ECOLOGICAL LANDSCAPE DESIGN & PLANNING

THE MEDITERRANEAN CONTEXT

JALA MAKHZOUMI & GLORIA PUNGETTI

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To the generations who sowed the seeds

Saniha and Mohammed Emma and Giorgio

and to the ones who will reap the harvest

Tara and Dhia Elisa and Emanuela

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Foreword by
Jay Appleton

In 1996 I had the good fortune to be involved in the examination of two PhD theses in the Universities of Cambridge and Sheffield respectively. Although they dealt with different study areas, Sardinia and Northern Cyprus, they approached the subjects along very similar lines. Both candidates brought to their post-graduate studies an unusually wide professional experience of both the theory and the practice of landscape design in several countries and this showed very clearly in their work, giving them an authority which one does not always find in post-graduate students. Both of them envisaged 'landscape' as the product of the interaction of all the phenomena—geological, geomorphological, climatic, biological and cultural—which had characterised the areas concerned; that is to say landscape and ecology could be interpreted as two expressions of essentially the same thing.

It became obvious that, following the submission of their respective theses which were both scholarly pieces of work, the next logical step was to explore the possibility of giving their ideas a wider circulation. Fortunately their personalities could hardly have been more compatible and it took very little time for them to come to the conclusion that a work of collaboration was not only feasible but almost inevitable.

The fact that they had applied their researches to different areas of field study provided an opportunity to test, exemplify and illustrate common themes in more than one context and, far from being a problem, this added to the force of their arguments. Underlying both of their theses was an awareness that the received wisdom in landscape ecology, which had been largely accumulated by work undertaken in Northern Europe and North America, could not be assumed to be equally relevant when applied to countries of the Mediterranean, not merely because of the physical differences of climate and its associated vegetation but, importantly, because the legacy of nature has been conspicuously altered by the intervention of human communities who have sequentially inhabited European landscapes for thousands of years. The cultural dimension, in short, is also fundamental.

A major function of this book, then, will be to introduce a note of caution, if not scepticism, about statements which purport to embody universal principles. Taking refuge in the simplistic is always a danger against which we need to be constantly reminded, and this book comes as another *aide mémoire* at a salutary time.

We are at last, and not before time, coming to a realisation not only that we are in danger of doing irreparable damage to the environment, but that the process is already well advanced. It is ironical that the very depth of our (very proper) concern with such issues as atmospheric pollution, global warming, the hole in the ozone layer, the disposal of nuclear and other kinds of toxic waste, and a whole host of other sources of damage, poses the danger that we may undervalue the claims on our attention made by the *visual* properties of the environment. We do not seem today to hear the term 'visual blight' as frequently as we did twenty years ago; and some of the measures advocated to improve the 'green' credentials of, for example, energy production, such as wind farms, have been introduced at a high cost to the aesthetic quality of the *landscape*.

A major source of the difficulties we encounter in solving these environmental problems lies in the fact that those who have advice to give tend to represent the point of view of particular disciplines or interest groups. A balanced interpretation of landscape demands a holistic approach; and not everybody has the breadth of knowledge and experience to be competent to achieve it. If Dr Pungetti and Dr Makhzoumi had not been able freely to cross the boundaries which we have erected between what we conceive to be discrete fields of knowledge, this book could not have been written and those of us who profess an interest in landscape would in consequence be much the poorer.

Jay Appleton, Cottingham, East Yorkshire, March, 1998.

Preface

Nowhere in the Mediterranean is the ecological and cultural significance of the traditional rural landscape more prominent than in larger islands, such as Sardinia and Cyprus. With the dominating influence of a semi-arid climate, a fragile ecosystem and a characteristic scarcity of natural resources, these islands can be seen as a microcosm of the Mediterranean environment. The traditional rural landscape, integrating agricultural, pastoral and silvicultural activities, has in the past limited the catastrophic effects of human impact. Recently, intensive land use and accelerated development have led to excessive soil erosion, water shortages and loss of biological and landscape diversity, inevitably affecting long-term ecological stability and environmental sustainability. Therefore, the protection and conservation of this landscape is justified; and in addition can be an inspiration for future ecological landscape design and planning.

This book represents a search for landscape design and planning that is appropriate both ecologically and culturally. The search has developed from several areas of concern. On the one hand, there are the rapid deterioration of the traditional Mediterranean landscape and its piecemeal transformation mainly by urbanisation and tourism. On the other hand, there is little appreciation among the public, decision makers and administrators of the role of traditional landscapes in sustaining the regional ecology. Landscape architecture and planning are pioneering professions in the Mediterranean islands and in much of its eastern and southern littorals. In the absence of an ecologically based tradition, North European and North American experience has been imported, both theoretical and practical, in landscape design and planning, often with a total disregard for the regional, ecological, cultural and aesthetic context. This book is our response and an attempt to contribute to holistic landscape research, creative landscape design and sustainable landscape planning.

One reason prompting us to join our efforts in a book was that we had the same areas of concern in our PhD studies, both of which were carried out in Mediterranean islands. The Sardinia case study was a result of Dr Pungetti's involvement in the MEDALUS II research project from the European Commission, a programme to identify, understand and mitigate the effects of desertification in southern Europe. Dr Makhzoumi's involvement in Cyprus was a result of her professional engagement in designing the landscape masterplan for a tourist project in North Cyprus.

Even though the research was undertaken by each of us independently, upon exchanging the completed works we were surprised to discover the many parallels in our trends of thought, in our respective approaches and in our proposals for ecological landscape design and planning methods. We had both utilised the holistic approach to landscape ecology, believing that it has the potential for better understanding of ecological processes, interpretation of landscape change and guidance of future landscape development and management. The central role of evolutionary historical inquiry into past ecological and cultural influences on the landscape is another aspect common to both approaches.

Further, it was intriguing that we had arrived at similar methodological conclusions by following two very different paths of inquiry. These paths were determined mainly by our academic and professional experience. Dr Pungetti's background and interest in research are clearly reflected in her systematic approach in defining all aspects related to landscape, culminating in her landscape research method for ecologically sound landscape planning. On the other hand, it is Dr Makhzoumi's background of practising, teaching and researching landscape architecture that has guided her in developing the ecological landscape design paradigm. The first approach can be seen as rational, analytic and comprehensive, while the second as intuitive, lateral and design-oriented.

At the cost of some unavoidable degree of overlap, the two parts have been kept separate because they represent alternative perspectives in tackling and solving problems relating to landscape architecture and planning. Accordingly, the book has been structured into four parts. The first is an introduction to the subject, defining landscape, ecology and the Mediterranean context. The main body of the two investigations is presented in the second and third parts: landscape research leading to ecological landscape planning; and the development of the ecological landscape design paradigm, respectively. Conclusions and recommendations for future landscape research and development are presented in the fourth part.

The book was assembled with landscape architects and planners in mind, but it also addresses administrators and decision makers, scholars of the subject and local populations. The aim is to provide a better understanding of our Mediterranean rural cultural landscape, one that can be useful in finding new research paths, stimulating debate, formulating environmental policies and above all raising the awareness in Mediterranean peoples of the value of their landscape.

Acknowledgements

The concepts presented in this book are the outcome of many years of personal experience in research, teaching and professional practice, as well as being influenced by many distinguished earlier contributions in the several fields related to landscape design and planning. Although we have acknowledged a large number of works in the text, we are still indebted to more people than we can mention, since we might have involuntarily incorporated their ideas which have become part of our framework of thinking.

We are particularly grateful to those whose guidance has been indispensable to this book. First among these are Jay Appleton, Owen Manning and Meto Vroom. We are also thankful to Peter Aspinall, Peter Cant, Hasan Ezzet, Oliver Gilbert, Zev Naveh, Donald Nicolson and Mike Weildon.

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Gratitude is also due to our families for their patience, support and unwavering love. Lastly we owe much to those wise Mediterraneans who shaped this outstanding cultural landscape which has simultaneously been an inspiration and a worry in the development of our ideas.

Illustrations

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Part One:

Background

Olive tree (Olea europaea) 400 yrs.

Chapter 1
Identifying landscape, ecology and landscape ecology

Before approaching the topic of landscape it is necessary to define landscape, ecology and landscape ecology. Any excursus on the concept of landscape, however, shows the plurality of meanings that the word embraces. This plurality is here examined and discussed with a view to a better understanding of the subject. The historical development of ecology also reveals fundamental changes in the discipline from its early beginnings and it is here discussed with emphasis on the linkage between ecology and landscape. This linkage is illustrated through the holistic and hierarchical approach of landscape ecology, which is central to the exploration of the humanised world of nature typical of the Mediterranean.

1.1
Etymology of the word 'landscape'

The English word landscape is a borrowing of the Middle Dutch word *lantscap,* Modern Dutch *landschap,* which in turn derives from the common Germanic land and the suffix -*schap* meaning 'constitution, condition', while both the Old English *landscipe* and the Old High German *lantscaf* had the connotation of 'region', 'tract'. Specifically, the Old High German *lantscaf* became in Modern German *Landschaft;* the Middle Dutch *lantscap* became in Modern Dutch *landschap;* the Old English *landscipe* became in the sixteenth century *landskip*; in the seventeenth century *lantskip* and now *landscape*.

In the sixteenth and seventeenth centuries, the word in English meant 'a picture representing natural inland scenery, as distinguished from a sea picture, portrait etc'. In the eighteenth century, its meaning was extended to 'a piece of country scenery', specifically 'a view or prospect of natural inland scenery, such as can be taken in at a glance from one point of view'; and in the nineteenth century to 'a tract of land with its distinguishing characteristics and features, especially considered as a product of modifying or shaping processes and agents' (Onions, 1966; Simpson and Weiner, 1989).

In the last century, the generalised sense of the English word deriving from all this has been simply 'inland natural scenery, or its representation in painting'. To add to this, the word is now used metaphorically too, for instance to express political or cultural states of affairs, e.g. 'the landscape of international politics' or 'the intellectual landscape'. Landscape can also be broken up into two words: *land+scape.* From the end of the eighteenth century similar words have been formed in imitation of landscape, e.g.

seascape with the meaning of ‘a picture or a picturesque view of the sea’, or cityscape, signifying ‘a view of, or the layout of a city’, namely city scenery.

1.2
Usage of the word ‘landscape’

All the above shows how landscape preserves a wide spectrum of meanings, ranging from a general perspective (e.g. countryside) to a distinct geographical definition (e.g. district, region, estates). It can also imply cultural and political situations. People indeed have used the word landscape in different ways, according to different points of view. Four major perspectives can be identified: landscape as scenery, as a specific place, as an expression of culture, and as a holistic entity.

Landscape as *scenery* is recorded in many geographical dictionaries (e.g. Clark, 1985; Stamp, 1966; Stamp and Clark, 1979), the term deriving from the Dutch expression illustrated before. The British tendency of the last century had confined the word mainly to the physical aspects, that is, implying natural scenery without human intervention. The definition by Hartshorne (1959, p. 168) of landscape as ‘the external visible surface of the earth’ implies, however, both objective interpretation, i.e. the description of the characteristics of an area and its view, and subjective interpretation, i.e. the total sum of certain features of an area. Goulty (1991, p. 158) has gone further, defining landscape as ‘a view of prospect of scenery, such as can be taken in at a glance from one point’. Physical and psychological perceptions, therefore, have been relevant in this usage of the word.

Landscape as a *specific place* is again a geographical question. The word *Landschaft* is really associated with the continental European school of *Landschaftsgeographie,* originating in Germany a century ago. The subject of ‘landscape science’, defined for the first time by this school (Johnston *et al.,* 1986), concerned mainly physical and geographical aspects, such as the form of the landscape of specific regions. Landscape is thus seen here as a ‘geographical place’. The understanding of the physical processes of a site, in addition, can be connected to the appreciation of beauty (Ruskin, 1988). Beauty indeed has been largely discussed in philosophy and such discussion constitutes the basis of landscape aesthetics. Going beyond aesthetic interpretation, moreover, it is possible to consider the relationship between landscape, place, culture and society. Hence, landscape is not merely seen as an aesthetic feature, rather ‘it is the setting that both expresses and conditions cultural attitudes and activities’ (Relph, 1976, p. 122). This definition, outlining the ‘sense of place’ in landscape, implies also that significant modifications to landscape are not possible without major changes in social attitudes.

Landscape as an *expression of culture* is the next usage of the word to consider. Landscape, in fact, means also how people have modified their environment from the natural state to the man-made. On a regional scale, landscape can be defined as ‘an area made up of a distinct association of forms, both physical and cultural’ (Sauer, 1963, p. 32). Thus *environment* and area have recently replaced the word landscape for conveying the meaning of ‘place for people’. Landscape accordingly can be considered a ‘place which humans inhabit’ and organise as a system of functional forms and spaces. To this extent, Jackson

(1986, p. 68) has argued that 'landscape is not a natural feature of the environment, but a synthetic space, a manmade system functioning and evolving not according to natural laws, but to serve a community'.

To add to this, several authors (e.g. Clark, 1985; Wittow, 1984) have pointed out the distinction between natural and cultural landscape. *Natural landscape* signifies physical landscape, referring to the physical effects of land form, water, soil and vegetation, while *cultural landscape* denotes humanised landscape, including the modification made by man in agricultural land, settlements and infrastructures (Small and Witherick, 1986). An extension of this is the use of landscape as an area of the earth's surface where both physical and cultural forms are taken into account (Clark, 1985). The word has also been used to describe the total sum of the aspects of an area (Goulty, 1991; Small and Witherick, 1986), both rural and urban, natural and man-made, cutting across the distinction between natural and cultural landscape (e.g. Wittow, 1984) and contemplating also economic components and land use.

These considerations have led to the concept of landscape as a *holistic entity*. This has been discussed by a group of authors (e.g. Naveh and Lieberman, 1990; Thomas, 1993; Troll, 1971) who have presented landscape as the integrated study of natural environment, comprehending all the ecological factors involved not only in natural science, but also in land use, urbanisation and society *(cf.* 1.7). Thomas, in particular, has observed that the notion of landscape seems to unite different disciplines, while their different aspects (e.g. scientific and ecological, social and cultural) tend to draw apart from each other and to define rather different research agendas. Clearly, the term 'landscape' relates ideas about the cultural significance of land to ways in which it is materially appropriated and used (Cosgrove, 1984). Hence, landscape is a concept which implies a certain way of seeing the land and, at the same time, can fit into the history of economic and social processes.

1.3 The geographical perspective of 'landscape'

The subdivision of geography into physical and human is well known. Physical geography concerns the study of the character, processes and distribution of natural phenomena over the earth space, while human geography is concerned with the study of features which relate directly to people, and their activities or organisation over the earth space (Clark, 1985). Physical geography, in addition, has been understood as concerned with landscape and environment. The discipline is seen as a study of the visible surface of natural landscapes as they would appear to a traveller, or as they are linked with environmental modifications and their implication for human welfare (Goudie, 1991). This understanding in some measure bridges the gap between physical and human geography.

In the last century, physical geography was often a description of the earth, with the sea and the air, plus its inhabitants and their distribution (Somerville, 1848). In this respect, Guyot (1850) was already arguing that physical geography should be more than mere description. He considered that it should be the science of the general phenomena of the globe. As a result, at the beginning of this century the first generation of human geographers felt the need to change perspective; thus, they continued with more emphasis to explore the relationship between human activities and elements of physical geography (e.g. climate, land forms, soil and vegetation). This way of thinking had a strong influence on new developments within the discipline, as it had previously tended to ignore human and environmental influences except when they were a factor in geomorphologic and biogeographic change.

Within this context, studies on landscape have been divided in this century into two main lines: natural landscape, more related to physical geography, and cultural landscape, closer to human geography. The former was a characteristic of British geography, which preferred geomorphology as the physical basis of the subject (Johnston *et al.,* 1986). The latter was promoted among others by the American school, particularly through Sauer's programme for historical geography at Berkeley (Sauer, 1963).

However, since landscape is a product of both natural and humaninduced forces, the old division between physical and human geography is inappropriate. In the history of geographical thought, in fact, landscape has also come to be considered as the totality of natural and man-made environment on the earth's surface, interacting with the global ecosystem and society at the same time (Helmfrid, 1980). Following this development moreover, in physical geography landscape is related to morphology, while in human geography landscape is mainly concerned with man-land relationships.

The morphological method, however, has been criticised by Cosgrove (1984, p. 16) as a 'static, determinate object of scientific enquiry'. He has also argued that 'while the scientific status of genetic morphology as method may be disputed, the rigorous exclusion of subjectivity in the interests of its scientific aims is not'. The limitations of morphological analysis lie in its tendency to operate only at a surface level of meaning; and symbolic and cultural meanings invested in landscape are here ignored. For this reason formal morphology remains unconvincing as an account of landscape. Consequently, it is necessary to examine both methods (i.e. morphological and cultural) within the context of the relationship between man and his environment.

1.4
Landscape as we see it

Three main factors can be identified in determining landscape: physical, biological and anthropic. Their interrelations are continuously composing the landscape in such a way that we can distinguish between a spatial and a temporal aspect of this composition. The spatial landscape variety consists in the present interrelation of these three factors in a certain place, while the temporal landscape variety is represented by their interrelation through time (Kerkstra et al., 1973).

This idea is the principal point of departure for our definition of landscape. Therefore, we see landscape as a 'dynamic process developing on the visible earth surface, resulting from the interaction between abiotic, biotic and human factors which vary according to site and time' (Pungetti, 1996a). This is what differentiates landscape from ecology: while ecology deals with environmental processes which are not necessarily visible, landscape is a visible result of these processes which are in continuous change and contribute to the character of the *genius loci*. Therefore, time and space are fundamentals to be considered in this framework, as it is the holistic approach to the subject which allows us to understand the complexity of landscape and its wholeness. This concept has been applied to the landscape planning process discussed in Part Two and to the landscape design paradigm illustrated in Part Three.

In countries of ancient tradition, the shaping of the land derives from both natural and human agency, and the product of this shaping is called 'cultural landscape'. As noted by Selman (1994, p. 2), over time cultural landscapes have acquired distinctive values and qualities, and 'their retention requires the maintenance of a complex balance of local conditions'. Cultural landscapes moreover are related not only to the natural sciences, but also to the socio-cultural sciences as an expression of the human impacts caused by land use (Langer, 1973). Therefore, cultural landscape has been here defined as 'the product of the shaping of the land by both natural and anthropic impacts developed often over a very long period of time' (Pungetti, 1996a).

Added to this there is the concept of 'rural landscape', namely areas that occur between wilderness and urbanised lands (Dower, 1994). These areas have been used for generations by people for their livelihood and are still rural. They differ from place to place, according to the impact of land on people and of people on land. As Rackham (1986, p. xiii) put it, 'rural landscape, no less than Trafalgar Square, is merely the result of human design and ambition'. Actually, it is the relationship between people and land that is the distinguishing feature of this type of landscape. Consequently, rural landscape is defined here as 'the shape of areas in between wild and urban, either seminatural or artificial, characterised by a persistent relationship between man and land' (Pungetti, 1996a).

1.5
The dimensions of ecology

Since its inception in the late nineteenth century, ecology has undergone radical transformations: it has contributed to nature conservation, has provided the stimulus for the environmental movement and continues to progress as a scientific discipline. The ecological sciences, i.e. ecology and landscape ecology, have in the course of their historical development directly influenced the landscape and indirectly contributed to its understanding and appreciation (Makhzoumi, 1996b). Ecology is also seen as the modern science 'that deals most directly with the ancient questions about human beings and nature' (Botkin, 1990, p. 32). As such, like landscape, ecology has the potential to offer different interpretations and to act in a variety of ways depending on the perspective and purpose for which it is used.

Developments that preceded the emergence of ecology as a recognised science, together with events in the century that followed, have led to a view of ecology as demonstrating a 'discursive elasticity that allows it to be used to structure the world in a number of ways' (van Wyck, 1997, p. 11). Ecology therefore has come to acquire several dimensions (Haila and Levins, 1992). The first is ecology *the science,* implying the biological discipline as defined by Haeckel, its founder, including its development and maturity in the decades that followed. Ecology and landscape ecology provide a rational foundation for understanding natural processes and their interaction and can guide approaches to landscape and environmental development and management. In this way, ecological sciences are increasingly influencing professions that deal with the landscape, i.e. landscape architecture and landscape planning.

The second dimension is ecology *the nature,* implying nature as a material fact and a material basis for human existence as well as a constraint of human culture. Here ecological thought, especially through the early years of its development, was influenced by pre-scientific beliefs of nature, mainly nature the creature and nature the divine (Botkin, 1990). Whereas the former described the earth as a kind of fellow creature, the latter proposed a divinely conceived nature which was stable and perfectly ordered. With the development of Cartesian mechanics in the eighteenth century, a third, mechanistic view of nature evolved: that of nature the machine. These three concepts, individually and in combination, continue to pervade twentieth century ecological thinking. As an example, a combination of the divine and animistic views of nature together with awareness of global ecology led to a view of nature as the biosphere, e.g. Lovelock (1979) with the Gaia hypothesis.

Third, there is ecology *the idea,* embracing prescriptive views of human existence. Ecology has often been associated with modern man's desire for moral reverence (van Wyck, 1997) and the search for a larger order in the modern world. The association, according to Orr (1992), is no accident but a reflection of the feeling that 'religion' and 'ecology' similarly imply relatedness. Deep ecology as initiated by Arne Naess (1973) and as expressed by his ecosophy is a clear example of the inspiration of ecology in defining a new ethical relationship between humans and the natural world. It is understandable that in this context ecology is not uncommonly envisaged as a'philosophy of life' (Chisholm, 1972) and a 'point of view' (Kormondy, 1965) as well as a branch of science.

The fourth dimension is ecology *the movement,* signifying political activities that are trying to transform society to agree with ecological ideals. The environmental movement of the 1960s and 1970s was the first to utilise the science of ecology to raise social, economic and political issues. The deep ecology movement, especially in North America (Devall and Sessions, 1985), continues the questions raised by environmentalism with stronger political implications.

The remainder of this chapter will try to outline basic approaches and definitions as developed by the science of ecology and landscape ecology. The ethical and philosophical implications for landscape of the other dimensions of ecology will be discussed in chapter ten.

1.6
The historical development of ecology

That the development of ecological thought preceded the development of ecology the 'science' has been argued by many historians (Egerton, 1976; Mclntosh, 1991; Worster, 1992). Three background elements are of direct significance (Botkin, 1990): pre-scientific beliefs about nature, as discussed above; the observations of the natural history essayists, including the development and acceptance of Darwin's theory of biological evolution; and advancement in the physical sciences (e.g. the Cartesian mechanistic view) that led to concepts of exact equilibria and to a world view of nature as the great machine.

Charles Darwin's (1859) *On the Origin of Species,* with its open and inclusive approach to all phenomena and its inexhaustible range of applications and concerns, provides a model of the ecological knowledge still in use today (Wallace, 1998). The three principles of Darwin's theory of evolution—ecological interdependence, relationship between organism and environment, and the dynamic balance of nature—were then and continue to be the foundation of ecological thinking. Darwin's views were later distorted into a counter-nature trend whereby the concept of competitive struggle for existence was enlarged to include the competition between man and nature. This became the foundation for later technological achievements and a rationale for the control and management of nature (Worster, 1992). Indirectly, Darwin's theory of evolution contributed to a breakdown in the unified views of religion. Man was proclaimed nature's engineer with the task of creating his own paradise on earth. This attitude of superiority continues to the present day, in particular in architecture, planning and the construction professions.

In the latter half of the nineteenth century natural history carried through many of the ideas and concepts put forth earlier by the Romantics and had a considerable influence on the development of ecology. The ideas of the natural history essayists Burroughs (1905), Hudson (1908) and Muir (1919) are among the better known in the English speaking world. The natural history movement can be seen as a counterattack against both the industrial society and new methods of scientific analysis (e.g. narrow specialisation, mathematical abstraction, and extensive reliance on instruments of measurement) which were seen as causes for the alienation of scientists in particular, and mankind in general, from nature (Worster, 1992). Natural history's emphasis on such words as 'holism' symbolised the need and intent to study all nature as a single integrated unit. Holism was later picked up and revived as the central concept of landscape ecology. It is no wonder, then, that ecology has been defined as 'scientific natural history', clearly crediting it with providing the beginning of a tradition leading to modern ecology (Kormondy, 1965).

Foundation and the early development

First appearing in 1866, Oecologie was coined by Ernst Haeckel, the leading German disciple of Darwin, in his efforts to give a semblance of order to the different and divergent lines of inquiry characterising the scientific world of his time (Kormondy, 1969). *Oecologie* was seen by him as the science of the relations of living organisms to the external world and their habitat. Haeckel saw the living organisms of the earth as constituting a single economic unit resembling a household or family dwelling, intimately related in conflict as well as in mutual aid. He based the new term on the root of the word 'economy' since the Greek oikos originally refers to the family household and its daily operations and maintenance (Haeckel, 1892, 1900). Although biologists ignored Haeckel's innovation for several decades, the new term eventually became popular first as oecology and later in its modern spelling as ecology.

The concepts initiated by Haeckel were transformed into a functioning science through a series of contributions. One of the earliest was the concept proposed by plant geographer Eugenius Warming (1909), who saw the ultimate goal of nature as providing for a diverse, stable, well-balanced, self-perpetuating plant society that can meet the needs of different habitats, which he called *community.* Warming's concepts followed the line of thought that influenced biologists of the time, leading to a view of undisturbed nature as 'good' and the maintaining of 'the balance of nature' as essential.

Another key contribution came from developments by Frederic Clements (1904) and Henry Cowles (1909). Although working independently, their contributions later came to be known as 'dynamic ecology', signifying an approach that was concerned primarily with the phenomenon of 'successional development' in plant communities, which had been proposed earlier by Warming (Etherington, 1975). Succession was seen as a directional change of vegetation types, each successive type establishing itself because the preceding type had modified the site in a way favourable to its successor; the sequence finally ending in a climax type that was stable and selfmaintaining under current conditions of site and climate (Miles, 1979). Ecological succession was later developed by the American ecologist Odum (1969) and seen as the strategy for ecosystem development.

Emergence of the 'new ecology'

The process of uprooting ecology from its earlier descriptive traditions into a dynamic science, referred to as the *new ecology,* took place in the first half of the twentieth century (Odum, 1964). The transformation resulted in a model of the environment based on both thermodynamics and modern economics. It was achieved through the combined contributions of three ecologists. The first was Charles Elton (1930), whose emphasis on functional analysis was everywhere replacing the nineteenth century evolutionary historical interest. Elton's principles of ecosystem organisation, i.e. the food chain, the effect of food size and species population on the structure of food chains, and the niche, have remained central up to the present. The second contribution came from Tansley (1935), who proposed a new model of organisation, namely the ecosystem, which embraces the organism-complex, the physical factors forming their environment and the constant interchange between them which forms the system. The ecosystem concept brought all of nature into a common ordering of material resources and marked ecology's coming of age as an adjunct to physical science. The third contribution was by Raymond Lindman (1942), who merged the overlapping ideas of Elton and Tansley into a comprehensive account of the energy-based economics of nature. Lindman's chief goal was to quantify energy losses from one level of the food chain to another.

The energy-economic model of the environment that began to emerge in the 1920s was virtually complete by the mid-1940s and remains overwhelmingly the dominant model followed in ecology today. Since the pioneering work of Elton, Tansley and Lindman, a new generation of mathematical ecologists has pushed their subject to the front ranks of the 'hard sciences'. Their efforts have been supported by the rapid growth of 'systems analysis' as a method for expressing interactions between components of any system whether biological, electrical, or mechanical (Aber and Melillo, 1991).

The ecosystem exemplifies the very definition of ecology as being concerned with the relationship between organisms and their environment. As a 'unit of biological organisation' the ecosystem is made up of 'all of the organisms in a given area (that is, community) interacting with the physical environment so that a flow of energy leads to characteristic trophic structure and material cycles within the system' (Odum, 1969, p. 262). Closely associated with the definition of ecosystem are the two complementary concepts of ecosystem function and ecosystem structure, whereby structure is the composition of the biological community, the quantity and distribution of the abiotic materials and the range or gradient of conditions of existence. Function on the other hand includes the rate of biological energy flow through the ecosystem, the rate of material or nutrient recycling and the biological or ecological reciprocal regulation of environment and organisms. It is the emphasis on the relationship within the system that distinguishes ecology from other disciplines which deal with natural phenomena, such as biology and geography.

1.7
The holistic approach of landscape ecology

The increasingly narrow path followed by twentieth century ecology made it less equipped to present the holistic outlook that had characteristically enabled ecology to deal with the totality of nature. Narrowing its scope to ecosystem energetics and to a trophic-dynamic analysis of the environment. ecology lost much of the emotional and ethical impetus that had characterised its earlier development (Worster, 1992). Landscape ecology, a younger branch of the science, gradually came to occupy part of this void. Its early founders, wanting to deal with landscape as a whole, had to bypass twentieth century ecological developments to find inspiration in the philosophical and holistic stance of earlier contributions.

