nature as it was in the past. We need to think wider using the Mediterranean rural cultural landscape that has the potential to easily link together nature, culture and society, as history shows us. Concluding, as we put in 1999 (Makhzoumi and Pungetti):

*We owe much to those wise Mediterraneans  
Who shaped this outstanding cultural landscape  
Which has simultaneously been an inspiration  
And worry in the development of our ideas*

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