Landscape ecology is a branch of modern ecology that deals with the interrelationships between man and his open and built-up landscapes (Forman and Godron, 1986; Naveh and Lieberman, 1990). Landscape ecology's subject matter is the landscape, its form, function and genesis (Zonneveld and Forman, 1990). Its integrative approach takes into consideration humanrelated, socio-economic and ecological processes which contribute towards a practical and more sophisticated approach appreciated by scientists and disciplines that deal with landscape and environment (Farina, 1998). Landscape ecology differs from traditional ecology in that it focuses on land or landscape as an object, utilising spatial and ecosystemic and, to a limited extent, aesthetic perspectives. Furthermore, it operates within a holistic framework, understanding wholes or systems without necessarily knowing all their internal details. This holistic and transdisciplinary approach overcomes the traditional distinction between rural and urban landscapes and offers instead an interrelated, interwoven whole. Finally, landscape ecology recognises the dynamic role of man as a central component of landscape. In this way, it reflects an older integrative concept of landscape that is characteristic to vernacular rural societies.

The German geographer Alexander von Humboldt was the first to regard landscape as 'the total character of a region'. The synthesised term landscape ecology, however, was first introduced by Carl Troll (1971) in the late 1930s. Aware that ecosystems are intangible, conceptual systems diffuse in space, Troll realised that they cannot be regarded as a key set for larger-scale landscapes. Alternatively, he saw the landscape as a concrete and tangible entity, which prompted his holistic definition of 'the total natural and human living space'. Troll's aim was that landscape ecology would integrate the spatial, 'horizontal' approach of geographers with the functional, 'vertical' approach of ecologists (Farina, 1998; Naveh and Lieberman, 1990; Zonneveld and Forman, 1990).

As Zonneveld and Forman (1990) suggest, landscape ecologists are mainly concerned with landscape from three overlapping points of view: first is the visual and aesthetic aspects of landscape; second, the chorological aspect, which is a conglomerate of land attribute units or map patterns—this is the approach of geography and geomorphology, soil and vegetation sciences; third, the perspective that sees the landscape as an ecosystem, and combines the two preceding views.

Hierarchical classification in landscape ecology

Hierarchical classification is a fundamental theory in landscape ecology, which helps in exploring patterns and processes across the different levels of the spatial and temporal scale (Farina, 1998). Such a classification can hence be conceived as forming three different categories, which are in turn ordered at three different scales. The first is the *biosphere,* which can be regarded as the largest concrete global natural, or close-to-natural system occupied by living organisms. The biosphere in turn is made up of *biosystems,* which can be natural and semi-natural landscapes, with the *biotope* as the smallest concrete biosystem.

The second category is the *ecosphere,* indicating the planetary system that includes and sustains life. The ecosphere is made up of ecosystems, which represent interacting organisms in particular habitats. The smallest concrete ecosystem is the *ecotope,* a term used in landscape ecology to denote the smallest homogeneous piece of land where at least one attribute—land form, soil or vegetation—is homogeneous even if the visual structure may still show some heterogeneity in vegetation (Naveh and Lieberman, 1990; Zonneveld, 1989; Zonneveld and Forman, 1990). An ecotope is therefore a spatially defined ecological unit, with composition and structure determined by local abiotic, biotic and human conditions.

The third category includes the *techno-sphere,* the world of man's creation with *technosystems* as its components. Technosystems comprise rural, suburban, urban and industrial landscapes which are also referred to as *human ecosystems.*

Naveh and Lieberman (1990) propose a functional classification of the biosphere and techno-sphere using the concept of the Total Human Ecosystem (Fig. 1.1). The Total Human Ecosystem is seen by them as the highest level of ecological integration, with the ecosphere as its concrete space-timedefined global landscape entity.

Hierarchical classification in landscape ecology is extremely significant, because it draws a distinction between abstract, functional interaction systems, as defined above by Odum, and concrete voluminous 'chunks of nature', for which the term 'ecotope' has been adopted by landscape ecologists and planners.

A holistic view of landscape

Historically, a holistic outlook originated in a conceptual need to identify the 'earth' and 'nature' as one unified entity, with the implicit connotation that the value of the whole does not lie in the simple totalling of its parts. This meaning has been noted in the writings of the Romantics and of the natural history essayists, and seems to be a recurring tendency, stemming from man's inner need to tidy the perceptions of his environment.

In ecology and landscape ecology, a holistic outlook is scientific and practical. It stems from the ecosystem theory, stressing the interconnectedness of the various biotic and abiotic components that interact within an ecosystem. This integrative rather than selective approach holds true regardless of the scale of the ecosystem at hand. Thus holism permits the simplification of scientific activity by reducing analytic observations in order to facilitate the understanding of complex structures and processes. At the same time, it warns against attempting to study wholes by analysing them in separate pieces without connecting them with each other. The term is also

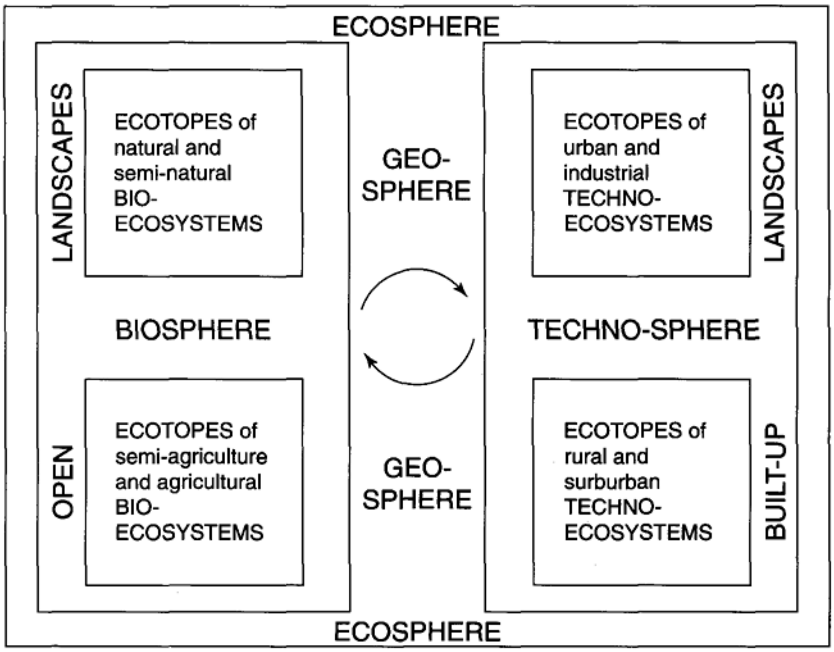


Fig. 1.1 The hierarchical organisation of ecosystems. (Source: Bakshi and Naveh, 1990.)

used to indicate a basic philosophy in which the landscape is perceived as a holistic entity that must be considered, studied and treated as a system and cannot, without danger to humanity, be studied in discrete units (Zonneveld and Forman, 1990).

Above all, a holistic outlook and a hierarchical approach in combination allow landscape ecology to overstep the purely natural realm of classical bio-ecological sciences and enter the realm of human-centred fields of knowledge: the socio-psychological, economic and cultural sciences connected with modern land uses (Naveh and Lieberman, 1990). The significance of such an integrative outlook in reconciling the clashing natural and cultural viewpoints will be further discussed.

To summarise, landscape ecology has the potential of forming the scientific foundation for a comprehensive understanding of the landscape. Its concern with linkages between resources, human use and the patterns they create on the land has much in common with the concerns of landscape architecture, landscape planning and management. As such, landscape ecology has increasingly influenced these fields in the Netherlands (e.g. Tjallingii and de Veer, 1982; Vink, 1983), in Germany (e.g. Haber, 1990), in Canada (e.g. Hills, 1974; Jacobs, 1979), and in the US (e.g. Forman and Godron, 1986). Landscape ecology has been adopted in this book for the development of landscape design and planning in the Mediterranean. Concepts of landscape ecology will form the basis for an ecological landscape planning approach in Part Two, and the ecological landscape design paradigm in Part Three.

Chapter 2
The Mediterranean context

The cultural and natural diversity of the Mediterranean is the outcome of a long history of interaction between successive civilisations and a land of austere resources. A combination of natural and cultural evolutionary processes over the centuries has resulted in a landscape that is rich and diverse and has maintained the delicate balance between man and nature. The impact of twentieth century population increase, industrialisation and tourism, however, is gradually transforming the region and resulting in fundamental imbalances. This chapter investigates the natural and cultural components of the Mediterranean landscape with special reference to its arid and semi-arid littorals. A discussion of the consequences of contemporary development which ignored environmental and ecological constraints provides the context for ecological landscape design and planning.

2.1
The natural and cultural setting

The Mediterranean, because of its diverse physical setting, has been likened to a miniature ocean contained by miniature continents and subcontinents each of which contains smaller physical worlds separated by coastal ranges and accessible only through narrow valleys or difficult mountains (Henry, 1977) (Fig. 2.1). This natural setting has, however, been so radically transformed by man that there remains very little of what once constituted the original ecosystem. The closely associated natural and cultural evolutionary processes that have shaped the environment are briefly reviewed below.

The natural setting

The Mediterranean topography is complex, fragmented and dominated by prominent mountain systems that surround the basin except on the southeastern desert coast. The complexity and instability of the relief and the many steep rocky slopes render the soil vulnerable to sheet and gully erosion, especially in the foothills. The situation, according to Naveh and Lieberman (1990), can become critical if the natural vegetation canopy which protects the soil is destroyed, thus exposing its shallow mantle to desiccation in the dry summer and to torrential rains in the winter. The significance of mountains as a habitat

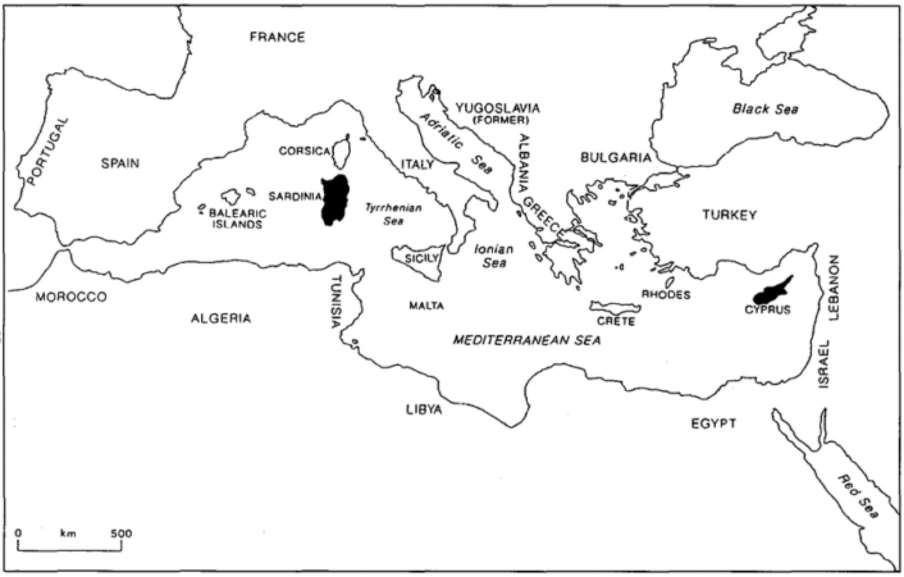


Fig. 2.1*Map of the Mediterranean, highlighting the islands of Sardinia and Cyprus, west and east, respectively*.

for Mediterranean rural communities has diminished in importance in the past decades because of the increased attraction of development in the plains.

Coastal plains are small and narrow except for the larger alluvial plains in the deltas of great rivers. The coastal environment is characteristically fragile, possessing considerable morphological, biological and geographical diversity. It is, however, under increasing human pressure from urbanisation and more recently from tourism.

Climate is by far the dominating feature in the Mediterranean. The characteristic warm to hot dry summer and mild cool wet winter is distinguished by local variations determined by topography, aspect and vegetation cover. The variations are mainly in the amount of rainfall, the duration of the rainless months, temperatures and plant cover. The majority of Mediterranean lands have a long dry season, which results in a characteristic scarcity of water resources. The uses of inland water, both biological and productive, have resulted in continued conflict between nature protection and the satisfaction of human needs.

The Mediterranean basin is one of the well-marked biogeographic regions of the world. The 'sclerophyll forest zone' (SFZ), as it is called, consists mainly of broad-leaved evergreen trees and shrubs. The early development of the Mediterranean forest can be traced to the relatively moist period following the Ice Age that favoured the extension of the evergreen sclerophyllous forests and pine forests. The forest reached its maximum development between the tenth and second millennia BC when it covered practically the entire basin, even in North Africa. Later, excessive clearing that accompanied population increase, together with climatic changes, favoured the desertification of the Sahara and

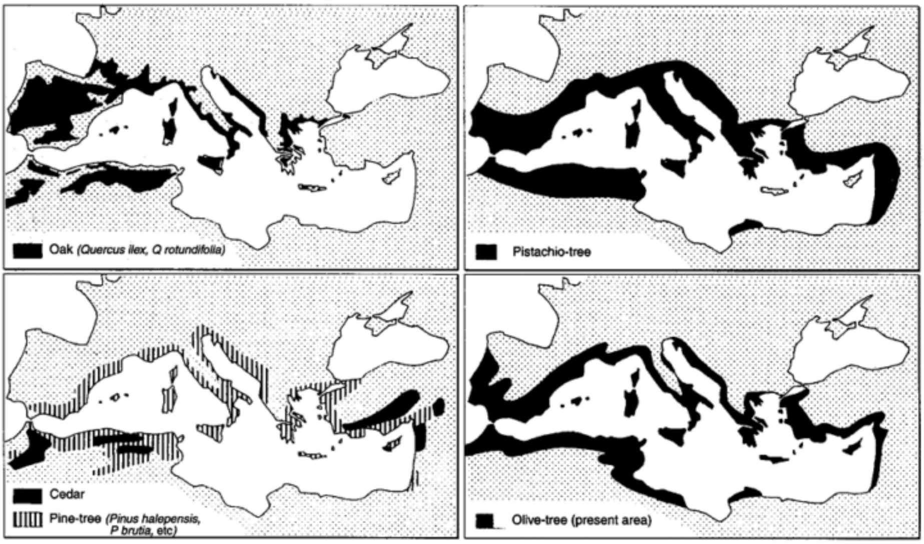


Fig. 2.2 The distribution of selected Mediterranean trees and shrubs. (Source: Grenon and Batisse, 1989.)

greater aridity through the southern littorals. Forest destruction in the following centuries resulted from the ancient maritime civilisations converting their land into fields, and using the fuel and wood for shipbuilding. Today the original Mediterranean forest is limited in extent, having long been replaced by the maquis (Fig. 2.2). The maquis is either a 'stage in the degradation of the Mediterranean sclerophyllous evergreen forest (a degradation almost entirely due to human intervention) or it is one of the stages in the gradual evolution of the vegetation towards that forest' (Tomaselli, 1977, p. 358). As such, the maquis represents a semi-natural landscape which is not only widely distributed in the Mediterranean basin but also of great environmental and ecological significance.

The Mediterranean is also referred to as the olive climate because of the wide distribution of the cultivated olive tree (Naveh and Lieberman, 1990; Polunin and Huxley, 1987). The olive and the carob form two significant plant associations: the *Oleo-Ceratonion* association found at lower elevations in coastal regions and foothills in the western Mediterranean; and the *Ceratonio-Pistadon* in the eastern Mediterranean. Both are maquis scrub and grasslands with numerous plant associations, with the wild olive *(Olea europaea)* and the very valuable fruit-bearing carob tree *(Ceratonia siliqua)* as the upper layer, and the mastic lentisk shrub *(Pistada lentiscus)* as the subdominant in the shrub layer (Naveh and Lieberman, 1990).

The Mediterranean forest is poor in the quantity and quality of its production. Further, the introduction of commercial species to develop industrial wood production increases the susceptibility of the forest to the already ever-present fire hazard. The main significance of the forest and the maquis lies in their environmental role in protecting watersheds, stabilising the soil and being a repository of genetic and species diversity.

More recently, as Grenon and Batisse (1989) point out, forest has been used for recreation, leisure and landscaping, even if it is not always well understood by both media and politicians. Improvement of education and stronger policies for environmental and landscape management are essential steps to take in order to protect the Mediterranean natural and semi-natural ecosystems.

The cultural setting

The Mediterranean has witnessed the rise and demise of many civilisations which have left a mark not just on the people but also on their land. Nowhere is the imprint of history more visible than in the contemporary network of towns and villages, the direct inheritance of 2000 years and more. Ancient cities like Alexandria, Rome and Istanbul are evidence of those great civilisations. The original Mediterranean rural landscape has changed in due course and new landscapes have developed around the old network of towns and villages. The unprecedented population growth in the cities in recent decades has raised the problem of power distribution and water supply, together with air pollution and traffic congestion. Also, developments in the countryside have led to a scarcity of fuel-wood resources, contributing to desertification and soil erosion. Fortunately, however, old towns expanded but most did not change site, thus preserving a distinct *genius loci*. The characteristic tightly knit fabric of Mediterranean towns rarely included large open spaces or green areas, mainly to minimise the area of the walled city and facilitate its defence. Similarly, the Mediterranean courtyard house reflects the concept of microcosm, where the traditional home is planned around irrigated gardens, underlining the prominence of individuality over collectivity (Pungetti, 1996a). Both town and house constitute key aspects of Mediterranean culture that have been taken into account in the development of this book, together with economy and related land use.

The most important economic sector of the Mediterranean basin is agriculture. It currently provides employment for nearly half of the labour force and it uses most of the land and water resources, leading to a competition between urbanisation and environmental conservation. Because population has grown faster than progress in food production, many Mediterranean countries are no longer able to feed themselves. In the process of trying to increase production, intensive cultivation by small farmers using traditional methods has produced soil degradation. Areas with potential for irrigation, in addition, have used water inefficiently with rudimentary techniques, giving rise to a consequent loss from run-off or evaporation. Agriculture has caused other problems, such as pollution from fertilisers and pesticides, desertification due to the use of mechanical tools, and erosion of upstream soil as a result of deforestation.

Industry is the sector which has priority in terms of investment, research, technology, innovation, development programmes and regional policies. This was particularly true of the post-war period, when industrial development was fast and dominated by public authorities. However, an imbalance still exists between the north and south Mediterranean: 70% of the basin's manufacturing industry is concentrated in areas like Spain, France and Italy (Grenon and Batisse, 1989).

Fig. 2.3 The village of Old Gairo in Sardinia.

The Mediterranean basin, it is known, is an important international tourist destination. Modern tourism, characterised by a massive influx during the summer to the seaside, originated on the French and Italian coasts but has now spread all over the basin. The impact of tourism is both physical, i.e. the need of space for tourist installations and required infrastructures, and socio-economic in that it changes life-styles and often leads to agricultural abandonment. In addition, there is its impact on the environment and the risk it poses in the over-exploitation of natural resources. Water consumption for instance is particularly high in the islands during the dry season, when forests are seriously threatened by fire. Plants and wild life furthermore can be damaged by the increasing number of tourists and their environmentally unfriendly attitudes.

Transport reflects the level of activity of the other economic sectors and is directly linked to the environment. The use of roads for travelling and the transport of goods dominates other forms of transportation. However, transport is a major source of air pollution and its network often occupies fertile agricultural land and can induce soil erosion and fragmentation. Furthermore, roads cause disruption among people by separating villages (e.g. with a motorway) and form barriers in the ecological network, being an impediment to the movement of domestic animals and the local fauna.

From the above, it is evident that the adverse consequences of contemporary development need to be contained and that the fragile Mediterranean environment necessitates an integrated approach in planning and management practices. It is also essential to realise that the economic sectors are not independent but are increasingly affecting human activities, social and cultural development. Researchers like Grenon and Batisse (1989) have outlined the possibility of recognising a deep relationship between the socio-economic parameters of development and environmental components. This relationship has to be taken into account in both environmental and landscape policy for the future.

2.2
Landscape heterogeneity

The rolling topography of the Mediterranean, the occurrence of many different local climates and the different degrees of intervention by man are reflected in the rich diversity of the landscape. Mediterranean landscapes, therefore, are mainly characterised by 'structural heterogeneity' (Di Castri and Mooney, 1973). Two fundamental issues are central to an understanding of this heterogeneity: the dominating influence of climate; and the centrality of anthropic influences (Makhzoumi, 1996b). Both are integral parts of landscape evolution and central to the achievement of the man-maintained balance of non-cultivated semi-natural Mediterranean landscapes.

The dominating influence of climate

Despite considerable diversity, the regions between latitude 32° and 40° north and south of the equator are characterised by a unified climate, better known as the *Mediterranean Climate* (Di Castri and Mooney, 1973). This occurs in four other, smaller regions of the world: south-west Australia, the western Cape in South Africa, south-central Chile and southern California. Common to all these regions is their location in a transition zone between temperate climates and extreme aridity.

The Mediterranean Climate is distinguished, according to Aschmann (1973), by three criteria. First, the concentration of rainfall (65–70% of annual precipitation) occurs in the winter half of the year, leaving all but favourably located vegetation subject to drought stress in summer. The months of June, July and August, although fairly dry around the western Mediterranean basin, are not rainless. The eastern basin, however, excluding the Aegean area north of Athens, shows sharp summer drought, often for more than six months. Combined with hot summers and moderate frost probability in winter, this distinguishes it as being semi-arid. Accordingly, and in terms of summer drought, the Mediterranean can be divided into three distinct regions: an arid region to the south; semi-arid regions in the eastern littorals, the western Spanish coast and the large islands, namely Sardinia, Sicily, Crete and Cyprus; and a humid region to the north (Fig. 2.4).

Second, the total amount of precipitation is sufficient to support continuous vegetative cover on all but the most rocky sites. Elevation, distance from the sea and exposure account for annual precipitation variability that ranges from 275 mm for cool coastal regions, to 350 mm for warm interior regions and 900mm for humid boundaries.

Third, Mediterranean climates must have a winter which can readily be defined as a month with an average temperature below 15°C. As a phenomenon that directly affects plant life, the proportion of time that temperatures are below 0°C is a good index of the severity of winter.

The climatic characteristics of the Mediterranean have greatly influenced anthropic activities, both in the past and in the present. More significantly, the climate is an important determinant of the Mediterranean ecosystem and a dominating influence in relation to the availability of natural resources. The reciprocal influence of climate,

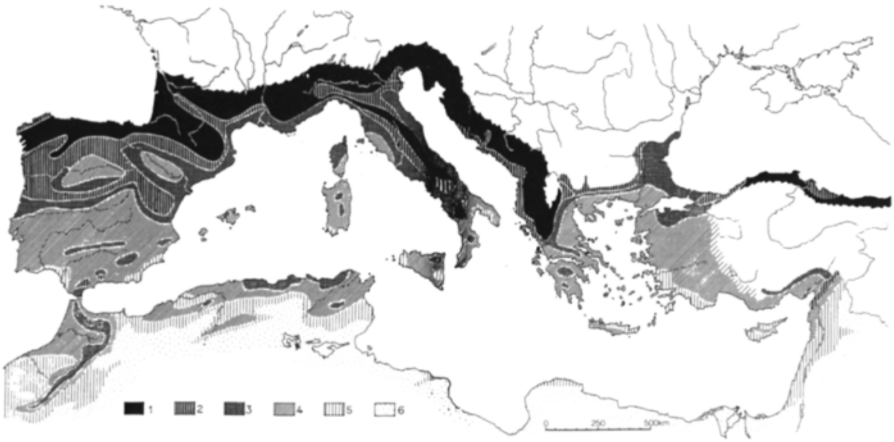


Fig. 2.4*Length of the dry season in the Mediterranean region. Number of dry days per year: (1) no dry days; (2) 0–40 dry days; (3) 40–75 dry days; (4) 75–125 dry days; (5) 125–200 dry days; (6) more than 200 dry days. (Source: Birot, 1964.)*

vegetative cover, soil and water resources can be better appreciated within the complexity of the Mediterranean ecosystem, discussed in the following section.

The necessity of an anthropic evolutionary perspective

The environmental, ecological and climatic factors discussed above clearly reflect that human intervention is an integral part in the morphogenesis of the Mediterranean. The closely intertwined physical, biological and cultural processes of co-evolutionary feedback relations became a major driving force in the creation of the semi-natural and agricultural landscapes of the semiarid Mediterranean. From this perspective, Naveh and Dan (1973, p. 387) view the Mediterranean landscape as 'multi-variate biofunctions governed by complex interactions between mode, duration and intensity of human interference, initial site conditions and state factors, climatic and biotic flux potentials and by the resilience and recuperative powers of the ecosystems'.

The complexity of human interference, however, is not linear nor can it be comprehended from a unidirectional, cause-effect explanation of disturbances. Instead, Naveh (1990) has proposed a mutual-cause process of co-evolution of Mediterranean people and their landscape. Here coevolution is 'the simultaneous evolution of two genetically independent, but ecologically interdependent lines via biological and cultural templates' *(ibid.,* p. 43). A co-evolutionary concept in this sense unifies these closely coupled processes of human evolution with the gradual conversion of natural landscapes and their vegetation into semi-natural and agricultural landscapes.

The complex interactions between the various landscape components have, over a long and chiefly destructive history of man-land relationships, arrived in the last hundred years at a 'new equilibrium'. The equilibrium has been established mainly in the non-cultivated upland ecosystems, which are neither overgrazed and heavily coppiced, nor completely protected (Naveh, 1975). This man-maintained equilibrium between trees, shrubs and herbs continues, as it has in the past, to contribute to the biological diversity, the stability and the attractiveness of the Mediterranean landscape.

2.3
The ecological complexity

The ecological complexity of the arid and semi-arid Mediterranean gives rise to a diversity of problems. The one common feature, however, is the fragility of the ecological balance and the potential threat of desertification in the southern and eastern littorals. In semi-arid regions nature maintains a very delicate balance between land, the intensity of its use, and proper conservation of the land under use. This balance dictates a design approach that is simultaneously ecologically motivated and ecologically informed (Amiran, 1964). Landscape design and planning that fails to comprehend the significance of this balance, or the ecological interrelatedness of the abiotic, biotic and human components of this fragile ecosystem, cannot contribute positively to the environment.

The ecology of semi-arid regions

Walker (1979) sums up the climatic determinants of semi-arid ecosystems as follows: a low and highly variable rainfall; highly variable primary production, mainly as a result of the rainfall pattern; soils characteristically low in organic matter; surface water universally in short supply; and vegetation generally a mixture of woody and herbaceous species. Merely climatic classifications of semi-arid regions are, however, restrictive. What is required is a classification based on the utilisation of natural resources which, as Walker argues, determine land use in these regions.

The overall seriousness of ecological conditions in the semi-arid regions has increased in proportion with world-wide population. The increased pressure of more people being forced to make a living in them accelerates the pace of degradation, ultimately leading to soil degradation and desertification. The resilience of semi-arid ecosystems, i.e. their ability to recover from different degrees of perturbation whether natural or man-made, is limited to coping with natural variation in growth conditions. When man-caused changes are superimposed, the limits may be exceeded and the change to a new equilibrium takes place. Should the vegetation cover in semi-arid ecosystems be damaged, the percentage of bare soil surface increases, plant growth is reduced, and a downward spiral begins which is very difficult to halt *(ibid.)*.

The Mediterranean ecosystem

The simultaneous variability and the extremes of two key factors, i.e. rainfall and temperature, dominate the interactions within the arid and semi-arid ecosystem (Graetz, 1991). The complex, long-term as well as short-term, interactions between these two factors, together with geology, topography, soil and vegetation cover, account for the fragility of these ecosystems. Typically, the low winter precipitation and summer drought result in a summer soil moisture shortage. The high variability of winter precipitation, and often a lack of winter rainfall, can lead to the gradual degradation of the vegetation and soil. The soils of degraded ecosystems then become unable to retain water supplied by the occasional high-intensity torrential rains, so that even the scarce rain water is not used efficiently, resulting in flooding and erosion. In extreme cases this can lead to desertification (Imeson and Groot, 1989; Mairota et al. 1997).

The consequences of the fragile ecology of these regions are realised primarily when one or more of the landscape components (e.g. the vegetation) is altered. The harsher and more fragile the local ecology, the more far-reaching and irreversible will be the man-induced changes and the slower and more difficult will be the process of recovery (Naveh and Dan, 1973). More positively, however, the long duration of landscape evolution has encouraged not only the invasion of xeric elements from adjacent arid zones but also the selection and evolution of local biotypes with the best adaptive resistance to the constant pressure of defoliation by fire, cutting and grazing (e.g. *Pistada lentiscus* and *Quercus calliprinos).* The resilience of the indigenous Mediterranean vegetation and its adaptability necessitate its protection in contemporary landscape planning and development.

2.4
The rural cultural landscape

The cultural landscape, as defined in the previous chapter, is the manifestation of human decisions to modify the land, regardless as to whether this is done intentionally or not. Historically, the evolution of the rural cultural landscape in the Mediterranean has undergone significant stages (Naveh and Dan, 1973; Naveh, 1982). The final shaping of the Mediterranean cultural landscapes took place during the Pleistocene, when the climate changed, and in the Holocene, when fire and grazing became important forces. The eastern Mediterranean was among the first places where stock farming, cereal production and domesticated plant cultivation developed. Thus, evolutionary processes of ecosystem specification and ecotype variation intensified (Naveh and Lieberman, 1990) and the semi-natural landscape evolved.

The Neolithic revolution was marked by the agricultural transformation and the breeding of domestic animals. While the former led to the clearing of forests in fertile lowlands and eventually to the terracing of arable slopes, the latter led to the periodic exposure of the remaining sclerophyll forests to fire, as a means of increasing edible herbs and plants for pasture.

As forests disappeared, starting from the south, the various civilisations extended their ravages northwards. The extent of destruction was so great that in 300 BC the kings of Cyprus took the forests under their protection (Tomaselli, 1977). Ravaging of the forest continued during Classical times, when large areas of dense woods were transformed into open and cultivated fields. The forest was pushed back to the most inaccessible peaks, while semi-natural vegetation was at the edge of well-managed terraces and fields of crops, vineyards, olive and fruit trees. Later, part of the Mediterranean basin, notably

Corsica, Sicily and Sardinia, became the granaries of the Roman Empire and many plains were modified by centuriation and irrigation works (Pungetti, 1995).

In the Middle Ages, population decline and agricultural decay resulted in environmental misuse and landscape degradation. The destruction of terraces, water channels and aqueducts and the denudation of slopes caused soil erosion, silting, riverbed sedimentation and conversion of fertile plains into unproductive and unhealthy land, e.g. into malarial swamps. Nevertheless, this situation, resulting from a combination of ecological heterogeneity, biotic richness and human modification, made possible the evolution of a very attractive and semi-natural landscape.

With the industrial revolution, technological interventions and intensified agro-pastoral land use brought the most evident modifications, both to lowlands and uplands. The latter were exploited for forestry production, although this contributed very little to the overall economy (Pungetti, 1996a). They were used in particular for cork production, the by-products of aromatic plants (e.g. spices and balsam) and coppice (i.e. for fuel, tools and hedges).

Rural cultural landscapes, like most traditional landscapes, are increasingly being eroded. Global trends in economic development, communications and socio-cultural changes are not only degrading the biological, scenic and cultural attributes of the landscape, but also eliminating the uniqueness of the rural cultural landscape everywhere.

The Mediterranean, indeed more than any other region in the world, best exemplifies the process of the man-environment interaction. The traditional rural landscape is diverse, integrating agricultural, pastoral and silvicultural activities. Ancient techniques of agriculture have limited the catastrophic effects of accelerated erosion and water shortages, by the construction of retaining terraces along the slopes and the utilisation of naturalised plant species, such as the vine, olive and carob trees. The diversity of rural activities resulted in a landscape that is versatile and thus more stable. These traditional landscapes reflect an overall awareness of the limits of development within the constraints of the semi-arid Mediterranean ecosystem (Fig. 2.5).

A number of surveys have successfully documented the general landscape characteristics in several Mediterranean regions (e.g. Grove *et al.,* 1993; Naveh and Dan, 1973; Naveh and Lieberman, 1990; Vos and Stortelder, 1988). In particular, a study of the landscapes of western Crete(Grove et al., 1993) indicates they are characterised by great complexity and diversity, being rich in both natural and cultural/historical features. Such a diversity and complexity, especially in a fragile semi-arid ecosystem such as that of Crete, allows for increased stability and productivity. In recent decades these landscapes, under various influences, have become less diverse and more uniform. Landscape homogeneity, for instance, undermines the long-term stability of these landscapes because of increased risks of fire and plant disease. Studies of this type therefore argue for the maintenance of landscape diversity, complexity and ecological stability, since it contributes not only to nature conservation but also to the beauty and attractiveness of a landscape.

The landscape changes recorded in Crete have also been observed in Tuscan landscapes. Traditional landscapes of the Solano Basin, for example, are experiencing a striking decrease in pattern and diversity, together with a progressive loss of organic,

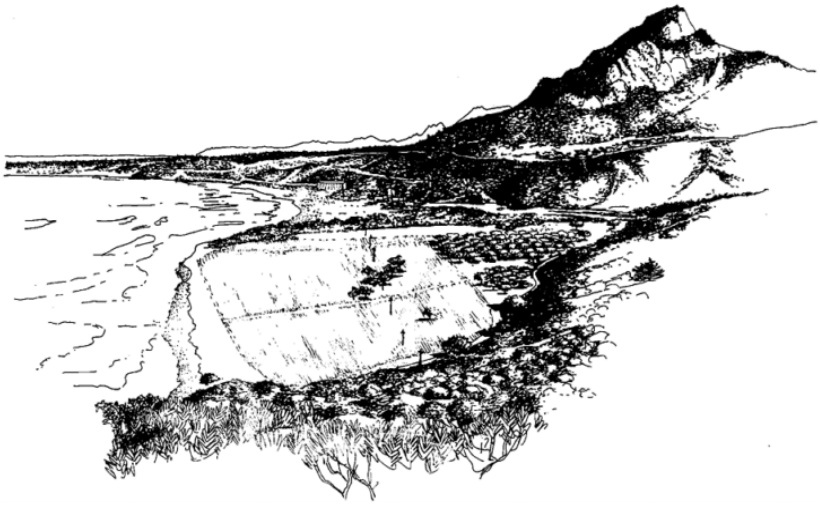


Fig. 2.5 Mediterranean rural landscapes in the Kyrenia Region in Cyprus.

cultural and scenic variety (Vos and Stortelder, 1988). These unique and relatively remote hill and mountain landscapes had traditionally fine-grained land uses, which are increasingly being replaced with a coarse and monotonous one. Of the ten original land units that were surveyed, it was predicted that only six would remain in the following fifty years.

The reason for landscape transformation is seen by Naveh (1993) as part of a process of 'neo-technological landscape despoliation', in which non-tillable and marginal uplands are either left to their fate of abandonment and neglect, or are exposed to agro-pastoral over-exploitation and uncontrolled urban industrial encroachment. The consequences are a rapid loss and fragmentation of unspoiled open landscapes, their soil, plant and animal resources, and their 'life-supporting' production, protection, carrier and regulatory functions.

Despite a similarity in purpose, rural cultural landscapes in arid and semiarid regions differ from those of temperate regions. Controlling nature in these two regions poses increasingly different problems. Whereas in temperate regions the main problem lies in checking the advance of the forest, in arid and semi-arid regions the preoccupation of the rural landscape is to curb the advance of desertification (Makhzoumi, 1996b). As a consequence, rural cultural landscapes in semi-arid regions have a fundamental environmental role because they conserve natural resources and maintain the ecological balance.

2.5
The contemporary Mediterranean

The fragility of the Mediterranean ecology is particularly critical in the eastern and southern littorals, the semi-arid and arid regions respectively. It is not only the varying degrees of aridity that characterise these regions but, in addition, four interrelated features: high rates of population increase, tourism as the main avenue for development, predominantly developing economies and a typical scarcity of natural resources (Makhzoumi, 1996b).

The first of these features is the distribution of the population. Countries of the Mediterranean, because of significant regional variations in the annual rate of population growth, are divided into three basic groups (Grenon and Batisse, 1989). Group A, Spain, France, Greece, Italy and Yugoslavia, had a distinctly low growth rate between 1950 and 1985, compared to group B, represented by Algeria, Egypt, Libya, Morocco, Syria, Tunisia and Turkey south and east of the Mediterranean, and group C, represented by Albania, Cyprus, Israel, Lebanon, Malta and Monaco. Projections for 2025 indicate that countries in group A will have no more than 36% of the total Mediterranean population, while the countries in group B will comprise 60% of the Mediterranean population in 2025, twice the current proportion.

The second feature is the dominating influence of tourism. The countries with a higher population concentration (the southern and eastern littorals) have, in the last two decades, become increasingly reliant on mass tourism. The Mediterranean accounted for nearly 35% of the world tourist market in 1984, of which France, Italy and Spain received between 70 and 80% of the total number. However, recent trends indicate a gradual shift towards the eastern and southern provinces. This is evident from the high average annual growth rate, which for Greece, Cyprus, Egypt and Tunisia was above or equal to 10% during the period 1970–1986, twice the average Mediterranean growth rate for that period (Grenon and Batisse, 1989). Moreover Greece, Turkey, Malta and Cyprus are successfully being targeted by organised tourism, which accounts for the large numbers of tourist arrivals.

The third feature of arid and semi-arid Mediterranean regions is the state of their economies. There is a marked contrast between the developing economies of the southern and eastern littorals and the industrialised ones to the north. In addition, there is the high indebtedness of these developing regions, whose exports are more vulnerable to commodity price fluctuations than those of the countries in the north. Although these countries' developing economies benefit from the backing of powerful financial centres in the European Community (Grenon and Batisse, 1989), the long-term effects on rural communities, cultural attitudes and the traditional landscape is considerable and not always advantageous. The developing economies of arid and semi-arid regions influence their outlook on environmental issues and their view of natural resources. Their urgent need for the income and employment generated by development, i.e. tourism, makes them uncritical of the form and extent of development. The outcome is a long list of environmental problems that is now threatening to destroy what is left of the balance between man and the Mediterranean environment (World Bank and European Investment Bank, 1990).

The scarcity of natural resources, mainly water and soil, is the fourth feature of arid and semi-arid regions. With rain limited in quantity and restricted to a few winter months, most of these regions rely on ground water reservoirs. The high water draw-off (Fig. 2.6) calls for non-conventional resources, such as non-renewable fossil aquifers, recycling of used water, multiple water uses, reduction of losses to the sea and, as a last resort, desalination (Grenon and Batisse, 1989). Tourism generates a sharp, seasonal peak demand which is largely concomitant with the irrigation and drinking-water demand of local communities. This seasonal pattern exacerbates the tensions between requirements and resources, especially in the summer. Moreover, precipitation is not only uneven in its seasonal distribution but often torrential, with run-off resulting in intense soil erosion (Fig. 2.7). The latter is the by-product of denuding the land of its vegetative cover, either through overgrazing or through deforestation. Its extent and seriousness make it, together with the scarcity of water resources, an environmental problem of the greatest urgency.

In short, the combination of high rates of population increase and mass tourism places large demands on the consumption of resources, specifically land and water. Eventually the result is an increase in pollution and irreversible damage to natural and cultural ecosystems alike (Grenon and Batisse, 1989; Tangi, 1977). This constitutes a major concern in our search for alternative approaches to landscape development.

2.6 Ecological landscape design and planning

As one of the world's oldest continually inhabited regions, the Mediterranean landscape has evolved to acquire a characteristic richness and heterogeneity. The complex interactions between the various landscape components have, over a long and chiefly destructive history of man-land relationships, arrived in the last hundred years at a new stage. The result is a fragile ecosystem which can be easily disturbed when one or more of the landscape components is altered. The long history of landscape evolution has encouraged the development of local biotypes with the best adaptive resistance to the constant pressure of use and abuse. The resilience of the indigenous Mediterranean vegetation and its adaptability therefore necessitate its protection in contemporary landscape development.

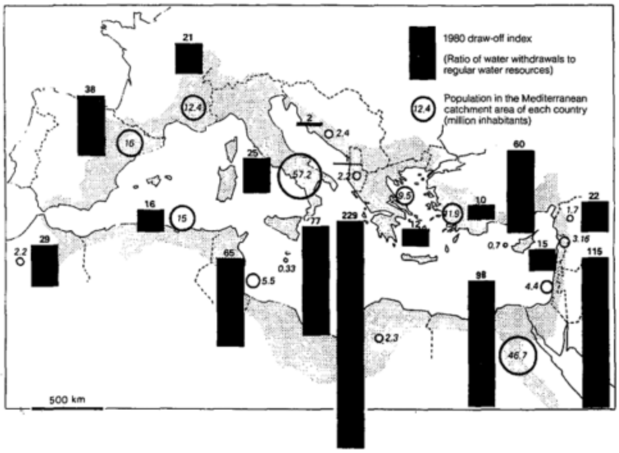


Fig. 2.6 Water draw-off in the Mediterranean catchment area, 1985 annual withdrawal as percentage of resources. (Source: Grenon and Batisse, 1989.)

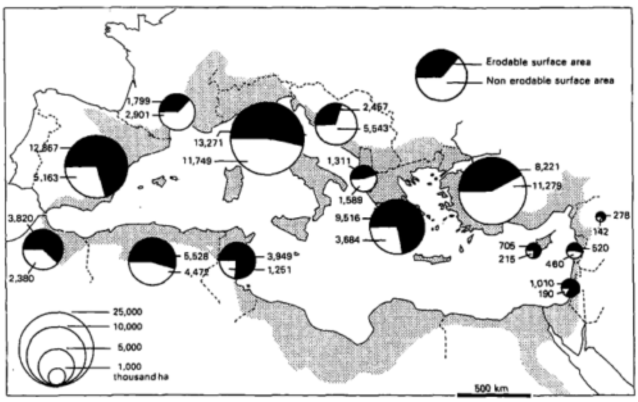


Fig. 2.7 Erodable land in the Mediterranean watershed (1000 hectares). Non-erodable land is land covered by forest, maquis and permanent crops as well as built-up areas. (Source: Grenon and Batisse, 1989.)

More recently, however, accelerated population growth, urbanisation and exploitative development have combined to place an increasing pressure on the scarce regional resources. They have also led to environmental degradation and far-reaching, sometimes irreversible, ecological consequences. The environmental and ecological problems are often compounded by the slow rate of recovery typical of arid and semi-arid ecosystems.

Against this background, the Mediterranean region calls for the investigation of an alternative type of landscape development. This alternative can be indicated in ecological landscape design and planning and has to be ecologically founded, culturally informed and sustainably anticipated. The fragility of the Mediterranean environment and the scarcity of natural resources necessitate the holistic and evolutionary outlook afforded by ecology. Ecological knowledge and understanding should therefore be integrated into landscape design, embraced by landscape planning and adopted in landscape policies. In this way, it is hoped that a contribution can be made towards future landscapes that are better suited to the ecological, cultural and aesthetic context of the Mediterranean region.

Part Two:

From landscape research to ecological landscape planning

Gloria Pungetti

Cyprus oak (Quercus infectoria) 400 yrs.

Introduction to Part Two

The Mediterranean basin, it is said, has been the centre of civilisation since ancient times and the activity of its peoples has had great impact on its environment. Its history, however, did not develop similarly in its various geographical regions and consequently, differences in culture, religion and social systems emerged. These induced shaping and managing the land in different ways, creating a complexity very difficult to unravel.

Nowadays, climate change and human activity greatly threaten permanent features all over the Mediterranean, causing damage to biodiversity of species and loss of rural cultural landscapes. Research on the latter is the subject presented in this part of the book with a general perspective as a first glance, supported by a view on the Mediterranean and Sardinia. Landscape is here considered as a part of the broader environmental process following both physical and human matters.

Landscape is certainly one of the most characteristic and poetic features of the Mediterranean environment. Despite this, a sense of both disappointment and powerlessness arises when conducting research on it. The behaviour of local people, sometimes far from showing environmental care, is rather depressing, but on the other hand, pride in their landscape reinforces hope for the future.

The widespread sense of environmental carelessness, however, induced more thought about the premises for landscape planning and the need for a better understanding of the Mediterranean rural cultural landscape. This led to the concept of landscape and its philosophy, the psychological setting, the culture and history of the place, in other words the *genius loci*. Deficiency of expertise in landscape planning and obstacles to managing Mediterranean environment led to the exploration of landscape policies, as well as to more consideration of a possible way to interpret and analyse that landscape. The European framework in landscape planning and ecology, moreover, has provided a background for the Italian and Sardinian setting.

The empirical type of research illustrated here is based on philosophical inquiry, where the need of understanding takes priority over the need of action. Following this postulate, I have found myself like the Sardinian shepherd described by Satta (1992, p. 32): 'and then, also when the shepherd sits down…the thoughts go on and on, and only the devil knows where they are all going to end'. Those continuous thoughts formed that preliminary to the process of cognition expressed before. To add to this, there was the need to clarify ideas, to develop expertise and above all to explore a methodology to carry out research on this topic 'by the discovery of non-trivial facts and insights' (Howard and Sharp, 1983, p. 6) following a social science type of approach. Accordingly, this research aims to add contributions to the existing knowledge, to explore the significance of the cultural Mediterranean landscape providing a systematic overview through the several disciplines related to landscape and through the Sardinian case studies. Such an overview is a prerequisite to sound landscape planning, of a kind which is useful to researchers, planners and policy makers and, last but not least, local people.

It is well known that southern European countries are lacking in a tradition of landscape planning and landscape ecology. This is one of the reasons why this research has been carried out in England and reviews mainly north European literature for the theory, while it uses available Sardinian literature for the applications. Theory and application actually form the two parts of the research. The first deals with all the fields listed in the methodology, while the second concerns the adaptation of the previously discussed theory to the case studies. The theory in addition has been preceded by a proposed methodology for conducting landscape research as a necessary basis for the planning of Mediterranean rural areas, ecologically and culturally oriented.

In particular, chapter three offers a discussion of the landscape research types carried out until now, providing a contribution to the topic with a new methodological approach based on 'landscape dimensions'. In order to facilitate the reading, these dimensions are grouped in the so called 'aspects of landscape'. The natural aspect of landscape has been considered in the first part of the book. The cultural aspect of landscape is examined in chapter four, where past methods in landscape art, philosophy, psychology and history have been reviewed. The analytical aspect of landscape is tackled in chapter five, through an excursus of research in landscape assessment reviewing past terminology, approaches and theories of landscape classification, description, evaluation and computer analysis. The political and interventional aspects of landscape are explored in chapter six with landscape legislation, strategy, planning and management constituting an introduction to the concept of ecological landscape planning. Procedures in landscape planning and landscape ecology are illustrated in chapter seven, which elucidates the divergence between north and south European countries. Finally, methods for addressing landscape history, assessment and planning of Mediterranean rural areas are presented in chapter eight. These methods have been applied to two case studies: the region of Sardinia in general and the catchment of the Rio S. Lucia in particular. Chapter nine provides a description of the physical, natural and human characteristics of the two study areas, a historical reconstruction of their landscape, a proposal for landscape assessment, and an illustration of the course of recent landscape planning. Related shortcomings have been pointed out and the human impact on Sardinian rural landscapes has been discussed, leaving to chapter sixteen suggestions on future directions to pursue, with a view to sustainable landscape planning.

Chapter 3
A holistic approach to landscape research in the Mediterranean

The complexity of a discipline like landscape ecology as illustrated in chapter one and the problems of a cultural region like the Mediterranean evidenced in chapter two suggest further fields of research. For instance: what follows on from the concept of landscape, what progress has been made in landscape research and which direction should be taken in planning for the future of Mediterranean landscapes? This chapter accordingly explores different types of landscape research and their development in this century, leading to the proposal of a new methodological approach to landscape research in Mediterranean rural areas. This holistic methodology, based on landscape dimensions, aims at a better understanding of landscape as a preliminary to ecological landscape planning.

3.1
Landscape research

Types of landscape research

According to the definitions provided in chapter one, understanding landscape means to interpret the interrelationships between physical, biological and anthropic elements of the environment, that is, between man and his surroundings. These interrelationships have to be studied at global, national and local scale. Global problems require an international viewpoint, while at the other end of the scale local problems demand consideration of the particular circumstances. Differences in scale and location demonstrate the heterogeneity of a topic like landscape, which thus requires the study of all the different aspects involved and several different types of research.

One type can be described as *morphological research* (*cf.* Cosgrove, 1984). Originating with Sauer in the 1920s, it mainly concerns the study of landforms and man-made landscape, and the consequent relationship between man and land. Using a multidisciplinary approach, morphological research played an important role in landscape studies until the 1970s, laying a theoretical foundation for 'total geography' through the link between man and nature.

A second type can be identified in *interdisciplinary research* (*cf.* Epton *et al.,* 1983; Nielsen, 1984). Since landscape is a broad subject, its planning involves several disciplines such as geology, hydrology, biology, agriculture, forestry, geography, history, philosophy, social sciences, economics and politics. Each of these disciplines influences the approach and the outcome (Cook and van Lier, 1994).

A third type is *holistic research*. It starts from the holistic axiom that 'the whole is more than the sum of its parts' (Naveh, 1984, p. 35) and it goes on to consider the universe as 'an ordered whole of a hierarchy of multilevel stratified systems' *(ibid.),* thus emphasising the hierarchical organisation of nature. The holistic viewpoint is fundamental in landscape research because it has been able to bridge the gap between sciences and humanities, using just one discipline as a basis, namely ecology (chapter one). By considering landscape as a whole, in fact, landscape ecology has presented a challenge to traditional geography (Nielsen, 1984), which has followed, on the contrary, the line of separate fields of research. Recent developments in landscape ecology research have indeed made relevant contributions in providing intellectual and practical tools for a better comprehension of the complex interrelationships between man and nature.

Dualities, separate approaches and common grounds

Research dealing with the analysis of landscape often takes into account such dualities as quantitative-qualitative and objective-subjective. Quantitative analysis is mainly related to the physical environment, qualitative analysis to the social environment. Duality, however, can imply not just differences, but also contradictions. A central contradiction within the landscape idea is the opposition between subjective and objective (Cosgrove, 1984). The former refers to the observer who records his inward 'impressions' of a landscape, while the latter refers to the observer 'expressing' what he sees from the outside. The subjective observer specifically lets his feeling colour the landscape he sees, while the objective observer tries to record it factually and unemotionally. To add to this, subjectivity in research and planning can lead to meaning without form, while objectivity can lead to form without meaning (Kennedy *et al.,* 1988). A holistic research method should consider them together, since both approaches are important in landscape analysis. This will be discussed in the following chapters.

Research on landscape ecology, as well as on ecology in general, has recently shown three distinct ways of thinking which have sometimes led to a separation in the subject. The first belongs to the group of scientists who study the interaction between organisms and their landscape; the second to the group of philosophers who study the relationship between man and landscape; the third to the group of planners who study the connections between man, organisms, physical features and landscape. Generally, scientists examine the physical and biological features of the earth, philosophers approach problems of landscape from the standpoint of human values, while planners deal with the complexity of a system that has to be studied in its totality (Greenbie, 1979). All three ways of thinking have to be considered. The lack of any one of these in fact results in the failure of the entire planning process. Part Two of this book deals with all of them.

An overlap between the different disciplines involved in landscape is a common occurrence in this type of research. The connection of planning with ecology for instance suggests that environmental planning can succeed only if it is based on ecological information (Roberts and Roberts, 1984). This approach, however, implies predominance of the physical environment over the social, whereas it should also give due weight to matters of culture, society, economics and policy-making.

The human emphasis

Among the scientific community it was and often still is a common practice in research to confine the problems to physical and biological features. Odum (1953) for example affirms that the total landscape can be divided into zones according to basic ecological roles, but he has not treated either the built environment or the social elements of landscape.

Lyle (1985) goes further. Trying to classify the landscape on the basis of Odum's model, he identifies four groups of landscape areas: highly productive areas; protected natural areas; compromise areas; urban and industrial areas. While the last group refers to biologically non-vital areas, the third group refers to areas where 'human beings and nature might be brought together again after a very long and dangerous period of estrangement' *(ibid.,* p. 15). It is from this postulate that Lyle defines the 'human ecosystems', linking society to land use and nature.

The above discussion demonstrates that the scientific community has reached a limit in the process of landscape planning, and awareness of this is a stimulus to follow further lines of research. Indeed, landscape planning has to put emphasis on human characteristics. In areas like the Mediterranean, marked by ancient tradition, it is necessary to consider not only abiotic and biotic, but also human features. It is also asserted here that a type of research, and consequently of planning, more oriented to ecology has to be implemented. In order to achieve this, a new holistic methodology for understanding the Mediterranean rural landscape has to be explored.

3.2
A methodology

Approach to landscape research methodology

The skill of a planner lies first in data interpretation and then in design production, using these in the preparation of the policy for the future. For the realisation of the landscape plan, in addition, a contribution of the research community in the form of a complete account of the studied landscape is required. Therefore the work of a researcher, like that of a planner, has to embrace the knowledge and analysis of many different fields. Researchers and planners furthermore have to find a way of working within a statutory planning framework, including policy and legislation.

All this is still hard to achieve in the Mediterranean, where there has been no tradition of classifying and evaluating landscape. Awareness of historical, cultural and social issues is indeed more common, but these subjects have only infrequently been studied in an integrated manner. In design, moreover, there is a tendency towards a certain rigidity due to a framework which has been for a long time physical and town planning oriented, rather than concerned with the environment and countryside (see chapter seven).

At this stage, the specific conditions of the various countries have to be taken into account. Each Mediterranean country is different, just as each planning system is distinct. This has consequently affected the procedures of landscape planning. The solution can be found by identifying the specific problems of each site and then using tools such as knowledge of the studied landscape and applying them in widely differing circumstances. This implies the necessity of an interdisciplinary team for the acquisition of landscape skills at the various levels of operation.

Developing the method

From the above, it is clear that the need to understand landscape is preliminary to any attempt at planning in Mediterranean areas. To succeed in this, a holistic approach should be pursued. Previous works, however, have clearly shown that the physical environment has often received more weight than the human. Many researchers in addition, though writing about past and present relationships between man and nature, have not taken into account one fundamental feature, that is, the appearance of landscape (Beer, 1987). The latter includes aesthetic and visual considerations which have often been ignored in pioneering studies coming from North America (*cf.* McHarg, 1969; Fabos, 1985). An explanation of this can be derived from the difference between a new culture like America and an old one like Europe. In the latter, history, anthropological diversity and visual complexity are indeed distinguishing elements which have to be explored in every study related to the 'larger landscape', signifying the consideration of landscape as a whole and at a larger scale.

In order to understand the Mediterranean cultural landscape therefore, the human side has to be emphasised, specifically such fields as aesthetics and culture. It is also necessary to overcome that rigidity which has characterised the landscape planning system in the Mediterranean until now, by taking the direction of ecologically oriented research. Moreover, the already mentioned interrelationships between physical, biological and anthropic elements of landscape have to be investigated, creating a web of support for future decisions. Clearly, all these aspects of landscape cannot be considered separately. A meeting ground between the different disciplines concerned with the subject has to be sought, allowing the investigation of the entire landscape process. Interdisciplinary teams are therefore the optimal solution.

Landscape, as discussed in chapter one, can be located between physical and human geography, but although taking both into account, the present research is closer to human geography, one of its main fields of interest being the human impact on Mediterranean rural landscape. To accomplish its purpose, the procedure proposed here consists in investigation of the sources relating to the subject, consequent critical analysis, attempt at a new methodology, application of this new theory and finally, through case studies, examination of how guidelines for planning policies might be developed for such an approach.

Since one of the aims of this book is to construct a sound methodology for approaching landscape planning in rural Mediterranean areas, an allembracing perspective should be adopted. Therefore, it is proposed that 14 dimensions of landscape, illustrated in the following section, should be studied in turn, integrating them within the unitary framework of holistic landscape research.

3.3
The dimensions of landscape

The dimensions of landscape are: science, art, philosophy, psychology, history, classification, description, evaluation, computer analysis, legislation, strategy, planning, design and management. Many of these have been considered in this part of the book, although landscape science has been researched throughout the book and landscape design is the core of Part Three.

The dimensions of landscape constitute the fundamentals of the proposed methodology for researching rural cultural landscapes before approaching ecological landscape design and planning. They are different themes of the topic of landscape which have developed into distinct disciplines. There are, however, other themes related to landscape, like biogeography, economics and education, that have been considered in this research but not specifically examined. A note on them is provided at the end of this section.

In order to guide the reader through the methodological framework, the 14 dimensions of landscape have been grouped into five landscape aspects, i.e. natural, cultural, analytical, political and interventional (Table 3.1). These serve to give more order to the distinct but interconnected sections of Part Two of the book and they represent different ways of looking at landscape. For example, the philosophical dimension of landscape has been set in the cultural aspect because here landscape is viewed from its cultural significance, while the descriptive dimension has been grouped in the analytical aspect because it involves landscape analysis. However, the landscape aspects are intended only to be convenient groupings and not as part of the basic methodological framework which is represented by the landscape dimensions. Moreover, since the landscape aspects are interrelated, the landscape dimensions do not belong strictly to the assigned group, but may appear in other groups according to the different points of view and the chosen research directions.

The successive stages reached in the excursus on the landscape dimensions are illustrated in chapters four to seven. Such an excursus has led to alternative methodologies for ecological landscape history, assessment and planning in the Mediterranean, as illustrated in chapter eight and applied to Sardinia in chapter nine.

The natural aspect

The natural aspect group consists mainly of landscape science subdivided into biography and landscape ecology. The latter has been defined as 'an interdisciplinary science dealing with the interrelation between human society and its living space' (Naveh and Lieberman, 1994, p. xi). Another definition is given by Forman and Godron (1986, p. 595): 'a study of the structure, function, and change in a heterogeneous land area composed of interacting ecosystems'. From this perspective, the view of landscape as a mosaic and the notion of holism are two relevant principles. The concept of the landscape as 'a mosaic of patches of different habitat' has been argued by Westman (1985, p. 468), who notes that

Table 3.1 Landscape dimensions

Aspects	Dimensions
Natural aspect	landscape science
Cultural aspect	landscape art landscape philosophy landscape psychology landscape history
Analytical aspect	landscape classification landscape description landscape evaluation landscape computer analysis
Political aspect	landscape legislation landscape strategy
Interventional aspect	landscape planning landscape design landscape management

the study of the process involving the flux of species, energy and material which occurs over a range of spatial scales and the study of the movement of both physical and organically bound energy between adjacent ecosystems both all fall within landscape ecology. Developments in landscape ecology have been illustrated in chapter one, considered in Part Two and further discussed in Part Three.

The cultural aspect

The cultural aspect group includes the artistic, philosophical, psychological and historical dimensions of landscape. Art, culture and history play an essential role in the understanding of the present landscape and, accordingly, in planning for its future. An essential preliminary to replanning any area of landscape is the clarification of the concept of landscape, which needs to be considered afresh in the context of each individual country. Some existing landscape studies, however, are based on confused definitions. One of the goals of this research, therefore, is to clarify the concept of rural landscape by exploring past and present theories and constructing sound definitions for the subject. This involves looking at landscape as a scenery, a place, a cultural expression and a holistic entity, as already attempted in chapter one.

From an artistic and philosophical standpoint, landscape carries multiple layers of meaning due to our different ways of perceiving it. Art is one manifestation of these perceptions. Art is expressed through painting, literature, music and, last but not least, environmental design. The subjective meaning is dominant here: as Cosgrove (1984, p. 14) puts it, 'the artistic use of landscape stresses a personal private and essentially *visual* experience'. The landscape which we see, on the other hand, can also be conceived with the help of the sciences, which have objective meanings. The knowledge of disciplines like geology, botany, psychology and optics can indeed make a contribution to understanding the world of nature (Tunnard, 1978). Other techniques like photography and remote sensing, in addition, are useful instruments to capture and analyse the landscape we have to study. In landscape, however, there are some aspects that lie beyond science, like beauty and ugliness. As was already recognised at the beginning of the century (Sauer, 1925), affection for landscape indicates a harmony between human life and environment. This harmony is the core of landscape aesthetics, one of the main subjects of investigation in landscape philosophy.

It has been suggested that landscape is not the world we see, but a selective composition of parts of that world (Cosgrove, 1984). Landscape features evoke a response in those who observe or experience them, and this response conditions the way we see them. Landscape psychology deals with this subjective response, examining people's experience and perception of landscape, the meaning and value it has for them, and their consequent feeling and behaviour.

In times past, man has often altered the physical environment through the way in which he has used and managed the land. Landscape consequently is a cultural product due to this collective human transformation of nature. One of the tasks of this research is to explore landscape history in order to understand the past and the causes of landscape changes, thus advancing a better comprehension of the present and helping to identify objects of historical value in need of preservation. The artistic, philosophical, psychological and historical dimensions of landscape are illustrated in chapter four, while a method in landscape history is proposed in chapter eight and applied to Sardinia in chapter nine.

The analytical aspect

Visual and functional arrangements of natural and human features of landscape can be classified, described, evaluated and finally analysed. Accordingly, there are four dimensions of landscape in the analytical aspect group: landscape classification, description, evaluation and computer analysis. Landscape classification has the task of sorting landscape into different types based on similar characteristics (Lloyd, 1993) in a hierarchy of levels. This approach should be as objective as possible. Landscape description concerns the systematic collection of information about each type of present landscape. Landscape components and their relationships should also be objectively described. By contrast, landscape evaluation is a type of subjective assessment. In landscape the personal element in fact plays a very important role; it is landscape evaluation that gathers and analyses the subjective responses to landscape. People indeed attribute different importance to landscape according to their culture and sensitivity; and the values ascribed to landscape might be used to identify features of special quality for conservation or development. Computer technology, lastly, is the modern approach to the assessment of landscape data. The limitations of the old techniques, like overlay mapping, are transcended by the new programs of modelling and analysis, which are efficient in storing, examining and presenting information on landscape. The dimensions of landscape description, classification, evaluation and computer analysis are expounded in chapter five, considered for the landscape assessment methodology in chapter eight and further applied in chapter nine.

The political aspect

The political aspect group covers the legislative and strategic dimensions of landscape. Legislation is at the base of the landscape planning process. Each plan has to conform with national and local laws and directives on landscape, environmental and physical planning issues. The institution of national and regional parks as areas where the ecosystems have to be protected is one way to answer the question of landscape conservation through legislative implementation.

Planning can involve people in decision-making, being very much a political activity (Robertson, 1984). Nevertheless, a problem arises when in landscape planning attention to details prevails over the global interpretation. At this stage strategies play an important role. Landscape strategies specifically should set up guidelines and directions for the future development of rural cultural landscape on the basis of previous established goals. In decision-making, therefore, it is important to ensure that these goals will be achieved in the planning. The involvement of local administrators and population can surely help: the education system should provide an understanding of landscape, while provision should be made for explaining the landscape plan to the people affected. The success of the plan depends indeed on how far locals have been involved in its formation (Steiner, 1991). The legislative and strategic dimensions of landscape are examined in chapters six, seven, eight and nine.

The interventional aspect

The interventional aspect group is concerned with the planning, design and management dimensions of landscape. The order of the first two dimensions has here been reversed compared with the order in the book's title, since planning has been considered the first step in the interventional aspect. Landscape planning specifically entails a search for the best sites for development or protection, leading to the elaboration of a scenario for the future based on a community response and statutory policy. The final goal is to provide flexible guidelines for both policy makers and environmental managers on landscape development.

The latter can be illustrated through landscape design, a discipline able to merge the scientific and artistic perspectives of landscape. Accordingly, both physical and cultural features have to be considered in a creative and practical process for outlining the future shape of the landscape. In such a process, the study of the physical, natural and socio-cultural systems of a place constitutes a preliminary. These systems are in fact assembled in the landscape master plan, together with the potentialities for land use of the place.

A further goal of landscape planning is to ensure that land is protected and used in the most appropriate manner. It follows that careful management of the countryside, according to its inherent qualities and characteristics, becomes a prerequisite, and an efficient administration is required to accomplish such a task. This is the field of landscape management, which can be conceived as the implementation of the landscape plan. As such, it has to be pursued through monitoring and evaluation, with any necessary amendments and adjustments to the plan itself. The planning and management dimensions of landscape are researched in chapters six, seven and nine, the design dimension is covered in Part Three and a methodology for ecological landscape planning is proposed in chapter eight.

Other landscape themes

Other themes to consider in landscape research are biogeography, economics and education. Biogeography deals with areas defined by natural boundaries. Natural characteristics, such as climate, water, soil, landform, flora and fauna, are therefore prevalent over human factors (Sale, 1985). Considering Europe, however, the boundaries of its regions have often been set partly for administrative convenience and partly for historical reasons and not in accordance with their natural features. Within this institutional regional framework, not many local governments take a bioregional approach in managing their natural resources. It follows that the latter are managed in different ways, thus resulting in a heterogeneous resource management at European level. A bioregion, nevertheless, is a region delimited by natural and not administrative boundaries. Since bioregional planning is ‘a way of understanding the complexity of ecosystems as they relate to regional culture’ (Reiniger, 1997, p. 186), variation in treatment should be avoided in favour of an integrated approach to landscape management. Biogeography has been used as a basis for our ecological approach and thus applied throughout the book.

Another theme to analyse in landscape research is economics. Planning has become in many modern states a political process for conducting business and creating instruments able to transform economy and society. This is evident in the economic perspective of landscape, which has been implied in both Part Two and Part Three of the book although not examined specifically. Landscape economics is in fact a complex and fairly new discipline which requires to be further developed by ecological economics specialists.

Education and landscape finally are an essential correlation in landscape research. This correlation forms a preliminary to landscape awareness and participation, which are in turn indispensable for a successful implementation of the planning process. Education therefore constitutes the key to use in every attempt at landscape management and should be pursued in each of the five aspects of landscape examined before. In this book, education has been always taken into account in the search for alternatives to landscape design and planning. Further specific discussion is provided in chapter sixteen.

The general aim of the proposed methodology, in conclusion, is to reach a means of understanding the complex interactions that underlie all landscapes. Although developed with the particular conditions and needs of the Mediterranean in mind, it is applicable to other, similar rural areas of ancient tradition. In order to establish which peculiar characteristics of each landscape should be preserved, natural and man-made changes have to be investigated. Landscape planning therefore takes place within the constraints set by the abiotic and biotic environment, having also to comply with society's psychological, social, cultural and economic requirements.

Chapter 4
The cultural aspect of landscape

In landscape there is the natural aspect with the dimension of landscape science and the related theme of landscape ecology. There are, however, other aspects that lie beyond science; the cultural aspect, with aesthetics, art and ethics, is an example. Both aspects, i.e. natural and cultural, have to be investigated in order to understand the relationship between man and landscape. This understanding is a preliminary to the explanation of the impact of human processes on the environment. The cultural aspect of landscape comprises four dimensions: landscape art, landscape philosophy, landscape psychology and landscape history. This chapter is concerned with these.

4.1
The artistic and philosophical dimensions

Landscape, art and science

Science makes a contribution in objectively interpreting the landscape we see. Now, the knowledge of disciplines like geology, botany, psychology, optics and in particular technology helps in understanding the world of nature (Tunnard, 1978). Info-technology, for example, offers the opportunity to handle the vast mass of data required to understand the interactions between physical and cultural aspects of landscape.

Art contributes to the appreciation of landscape by offering a more subjective interpretation than science. Moving from the objective to the subjective perception, in fact, one can move from the real landscape to the landscape of fantasy. The latter is made up of components taken directly from the world, but fitted together differently from reality so as to compose a landscape which has never existed in nature (Appleton, 1980). Arts like painting, however, present a low degree of fidelity due to the predominantly subjective interpretation. Literature is another form of art, one that can hardly fit within the objective interpretation of landscape. The writer has to translate his direct experience of landscape into a language code, from which the reader must translate it back into a spatial experience.

The idea of landscape as a meeting ground for art and science has been underlined by Colvin (1970, p. xxii), who has found the isolation and separate development of these two disciplines dangerous for society, while they can come together most easily through the joint appreciation of landscape. Science and art indeed often meet in the interpretation of landscape: science, for example, can be a tool in understanding landscape as it has been perceived by artists.

The concept of Colvin has been taken up by Appleton to develop his ideas about the relation between art and science in several works (Appleton, 1975, 1980, 1986). Starting from the assertion of Ruskin (1904, vol. XI, p. 48) that 'science studies the relation of things to each other, but art studies only their relation to man', Appleton has identified two fields for landscape research: (a) the origin of landscape, where landscape is seen as the physical product of a formative process, and (b) the impact of this product on the people who interact with it. The former is mainly concerned with science, the latter with art, culture and society.

With this view, it is possible to make explicit the difference between the scientific and the artistic perception of landscape. While scientists perceive the world as it is, artists perceive it with their own individual minds, never suppressing their idiosyncrasy. From this consideration again derives the dichotomy between objectivity and subjectivity, that is to say between generality and individuality. Consequently, even the language becomes different. Scientists describe the landscape as a physical process of land-forms or historical events, supported by scientific data and analysis. Artists by contrast describe the landscape as they perceive it with their imaginative speculation. Poets and painters hence 'are much more free to explore the *terra incognita* which lies beyond the advancing fronts of science' (Appleton, 1986, p. 35).

All this has contributed to the previously discussed duality in landscape research (chapter three). The objective approach in aesthetics has focused on the visual aspects of landscape, seeing beauty as forms and elements, while the subjective approach has concentrated on values and meanings, deriving from the beauty of individual places and human responses to it. Clearly, people's ideas of beauty change over time: they are to a major degree culturally derived and not totally innate. A discussion on this argument will be attempted in section 4.2.

Landscape aesthetics

Many authors (Appleton, 1975; Colvin, 1970; Laurie, 1986; Sadler and Carlson, 1982; Robinson *et al.,* 1976; Tunnard, 1978) suggest that 'beauty' is an essential ingredient of a satisfactory human habitat. The spread of urban conditions and associated 'ugliness' is thus seen as a terrible threat to the natural beauty of rural landscape. That man does not live detached from his environment is asserted by Colvin (1970) who affirms that the development of intellectual and spiritual life requires contact with nature and beauty, while Appleton (1975) suggests that the idea of beauty can be considered as a sort of reflection of an underlying order; this notion can be found in many philosophers, from Plato onwards.

Beauty, in fact, has been a common subject in philosophy. Here exponents like Croce (1912, 1920) gave a relevant contribution to aesthetics. His view on the global concept of nature, however, did not induce him to clarify the essence of the word 'landscape', often producing confusion in terminology. Therefore, semantic discussion has become a central point in the literature of aesthetics. Clearly, the frequent use of abstract terms (e.g. harmony and taste) is a feature of aesthetic language, but these terms are difficult to comprehend because of their ambiguity or multiple meanings. The same problem arises with attributes (e.g. the subjectivity and immeasurability of beauty), which leads to dubious or imprecise interpretations. As Lewis (1973) puts it, these difficulties led to a tendency in many geographers to avoid the area of aesthetic judgement.

The historical foundation of landscape aesthetics can be noted in European art and literature, especially in painting and in early geographical literature of sensitive travellers. Some thinkers of the nineteenth century (e.g. Humboldt, 1850; Ruskin, 1988) developed the concept of perception of beautiful landscape and described the relationship between physical surroundings and individual perception. Here, individual elements of the landscape were to be observed separately and then synthesised in order to understand that relationship and finally perceive order in the total landscape.

Between the 1930s and the 1960s, geographers tended to be focused on the objective approach to landscape, such as physical forms, movement and regional characteristics, leaving the aesthetic consideration as a secondary element. Around the 1960s, however, as human values appeared more important, interest in environmental aesthetics grew again. Likewise, awareness of landscape ecology and landscape aesthetics was increasing with the advent of the environmental movement in the 1960s and 1970s. During that period most of the environmental legislation concerned with land management and construction projects gave emphasis to visual and amenity values (e.g. scenic quality and visual impact), directing a new interest in environmental perception and ecological principles. Afterwards, moral issues in environmental works started to be prominent (McHarg, 1969) and the debate on landscape aesthetics also found a new interest in Italy with the theory of Assunto (1973) who linked the topic to history, nature and art.

It is now generally recognised that notions of cultural and individual characteristics, human values and visual experience were common in geographical literature. However, as Appleton (1975) observed, landscape aesthetics was sadly lacking in theory. Therefore Appleton started to develop an evolutionary view based on two theories: ‘habitat’ and ‘prospect-refuge’. This theory evidences two types of desire, which in turn reflect the objectivesubjective dichotomy: to satisfy man’s biological needs and to see the outside world from a hidden position.

Being innovative, the work of Appleton has often come under criticism, but has also been taken into account in much subsequent work. For example, recent US geographers (Jackson, 1984; Lowenthal, 1979; Meinig, 1979; Relph, 1981; Tuan, 1979, 1990; Zube, 1984a) have applied the objective-subjective duality in their work on landscape aesthetics. S. Kaplan (1979) moreover, discussing a functional approach to landscape aesthetics, has analysed people’s reactions to beauty by investigating with what sense they are able to perceive the scene and what interest they can find in it. Others have outlined the relationship between earth and humans, arguing that aesthetics is a significant aspect of that relationship (Kennedy et al., 1988). Therefore much of the work in understanding the landscape should involve a knowledge of the aesthetic, social, economic and, last but not least, spiritual values of the site. The aesthetic effect of places and landscapes, furthermore, is an important dimension of human psychology. As such ‘a sense of beauty or even harmony enhances our lives; a sense of blight or discordance correspondingly diminishes them' (Sadler and Carlson, 1982, p. 1).

A relevant recent contribution to landscape aesthetics comes from Bourassa (1991), who has dealt with both the nature of landscape as an aesthetic object and the analysis of the nature of aesthetic experience. As he puts it, 'landscape is a particularly unwieldy aesthetic object. It is a messy mix of art, artefact and nature, and it is inextricably intertwined with our everyday, practical lives' (Bourassa, 1991, p. xiv).

4.2
The psychological dimension

The background

An essential preliminary to landscape psychology is environmental psychology. Studying man as part of his environment, the discipline takes as its guiding principle the 'dynamic interchange' between man and his milieu (Ittelson *et al.,* 1974). The study of some basic psychological processes within the above interchange is one of its aspects, addressed to the understanding of human behaviour in relation to specific environments. In recognition of the fact that man is connected not only to nature but also to society, environmental psychology adopts a humanistic orientation as well as a multidisciplinary approach, directing research towards the living environment of humanity.

Different views can at present be recognised in environmental psychology, having developed from distinct philosophical positions. Two of these can be distinguished in the positions of Kant and Hume, the first outlining a mental operation which aims at making order and coherence of the external world, the second deriving mental operation mainly from the senses. These positions underpin the present situation of both environmental and landscape psychology. The latter is illustrated here through several themes which are, however, interconnected and have thus to be seen as interactive perspectives of the wider psychological dimension.

Landscape psychology

It is possible to recognise in landscape perception and landscape experience two of the major fields of landscape psychology. The perception of landscape involves the characteristics of the space, exploring the way in which the observer looks at landscape, while the experience of landscape deals with the characteristics of the observer, investigating the satisfaction that he derives from contemplating landscape. However, perception and experience lead to other research areas, such as landscape meaning and value, landscape interpretation, or fields related to the feeling and behaviour of people towards landscape.

The experience of landscape is determined by the feeling for landscape, which encompasses emotion, while the interpretation of landscape, fundamental for landscape evaluation, implies an explanation of the phenomena of our visible surroundings. From here it is possible to move to landscape meaning, which includes cognition, and landscape value, which includes personality. Lastly, there is the behaviour of people towards landscape, which leads to problems connected to ethics and politics. The following sections offer a discussion of all these topics related to landscape, generally introduced by the corresponding elements in environment.

The perception of landscape

A main standpoint in the explanation of landscape perception is environmental perception. This has been defined as man's awareness through his senses of the features of his environment (Goodey, 1974), actually similar to the relationship between an animal and its environment (Dewey, 1934). The environment then becomes landscape when people perceive it, knowing that there are differences in cognition according to what landscape symbolises to people. On this basis, Bourassa (1991) has proposed a dual mode of perception, namely biological and cultural. In landscape perception, therefore, it is possible to recognise not only a scientific, but also a philosophical bias. The first deals with physical elements (e.g. light or colours), magnitude (e.g. sun or moon) and geometry. The second deals with aesthetics, related to scenery and its abstract features (e.g. tranquillity, reminiscence and beauty).

A central issue in the appreciation of landscape is visual perception (R. Kaplan, 1975). It is in fact the visual system which enables man to distinguish landscape features within their context and composition. This provides the basis for a consequent aesthetic judgement. Furthermore, assuming (a) that perception is oriented to make sense of the environment and (b) that the process of perception is conditioned by knowledge, experience and interpretation, it is possible to distinguish a functional approach to landscape perception (S. Kaplan, 1975). Hence, considering landscape in terms of the information provided by human perception, the researcher can discover and eventually predict preferences for landscape.

The experience of landscape

'The environment is a spatial experience and the location of things in space is vital to our understanding' (R. Kaplan, 1979, p. 213). If one thinks about the location of man in landscape, the previous statement can provide a clue to the concept of landscape experience, namely to the debate between insider and outsider. In fact the experience of landscape, as Appleton (1975) and Bourassa (1991) tell us, is of two opposite kinds: detached (i.e. the outsider) and engaged (i.e. the insider). The difference between the outsider and the insider consists in the fact that the former is out of the landscape, seeing it with a certain detachment, while the latter is actively immersed in that landscape, seeing it in terms of practical significance for everyday life.

Three fundamental levels of landscape experience are: biological, cultural and personal. Taking the observation of Dewey (1934) that people share a certain aesthetic experience with nature, Bourassa has suggested a biological basis for the aesthetic experience of landscape, which involves a biological interaction between organisms and their environments. Landscape experience, nevertheless, has also a cultural basis because the environment perceived is human as well as physical. This involves the incorporation of memories, traditions and policies. Landscape, lastly, goes into the sphere of personal experience, since the aesthetic quality of landscape is not only individual, but also emotional. Therefore, one can conclude that landscape aesthetics is a matter of the interaction between objective and subjective experiences.

Blending perception with experience

The duality of knowledge and personality lies beneath the cognitive and the psychological processes which guide the everyday perception and experience of landscape. Landscape can be seen as a sequence of images of land, passing rapidly around the observer. Then, the direction of attention on the entire setting leads to a fuller perception of the landscape. Finally, experiencing landscape through cognition provides the sense of a recognised composition. This implies the definition of landscape perception given by Craik (1986, p. 51) as a 'continually transformed, not static, compositional experience' of the surrounding landscape, a definition which thus blends perception with experience.

With the establishment of social archaeology, the perception and experience of landscape have slightly changed: landscape is now seen as a whole entity in its setting, that is to say 'a continuous record of human behaviour, co-varying with ecological conditions' (Thomas, 1993, p. 19). Landscape in effect has been created by people through their experience and bonding with the world around them (Bender, 1993). The question is what we want to take from the landscape we observe. The objective approach indicates the physical elements of landscape as the main features of interest, while the subjective approach indicates the psychological elements as the features to perceive. In the modern western world we tend to perceive landscape as subjective observers. The result is a perspective of landscape made up of views and vistas, but also of feelings and memories. Bender has noted how, in the past and also at the present elsewhere, the visual may be not the most significant aspect and thus land may be not observer-centred. Therefore, perception and experience of landscape cannot be confined to a particular time, place and class. The case of inner Sardinia is an example of this (chapter nine).

The feeling for landscape

It is well known that there are difficulties in interpreting the link between feelings and landscape (Appleton, 1975; Sjöstrand, 1980), just as it is recognised that there is a lack of theory by which landscape and emotions can be connected. A tool for this interpretation can be found in artistic expression.

Since ancient times, landscape has been a subject of art including painting, literature and music. Painting is the primordial expression of the artistic feeling for landscape. When we deal with landscape painting, however, the explanation of feelings becomes less convincing. Language, by contrast, is the most comprehensive tool to translate the feeling for landscape, describing and verbalising what we have experienced. Music too through songs, hymns and ballads has influenced the human concept of nature, playing an important role in our feeling for landscape; in fact, for many people music is an essential part of their way of experiencing landscape. Clearly, a task for art is to extend human horizons and enable man to react to the stultifying conditions and monotony of life. Hence art, with its capacity for stimulating feelings, can make man alive. Since art is necessary to man and landscape is necessary to art, landscape becomes a relevant feature in man's life.

Landscape therefore can also be seen for its emotional and spiritual character. Beauty of nature has always influenced man, guiding him and making him kinder, better and richer (Soloukhin, 1980). By linking landscape with beauty one may actually see how beauty resides in the soul of man and how man's need for beauty is a natural fact. The beauty of landscape thus touches man's soul and animates new human forces which enable him to reach a high level of personal experience. Landscape, moreover, has a living tradition, something that we feel to be part of ourselves, something that has to do with our mental health. Now the description of nature becomes a matter of hidden depths, what Sjöstrand (1980) calls 'hidden music'. Furthermore, any landscape can be seen with a spiritual perspective, made plain through inside and outside consciousness (Blythe, 1980). The inside awareness is instinctive and unlettered and therefore it represents a 'magic' kind of knowledge very far removed from the tangible world. The outside awareness by contrast has scientific, sociological, aesthetic, religious and intellectual dimensions, closely relating to actual reality.

The concept of consciousness truly emerged at the beginning of the century with the work of sensitive travellers. Huntington (1915), for instance, explored possible psychological effects of special environmental features like clarity of air, vividness of colours, sound of water and wind, song of birds etc. When man is aware of these features he can experience landscape from his inner being. Consciousness of landscape, in conclusion, means being aware of the physical attributes of the surroundings and experiencing them from inside.

The interpretation of landscape

After having perceived and experienced landscape, we must next take the step of interpreting it. Interpretation of landscape involves an explanation of the phenomena of our visible surroundings, their origin and development, their natural relationships and their variation from place to place (Appleton, 1975). Interpreting landscape, in addition, implies exploring the pleasure we feel in contemplating it. However, 'aesthetic' pleasure is not an immediate consequence of the pleasures of the senses, but depends on the process of thought (Scruton, 1979). Pleasure in landscape, for example, can be found in an open view coming after an enclosure, because this underlines the contrast between those two opposites. Visual pleasure and psychological satisfaction therefore are an important pair in landscape interpretation.

The interpretation of landscape indeed is a consequence of the interpretation of nature. Natural sciences, it has been noted (Simmons, 1993), provide the researcher with only one type of information about the environment. The scholar nevertheless has to consider also the cultural framework in which the sciences are embedded. In this perspective, interpretation of landscape involves not only the explanation of the external phenomena of landscape, but also the way in which people look at landscape, what they really see and how they respond to it. Hence landscape interpretation becomes a preliminary for landscape evaluation, which is in turn one of the fundamentals in landscape planning. Interpretation and evaluation of landscape will be further discussed in chapter five.

Landscape meanings

A relevant consideration in landscape interpretation is the enjoyment that man derives from understanding what he perceives. It has already been illustrated (e.g. Appleton, 1980; Bourassa, 1991) how landscape pleasure differs between animals and man. In particular, man can achieve pleasure not only from spontaneous perception of his habitat, but also from the recognition of attached meanings. However, there is a compromise between seeing in the meaning of retinal vision and knowing in the meaning of conceptual looking. As Berenson (1953) points out, it is knowing that actually plays the most important part in the comprehension of what we see.

Moreover, the affective bonds between human beings and the external world are not only a personal matter but also contribute to the collective investment of meaning in a certain place (Cosgrove, 1984). As an individual becomes more acquainted with the landscape of a region a sense of familiarity is formed. Consequently, meanings of landscape vary according to different individuals and groups who use different symbolic systems to interpret landscape. Therefore symbolism can be linked with the meaning of what people perceive (Appleton, 1986). The meaning of landscape specifically derives from individual perception and response to an individual scene. Since symbolic meaning can be communicated by objects associated with particular ideas over time, these symbolic associations have important implications in landscape.

Landscape values

'Much of what we perceive has values for us' (Tuan, 1990, p. 4), in the sense that it provides either biological survival or cultural satisfaction. Accordingly, the values for a specific landscape derive from our experience of it, which in turn is related to personal and collective perception. Clearly, personal perception of landscape and accordingly the way we attribute values in landscape vary with the individual. Some people display awareness of landscape, while others show less sensitivity. Artists, for example, ascribe cultural and personal values to the physical attributes of the landscape. To this extent Bourassa (1991) suggests that certain types of landscape are preferred because people associate their features with certain habitats. Here personal enjoyment which is achieved by remembrance is also relevant and personal environmental histories, expressed by ties and memories, can play an important role in this matter. They in fact induce people to ascribe a particular value to landscape and consequently to pay a high price for safeguarding it.

On the other hand, collective perception of landscape varies between different classes or groups. People who grow up and live in a place invest meaning in it (Appleton, 1975; Tuan, 1990). A place has consequently a particular, generally higher, value for natives than for newcomers. The meaning attributed by local people, in addition, might be different from that expressed by designers who have to deal with planning (Jacobs, 1962). It is acknowledged by several studies that different groups, like shepherds, citizens, environmentalists and planners, have a different orientation and disposition towards landscape (e.g. Craik, 1986; Dearden, 1989; S. Kaplan, 1975). In particular, social landscape preferences can influence the degree of consensus on landscape values. Overall, this consensus produces significant differences related to landscape characteristics, observer characteristics or even to their interaction with each other.

People furthermore attribute positive and negative values to landscape according to its advantages and disadvantages, or the varying suitability for purpose between open and confined landscape, elevated and low ground, bridged and unbridged rivers, easy paths and impediments (e.g. walls and fences) etc. People's reaction to landscape, lastly, depends on certain values like form, line, colour, texture, access and last uniqueness. The latter is synonymous with distinctiveness and it is a characteristic of the 'sense of place', which has often been referred to in this part of the book, where the above values have been employed in the landscape assessment procedure (see chapters eight and nine).

Landscape behaviour

The experience of landscape also involves man's behaviour towards it. Behavioural traits can be either acquired by heredity, or learned from the environment. Although man shares with animals the inborn desires, other factors, e.g. culture, art and sensitivity, condition his perception. The aesthetic taste, for example, is not only innate but also derives from the visible environment and changes over the ages (Crowe and Mitchell, 1988).

That there is a need to explain man's behaviour towards environment is well established (Vygotsky, 1978; Zube et al., 1982). An understanding of biological evolution, historical development of culture and the process by which individuals themselves develop is fundamental for the comprehension of human behaviour. Thus biological evolution, cultural history and individual development are here combined to better investigate this aspect.

Moreover, the biological basis, transmitted genetically, involves innate behaviour while the cultural basis, transmitted socially, involves learned behaviour (Bourassa, 1991). In general, human behaviour involves the interaction of biological and cultural influences. Consequently, it is necessary to embrace both biological and cultural factors in examining the behaviour of people towards landscape. From this standpoint one may see how it is relevant to consider not only culture, but also personality. This theory, embracing both cultural and biological bases of behaviour, has already been addressed by Bachelard (1969) putting an emphasis on personal creativity, which is manifested in art through poetic images of beautiful phenomena.

The behaviour of people towards landscape depends also upon particular conditions developing in a specific time and place. It depends in addition upon gender, age, class and socio-economic situations (Laurie, 1986). The fundamental point, however, is that 'landscape is never inert' (Bender, 1993, p. 3): people engage with it, construct it and become part of it. In this process of experience and behaviour, people also appropriate landscape and contest it. Thus landscape becomes politics, a bond between history and economy, between cultural perceptions and social relations. The political dimension of landscape will be discussed in chapter five.

4.3
The historical dimension

The issue of rural landscape history

The subject of landscape history encompasses a range of historical interests in different kinds of site. It can refer to an agricultural as well as an urban area, to a garden or a park, to an archaeological or a historical site. What is relevant is to maintain the information from the past, objectively recorded as if it was an archive in stone, brick, earth or vegetation (Montagu, 1991). Understanding the genesis, growth and morphology of a given landscape is indeed one of the primary tasks of landscape history. Considering in addition the evidence of both natural evolution and human creation of the past can help us to understand the landscape which exists today.

Evolution and creation in fact are the two fundamental processes which have determined the features of landscape. While evolution is characterised by slow and unpredictable changes, creation is marked by systematic and planned modifications. In view of these processes, the elements of rural landscape have never been static through a long period of time, although its structural patterns, as argued by Houston (1971), may have persisted quite rigidly. Accordingly, phrases like ‘landscape will always be dynamic’ (Meeus et al., 1990, p. 290) or ‘landscape has always been changing’ (Taylor, 1988, p. 8) or ‘everything is older than we think’ (Hoskins, 1985, p. 12) are quite common in landscape literature.

It seems, however, that they are not a common idiom in urban society, which has an unrealistic expectation of rural landscape (Sinclair, 1983). Urban life in fact has led people to consider the countryside as something static and beautiful rather than mutable and ugly; and what is more to see it as a view rather than an environment. In this perspective, changes in the landscape are seen as intrusions into and pressures on that ‘unspoiled’ scene, as opposed to the ‘deteriorated’ urban scene.

Past changes in the landscape are fundamental in determining the cultural landscape of today, which exemplifies the general historical statement that the ‘past is modified by the present as much as the present is influenced by the past’ (Houston, 1971, p. 159). Landscape, in particular, displays layers of historical development, sometimes well preserved, at other times altogether modified. These layers are relevant because they can help to classify features according to the age of the landscape, the analysis being based upon the design, purpose and position of the material found on them.

However, there is much more to be learned than chronological changes (*cf.* Meinig, 1979). The pattern of a field, for example, reveals how people cultivated the land, just as the physiognomy of a house shows the way in which people lived. Rural landscape, it can be argued, embodies the ways of life of past and present and in turn evidences past and present human interactions with the land. Now the quest moves from the examination of patterns to the search for processes in landscape, and accordingly the emphasis switches from a scientific to a humanistic approach. Specifically, as illustrated by Meinig, the difference lies mainly in the fact that the first approach is based on the association of features in each pattern, while the second is based on the cumulative effects of processes occurring at that site. This perspective reaffirms the previous assertion that the past endures and has a fundamental significance for the present. It also leads to a revealing of the relationship between people and their environment, a type of work which has already been attempted (cf. Fairclough, 1994; Skinkis, 1994; Tobey, 1973) but needs to be deepened.

Trends in rural landscape history

Since the last century, investigation of landscape changes has been part of early ecological studies (e.g. Clements, 1916, 1920; Cowles, 1901; Kerner, 1863). In this century, many researchers have described a succession of types of vegetation community, while others have focused on the sequence of each individual landscape element. In landscape ecology a number of authors (e.g. Di Castri and Mooney, 1973; Forman and Godron, 1986) have proposed a scientific approach to the study of landscape history based on stability, instability and metastability, patterns of change, dynamics and linkages among landscapes, while others (e.g. Naveh and Lieberman, 1990) have added aspects of human impact and management.

It was really only at the beginning of this century that a desire to reconstruct landscape history based on a scientific approach emerged in Europe (e.g. Faegri, 1944; Firbas, 1937; Iversen, 1941). In the last 40 years other works have been produced in the same direction, studying pollen analysis, prehistoric archaeology and plant ecology, while others took different directions, examining specific aspects or small scale landscapes.

To overcome these limitations, a wider approach which embraces several disciplines has been followed by Hoskins (1955), and a more inclusive approach has been proposed by Rackham (1986), stressing testimony and tradition (*cf.* Evans, 1971). Old people indeed are able to tell us about many details of past landscape which can rarely be found in literature and are anyhow different from written records. Testimony, however, should seldom be used on its own and possibly for no more than three generations back. Rackham's method has been used for carrying out the fieldwork of this research, in order to reconstruct the landscape history of the Rio S. Lucia, while a new method has been set up for the landscape history of Sardinia (chapter nine).

Memory is another recurrent theme in landscape history. Schama (1995) shows that memory can be a useful tool to re-establish the bond between man and nature. Landscape memory in fact is often built around the recognition of places connected with an ancient or peculiar vision of nature (e.g. forest, mountain or river sites). 'Landscape *of* memory' and 'landscape as memory' (Küchler, 1993; Morphy, 1993) feature frequently in landscape history. In a study on the mapping process of a Melanesian society Morphy (1993), as an example, has linked the first to place names recorded by external human agents (i.e. by the colonists) and the second to place names recorded according to ancestral actions (i.e. by the natives) originating in natural and spiritual forces.

The importance of memory in landscape history leads to the consideration of mythology, exploring the existence of a cyclical movement which goes from wild nature to built culture, from hunting to husbandry, from gardening to building, from countryside to city. Cosgrove (1993) in particular shows how these myths are reinterpreted during history using landscape in the background. Awareness of the endurance of core myths has been urged also by Schama (1995), suggesting that this can be useful to better understand an old landscape which has been covered by many layers of different new land uses.

Land use becomes relevant in rural landscape history in considering lowlands and uplands. Landscape exploitation in British lowlands and uplands started in the second millennium BC (Fowler, 1978). However, lowlands differ from uplands in the way of working the land (Sinclair, 1983). The former have changed through technological development in farming, which has caused removal of trees and hedgerows, erection of new buildings, intensive livestock systems and the need for considerable capital. The latter, although differing from the lowlands in climate and economic development and hence in their more marginal status in food production, have changed as well. Their landowners in fact have been encouraged by the government to expand and intensify their production methods, and therefore they have replaced grazing by improved grassland, reduced the number of vernacular buildings and enclosures, and planted conifer forest in the place of declining deciduous woodlands. Consequently, the rural population has fallen to the point that it can no longer be sustained. This lesson from the past evidences again the link between land, society and policy, which must be considered in approaching landscape history.

A method along these lines has been followed by Sereni (1961), who has studied the Italian agricultural landscape throughout history, explaining the decisive events which made the landscape change. He has shown how determinant were the social and political struggles of peasants in the land use of Italian agricultural areas. These events, associated with technological development (e.g. employment of new cultivation techniques) and land tenure changes (e.g. disappearance of the *latifundia*), caused a major modification of Italian landscape, especially in the post-war period. It is this anthropological approach, based on the bond between landscape and society and combined with the natural evolution of the environment, that has been pursued for the study of the Sardinian landscape history illustrated in chapter nine.

4.4
Conclusions

On landscape philosophy

'We should familiarise ourselves with the widest possible range of landscape experience' in order to embrace a broad view about landscape (Appleton, 1986, p. 42). This idea has promoted an integrated methodology between the disciplines involved in landscape, where distinctive contributions can lead to achieving a common objective. On this view, a new approach in landscape research should be pursued, based particularly on the link between science and art. Science can help to explain all the landscapes which exist independently of any artistic interpretation. Scientists nevertheless do not have to regret the artistic meaning that has been put in landscape, but rather look at it with a positive spirit in order to discover that experience of landscape which lies beyond their own point of view. On the other hand, artists have to be innovators, contributing new ideas and meanings to landscape study. Art can indeed be an influence in appreciating landscape.

The appreciation of landscape furthermore is a primary task in both the understanding of landscape values and the development of landscape design. Landscape architecture after all can be described as the arranging and modifying of natural scenery over a tract of land for aesthetic effect (Forman and Godron, 1986). The aesthetics of nature and art, however, are interrelated in a complex manner. Authors who propose that aesthetics has a biological basis (e.g. Humphrey, 1980) argue that appreciation of art is conditioned by appreciation of nature. Therefore they invite landscape planners to go out into the countryside in order to experience landscape with its structure, features, beauty and even ugliness and consequently to develop the ability to see, observe, appreciate and eventually criticise the existing design of landscape.

The problem arises when seeing is limited to the visual domain, rather than widening to observation and implying an understanding of the underlying phenomena. Many people in effect tend to 'see' rather than 'observe'. This aspect has a feedback in landscape planning. If a planner is not able to observe the entire landscape, he remains in the sphere of seeing without understanding the features of the environment in which he is working. Hence, landscape is understood as scenery to be manipulated like an art form and not as a place resulting from the complex interactions between its phenomena and man's activities. A landscape planner who only 'sees' is therefore unable to tackle the problem and encompass all the aspects of landscape.

On landscape psychology

In assessing perceived landscape values it is relevant to consider psychological attitudes related to landscape, such as experience and knowledge. To this extent, knowledge about people's reaction to the landscape scene is an important matter of study. Clearly, by becoming familiar with the public's point of view, the decision maker is provided with another way to see the landscape. However, if people's reactions to the scene depend upon their intentions for it, then the understanding of preferences requires a previous understanding of what these intentions are (R. Kaplan, 1979; S. Kaplan, 1979). The final aim is to conceptualise the types of reactions that people have when seeing a landscape; while doing that, they make judgements which in turn involve their past experience. On this basis, it is important to take account of people's intentions as mentioned above because, if they carry great weight for humans, it signifies that the environment which supports these intentions should be preferred and therefore considered in the planning process.

Indeed, the importance of being conscious of human values has a great relevance for the future, especially as it is believed that future society will move towards a more consumer-directed attitude (Lönnroth, 1980). The feeling for landscape, for instance, can help mankind to find a new way of living which is closer to a noble and refined art. Human emotions likewise condition individual opinions about landscape, which may coincide with landscape experience, taste and value. These are mutable and may in turn be conditioned by society. Therefore, it is necessary to take account of the feeling for landscape in research which is aiming to achieve a sound assessment and evaluation.

Besides, many factors interact upon each other in the landscape scene to condition landscape values. They depend on the physical, social, cultural and economic setting of our environment and, as Eckbo (1975, p. 31) puts it, 'we cannot be separated from it'. This is actually the direct result of the impact of man, who imposes his social, cultural and economic values upon non-human ecosystems. Since landscape incorporates responses to such an impact, landscape research has to consider all these attributes.

The environment, after all, can be regarded as a source of stimulus and a determinant of behaviour. Therefore the researcher has to explore the range of human characteristics, needs and concerns of local people, understanding the mechanism of perception, the variables that affect it, and the link between perception and behaviour. Environmental design in turn must develop a framework that facilitates rather than inhibits the fulfilment of individual needs without social conflict (Laurie, 1986). The designer in fact has the potential to influence human behaviour. As a consequence, research should be oriented towards the perception, experience and behavioural patterns of local people. Landscape design should then fit the users' needs, allowing flexibility when these are not clearly understood.

Furthermore, in the western perspective the observer is mainly outside and above the action (Thomas, 1993). But experiencing landscape means living the landscape; this can be translated into 'being in the landscape' and it relates again to human behaviour. Thus the focus is on social action and the observer starts to participate up to the point where he becomes integrated with his environment. Through these interconnections, the landscape is socialised and 'drawn into the domain of human negotiation' (Bender, 1993, p. 11). With time, social relations become more dependent upon the physical structures of landscape, which are perceived by local people through both literary and social understanding. This brings together man and landscape, individuality and collectivity. In other words, it implies the passage from the psychological to the political dimension of landscape, which will be discussed in chapter six.

Landscape meanings and values vary in time and place. However, it is still unclear what physical properties and symbolic meanings they retain or what components and attributes are preferred. We do not even know which landscape attachments are universal and which are specific to a particular time and place (Lowenthal, 1986). Landscape research has still much to explore on this subject. Landscape psychology in fact is a rather young subject that needs to be further investigated through pioneering research.

On landscape history

In the past, people who lived in the countryside had an intimate understanding of their land and their environment. Elements of agricultural landscape, e.g. organisation of the fields, terraces, shelter belts, roads and buildings, often fitted that environment, creating a valuable landscape. Beauty and aesthetics certainly were not in the mind of those people (Laurie, 1986), but the quality of some old agricultural landscapes satisfies these concepts entirely.

Likewise, economic principles were not in the mind of primitive societies. However, their landscapes had certain values. Today, by linking these values with historical associations, they can turn out to be of economic significance because they stimulate tourism. Hence landscape can also be interpreted in terms of educational, recreational and economic interests (Beer, 1990). In this way, traces of the past should be considered as valuable cultural resources and should be conserved.

Since history is written by man, it is important to bear in mind the teaching of wise landscape historians like Hoskins (1955). Discussing the continual changes in landscapes, he has indicated how they can differ, being localised as well as dispersed, though they may have in common the power to improve or cause deterioration in landscape. In the latter case, a sense of abandonment often arises, while in places where no changes have occurred at all a sense of the past can be perceived, since the landscape has remained just as our ancestors left it ages ago. 'It is to these quiet solitudes, above all perhaps our old common lands, that we can still gratefully turn for refreshment and sanctuary from noise and meaningless movement' (Hoskins, 1985, p. 16).

In conclusion, the local character of a site should be examined with attention to that 'sense of place' which plays an essential role in the understanding of landscape. Hence, the 'human roots' of a place (Dower, 1994), which are important values for those who live in it, should be explored. Furthermore, landscape exists not only in space, but also in time. From the surviving evidence of past activity, the nature of the political actions that produced it can be deduced. The landscape retains in its characteristic identity, as it were, a record of its past. All the man-made landscape has a cultural meaning, 'no matter how ordinary that landscape may be' (Lewis, 1979, p. 12). In reflecting human tastes, values and aspirations, landscape becomes a cultural record of the earth. Consequently, the notion of landscape is a clue to culture and, as Lewis (1979, p. 15) writes, 'the man-made landscape…provides strong evidence of the kind of people we are, and were, and are in the process of becoming'. From all this, it is evident that people are not inclined to change their landscape unless they are under pressure to do so and, on the other hand, if there is a major change in cultural landscape it means there has been a change in society too. Local culture, hence, reflects its vernacular landscape and in turn almost all items in human landscape reflect culture in some way.

Chapter 5
The analytical aspect of landscape

Landscape assessment is fundamental in the analytical aspect of landscape. In order to understand its significance, however, it is necessary to clarify the related terminology, which has sometimes created confusion in the discipline. This chapter revises and provides definitions of basic concepts and terms related to landscape assessment, discusses approaches that have been attempted and examines the ecological relationships which can be found during the process of analysis. Four phases are thus illustrated in sequence, according to the four dimensions involved in the analytical aspect of landscape: landscape classification, description, evaluation and computer analysis.

5.1
The quest of ecological landscape assessment

Landscape assessment

Despite the extensive literature on landscape assessment, confusion in defining terms is often evident. In this book, the term 'landscape assessment' has been used in a broad sense to encompass the general meaning of assessment, that is, all the ways of looking at, describing, analysing and evaluating the landscape (*cf.* Countryside Commission, 1987a; Landscape Research Group, 1988).

Within landscape assessment we can recognise four phases: landscape classification, description, evaluation and final analysis. *Landscape classifica tion* is a method of sorting the landscape into different types (Countryside Commission, 1987a) based on similar characteristics and should not involve personal judgement.

Landscape description involves the collection of information about landscape components and their interaction (Lloyd, 1993). It is a portrayal of the appearance of landscape and provides its description in a systematic way. Also this stage should be as objective as possible, using geographical or ecological terms.

Landscape evaluation is a way to attribute values to landscape, based on criteria established in advance for specific purposes. It involves a subjective response, including landscape preference and landscape appreciation. The former refers to the way in which people react to particular views (Lucas, 1992), while the latter refers to the consideration by an expert with aesthetic skills.

These three stages lead to the *final analysis,* which sums up the features of the studied landscape. Now landscape is examined according to its natural and man-made components, ecosystems, interactions and values in order to understand how it is made up and what it signifies. Computer technology is a useful instrument for accomplishing this task, today generally performed through Geographical Information System (GIS).

Different approaches in landscape assessment

During the past decades, several approaches have been proposed for the assessment of landscape. Among them it is possible to distinguish some fundamental dualisms, like descriptive and analytic, subjective and objective, direct and indirect, professional and academic approaches.

The descriptive approach deals with the delineation of landscape characteristics, namely landscape description; while the analytic approach is a tool to assess the quality of landscape, which is a matter of landscape evaluation (Dunn, 1974). Both approaches have been considered in the methodology proposed here for landscape assessment.

The main distinction between the subjective and the objective approach (Countryside Commission, 1987a) is that the former reflects the responses of the viewer, while the latter represents intrinsic qualities of the landscape itself. In addition, the former has been based on theories about taste and beauty in landscape, while the latter has followed statistical methods for measuring particular elements of the landscape in a given area. A great amount of literature has been written on this dualism, which is common among other aspects of landscape as well *(cf.* chapters three and four).

Direct and indirect approaches are methods respectively dependent and not dependent upon landscape users (Penning-Rowsell, 1973). This division is an example of the debate between consumer preference and abstract measurement methods. Both approaches, as also suggested by Laurie (1970), should be considered in parallel in order to overcome the problem of giving the research a one-sided emphasis.

Lastly, the professional approach is carried out with the specific intention to tackle a real problem, meaning to reach a practical end product. The academic approach, on the contrary, is mainly concerned with research, that is, with concepts, principles and theories on landscape assessment (Landscape Research Group, 1988).

Ecological relationships in landscape assessment

If we take the definition of ecology as that part of biology dealing with the interrelationships between communities and their environment, we come across the matter of ecological relationships. In landscape these are ‘process relationships’, defined by Vink (1983, p. 72) as ‘relationships which are established through processes and are maintained by the same or by related processes’. Accordingly, Jongman (1995a) proposes two types of ecological research: autoecological and synecological. The former is the study of *just* one species in relation to its environment, while the latter is the study of *many* species simultaneously in relation to their environment. In order to achieve a successful result, the integration of both approaches with landscape ecology should be pursued, providing a better understanding of the complex correlations existing in this field.

In early studies, however, only relationships between abiotic and biotic factors and landscape were considered, while the human influence was purposely omitted. Aware of the gap, later studies (e.g. Vink, 1983) have introduced the relationship between man and landscape, in order to promote a better comprehension of the nature of the present-day landscape. In line with the philosophy of anthropocentric landscape ecology, the methodology for landscape assessment proposed in this book follows this approach.

The question of spatial dimension has also been considered. The spatial dimension deals with structure and function of landscape, while the temporal dimension deals with change. To be precise, *landscape structure* has been defined as the spatial relationships among the distinctive ecosystems or elements of landscape (Forman and Godron, 1986), *landscape function* as the interactions among the spatial elements of landscape, and *landscape change* as the alteration in the structure and function of the ecological mosaic over time.

Since landscape ecology has to focus on patterns and their related processes, the concept of *spatial heterogeneity* (Jongman, 1995a) should be taken into account. All the ecological processes, moreover, occur in a certain period and are modified during time, therefore research should be fitted into a long-term model. From the foregoing, it is evident that both spatial and temporal interactions which develop in heterogeneous landscapes have to be examined in order to produce ecologically sound assessment. Accordingly, this research sets landscape in its dynamic process, employing the concept of *landscape development* (Forman and Godron, 1986) which results from mechanisms operating within landscape boundaries over time.

5.2
Definitions in ecological landscape assessment

Review of fundamental concepts

The above assumptions are essential in reconsidering the question of space and in introducing the concept of *hierarchy,* depending on different scales of landscape and on its changes over time. In a certain place, for example, it is possible to find groups of landscape components separated from each other by abrupt boundaries, by transition zones or by gradual continuous change in species, thus creating different scales of landscape. All these separations and changes, mainly caused by human influence over time. demarcate specific areas of landscape that can consequently be classified with their intrinsic hierarchy, from the single micro level (local) to the plural macro level (global). In these areas, landscape can also be described and evaluated in relation to its characters and values and it can be analysed through a computer program in order to complete the framework of landscape assessment.

Within this framework, however, confusion of terminology often arises. Therefore, as a preliminary to landscape assessment it is necessary to clarify a few concepts related to scale and space in landscape. First of all there is the regional scale. A *landscape region* can be many square kilometres in extent and has been defined by several authors (e.g. Dickinson, 1970; Forman and Godron, 1986; Isard, 1975) by its physical, biological and human characteristics, following a geographical perspective.

Second, there is the subdivision of landscape into different types. The definition of *landscape type* is self-explanatory, i.e. it expresses the way to sort the landscape of a certain region into several classes. This ordering is the result of local landscape characters reflecting vegetation, pattern of fields, landform and land use (Countryside Commission, 1991). *Land type* is the preliminary of the above concept, being the basic biophysical land unit that can be interpreted to provide land evaluation data and can be mapped at a scale from 1:20 000 to 1:10 000 (Naveh and Lieberman, 1994). Other authors (e.g. Howard and Mitchell, 1980) mention instead the term *landscape system* or *land system* to indicate the most widely used land unit, defining it as 'a recurrent pattern of genetically linked facets having a predominantly uniform geology and geomorphic history' (*ibid.,* p. 85).

Third, the term *landscape unit* has been used to identify 'a mappable area, roughly homogeneous as to soil, topography, climate, and biological potential, whose margins are determined by change in one or more characteristics' (Naveh and Lieberman, 1994, p. 208) referring to an ecosystem. In defining an area as a landscape unit, it is important to recognise differentiation from, and similarity to, adjacent units or units elsewhere. It has been observed (Countryside Commission, 1991) that a unit of landscape derives from a combination of landform and landcover and such units form the building blocks of the different landscape types. Unlike these last, however, landscape units form geographical units which are defined by groups of parcels with the same or similar coding; thus sometimes landscape units have been named *landscape parcels*. Lastly, in ecology the terms *ecotope* and *tessera* have been introduced to define the smallest homogeneous land unit (*cf.* chapter one).

Definition of fundamental terms

According to the arguments discussed above, a clarification of the terminology in ecological landscape assessment is a necessary step to take before attempting any new methodology. Regarding concepts related to scale and space in landscape, *landscape region* is an area of landscape with a regional character, where *region* signifies a space determined by a complex of climatic, physiographic, biological, economic, social and cultural characteristics and which contains a number of different landscape types. *Landscape type,* comparable to 'landscape system', is a recurrent pattern of landscape which is the result of local landscape characters reflecting landform, land use, field pattern and tree cover. *Landscape character zone,* referring to an ecosystem similar to the previous term 'landscape unit', is a mappable zone of landscape, with almost homogeneous abiotic and biotic features delimited by distinct margins. *Landscape parcel* is a further subdivision of the landscape character zone, due to different shapes of fields combined with differences in land use, defined by an evident physical border. The ecotope, lastly, is the smallest mappable piece of landscape, that is, a spatially defined ecological unit determined by abiotic, biotic and human features.

Since the type of landscape assessment pursued in this research is ecology oriented, some basic concepts in ecology as illustrated in chapter one have been considered fundamental throughout the analysis. To these, the term *architope* (Pungetti, 1996a) has been coined in this research to indicate the smallest architectural unit, namely an artefact of a certain relevance. Hence the ecotope can be further subdivided into abiotopes, biotopes and architopes, constituting the *landscape elements*.

5.3
The classificatory dimension

In the last twenty years, the trends in landscape classification have been of two main kinds: geographical and statistical. The first has tended to classify landscape in a subjective way, identifying tracts of country where features related to geology, topography, vegetation, land use and settlements were similarly represented. The second by contrast has classified the landscape in a more objective way, recording those features with a systematic approach (e.g. in grid squares) and using a statistical methodology to group features (e.g. squares) with similar characteristics (Green and Blankson, 1993). The method presented here is an attempt to link both approaches with desk survey, fieldwork observation and the proposal for the use of a simplified version of GIS.

Different directions have been followed in classifying landscape according to the initial aim required by each project. For example, some classifications have a broad view of landscape and often relate to a very large scale, while others put the emphasis on specific features like forestry, vegetation cover, visual perception, aesthetics or cultural heritage mainly on a medium to small scale. To the first group belong works on the general topic of landscape which have tried to use big classes, such as agricultural, upland, lowland, urban and industrial areas, or patterns of landscape at large scale (e.g. Crowe and Mitchell, 1988), or which have subdivided geographical areas into big landscape types (e.g. Meeus et al., 1988).

The second group comprises studies on biotic aspects of landscape, like that on woodlands by the Forestry Authority of England (based at Cambridge) which has identified ‘regional character areas’, namely tracts of countryside where common physical, historical and ecological associations provide a ‘sense of unity’ to the landscape (Price, 1993, p. 7). There are similar works on the physical features of land providing ‘variety classes’ (e.g. Forest Service of the US Department of Agriculture, 1974) and on vegetation. There are others aiming at the production of landscape maps based on ecology and botany (e.g. the Vegetation Mapping by Küchler and Zonneveld, 1988) and based on phyto-geomorphic units (e.g. the Phyto-Geomorphic Classification of the Landscape by Howard and Mitchell, 1980).

On specific features of landscape, there are also humanistic studies related to visual, aesthetic and cultural aspects. Classifications based on aesthetic and visual features have been carried out along these lines (e.g. Elsner and Smardon, 1979). So have classifications based on preference surveying, which has often aimed to evaluate landscape attractiveness through a collection of data related to both landscape characteristics and public attitudes (e.g. Penning-Rowsell, 1973). There have also been attempts to merge natural and human features, like classifications which have used landscape units based on natural and cultural identity (e.g. Pinborg, 1984). On the basis of this discussion, a new approach to landscape classification has been proposed in chapter eight and applied to the Sardinian case studies illustrated in chapter nine.

5.4
The descriptive dimension

Landscape description is perhaps the most ancient topic among those related to landscape assessment. In the past, writers described landscape in prose and poetry, in scientific or narrative essays, while travelling or sitting in their studios. In this respect it is possible to distinguish differences in the descriptions, which suggest how heterogeneous landscape can be. This is due not only to the variety of landscape elements but also to the different perception of them.

Perception indeed plays an important role in this field, giving guidance on what has to be included in an inventory. Perception in addition depends on what value one attaches to a particular landscape. A description made on this basis has been called here *indirect description*. This generally uses parameters of aesthetics, while *direct description* uses scientific factors. Both of them are relevant. It is therefore possible to find different approaches to the description of landscape, reflecting the author's philosophy, policy or simply enjoyment and varying historically and regionally (Litton, 1979).

Unfortunately, rarely has a tested methodology been used in landscape description. Written description, for example, incorporates information related to physical and historical influences, as well as perceptual qualities and elements of the landscape. Descriptive information, furthermore, can be followed by analysis of the landscape in relation to particular issues, i.e. landscape character, homogeneity, strength, weakness, vulnerability, views, scale significance and impact on development (Landscape Research Group, 1988). The description, on the other hand, can be simplified using just five main factors: scale, shape, visual force, unity and diversity. Whatever the method of landscape description used, there is nonetheless a need to have a purpose behind it. The choice of procedure and criteria to follow in the description determines in fact the success or failure of the entire process *(cf.* Chenoweth and Gobster, 1986).

From what has been said, it follows that any description might have more than one reason which would justify the effort for its completion. Views on the usefulness of a general methodological approach in landscape description (e.g. Craik, 1975) concluded that a certain description and even classification and evaluation of landscape is a useful tool in the comprehension of landscape itself and of assistance to those who are working on it. Relevant European methods for landscape description have been taken into account for the methodology presented in chapter eight and applied in chapter nine.

5.5
The evaluative dimension

Landscape evaluation is one of the most discussed areas of landscape assessment. The voluminous literature on the subject makes the selection of material difficult to consider and discuss. However, this is by no means indicative of progress; researchers and professionals are still applying earlier evaluation methods and developing alternatives (Landscape Research Group, 1988).

The need for a general theoretical framework in this field has been pointed out by many authors (e.g. Carlson, 1993; Dearden, 1987; Turner, 1975; Zube, 1984b). The fact is that landscape evaluation evolved in three categories: consensus approach, measurement techniques and preference techniques. Some authors (e.g. Dearden, 1987) have recognised the basis for a theoretical framework to lie in the general consensus of the population. Theory following this view can identify circumstances that intuitively and empirically can be linked with consensus, and consequently, the researcher can suggest guidelines for choice of appropriate methodology.

Other authors have concentrated on measurement and preference techniques. More than twenty years ago, for instance, it was pointed out that two major problems in landscape evaluation were the difficulty of developing techniques that could be easily replicated, and the improbability of finding skilled people able to use those sophisticated techniques (Turner, 1975). Nowadays the situation is different: more people are specialised in landscape assessment and the techniques are becoming easier to learn and use. The replication of techniques, nevertheless, is still a problem that researchers have to solve. The direction to take is therefore that of developing methods which can be easily understood and widely applied. The present work has pursued this direction in landscape evaluation, further illustrated in chapters eight and nine.

In landscape evaluation there are also key elements to be considered, like the criteria used in the interpretation of the values of a place. A fundamental dilemma, however, comes from the nature of those values. It is certainly questionable whether visual and aesthetic values can be separated from each other. It is hence essential that visual and aesthetic criteria in the evaluation are expressed in that tangible way which enables us to recognise the real landscape values. To this extent, Litton (1979) assumes that numerical values do not produce quantitative evaluation, but comparative evaluation. Therefore a correlation should be established between physical landscape criteria used by professionals and perceptual values identified by researchers, and consequently it is necessary to reinforce visual analysis procedures.

Visual and cultural landscape resource values are fundamental in landscape evaluation, but unfortunately they have been threatened by the satisfaction of human needs. From this standpoint Fabos (1973) in the METLAND study developed a quantitative system to measure the effect of metropolitanisation on visual and cultural values in landscape resources. After the value of these resources has been estimated, there is the possibility of designing predictive models, useful in allocating land use with the purpose of minimising loss of existing resource value. This can further be used as a planning aid for decision-making about future land use. A similar line has been followed in this research, substituting guidelines useful to planners and politicians in place of predictive models (see chapters nine and sixteen).

5.6
The computing dimension

Fundamentals

One of the most popular past methodologies in the analysis of landscape data has been the *overlay technique* set up by McHarg (1969) in the US and quickly diffused elsewhere. This consists of the hand-drawn overlay of transparent maps which contain information about landscape elements. Although useful for small study sites, it became difficult to handle in big projects where the resulting map appears opaque because of the considerable number of sheets to overlay. Consequently, its accuracy had to be improved and alternative approaches were sought One of these is computer technology. Modelling and analysis programs can indeed help to overcome the limitation of the overlay technique, gaining efficiency in information handling (Steiner, 1991).

In the last two decades, landscape analysis has placed a growing emphasis on ecological sustainability and nature conservation, outlining the requirement of a basic understanding of ecological sciences at all levels, especially focusing on the landscape ecological aspects (Bridgewater, 1993). To add to this, the previously discussed studies on ecological relationships in landscape have underlined the necessity to see landscape in its totality. Accordingly, landscape ecologists are seeking an integrated view able to show all the complexity of landscape. However, until the 1980s integrated approaches to landscape analysis suffered from lack of suitable conceptual tools and logistical problems in handling and processing data (Bartlett, 1988). An attempt to understand ecological infrastructure, which can be supported by documentation of information and elaboration of models, is vital at this stage.

To meet the situation, the development of technologies in GIS comes into play. Four main functions can be included in such a system: input, storage, manipulation and output of data. GIS also allows saving of money; and time and data can be made accessible to a network of users for a wide range of applications. Precisely, Burrough (1986, p. 6) defines GIS as a 'powerful set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purposes'.

GIS really can describe objects from the earth in terms of their position, attributes and above all their spatial interrelations, transforming the information into a database. In addition, by examining this database, it can provide a means to carry out landscape analysis. Moreover, since the database can be interactively transformed, GIS can be used in the organisation and management of large quantities of data. Furthermore, because the data can be easily manipulated, GIS can serve as a tool in landscape history, planning and management. Along the same lines, some authors have applied GIS in landscape planning, forming a link between abstraction and reality. Among these there is Steinitz (1993), who went beyond the foundations of McHarg with the application of GIS to many projects leading to the identification of a methodology for landscape planning using GIS. His view of integrating theory with practice has indicated a change in GIS methods, directing them more towards 'problem-solving' rather than a mere 'technique-development'.

Methodologies

From the point of view of landscape ecology as an interdisciplinary science, many fields should be involved, each using quantitative research techniques. New approaches are coming in this decade, relating to quantitative analysis of spatial heterogeneity of landscape. However, landscape research still requires new methods to quantify spatial patterns, compare landscapes, identify relevant differences and determine relationships of functional processes to landscape patterns (Turner and Gardner, 1991). In this respect, management of natural resources concerns landscape structure, function and rate of change (Coulson *et al.,* 1991). Thus, it involves integration and interpretation of various forms of knowledge and one of the principal techniques available for this type of landscape investigation is again GIS.

One of the major research challenges of the 1990s in fact is the realisation of potential roles that GIS can play in advancing knowledge of ecological functions and assessing human impact on the landscape ecological structure (Stow, 1993). These roles accordingly can lead to landscape ecological uses like storing and managing ecosystem data, aggregation of data at different scales, location of sensitive areas, analysis of ecological distributions, interpretation of hydrological structure (e.g. van Buuren, 1991), information processing and ecosystem modelling. Spatial Information System (SIS), a parameter within GIS, is already playing a key role in landscape ecology. Specifically, it relates to the spatial structure and dynamics of ecological systems. As illustrated by Lavers and HainesYoung (1993, p. 68), access to this new technology 'might provide both a language and tradition in which we can better articulate the concern of the landscape ecologists'.

Since landscape is dynamic in structure, function and spatial patterns, temporal changes also should be considered in the analysis of landscape processes. These changes, as a combination of natural and human influences, as well as their impact on landscape, can also be examined with the use of GIS. Certainly, databases have greatly facilitated the analysis of landscape changes through insights into the ecological dynamics of landscape, that is, the identification of changes in landscape patterns and methodologies to use (Dunn *et al.,* 1991).

Applications

It is known that information organised within GIS provides a framework to support the planning practice, decision-making and management of landscape. Burrough (1986), for example, suggests the possibility of using GIS for studying environmental processes, analysing the results of trends and anticipating the results of planning decisions. Risser *et al.* (1984) underline the necessity of improving existing methodologies in landscape ecology through the input of ecological processes into a GIS which could be used for planning purposes. Others (e.g. Ottens, 1990; Scholten and Stillwell, 1990), furthermore, show how GIS can provide an enhanced environment for analysis, evaluation and decision-making in urban and regional planning.

Others again (e.g. Janssen and Rietveld, 1990) use MultiCriteria Analysis (MCA) and GIS for analysing in a spatial context the conflicts between making policy criteria, generating compromise and ranking of alternatives. To add to this, Decision Support System (DSS) linked to GIS can be a tool in analysing and supporting decisions through the examination of alternative options and the evaluation of criteria, goals and objectives of the planning process (Fedra and Reitsma, 1990). However, the bridge between the implementation of a GIS and the transfer of information to a planning office is difficult to build and its use is still problematic (Nijkamp, 1990). Some of the answers can be found in bridging the gap between GIS and Computerised Information Analysis (CIA) and therewith moving to a 'desk-based' type of planning.

Nevertheless, GIS can be employed in research that involves land-based spatial analysis and modelling. It has already been observed (Jongman, 1995a) that ecological research can be used to support and evaluate nature conservation and can be applied in landscape planning at different levels of scale. Most of the Dutch Provinces, for example, have developed programs for mapping and monitoring landscape, and the data coming from this process are used in planning and policy-making. However, in order to succeed, data have to be collected in a way determined by the research objectives. The latter, moreover, have to match methods of sampling and analysing data. Thus data collection, along with its relation to objectives and methods of analysis, is one of the key issues in GIS.

By contrast, in Britain GIS has been developed as an analytical tool not in relation to landscape, but rather in relation to land use planning. GIS in fact has been used mainly to produce maps from physical and biological landscape features and not much in predicting future scenarios or in decision-making. There is therefore a need to set up models to use with GIS for predicting landscape changes and consequently to develop new theories related to them. An approach along these lines is proposed in chapter eight and applied in Sardinia as shown in chapter nine.

5.7
Conclusions

We have illustrated above the lack of a conceptual base in landscape evaluation, the shortcomings of the projects for addressing relevant problems and the neglect of humanistic studies. To remedy this, Zube (1984b) suggests a link among research findings, landscape information and professional models, based on three paradigms: behavioural, humanistic and professional. These paradigms lead to a conceptual relationship between three dominant theoretical themes: biological heritage, cultural influence and aesthetic values. Therefore, man too is the element to take into account in landscape assessment in order to gain a better understanding of the meanings and values of a certain place. The humanistic paradigm, in addition, is essential in the analysis of landscape, since man is not just a subject, but an active participant.

In evaluating the value of a place, moreover, landscape has to be considered as more than the sum of its component parts. It has to be viewed in a way which takes account of how these parts combine to make up the whole scene and above all of how people react to that scene. Human values and the way that people respond and relate to landscape are hence fundamental in landscape assessment.

Further, it has been observed that much research in this field has been rich in organisational, orientational and explanatory power, but poor in justificatory power (Carlson, 1993). The latter is the kind of theory which is still lacking. It is a philosophical quest, concentrating on concepts and ideas, which provides a 'conceptual knowledge that allows us to reason, that is, to formulate positions, argue for them, and to justify them' (Carlson, 1993, p. 53). This is really one of the fundamental points of landscape research and is followed by the present study.

Regarding GIS, it has previously been outlined how it can be used to solve particular problems or to look at the world from a new perspective. However, several limitations have already been recognised from its use. First, scale has become a critical issue; it is not clear whether information is lost or gained when changing scale (Michener *et al.,* 1994). In addition, spatial analysis lacks programs for examining landscape structure at different scales (i.e. multiscale analysis).

Second, the problem of how to extract specific information from a large database for decentralised processing is still seeking a proper solution (Ottens, 1990). GIS should also be more compatible with other information systems (e.g. SIS, MCA, DSS and CIA), increasing the possibility of using it for planning and management purposes.

Third, GIS presents often complex mathematical models and is mainly operated by specialists. Middle managers and researchers have problems using the system by themselves. GIS, moreover, has high costs of training and support and the database requires time for building and maintenance. This results in difficulty managing research which needs easy systems to operate and consequently increases the overall cost of information projects.

Fourth, database management and software packages have not been developed with broad-scale and long-term environmental research in mind. Therefore, they have been shown to be weak for the examination of spatial change (Michener *et al.,* 1994). Ecologists accordingly are still seeking advice on the best design of scientific database management and information systems.

Fifth, data collected for a specific objective can be repackaged and utilised in additional studies by other scientists. This repackaging, however, can raise many questions for environmentalists related to the data, e.g. how to design and share them and how to develop appropriate standards for collecting and using them.

Sixth, the technological aspect of GIS has often limited its use to measurable scientific issues. GIS research, for example, is more concerned with abiotic and biotic features of landscape like water flow and animal and plant distribution (e.g. Haines-Young *et al.,* 1993) than with human input. Indeed, there is difficulty in handling anthropological data. In part the explanation of this is that human input is qualitative, non-measurable data, thus arduous to map and build into models. Human reaction to landscape, for example, is subjective and difficult to quantify, while the vision of landscape as a place is broad and complex to translate into data. Another explanation comes from the planning system, which deals with both social space and spatial behaviour, and which is often irrational and changeable. Therefore it requires a flexibility that GIS does not have.

The aim of landscape assessment, however, is to document properties of landscape as a whole and above all to understand the spatial structure of ecosystems and their relationship with humans. The approach thus has to move from descriptive to analytical. A further solution to the problem of human input would be the development of a GIS that would allow definition of non-spatial relationships and the possibility for sophisticated analysis and for modelling, based on both scientific and human attributes.

In conclusion, the idea of GIS as a stimulus to landscape ecology, planning and management is becoming more obvious with the development of connected methodologies. The major problem that research has to face is matching technical advantages with new conceptual models related to ecological landscape systems (Lavers and Haines-Young, 1993). Affirming that landscapes are spatially heterogeneous, Gardner and Turner (1991) suggest that it is necessary to understand not only the mechanism of interaction among individual components, but also how these components are arranged, using spatial analysis. Hence GIS represents a significant advantage in this type of analysis, especially in the framework of quantitative approaches to landscape ecology which are now developing quickly. However, the growth of theories and models requires a more sophisticated way to represent ideas and descriptions of landscape ecological systems. There is a need to continue research in this sector, bearing in mind all these constraints and pursuing sound methodologies capable of being applied directly.

Chapter 6
The political and interventional aspects of landscape

Landscape design and planning can provide guidance in safeguarding the natural environment of this planet, and their implementation through landscape management can fulfil that aim. These three dimensions form the interventional aspect of landscape. However, before proceeding in the fields of design, planning and management, the topics of landscape legislation and strategy must first be taken up. These two dimensions make up the political aspect of landscape. To help in the understanding of all these dimensions, it is appropriate to explore their definitions and trends, linking them to landscape ecology. While landscape design will be covered in Part Three, discussion on landscape legislation, strategy, planning and management is provided in this chapter, which also illustrates recent developments in ecological landscape planning and nature conservation.

6.1
Definitions

Landscape planning and related concepts

Societies continuously change the environment through land use planning (Fabos, 1985). The latter can hence be considered a fundamental for landscape planning. *Planning* in general has been described as 'the use of scientific and technical information to provide options for decision makers, as well as a process for considering and reaching consensus on a range of choices' (Steiner and van Lier, 1984, p. 2). *Land use planning,* by contrast, is the planning of land to be used in the future to provide for people's needs (van Lier, 1994). Both definitions are conceived here in the perspective of planning activities, while other perspectives can be identified in planning disciplines and planning professions.

Moving to *countryside planning,* there are views for which this concept comprises legislation and administration of detailed provisions, like that of Primdahl (1991) where public efforts regulate rural land use, natural resources exploitation and landscape change. Other views set up countryside planning in the framework of making 'plans and decisions of the many public authorities and individuals that have an impact on the countryside' (Countryside Commission, 1989, p. 4). In any case, *project planning* involves the design of a specific object (e.g. a dam, harbour or a group of buildings), whereas *comprehensive planning* involves a broad range of choices relating to all the functions of an area (Steiner and van Lier, 1984), and accordingly its purpose is to solve conflicts, often through compromises.

A passage from land use planning to *landscape planning* can be noted in defining the latter as the art of fitting land uses together to make harmonious places (Turner, 1987). In the perspective of planning activities, landscape planning can be seen as an extra dimension of comprehensive planning (Vroom, 1990a). From this point of view, *regional planning* should change from land use zoning to a design approach *(cf.*chapter fourteen) and in addition it should be concerned with the protection and conservation of regional natural processes. The design approach can in turn be conceived in the perspective of planning professions. *Landscape design* in particular is a profession which combines scientific expertise and creativity in order to give shape to the future physical and cultural landscape. Further discussion on this topic is proposed in chapter eleven.

Linking landscape planning to landscape ecology and design

There is no doubt that landscape design and planning relate human attitudes with the analysis of landscape features, processes and systems. This ecological bias had already been suggested in the perspective of planning disciplines (e.g. Hackett, 1971), outlining their function of understanding the pattern of natural habitats and the development of landscape. From this standpoint one may recognise a distinction between land use and landscape planning 'by the way of emphasis on landscape resources and environmental attributes as the primary determinants in decision-making' (Cook and van Lier, 1994, p. 3).

In planning indeed, landscape is often associated with the environmental, ecological and anthropological outlooks. In a broader sense, *environmental planning* has been suggested as 'an attempt to balance and harmonise the various enterprises which man, for his own benefit, has superimposed on natural environment' (Edington and Edington, 1977, p. 1). Then the views of authors such as Lyle (1985, p. *3)* have influenced the environmental perspective focusing on ecology: 'it is important to recognise that when we make a plan for a piece of land … we are designing an ecosystem'.

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 for studying the biophysical and socio-cultural systems of a place to reveal where specific land uses may be best practised' (Steiner, 1991, p. 9). From here one can derive the concept of *ecological landscape planning,* which is geared to connect the physical data of the entire ecosystem to cultural information, in order to suggest opportunities and constraints for decisionmaking about the future of landscape. Lastly, *ecological design* can be viewed as the effort to respond to the ecological and cultural conditions of the environment, with the aim to impose order on a certain landscape using the tools of art and science (Part Three).

Landscape management

The distinction between planning and management is sometimes not clear and confusion has arisen from using both with the same meaning (e.g. Bos and Hekhuis, 1994). Clearly, there is an interdependence between them: the management of resources may be an aim for planning, while planning may be a means of management.

Management has been defined as 'the judicious use of means to accomplish a desired end' (Steiner, 1991, p. 4). In order to reach this goal, it is necessary to take action on the ground and work with local people. Farmers and landowners can have a direct involvement on their own land, while public bodies have indirect influence with their advice and regulation.

Countryside management on the other hand has been interpreted as 'the enhancement of the landscape, including flora, fauna and historical features, and the improvement of public access to the countryside through such measures' (Countryside Commission, 1989, p. 4). In particular, a *manage ment plan* is 'a site-specific document prepared by the controlling owner, occupier or manager of a piece of land and which guides the planning and management of that land' (Countryside Commission, 1986 p. 4).

Landscape management then can be recognised as the process of putting into practice the intentions of those who control land (Kirby, 1986). It is specifically the implementation of a landscape plan, sometimes reflecting traditions and habits of a site, so relevant in cultural areas like the Mediterranean.

6.2
The legislative dimension

Hackett (1971) nearly thirty years ago pointed out that it would have been easier to define the scope of landscape planning if legislation laid down for this purpose had been available. This statement is unfortunately valid today as well, since many countries are still lacking regulations on this specific matter. The consequence is that landscape planners often have to operate without a precise body of legislation, or have to find something consistent with landscape within the environmental sector.

This is not the case in north-west European countries like Germany and the Netherlands. In the latter, for example, landscape planning has been established since 1945 with the Land Consolidation Act for the modernisation of rural areas (chapter seven). In the United Kingdom, on the other hand, the several Town and Country Planning Acts have been useful tools for planners, allowing preservation of specific areas of landscape. However, unlike other northern European countries, there are no specific 'landscape planning' laws or regulations in the UK. Such matters are included indirectly in the general planning system at all levels and dealt with, again indirectly, through a series of planning policy guidance notes.

Specific legislation to set up landscape planning and management roles is indeed essential for achieving recognition of landscape priorities at each level. It is also necessary to designate single areas of valued landscape, since sometimes it may be difficult to secure general enabling legislation. There are clearly advantages in having a national legislation which includes the topic of landscape, as well as guidelines for accomplishing the task of landscape preservation. The problem, however, is that no simple single approach can be followed. A solution could be finding a legal and administrative structure that fits each country and meets local and national objectives and goals for protected landscape (Lucas, 1992). Consequently, it is desirable that legislation should indicate precisely its purpose, specify its objectives for landscape conservation and lay down procedures for the establishment of valued landscapes to be safeguarded.

Clearly, the institution of laws and regulations for the present and future management of landscape is essential in rural areas. In addition, sound government policies and active guidance are the ingredients for the success of sustainable development. The aim of legislation, furthermore, is to ensure the coherence of all government policies and activities dealing with spatial aspects of rural areas.

6.3 The strategic dimension

The development of an area depends on the implications of planning strategies set up for that context. The planning process in fact includes a statement of strategies coming from the goals and objectives adopted by the body in charge. These specific strategies, however, must be linked with broad policies and existing legislation at different levels in order to achieve the designated goals and objectives. The latter should be ranked in priority to form the basis of management policies (Beer, 1990; Kirby, 1986; van de Laak, 1994; Steiner, 1991).

From the above it is possible to conceive landscape planning as a comprehensive approach to landscape management which in turn reflects the policies on the matter. Planning and management also take account of future uncertainty and a strategic view of decision-making. According to this, responsibility for the future induces caution in the present, better known as the 'precautionary principle' (see Blowers, 1993), and the development of sustainable policies. These, however, will give positive responses only in the medium or long term. In order to avoid short-term priorities and centralised power it is necessary to have a strategic approach at all levels of government. For this purpose, the power of regional and local government needs to be reinforced to enable them to promote initiatives and implementation of policy for sustainability.

A landscape policy goal, in particular, can have both economic and environmental aspects. The first consists in minimising the costs, the second in minimising the damage (O'Neill, 1993). It is therefore necessary to work out an optimal arrangement of land uses and design of landscape to reach the established goal. Moreover, broad conservation objectives like biodiversity conservation and self-sufficiency requirements can be applied to strategic planning. Ecological principles can then be recognised as essential for the success of environmental improvement schemes (Selman, 1981).

Long-term strategy is one of the most important measures required for a sound policy towards conservation and improvement of the rural landscape. This type of strategy in fact has to be founded upon principles for countryside conservation. As observed by the Agrolandscapes Working Party (1981, p. 6), this 'calls for more than statements which require that every Minister ...shall have regard to the desirability of conserving the natural beauty and amenity of the countryside'.

Yet at the national level it is possible to influence greatly landscape policy (Gilg, 1991). National authorities can be supported in this task by positive public opinion and sympathetic Non-Governmental Organisations (NGOs). A flow of informatiqn on both sides is clearly challenging the administrative structure to respond to proposals (Lucas, 1992) and, where necessary and possible, influence general policies in favour of landscape issues.

Implementation of policy in addition requires approved legal measures such as zoning, standards, building, engineering and mining ordinances, nature protection regulations and means of compensation (Laurie, 1986). While the State generally imposes limitations for the planning activity control, many jurisdictions use a zoning system for specific areas. Within each *zone,* land use variations are allowed only if they are in conformity with the legislation. Regulations for single use (e.g. zoning for just one land use) nonetheless are appropriate for countries like the US, but not for Europe, where landscape is a product of several complex evolutionary processes. This is part of the landscape strategy, which is not a national plan but a public set of principles against which each citizen should measure private actions.

6.4
The planning dimension

Human beings have been designing landscape for something like 12000 years now, i.e. since the Neolithic agricultural revolution. Any change of land use, however, is a potential source of disruption and the task of a planner is to supervise rearrangements of the environment in order to reduce the disharmony caused by such a change (Edington and Edington, 1977). Accordingly land use planning has evolved, both underneath and on the surface of local policies, as a process to guide land development in relation to nature conservation and human requirements. Therefore, as also shown before, land use planning can form the basis for landscape planning.

Description of legal measures for controlling land use guided literature on site and countryside planning until the 1970s. At that time, a redefinition of the terminology in all these planning fields was necessary. This has been attempted by Fabos (1985), presenting a more accurate and comprehensive description of land use planning in the US and other countries. Following these lines, land use planning should be mainly based on three issues: scientific knowledge, technology and society's values. The first can advance the understanding of ecological principles related to land and landscape, and can aid in assessing land resources, determining land suitability. The second can provide tools (e.g. computer technology) which can help in clarifying the present planning and sometimes even modifying the methods of previous planning practices. The third can aid in exploring the reasons for the changes in society's values. By simulating consequences of plans based on different views, the planners build up useful assistance for resolving conflicts and selecting alternative options.

The view of Fabos reflects a comprehensive approach to planning, which can be easily utilised in landscape to ensure a greater stability. Applied science, for example, would be useful in determining the physical features of landscape; technology would help to diversify past and present land uses which have determined the landscape; human values would aid the evaluation of the landscape for a better understanding of society's needs and approaching sound land development. In doing so, however, it is necessary to deal with both global and local issues. Global issues need increased centralisation in some countries (e.g. in the US), while in others (e.g. in Italy) they urge more decentralisation. Local issues, on the other hand, must respond better to human needs and in turn land use and landscape planning must take account of the consequences of local decisions on their environment.

The identification of fundamental principles in site planning can meet the situation. As Beer (1990) suggests, four basic principles can be established in environmentally oriented site planning. First, the conservation of an environment capable of supporting human life, that is, related to the requirements of fertile soil, clean water, clean air and shelter. Second, the awareness of human wellbeing, dealing both with the concerns of people for the environment and with the role of planners. Third, the maintenance of cultural diversity, taking into account the link between culture and the environment. Fourth, the preservation of non-renewable resources.

Balancing the contrasting requirements of development and conservation of natural resources is really one of the aims of countryside planning too. The objectives of countryside development, however, are less likely to be achieved without a planning framework. Plans, often designed for spatial organisation, can help in this task, guiding land use, protecting land resources and limiting hazards. The final product is to enhance or reduce particular land values by denying a type of use for a certain area or preferring one type of use over another (Held and Visser, 1984). While planning authorities employ legal instruments to achieve these goals, planners can adopt a strategic attitude to the future of the countryside (Primdahl, 1991). The knowledge of countryside changes is thus a prerequisite for such a strategy.

Finally, considering that the aim of land use and landscape planning is to attempt a match between the physical environment and people's needs, gathering data about both nature and man becomes essential. Scientific knowledge provides a great deal of information which can be of use for the purpose. This information, according to Lyle (1985), can be divided into two types: facts and concepts. The first concern the situation at hand and deal with specific parts of design. The second are general notions, ideas and principles. Ecology, for example, has developed basic concepts that help to unify and give coherence to the many unrelated facts assembled by research. Although the latter is continuously producing information, a need for further understanding of the interactions in landscape at local level is always there. This understanding should in turn be applied to advance appropriate types and forms of development using theories of ecological design. In a good design, 'concepts provide the basis for the larger framework of organisation, while facts provide the specifics' (Lyle, 1985, p. 16).

6.5 The management dimension

Ecological landscape management

Statutory landscape planning includes strategies associated with programmes, and implementation associated with plans. The former is a matter of landscape policy, while the latter is a matter of landscape management. Approaches to landscape management have initially been sectional, but now are tending to be more general. A sectional approach was adequate until the technological development (Kirby, 1986), which is one of the causes of the present landscape deterioration. In the last 30 years, fortunately, a more systematic and integrated view on landscape management has been advanced. According to this view, each portion of land can perform different but interrelated functions and, following the ecological principles of holism discussed in previous chapters, landscape can finally be considered as a whole and not just a sum of its parts.

In this respect, a full understanding of all the attributes of a certain landscape is necessary before deciding how to manage it. In doing so, managers can take a step towards the preservation of the *genius loci,* namely the essential unique character; and at the same time take a step towards fulfilling the desired functions for the progress of the area. Yet the examination of the bond between conservation and socio-economic development is one of the first steps to take in management, followed by the identification of opportunities for the promotion of sustainable uses.

To add to this, there is the setting out of clear objectives as well as the definition of their role and use in the management process. Landscape management objectives must be explicit, flexible, precise, relevant, feasible, realistic and ranked (Kirby, 1986). Objectives, moreover, should be drawn up according to defined principles which have to be reviewed regularly. Principles, however, should not remain within the circle of a limited number of specialists, but should circulate and prompt other specialists to advance in the matter. Ecological understanding can help in this. For example, a broad understanding of processes, such as the ecological strategy of different plants, can be utilised for the management of vegetation (Grime, 1986).

Ecological knowledge, furthermore, can be applied to accommodate varied methods of management. It is known that there is a considerable body of existing knowledge, though developed in many cases just in response to the needs of land managers (Bradshaw *et al.,* 1986). The information, however, is not always available and therefore there is a need for ecologists to better synthesise their data. Ecological principles can indeed provide a basis for developing alternative methods of landscape management in both rural and urban areas. On the one hand, land which is no longer managed in a traditional way for socio-economic reasons requires new solutions to meet the changing needs. Traditional forms of husbandry, for example, can be introduced in a new way for managing urban parks aimed at nature conservation and biological diversity. On the other hand, the conservation of natural beauty is becoming one of the foremost considerations in the management of rural areas. A framework for the conservation of valued landscape should be set up to accomplish the task. For this purpose, it has been proposed (Woolerton Truscott, 1992) to follow eight steps: statement of aims, landscape assessment, examination of the threats to landscape, outline of strategic management objectives, description of proposals, policy implementation, monitoring and review.

A landscape management strategy should then be developed into guidelines which describe the immediate actions to take on the site and, for the future, the maintenance operations and their frequency (Beer, 1990). In particular, guidelines should aim to: (a) identify and protect those landscape features that contribute to the character and quality of an area; (b) support measures for landscape improvement; (c) encourage retention of ecological biodiversity; (d) increase public awareness and appreciation of landscape (Woolerton Truscott, 1992).

There is a need for advancing uniform methods, which can help in co-ordinating the several fields of studies involved (Naveh and Lieberman, 1994). The latter can provide a great deal of useful information for conservation management practices. These fields of study, however, are often still separated. The future solution is therefore to develop more comprehensive ecosystem studies able to overcome the problem.

The management plan

Landscape management has the task of reconciling activities and conflicts coming from landscape managers and users. The instrument to use is the management plan, which is a prerequisite to effective action on the ground (Woolerton Truscott, 1992). The management plan really represents an integrated approach to the organisation of the countryside on a strategic level, relying on local co-operation. Specifically, the principal purpose of the management plan has been defined as a 'positive action towards implementing measures for conservation and enhancement of natural resources, and for promoting acceptable social and economic development, including recreation' (Smart and Anderson, 1990).

Management plans began to spread in northern Europe during the 1970s, presenting guidelines for administrators on decision-making. To be precise, the management plan has helped to interpret and apply specific legislation and general policy to a certain area. The plan in fact has the task of setting out the policy of the management institution. Its main goals are: to conserve character and quality of landscape; to respect social, economic and cultural needs of local communities; and to provide for public use and enjoyment of the area (Lucas, 1992).

The management plan provides a framework to guide development by giving a systematic basis through co-operation and by communicating this to the public involved. The plan, on one hand, is the basis for co-operation with other landowners (public and private) and with organisations (statutory and voluntary) interested in the area, in order to achieve conservation, recreation and other community goals. Communication, on the other hand, is a key to success in landscape management. Another key is a plan with which people can identify. Consultation is therefore most important both in the plan preparation phase and in its implementation and review.

6.6
Developments in ecological landscape planning

Landscape planning and nature conservation

The debate on nature conservation in Europe started at the end of the nineteenth century, originating from the controversy between loss of nature and valuation of nature (Jongman, 1995b). On the one hand, mainly in north-west Europe, nature was going to disappear due to increasing economic development. On the other hand, recognition of artistic and historical meaning of the landscape and philosophical theories on aesthetics coming from the South (e.g. Croce, 1902) led to a rising awareness of beauty and love for nature (chapter seven).

Consequently, the notion of nature conservation spread all over Europe, developing differently in each country due to different cultural, economic, political and social settings. Some governments for instance abandoned the idea of conserving natural and historical values, while others allowed even free enterprise to continue while protecting nature. Accordingly, new ideas on urban planning were advanced and broadened into the regional planning systems. Theories on garden cities, regional plans, parks and recreation development led to the recognition of nature within both urban and rural planning policies, at times linked to the landscape context.

After the Second World War, the dichotomy between decline of nature and awareness of the problem continued. Because of the latter, nature conservation strategies were directed to the semi-natural landscapes, while environmental legislation improved. In this setting, some policy directions were focusing on urban areas, others on agriculture, legislation or nature conservation. At the same time the international debate increased, facilitated by a consciousness for nature conservation established at global level by NGOs.

In the past decades, nature conservation has been considered all over Europe, formulating new strategies and co-operating world-wide. In this framework, ecological theories on metapopulation and island biogeography gained consideration in the planning system of a few states, finally moving the point of view from local to global consideration. Before, attention was in fact primarily on areas of high nature concentration, while now attention is directed to the whole ecosystem structure. Therefore, nature conservation has been recently thought of not only as species and site protection, but also as a 'coherent spatial structure' (Jongman, 1995b). This has led to the consideration of landscape matters, to the integration of nature conservation into physical planning, and to the development of the ecological network concept.

Landscape planning and ecological networks

As already 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 be translated into: (a) core areas; (b) corridors; (c) buffer zones; (d) barriers, hence forming the basis of an ecological network. From this angle, landscape is conceived as a network of patches connected by fluxes (i.e.

air, water, energy, nutrients, organisms) which in turn define the interactions between habitats.

Core areas, however, must be connected to each other and must be considered in the context of a network. They actually function as a source and refuge area for species; therefore they are studied in the wider landscape and serve for rural landscape planning and policy. In this context, the analysis of ecological data related to the wider landscape, namely the elements of an ecological network, becomes essential. The step to take is to assess biological and landscape diversity, as well as to assess whether the full range of landscape functions are able to fulfil requirements for nature conservation. In order to achieve this, it is necessary at first to set out the overall character of an area and then to consider the features required across areas. This means also assessing the full range of ecological needs of species involved including movement, dispersal, migration and genetic exchange.

6.7 Conclusions

Beyond landscape policy

Sustainable land use planning can be linked to landscape policy, defining the former as an instrument to carry out the latter; in other words to implement policies for the right location of land activities. It serves also to improve the general condition of rural areas, with a view to 'an optimal use and protection of the natural resources on the long term while meeting the needs and aspirations of the present generations' (van Lier, 1994, p. 10).

Beyond landscape policy there is the politicisation of the countryside. In the past decades there has been a considerable increase in both number of environmental groups and their membership. This 'potentially powerful amalgam of rural interest groups' (Wibberley, 1982, p. 32) has different, sometimes opposing, views on several matters but it is united on countryside conservation.

Lastly, there is the view of politicians, some of whom are conscious of environmental issues and, what is more, of the conflict of interest between different social groups, while others simply ignore the problem. However, in some European countries a change in political awareness can be noted in recent years. This change has to be considered within the decision-making framework of rural districts which is sometimes still based on agricultural postulates.

Beyond landscape planning

Beyond landscape planning there is the need to consider both ecological and anthropological aspects of the process. Society aspires to the satisfaction of its needs and consequently influences natural resources positively or negatively. These therefore must be safeguarded. Some authors (e.g. Zonneveld, 1994) have indicated an answer to this problem in the design of proper landscape ecological networks, referring to relationships which have always existed in nature. In particular, a network combines connection (the threads of the net) with separation. A path, for example, can act as a connection between two areas, or as a separation between them. This has guided Zonneveld to an important conclusion: connectivity, made up by separation and connection, cannot be served by one multipurpose network; each activity in fact needs its own specific network. The inclusion of ecological networks in the planning process, however, requires the development of further research in landscape ecology, supported by a holistic methodology.

Another topic to consider is the anthropological implication in planning. Robertson (1984), for example, has described how plans are made and has analysed institutions of national development planning, explaining how these became routinised as part of the modern state's apparatus and how this fact has made popular participation one of the central issues of planned development. These institutions, nevertheless, are seeking to plan for progressive purposes and though they are making much effort to turn ideas into reality, they are often failing. This anthropological view of planning leads to the question whether these institutions are appropriate or not; and in what way better solutions for planning could be achieved. Research in landscape planning should provide an answer to these questions.

Beyond landscape management

Progress in landscape management research (e.g. Forman and Godron, 1986) has recently considered the ecological bias. Over time, management operations have, under human influence, modified landscape characteristics such as patches, corridors and elements. The novelty of the approach lies in the possibility of using landscape ecology principles for the management procedure of different landscape types. It is first necessary to evaluate patch-matrix interactions and relative uniqueness of each landscape element, and then develop a simple input-output model to simplify the complex phenomena and thus to help the management of landscape ecosystems.

The ecological dimension is, however, only one aspect of landscape management. Many other constraints are applicable, relating to different topics like land use and countryside, nature and protected areas, socioeconomics and policy. Research on nature and protected areas, for example, enables farmers to develop their land better using management plans. Dijkstra *et al.* (1994) propose a method of this kind consisting of: (a) developing a sustainable framework; (b) making models which contain management measures; (c) translating these models into farm models; (d) evaluating the effects on agriculture. Severe management restrictions, moreover, has been found the most suitable way to adapt farms to nature management. This type of procedure, one can argue, should further be related to policy, indicating management restrictions in farm practice in places where a lack of regulations has led to intensity of land use.

The wider landscape context

Several recent studies (Jongman and Troumbis, 1995; Naveh and Lieberman, 1994; Pungetti, 1996a) and workshops on landscape ecology (e.g. IALE—International

Association for Landscape Ecology) have reached the conclusion that a holistic approach should be introduced in traditional nature conservation. In particular, it has been agreed that a methodology to assess the state and trends of biodiversity cannot be restricted to specific aspects but has to take into account several criteria. These should not be confined only to species and habitats but should refer also to the larger context of landscape.

This statement has introduced two important concepts: the inclusion of landscape as a fundamental topic in studies on nature conservation; and the shift from island to global approach in ecological studies. The former is based on the fact that in Europe rural landscapes and related species richness are diverse, thus landscape can play a critical role in the sustainable development of the European environment (Jongman and Troumbis, 1995). The latter brings about the idea of using the 'wider landscape context' in ecological studies. It is therefore important to move the point of view from the key areas to the surrounding large areas, often dominated by agriculture and forestry. Buffer zones, moreover, are relevant for European wildlife but at the same time they are greatly threatened by human activities. Despite all the efforts towards nature conservation, in fact species and natural habitats in Europe are continuously decreasing and cultural landscapes are seriously vanishing.

Clearly, land use is an important element to consider in the wider landscape context. At IALE-Toulouse in 1995 the relationship between land use changes and biological and landscape diversity changes has been widely underlined. This implies that in order to preserve landscape diversity, it is necessary to act upon land use changes. It also implies that in ecology, approaches oriented to the wider landscape context have to include the cultural context and its socio-economic setting.

Chapter 7
Procedures in landscape planning

Policies in landscape planning and their implementation reflect the culture of the place where they originated. The course of landscape policy and planning in Europe during this century is here described and its shortcomings are pointed out. Development in selected north-west and south-west European countries sheds light on difficulties in laying down and implementing landscape planning and ecology. Accordingly, divergences among the specific approaches have been outlined within the more general framework of the European Union.

7.1
The procedures

North-west European procedure

North-west European countries have advanced an active policy in landscape and environmental planning. They have also developed an understanding based on the rights of society. In the UK planning system, for example, it is assumed that society has the right to ensure that development takes place within established environmental standards (Beer, 1990) and additionally it has the right to ask the developers to produce environmentally oriented land use policies.

The Dutch planning system too is directed to a spatial development which follows a line favourable for society as a whole and therefore it involves something more than the establishment of regulations. Yet, as Held and Visser (1984, p. 377) note, it is a matter of 'conscious government guidance of spatial development along certain avenues' giving order to a process which involves society. In fact a system of physical ordering has been developed in the Netherlands since 1965 with the Physical Planning Act (Pungetti, 1991). The Netherlands clearly has gained an advanced position on planning matters. The ever present problem of the defence of the land from the sea has contributed to creating a democracy based on co-operation. On this basis, planning has never been considered on its own but rather forms part of the general governmental framework. This is true also for landscape concerns, which in turn have been contemplated within the broader policy of planning. The latter finally deals with all the spatial aspects of management as a whole, being thus more consistent with the holistic approach than in other countries where landscape planning has often been isolated.

In north-west Europe there is also a considerable source of volunteer labour in the form of local and national conservation groups. To add to this, policies have often concerned local, low-cost solutions rather than capital intensive projects (Kirby, 1986). The problem is that past landscape planning and management were directed more towards urban areas than rural. This is the case with several European conservation bodies on wildlife and ecology which have often emphasised the protection of wildlife habitat in urban landscape because here the need is immediately apparent and thus urgently demands action. Little attention has been paid in the past by them to the rural environment. By contrast, a few governments (e.g. Great Britain and the Netherlands) have already established goals for both town and country planning in their programmes, thus helping in the recognition and finally protection of rural areas too.

Mediterranean procedure

Planning implementation is a prerequisite for successful landscape management. Recent studies (Pungetti, 1996b; Smart and Anderson, 1990; Woolerton Truscott, 1992), however, have revealed that actions on the ground are still difficult to achieve. Consequently the landscape changes and pressures on the countryside have resulted in the decline in landscape quality of many rural areas, especially in the Mediterranean.

Financial constraints are partly responsible for this condition. As Lucas (1992, p. 91) points out, 'landscape protection is possible only when there is a vital and sound local economy with a positive perspective to the future .... The management of a protected landscape is, in fact, the management of local economies and change'. This constitutes a problem in the Mediterranean where some countries are still struggling with political difficulties. In other areas, moreover, the absence of co-ordinated approaches to policy formulation and management is another cause of this inefficient situation. A discussion on north-west and south-west European trends on landscape planning and landscape ecology follows.

7.2
Landscape planning and landscape ecology in selected north-west European countries

This section illustrates the development of thinking on landscape ecology and landscape planning in north-west Europe. Two countries, namely Germany and the Netherlands, have been selected because of their pioneering work in this subject. A discussion on procedures and divergences is given in section 7.4.

Germany

Germany, together with the Netherlands, has achieved the most highly developed landscape planning in Europe. Since the 1920s efforts in landscape conservation have been made in areas of rapid industrial development like the Ruhr, the most densely populated region in Germany. In 1923 a general plan to secure the permanent existence of open space at regional level was set up in the principal city of Essen. This plan was concerned with environmental factors such as water supplies, nature conservation and outdoor recreation within the urban area. In 1935 protection of valuable landscape elements and areas was announced in the first national Act on Nature Conservation, although a contribution from landscape planners did not yet form part of the process.

After the Second World War, the division of Germany into two states brought differences to the two political and social systems, and different views on landscape and nature conservation emerged (Grebe, 1990). Indeed, the central planning of the German Democratic Republic (DDR), marked by a centralised economy, did not allow much independent development of policies on landscape planning. However, while a gap in the practice is evident, the production of research was consistent in the past decades. Academics like Haase (1984), for instance, carried out an inventory and a survey of landscape, pointing out the need for further development in order to reach a uniform methodology connecting the tasks of landscape ecology with its applications to landscape planning. In 1989, with the removal of the Berlin Wall, co-operation between the two countries became possible on issues related to nature and landscape conservation.

By contrast, the German Federal Republic (BRD) was already putting landscape planning into action well before this. In the 1960s, for example, the BRD produced the first landscape plans focusing on environmental problems of areas where nature was threatened. At that time, environmental protection proceeded on a local rather than regional scale, using landscape planning as a measure to safeguard mainly urban environmental quality. It was in the 1970s with the new Act on Nature Conservation that landscape planning was designed to cover the total area of both urban and rural communities. In the 1980s the BRD incorporated the request of the EU for Environmental Impact Assessment (EIA) in its planning process. Thus the impact of each development on natural processes had to be assessed and mitigation measures taken.

The BRD procedure involved the integration of landscape planning into the general planning framework at three different levels: national, regional and municipal. Considered at municipal level, all the planning sectors had to be fitted into regional planning, which in turn was and still is based on the national legislation. This approach nevertheless was marked by a decentralisation of power in the BRD planning system almost from the beginning. The 11 regional states *(Länder)* regulated their planning independently (Mamoli, 1989) within the framework of the legislation of the federal state *(Bundesrepublik)*. Consequently, differences in local planning were evident. Goals of regional planning were expressed, for example, in several planning laws of *Länder* in the 1950s with description of objectives to implement, including provisions for *Länder* development programmes (Kunzmann, 1984).

In terms of compulsory application of planning regulations, the municipality level has been the most appropriate to implement landscape plans. Local authorities *(Gemeinden)* can control the industrial and urban development, as well as landscape protection, through policies related to land use. It follows that landscape plans are playing a key role in Germany for the decision-making process at urban level. In this respect, Grebe distinguishes three main contributions of landscape plans to the urban expansion programmes: (a) overall, evaluating the impact of development and setting up alternative plans; (b) on landscape and nature, proposing their protection and management; (c) on outdoor recreation, introducing planning measures for both urban and rural areas. Given that the protection of ecosystems is fundamental in landscape planning, Grebe has argued that landscape qualities are always connected with habitats and every ecosystem is a closed system. Hence habitat must be analysed and human impact has to be assessed. Interventions on each ecosystem, moreover, have an effect on the total environment. The landscape plan has therefore to be set up on these considerations.

In recent years the debate on linking environment with politics and planning has become widespread, leading planners to take a firm position on the matter. It has been stressed that knowledge of existing ecosystems is essential in the decision-making process. Therefore, politicians have to be informed about the reality and 'those who have no insight cannot take decisions' (Grebe, 1990, p. 129).

The Netherlands

In the Netherlands landscape planning has always been understood as attached to physical planning. At the beginning of the century the latter was concerned with social and cultural wellbeing, determining policies for improving mainly the built environment as in Germany.

From the 1920s the Netherlands was influenced by new American ideas on nature conservation such as the park movement, the development of greenways and the connection of urban parks with rural areas. However, early greenway planners at the beginning of this century had limited ideas on the role of green corridors (Jongman, 1995b). It is only in the current decade that the concept of ecological networks has gained more recognition among Dutch planners.

The initial intention of working at local level moved rapidly to regional and then to national level. Hence landscape planning was established within the programmes of the Department of Forest and Landscape Development, belonging to the Ministry of Agriculture. The Ministry issued in 1954 the new Land Consolidation Act (Rosso Grossman and Brussard, 1988) stating that all the reallotment or redevelopment schemes of rural areas have to include a landscape plan. The State Forest Department, which had to super intend those plans, greatly influenced the Dutch landscape planning of that period (Pungetti, 1991).

After the Second World War the Government Agency for the National Plan, which was in charge of national development, put forward the goal to fix land use for several years. However, the rapid changes in economic and social conditions made it plain that it was impossible to reach this goal nation-wide. Accordingly, in the 1960s the concerns about landscape moved from the drawing of plans to research activity. The gathering and the analysis of data were the main objectives of this period. They were meant to create new foundations for physical planning and environmental development, thus shifting from practice to conceptual thinking. As a result, a number of provincial plans were produced on the basis of zoning ordinances and were illustrated with maps presenting the research conclusions. They assessed the existing qualities of rural areas and indicated the zones where land use development could be allowed, excluding those of high scenic or natural quality. As Vroom (1990b, p. 141) observes, this reflects a type of 'defensive planning', a sort of 'non-creative way of planning for the future'.

Paradoxically, however, the above conceptual thinking involved complicated planning procedures with many unsatisfactory results. Therefore, the focus changed once again, this time towards public participation in the planning process. Emphasis was put on procedures rather than on production, in the belief that in a democratic society the active involvement of all the participants in the planning process could be a guarantee of environmental quality *(ibid.).* The local scale was considered the most appropriate for this target, being closer to the everyday experience of individuals. Nevertheless, this methodology was sometimes unsuccessful and a few planners were even disappointed.

The most significant instrument of Dutch physical planning is the Report *(Relatienota)* of 1975 which tried to integrate agricultural use with environmental and landscape values. It focused specifically on landscape and environmental conservation, setting up a political framework for the co-ordination of the interests which exist in areas of high vulnerability. In this respect, during the period of the *Relatienota* Dutch society switched emphasis from agricultural development to environmental protection, considering the landscape itself as a source of cultural and natural information (Pungetti, 1991).

Consequently, a change of attitude dominated the 1980s, moving towards ecological issues related to landscape planning. As Vroom observes, the existing patterns and processes tended to limit development, and the study of ecological relationships at a larger scale became necessary. He also notes that new ways to introduce conceptual thinking into regional planning can be found in combining land use types, ecological infrastructures and design of landscape forms. This process has been called 'comprehensive planning'; the theories of McHarg (1969) and Odum (1969) greatly influenced this new procedure. Comprehensive landscape planning should be based on the interaction between ecosystems in the landscape (Harms and Knaapen, 1988; Zonneveld, 1985), identifying the effects of abiotic, biotic and anthropic factors. The final goal is to use comprehensive planning for design and evaluation of landscape plans, as well as a tool for decision-making.

One of the most recent instruments of the Ministry of Agriculture (1990) is the Nature Policy Plan of the Netherlands, set up for the management and conservation of the variety of natural ecosystems and landscape types. Landscape policy in particular aims to maintain the cultural, physical and scenic values of the Dutch landscape. The plan has to be implemented in co-operation with local authorities and private initiatives, mainly directed to rural areas. In order to increase the support for nature conservation, moreover, there is an increasing emphasis on ecological education, practical ecological training and improvement of research.

7.3
Landscape planning in selected south-west European countries

This section shows the trends of landscape planning in Spain and Italy, which have been selected as examples in south-west Europe. Further discussion on the difficulties of these countries in achieving ecological landscape planning can be found in section 7.4.

Spain

In Spain, as in the other southern European countries, landscape planning is not supported by a long tradition. Even now there are no Spanish schools of landscape planning or landscape architecture, while there are several in Germany, the Netherlands, Britain and other European countries. These topics, studied mainly at post-graduate level, are delegated to other faculties or departments (e.g. to Forestry, Ecology, Horticulture and Architecture). Such a situation has therefore not allowed an adequate introduction of landscape and ecological values into the planning process.

Planning methodologies started only in the 1970s with the development of computer programs which aimed to optimise land capacity by analysing the physical environment. These were promoted by Ramos and his staff at the Polytechnic University of Madrid Forestry School, on the basis of ideas they had studied in the US. With the aid of such programs, development restrictions were set up taking into account land vulnerability. In the same decade two relevant regulations for this subject were issued: the Act on Town Planning and Land Use (Royal Decree of 1976) and the Legal Planning Regulations (Royal Decree of 1978). In Spain town planning legislation has been the legal basis for the introduction of landscape and ecological values to the planning system. Despite the fact that these recommendations forced attention to environmental factors, they have not shown particular effectiveness in the matter of implementation. Truly they have been interpreted 'more in the sense of setting up conditions and limitations for town planning rather than…giving priority to the protection of ecological and landscape values' (Aguiló *et al.,* 1990, p. 100).

The 1980s saw notable changes, due mainly to the new political situation with consolidated democracy and more freedom. In particular the decentralisation of political power resulting from the institution of 17 Autonomous Regions was fundamental. It was an opportune time to set up new planning procedures (e.g. the Regional Planning Code and the Regional Planning Setting) emphasising both citizens' interests and environmental issues. The Region of Madrid was the first example of the application of this new form of planning, which was based on land use regulations.

These procedures, together with the Declarations on Protected Nature Areas and the Physical Environmental Planning Programmes, were relevant for the conservation of the Spanish environment at regional level. However, they were still based on land type classification rather than on the protection of environmental features. It took a while to switch from the first to the second approach. One had to wait until the second half of the 1980s in order to see landscape factors placed within Spanish legislation. Particularly relevant for landscape were the jurisdiction of the Autonomous Regions over both Protected Areas and Use-Management Guidance and Programmes, the State Decrees on Environmental Impact Assessment and the State Act on the Conservation of Nature Areas and Wild Flora and Fauna. The latter has answered the need for the planning of natural resources, through the Natural Resources Programme and the Guidelines for Natural Resources Planning. These regulations were fundamental in changing the philosophy on land use, passing from the urban to the territorial scale *(ibid.)*. Until the 1980s, in fact, the rural environment was often ignored for the sake of the 'more valuable' urban environment, still following the early philosophy on land use which put most value on urban land.

Italy

The Italian situation on landscape planning is characterised by evident delay in its implementation. Despite this, landscape studies have been carried out since the beginning of the century, focusing on two main directions: aesthetic and visual perception; and geographical and naturalistic views. The former has found a tradition in pictorial representation and philosophical theories, like Romantic idealism. An exponent of this culture is Benedetto Croce (1902, 1935), who deeply influenced the Italian view of landscape in the first half of this century. Croce's views have their roots in the global concept of nature, coming from the European naturalistic school set up by Alexander von Humboldt. Neither of them, however, pondered over the meaning of the word 'landscape', thus giving rise to a quite confusing situation which still persists.

In 1909 an act (L. 364/09) protected some scenery and natural phenomena connected with Italian history and culture, that is, connected with historical events or pages of literature. In 1912 another act (L. 688/12) safeguarded estates, parks and gardens of particular historical and artistic interest. The protection of natural beauty started in 1922 with an act (L. 778/22) on the preservation of panoramic views of great beauty, as well as specific estates and their associated landscapes. This was done in relation once again to their natural beauty and their civil or literary history (Pungetti, 1991).

The above act marked an important step in Italian legislation, because for the first time it raised the debate on the concept of landscape. The reason for this can be derived from the fact that Benedetto Croce was at that time head of the Ministry which proposed this protection. It has here to be explained that the concept of beauty for Croce existed only in connection with human creativity. Accordingly, landscape was considered for its artistic and historical importance and not for its scientific values. This has had strong implications for the development of landscape planning in Italy. Indeed, the prevalence of aesthetic enjoyment over scientific reasons gave rise to a peculiar methodology for the setting of standards on landscape and nature conservation, aiming mainly at the protection of 'designed' beauty. Such a philosophy continued to prevail later, when the first measures of environmental conservation came out. Since they were directed towards restoration rather than prevention, the result was a partial preservation of the environment with consequent damage for that landscape which was not under protection.

The first attempt to enforce landscape plans was in 1939 with an act (L. 1479/39) that extended the notion of landscape to larger views. Once again the aesthetic concept prevailed and the regulations were addressed mainly to conserving visual qualities. In addition, only ten landscape plans, related to small specific areas, were prepared. On the matter of physical planning, moreover, the Town Planning Act *(Legge Urbanistica)* of 1942 (L. 1150/42) has been decisive for landscape conservation *(ibid.)*. In fact, it has extended compulsory planning to the entire municipal territory, including in the town plan the rural areas which had generally been ignored before. In 1947, with the approval of the Italian Constitution, the State declared its interest in protecting the national landscape as well as historical and artistic heritage (Art. No. 9).

A scientific approach in landscape analysis had already started in Italy in the 1930s and 1940s. However, this knowledge has never been linked to human issues, leading to separate approaches to the matter. It was only in the 1970s, with the spread of environmental movements, that the aesthetic analysis of landscape was overtaken by the need for scientific classification.

Already at the end of the 1950s, nonetheless, a compromise between aesthetic and scientific values of landscape started to become a common ground and landscape itself was seen as a visible expression of the whole of nature. This duality continued until the 1970s when ecological issues started to develop, due to the then current thinking which stressed the analysis of the earth ecosystems and defined landscape as an evolutionary process in the biosphere. Valerio Giacomini is one of the most well known exponents of this scientific school.

In 1972 the State transferred authority over the administration of town and physical planning to the Italian Regions, which thus gained the autonomy necessary for the development of landscape planning. As a consequence, the variety of cultural basis and methodological approaches within the different Regions has stimulated a productive debate, leading to new ideas in town and physical planning (Maniglio Calcagno, 1990).

Finally, in 1975 the Ministry of Cultural and Environmental Heritage was instituted. Until that time confusion on the notion of landscape, strong idealistic philosophy, absence of adequate territorial planning and lack of methodology in landscape planning had produced a long period of landscape deterioration. Hence the Ministry set up standard planning procedures for parks and nature reserves. In 1984, moreover, it came out with the Galasso Decree (Decreto Galasso), a declaration on the notable public concern for areas of particular environmental interest like lakes, rivers, glaciers, coasts, mountains, forests, woods, parks and reserves (Ministerial Decree of 21/9/1984). To implement the Galasso Decree some other decrees were issued in August 1985 for specific Italian areas, called *Galassini* (Ministerial Decrees of 1/8/1985).

In the same year the Galasso Decree was finally converted into an act: the Galasso Act (*Legge Galasso,* L. 431/85). The latter represents one of the most important steps in Italian environmental legislation for three main reasons. First, because it provided compulsory landscape protection for those areas of particular environmental interest as listed above, where every modification now requires previous authorisation from the Region or the State. Second, because it obliged the Regions to produce, before December 1986, either landscape plans or territorial plans with a specific consideration of landscape and environmental values. Third, because within a legislative setting it changed the consideration of the territory from an aesthetic to a scientific point of view.

This new approach places the landscape which needs to be protected within its physical territorial context. In addition, it takes into account the modifications which have occurred over time. Therefore it embraces an overall consideration of the site, which is essential for sound environmental planning. However, the legislators ignored some relevant points. They did not consider that in Italy there was a cultural gap in both landscape theory and practice. That is, they forgot about the uncertainty of the concept of landscape, not yet defined, and the absence of procedures for planning implementation. The result, as evidenced by Maniglio Calcagno (1990, p. 95), was a 'heterogeneous collection of planning approaches', which, however, 'helped in awaking new interest on landscape issues' in public opinion and administrations.

The Ministry of Environment in Italy was established only in 1986, much later than in other European countries. In 1987 the Ministry issued a decree (D.M. 29.7.1987) called 'lnstitution of national nature reserves in public areas', through which the forest areas can be converted into national or regional nature reserves.

In 1989 an act (L. 183/89) on the organisational and functional re-setting of soil protection, evaluation and conservation brought up the new concept of the 'hydrologic basin'. The River Plan is the instrument for the implementation of such an act aimed at the correct use of all territorial resources. Lastly, the institution and management of protected areas have been delineated in the Outline Act on Protected Areas (L. 394/91), for the conservation and valorisation of the national natural heritage.

In the past decade, attention has been gradually switched from aesthetic perception and designed landscape to geographical and ecological knowledge. The latter, related to a holistic concept of nature, has led to a more diffused approach to ecological planning. As a result, the SIEP *(Società Italiana di Ecologia del Paesaggio),* the Italian Society of Landscape Ecology attached to IALE, was founded in 1989, much later than similar institutions in northern European countries. Moreover, studies on landscape analysis and evaluation started to be set up on the basis of a balance between historical importance, land use and ecological values.

Nowadays Italian landscape planning operates on four main sectors: (a) rehabilitation and restoration of degenerated areas; (b) conservation of parks, nature areas and protected zones; (c) EIA procedures; (d) theoretical studies on landscape criteria at urban and regional scale.

7.4
Pointing out the divergence

On European procedure

Within the wide variety of competence that the EU has, landscape planning occupies a very small place. However, there are many sectors to which landscape planning can be connected, for example environment and nature protection, town and countryside development, agriculture, forestry, water management, transport, tourism and economy; namely the issues which are the responsibility of planning authorities. These issues in general, and environment in particular, are receiving increasing attention within EU institutions. Despite this, not much emphasis has been placed on landscape, though a better perspective can be expected for the future.

The European countries have much in common: several of them face the same problems. The differences lie, first, in distinct history and institutions and, second, in the political debate within each nation, animated by indications and decisions which emerge from each planning system. On the other hand, the EU members share a common goal in the preservation of their environments and landscapes. In Europe after the Second World War the general desire for reconstruction and creation of a better environment inspired many politicians and planners to create an effective system of town and country planning (Williams, 1984). Later an increasing though slow awareness of environmental issues has gained recognition within the above system.

On north-west European procedure

In Germany as in the Netherlands, there is a strong tradition of landscape planning, supported by a long-standing planning system co-ordinated at different levels. Although landscape planning has been successfully incorporated into the planning process, in Germany it is often seen as an obstacle to local development by politicians; this has happened particularly in rural areas. Nowadays landscape policies undertaken by planners have moved towards individual needs, with emphasis on public recognition (Grebe, 1990). Indeed, landscape planning has recently been considered successful in Germany when directed towards that. Its task therefore consists not only in improving natural qualities but also in implementing measures for a better living environment in both urban and rural areas.

The Dutch approach to landscape issues differs from those of the other countries in three respects. First, the importance of debating the matter; for example, questions are raised repeatedly about the adequacy of legal instruments and management techniques, or adequacy of expertise on policy-making. Second, the fact that intervening in the name of nature conservation without delay or preconceptions has constantly been an obvious necessity. Third, innovative ideas on regional development are always welcome in the country for their stimulating effect and their contribution to the clarification of procedures in landscape planning. Accordingly, competitions in regional landscape planning have played a crucial role in the whole process. In these circumstances a landscape plan can obtain a certain autonomy, being far from the official planning bureaucracy where local and regional policies always interfere. As Vroom (1990b, p. 160) writes, 'imaginative planning at this scale presents a framework for future development with better opportunities for a harmonious layout than could be attained on the basis of a mere zoning of activities'.

On south-west European procedure

In the Mediterranean there is a need for directing more emphasis on landscape and environmental issues. Recent advances in the introduction of landscape values into the planning process show indeed a prevalence of theoretical intentions over practical applications. Public opinion, however, is in favour of environmental conservation and the young are now moving from a technical specialisation to an integral view of preserving both nature and landscape. Ecological studies like that for the Metropolitan area of Madrid (Aguiló et al., 1990) can open a new route on the matter, acting as a basis for ecological and landscape criteria and above all influencing political decisions with specific recommendations.

In Italy, landscape planning suffered from a delay due to a long period of inattention to landscape matters in academia, politics and public opinion. Moreover, the division between human and scientific analysis of nature prevented an adequate interpretation of the complexity of landscape, which it is now agreed has to be pursued on a multidisciplinary basis. Furthermore, policy on environmental matters has too long been centralised at governmental level, while at other levels they have been confined within public administrations often obsolete and lacking a coherent internal structure, technology and expertise. Accordingly, the legislative instrument failed because of both the absence of a clear definition of landscape methodology and planning and the incapacity to advance sustainable issues. To add to this, the rare application of landscape plans, poor implementation of the legislation and lack of interest in ecological values continued to worsen the situation. Despite this, a growing attention to landscape and environmental matters is today a reality in Italy even if it has not yet been perfectly adapted to the decision-making process through the development of adequate methodologies by which to address landscape planning issues. There is an evident need for this to be rectified soon in order to overcome the problem; and this research aims to further the development of these methodologies.

7.5
Conclusions

In recent decades the EU Commission has proposed the setting up of policies for environmental conservation. Since one of the EU sectors deals with the quality of the environment and related land use, a longterm objective is to reach an understanding of the link between nature and development. However, as already noted (Vroom, 1990a), common goals and strategies on environmental and landscape planning are still far away. Differences between the various countries can be found in the legislative apparatus, its implementation, directions to follow, expertise and above all cultural background.

In many instances, moreover, the bias that each country puts on particular sectors leads to following different directions in environmental conservation. The Italian case, for example, shows emphasis on historical issues while the German case demonstrates the implementation of landscape planning within the local framework. Germany in addition is already considering a type of planning which incorporates land development without a threat to the ecological features, while the Netherlands is looking at this by unifying ecological, aesthetic and economic aspects.

Mediterranean countries, on the contrary, have generally carried out landscape planning by methods closer to physical planning than to nature conservation. Several reasons may be advanced for this. First, the predominance of individuality over the community, that is to say prevalence of private over public issues and more concern for the built environment than the natural. Second, the urgent need in this time of fast economic development to tackle political and social problems deriving from particular national conditions. This has often prevented the development of new environmental ideas and movements. Third, difficulties in administration and bureaucracy, especially in countries like Spain, Italy and Greece, have tended to discourage progressive initiatives and to create restrictions in implementing the work.

Underlying this, a rigid methodology in landscape research has been adopted, which has hardly reached the environmental vision of landscape (*cf.* chapter three). In Mediterranean countries, in fact, landscape research too has mainly followed the direction of physical planning rather than environmental planning. In addition, there was also a lack of professional expertise in landscape analysis and evaluation and in landscape ecology (*cf.* chapters two and five). All these circumstances have produced a setting for landscape planning fraught with difficulties.

A further reason for the failure in landscape planning implementation in southern Europe is the lack of support and involvement of local people. This is due to certain policy orientations, poor education and lack of economic incentives. In addition, the analysis of values, goals and impacts of landscape policies is often inadequate and, what is worse, discussion with locals is rather limited. Moreover, the control measures are frequently ignored or not even introduced. Hence it becomes difficult to govern the situation, which then inevitably collapses. To remedy this, specific requirements, principles and guidelines for the management of valuable rural landscapes (Lucas, 1992) should be applied at the local level.

A main divergence is that northern European countries started earlier to set up regulations on landscape and environmental issues, while southern European countries have only begun recently. As a consequence, in the South environment and landscape procedures have often been inefficient and the implementation of the legislative sector has been slower than in the North. Also, the public debate on what should be referred to as 'nature' developed mainly in the north-west European countries, leading nevertheless to different strategies for the protection of nature and biodiversity. The key is that principles of landscape planning in the Mediterranean, as generally discussed in the literature, have tended to be based on the experience of north European and American countries. Such principles, however, have been inappropriately applied to conditions prevailing in Mediterranean lands, traditionally diverse from the others.

Because of these divergences the choice of landscape development policies might not necessarily be decided just at European level. These processes indeed occur in different sites, different periods and at different stages in each country. They also depend upon the various organisations in charge and accordingly upon different policies. Consequently, their dissimilarities do not enable us to choose the same option. Meeus *et al.* (1988) see a solution to this puzzle in developing flexible landscapes to incorporate land changes without threatening either ecological values or social requirements. A thorough understanding of the processes which contribute to the formation of landscape, a development of landscape education, awareness and participation, a setting up of appropriate legislation and its further implementation is the answer to reconciling the different policies of the EU member states with the need of pursuing more sustainable landscape planning for the Mediterranean region as a whole.

Chapter 8
Methodology for ecological landscape history, assessment and planning in the Mediterranean

The trends on the several landscape dimensions put forward in previous chapters have demonstrated the heterogeneous character of landscape. Still, a theoretical vacuum has become apparent in the review and discussion of the literature. It is now recognised that there is a need to propose advanced methodologies on the subject, based on the link between ecology and culture. This chapter forms an attempt at this task, proposing alternative methodologies for ecological landscape history, assessment and planning which are rooted in the reality of Mediterranean rural areas but are also appropriate for other regions of rural cultural landscapes.

8.1
Addressing ecological landscape history of Mediterranean rural areas

The assumptions

It is true that the earth's ecosystems can proceed independently of human agency but it is difficult nowadays to think of 'a single such natural system that has not, for better or worse, been substantially modified by human culture' (Schama, 1995). Even in Scandinavia landscape is far from being natural. In a symposium held in Bergen in 1986 (Birks *et al.,* 1988) it was realised that even in north Europe a virgin landscape is now a fiction. Thus instead of thinking of Scandinavian landscape as a vast natural area with small cultivated patches, the idea of a whole landscape system (e.g. a whole fjord or a whole valley) as one great cultivated unit has prevailed. Consequently, the emphasis has shifted from the dualistic concept of 'cultivated-uncultivated' to the more general idea of a gradient of human impact (Faegri, 1988).

The above is an important assumption in landscape research because it determines a different perspective on the question of landscape history. First of all it directs the search towards a more oriented anthropological approach and then it highlights the necessity to preserve the abovementioned gradient as a challenge for modern nature conservation (Fægri, 1954, 1962). In addition, it reveals that landscape is extremely rich in data about people who have created it (Meinig, 1979) and suggests that researchers use these data to study landscape changes. The data, however, must be placed in their appropriate historical context in order to be interpreted correctly. The multiplicity of the data, moreover, indicates that landscape history is, like the general field of landscape, a subject which requires a range of expertise that nowadays can hardly be found in just one person. Therefore a detailed study of historical landscape should be carried out by a team of researchers coming from both the scientific and the humanistic sides of the discipline.

Landscape history, in conclusion, has to take into account three fundamental dimensions: spatial, temporal and social. Cultural landscape takes a place somewhere between ecology and culture, and the co-existence of these two aspects is a common feature of landscape history, which hence combines the consideration of the works of both nature and man (Fig. 8.1).

The method

Rural Mediterranean landscapes are extremely complex because they result from the above-mentioned interaction between ecological and cultural processes. The meaning of the present Mediterranean landscape can be reached only through an understanding of those processes, while to perceive the features of its evolution it is necessary to study its history with particular reference to both nature and man. The previous discussion on the developments in landscape history, however, shows that most studies have followed merely the scientific approach (section 4.3). Indeed, much attention has been paid to the nature side of research, collecting information

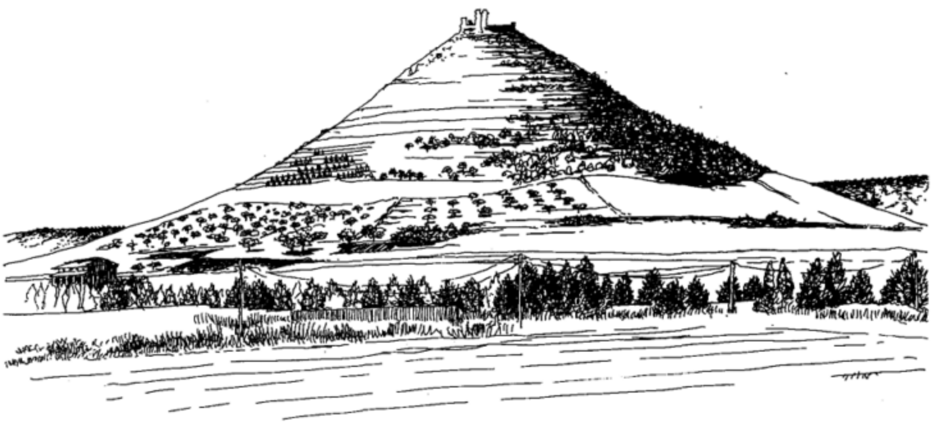


Fig. 8.1 The cultural landscape in Sardinia (La Plassas), showing the co-existence and persistence of human and natural aspects in the Mediterranean.

about abiotic and biotic factors. Although these studies are relevant, they are not exhaustive. This framework should be completed with further investigation on human processes, which are so determinant in landscape changes.

Hence there is a need to achieve a methodology in landscape history based on the relationship between ecology and culture. The method can be pursued following seven main steps (Table 8.1). The first is the exploration of written records in literature and

Table 8.1 Procedure in addressing ecological landscape history

LANDSCAPE HISTORY	written records ▼ iconography ▼ remote sensing ▼ past research ▼ interviews ▼ field check ▼ final analysis

libraries. The second is the iconographic research for visual clues in historical maps, paintings and pictures through public and private archives (Fig. 8.2). The third is the use of remote sensing

Fig. 8.2 Anonymous manuscript of the eighteenth century, a useful tool in the reconstruction of the landscape history of Cagliari and surroundings (Sardinia), After Piloni (1974), plate CXLVII (Reproduced with the permission of Edizion! della Torre.)

Fig. 8.3 A nuraghe, the symbol of the original Nuragic culture developed in Sardinia in the second and first millennia BC.

like aerial photographs and satellite images. The fourth is the examination of past research on the physical, biological and, where available, anthropic attributes of the site. The fifth is interviews with experts and local people, especially the aged. The sixth is investigation and checking in the field. The seventh is the final analysis, essential for the delineation of the landscape history of the site.

Certainly physical and biological attributes are relevant indicators for the exploration of landscape changes through the use of pollen analysis, geology and lithology, archaeology, ancient building investigation and plant observation (Fig. 8.3). However, since population plays a basic role in cultural impact on the landscape, cultural phenomena and human reactions become essential factors in the interpretation of landscape history. Therefore this continuous process should be recorded and studied following an anthropology-oriented approach able to offer a clear picture of the present landscape with the support of scientific data.

As Beer (1990, p. 121) summarises, 'each landscape has a different character, as a result of the way that people have related to the physical and natural environment in the past. This landscape character can be very important to retain, as it reflects cultural heritage and the way people have used the land within the constraints of the local environment. Landscape is part of people's sense of belonging to a particular place'. It is this correlation between man and landscape, supported by the *genius loci,* which has constituted the guideline in this part of the book for the study of rural landscape history in Sardinia. Applications of this method are demonstrated in chapter nine.

8.2
Preliminary to ecological landscape assessment

That there is a need for fundamental bases in landscape assessment is well known (chapter five). In particular, it has already been urged that theory should be more fully developed before techniques are devised (Needham, 1973). The process consists of clarification and investigation, testing the method carefully, and consequently, with new theory, developing the fundamentals for the new technique.

Theoretically speaking, more ecologically based approaches to landscape assessment have been attempted in .North America, Germany and the Netherlands, while Great Britain in general has come to recognise this line only recently. However, a fundamental difference between the American and the British approaches is that the former has put an emphasis on visual resources research, inputting the results to many aspects of policy and decision-making, while the latter has mainly emphasised quantitative approaches, rarely putting visual resource techniques into practice.

A passage from theory to technique can be seen in the pressure on countryside resources, which has led to the quest for a sound approach to landscape evaluation (i.e. theory). The purpose of this is to provide tools (i.e. techniques) for policies directed towards a type of landscape protection which should be functional and not cosmetic. After the evaluation has been made, decisions on the future of valuable landscapes have to be taken by planners and local authorities. Since Mediterranean landscapes have regional variations, the most appropriate policy would seem to be one of maintaining the landscape's visual integrity without losing its aesthetic quality.

Furthermore, the interaction of natural factors with socio-economic needs should be included in landscape assessment methodology in order to achieve an optimum degree of stability and diversity (Robinson *et al.,* 1976). It is then essential to bear in mind that visual forms and landscape functions are interdependent. Therefore, we must not isolate visual quality evaluation, but rather fit it into the entire assessment process. In doing so, a further problem arises: subjective versus objective evaluation. Visual quality indeed depends on individual observation, which is subjective. We can overcome part of the problem by considering landscape as a total visual experience and not just a collection of components. By contrast, statistical processing of landscape components in computer analysis and cost-benefit analysis in landscape economics are based on a predominantly objective evaluation which, if considered in isolation, puts a limit on the holistic view of the assessment. Lastly, landscape quality is not static: not only the landscape itself but also its values are changing with time.

There is a need to consider all these aspects of the evaluation in order to pursue a comprehensive landscape assessment. This should ideally include all four phases mentioned in chapter five, that is, landscape classification, description, evaluation and final analysis. The approach can vary according to circumstances. Hence as already pointed out by several authors (e.g. Robinson *et al.,* 1976; Landscape Research Group, 1988), it is essential to define the aims and purposes of the assessment and adjust the method accordingly. Furthermore, in order to maintain a sound link with the planning process, the above aims should reflect those of the whole planning strategy. To meet the situation the method to use in landscape assessment should be logically sound, generally accepted, easy and economical to run. However, since landscapes differ, it is possible to state that there is no single universal method and that, moreover, the values attached to any landscape may depend upon the criteria chosen.

Discussion of the extent to which values should be based on professional views or on public preferences has been attempted in the US and to varying degrees in the UK. While in the former the debate has taken into account the responses of public groups, in the latter no direct consultation with the general public has yet been developed. In both cases, however, it is not possible to talk about a general consensus. The key instead is in the role that society can play. It can be assumed, supporting the view of the Landscape Research Group, that there may be a stronger case in the near future to consider the public as a 'consumer' of landscape and consequently to develop the aspect related to landscape economics. There is also awareness that landscape can be perceived dififerently by different groups and that public preference is just one aspect of the entire evaluation process. It is believed, however, that society is determinant in setting up landscape qualities and thus that local landscapes have to be evaluated not only by professionals but also by locals. Consequently, it is fundamental to consider in parallel functional, ecological, visual and cultural aspects of landscape.

8.3
Addressing ecological landscape assessment of Mediterranean rural areas

The bias in ecological landscape assessment

Recent developments in landscape ecology have demonstrated the importance of spatial patterns in ecological processes (Turner and Gardner, 1991). This in turn has required the understanding of spatial and temporal scales related to ecological heterogeneity and hierarchy. Accordingly, the ecological assessment of landscape can be based on quantitative methodology which estimates the value of a given landscape resource in a given area at a given point in time (Fabos *et al.,* 1975).

However, in landscape, as already discussed, there are also qualitative parameters that have to be considered. The conflict between quantitative and qualitative approaches motivates a re-examination of the purpose of the assessment. Hence objectives and final goals of the analysis have to be identified in order to create a guidance for the entire process.

As a preliminary it is important to choose the instruments, the techniques and the type of measures that can be utilised in the assessment. Then the main objectives of the work have to be specified. In order to do this, it is necessary to answer a few questions related for example to the purpose of the assessment, the reason for choosing a specific database, what sort of parameters to evaluate and above all what it is necessary to understand in the studied landscape and why.

Afterwards, the final goal of the analysis has to be addressed and pursued. In achieving this, information is vital for effective guidance. Thus data have to be gathered and the assessment of landscape follows.

The method

The proposed assessment of Mediterranean rural landscapes has emerged from the considerations mentioned in previous chapters, assuming that sustainable landscape planning is based on sound landscape assessment. The aim at this stage is twofold. First, to move towards the development of an alternative methodology in landscape assessment for this region of the world. Second, to provide data to local planners, acquainting them with the features of the area and allowing them to develop targets for environmental conservation.

In a few European countries (e.g. the Netherlands) environmental zoning is becoming an integral component of strategic regional planning and decision-making. For the preparation of landscape planning, for instance, zoning of land use and landscape should be drawn up as an instrument for the decision-making of local authorities. Landscape character zones in particular can play a key role in this process, hence they might be used as basic units for gathering and examining the data of the studied site. Considering this, the assessment methodology proposed in this part of the book has been based on *landscape character zones*.

On the whole, a procedure for implementing landscape assessment should be set up following five steps: reconnaissance survey, desk survey, field survey, computer collation and data analysis (Table 8.2). The *recon naissance survey* consists in determining the methodology to adopt for the assessment of the site. The *desk survey* includes the archive exploration of past environment, a first mapping (hand drawing) of present landscape features and the creation of a database. During the *field survey,* landscape data (past and present) and policy history can be collected and studied, and landscape evaluation, which is clearly more subjective than the gathering of data, should be attempted.

Table 8.2 Procedure for implementing ecological landscape assessment

Reconnaissance survey	landscape classification landscape description landscape history landscape legislation landscape evaluation
↓ Desk survey	archive exploration first mapping (sketching) database creation
↓ Field survey	objective data collection subjective evaluation
↓ Computer collation	second mapping (digitising) database completion third mapping (editing)
↓ Data analysis	computer analysis discussion

With field survey completed, a *computer collation* of data is the next convenient step. It can be achieved with a second mapping (this time digitised) and the completion of the database. A computer program, in addition, is needed to link the database to the site, creating new maps (by editing) that can be overlaid and easily reproduced. Lastly, the data collected and the new figures produced should be analysed, possibly with the help of a computing system, and finally discussed in order to complete the *data analysis.*

Reconnaissance survey

The landscape assessment can be first accomplished following reconnaissance survey, desk survey and field survey. This subsection illustrates the reconnaissance survey with its five main steps: landscape classification, description, history, legislation and evaluation (Table 8.3), which are common to desk survey and field survey too. Further specification will be provided in chapter nine.

As already stated, *landscape classification* has the task of sorting landscape into different systems based on observed similar characteristics. Since the landscape of a site varies notably, these landscape systems might be previously grouped according to the most appropriate scale (Table 8.3). First of all, landscape regions can be identified and defined by geographical boundaries (e.g. upland and lowland of a catchment). Then landscape types can be recognised, according to present land use and ecological peculiarities of the site. The generic nature of landscape systems moreover suggests their subdivision into landscape character zones, within which landscape presents homogeneous characteristics. The different shaping of the land (e.g. into fields), linked to differences in soil and land use, can be added to the above classification, leading to the identification of landscape parcels delimited by a physical border (e.g. road, path, trees, hedgerow, water). Lastly, each landscape parcel can contain single landscape elements in the form of different ecotopes.

Landscape description concerns the collection of information about the present state of landscape, taking into account its components and their relationships. Description of landscape uses three types of features: abiotic, biotic and human. Climate, geology, soils, geomorphology and water are abiotic factors, while vegetation and wildlife are biotic and land use human. Regarding land use, its impact on environment such as erosion or land degradation has to be noted, as well as evident landmarks, like transport corridors and architopes (chapter five).

The procedure presented here can be distinguished from the previous methods by the emphasis put on human attributes and by the importance assigned to the *genius loci*. Accordingly, two new headings have been introduced in the assessment of landscape: landscape history and landscape legislation. *Landscape history* deals with cultural features of the site. Archive and field data on past land use, cultural heritage, historical ecotopes and historical architopes have to be gathered and selected for the understanding of past environment.

Landscape legislation helps in recognising which policy has been chosen for the management of the study site. Laws, instruments and enforcing agencies provide a clear

Table 8.3 The five main steps of the reconnaissance survey

Landscape classification	landscape regions landscape types landscape character zones landscape parcels landscape elements
Landscape description	abiotic features biotic features human features
Landscape history	past land use cultural heritage historical ecotopes architopes
Landscape legislation	laws plans protected areas manager institutions
Landscape evaluation	landscape elements visual evaluation aesthetic perception psychological perception

outlook on the present situation. Similarly the number of parks, nature reserves and protected areas indicates the extent to which the manager institutions have dealt with the site. These types of data should be collected and studied for an outline of the past and present situation in order to identify gaps and propose further directions to take.

The last step of landscape assessment is *landscape evaluation,* which implies subjective perception of the present landscape. Several landscape elements have to be assessed and recorded. Evaluation then moves into specific fields, aiming to discern the significance of landscape. Visual evaluation is the starting point in defining landscape features through visual perception. Aesthetic perception has a more difficult task to perform as its principles vary with time, culture, society, and it is therefore a function of subjective discernment. The same type of estimation characterises psychological perception, the last part of landscape evaluation.

Further steps in ecological landscape assessment

The reconnaissance survey, completed, the assessment moves to desk survey and field survey and lastly to computer collation and data analysis (Table 8.2). After the assessment, the analysis and interpretation of landscape data can be carried out assisted by a GIS-based system. In the proposed methodology, three main steps should be followed: database, mapping and spatial analysis.

During the desk survey, after archive exploration and a first sketched mapping, the creation of a *database* can help in identifying and listing landscape features. The latter are key elements of the rural environment and they can be collected not just via desk, but also via field survey. The database design is determined by the user need, that is, to offer the information needed in order to perform the work. It follows also from the results of the analysis of existing data: this determines whether they can support the decision-making process which is planned. Since many technical factors are involved in this procedure, professional assistance would be appropriate.

The database then can be completed in the phase of the computer collation. In the same phase, a second *mapping* has to be carried out through both digitisation of cartographic data sources and linkage between database and computer program. Particular attention to the choice of this linkage is necessary at this stage. After that a third mapping, namely the map editing, can follow.

In the phase of the data analysis, *spatial analysis* governs the discussion of the cartographic output. Its results can be used as a decision support tool for landscape planning and decision-making. Spatial analysis is in fact the final goal of this procedure, which has to provide a data-model for policy advisers, capable of use in the short term, easily operated and illustrated. The approach to landscape assessment proposed here has been applied to the region of Sardinia and to the catchment of the Rio S. Lucia (chapter nine).

8.4
Beyond the assessment

Beyond the assessment, the cycle is not completed and other questions arise. First of all there is the modelling, which can implement GIS capabilities. Although it can increase the rationality of the analysis because phenomena must be represented explicitly and quantitatively, it also requires that those who make decisions must be able to state, clearly and numerically, the reasons for making them (Dangermond, 1990). However, this is sometimes a difficult task to perform. Moreover, there is the need to evaluate proposals emerging from the spatial analysis. The quest is how to weight and evaluate them in a quantitative way and include them in the plan. At this stage it is important to be realistic and reasonable in devising the implementation for the GIS, to keep the process viable and flexible.

Although the work might have been completed, GIS has not finished its task. New system cycles can be undertaken at any time, due to new capabilities or additional needs. These cycles can occur every three to five years and in the next cycle the problems that result are generally less difficult to resolve. However, a few shortcomings are still evident in the process. Above all, the cartographic origin of GIS has led to more emphasis being placed on map manipulation than on map analysis. The cartographic data in addition are playing the role that statistical analysis and modelling have played in the past (Openshaw, 1990) and consequently a need emerges to go beyond mapping when contemplating analysis. It is therefore important to define the purpose of the assessment to avoid vaguely defined projects lacking scientific basis. This approach has been used for landscape classification, description and above all landscape evaluation in Sardinia (see Pungetti, 1996b), briefly illustrated in chapter nine.

Defining the purpose of the assessment means outlining the criteria mentioned in previous sections, namely objectives and final goals. The latter are generally related to problem-solving and decision-making. This is the stage where GIS can be used to integrate different kinds of knowledge (Coulson *et al.,* 1991). Being a broad discipline, any study of the landscape implies an interdisciplinary approach, as already argued in previous chapters. GIS is particularly useful for interpreting the interactions identified by such an approach and thus for setting up appropriate landscape analysis that can be further used to solve problems in landscape management.

Recent studies have provided a sound conceptual basis for landscape analysis but there are still limitations in the access to recent developments of related techniques (Turner and Gardner, 1991). Landscape research therefore requires new methods to quantify and qualify all the attributes of landscape. New directions are now taken to meet the situation. One, as proposed in the previous section, can be defined in developing a basic knowledge for GIS application using database, mapping and analysis. In addition, an integration of quantitative information and qualitative knowledge should be resolved by experts in preparing the ground for problem-solving and decision-making.

Another direction can be seen in developing a new *modus operandi* in a field which is rich in data but so often poor in theory. Such a *modus operandi* encourages a more creative approach to landscape analysis, which should not merely be based on a rigid application of traditional scientific design but be open to the heterogeneity of landscape, which is the result also of human interference. This leads to the quest for how to input human data in GIS. The answer may lie in the fact that landscape analysis in GIS only needs simple technology. 'The limitations on spatial analysis combine with the usual absence of process detail to argue strongly in favour of a more relaxed, flexible, artistic and less statistical approach than perhaps many may have expected' (Openshaw, 1990, p. 153).

For these reasons, this research supports the use of a computer system which offers database and mapping capabilities in a versatile and sophisticated, but also rapid and friendly way. The use of such a system will simplify the application of GIS to landscape analysis, pursuing the above new *modus operandi* which is required to overcome the present limits of this field. The landscape analysis outline proposed in this part of the book is shown in chapter nine.

8.5
Addressing ecological landscape planning of Mediterranean rural areas

The framework

The necessity of efficiently fitting land uses together has led to the suggestion that the aim of landscape planning is to reconcile the needs of competing land uses and to incorporate them into a landscape which comes from both progress and conservation of natural and cultural resources (IUCN, 1969). Considering the scale of global ecological issues, however, the challenge is to remain responsive to local needs and be able to reach sustainability through appropriate land use planning and practice (Cook and van Lier, 1994).

Fortunately, designers and planners are becoming more and more aware of planning *with* nature, as taught by McHarg (1969), and are starting to link design with ecology. This has led to a change from a physical-urban type of planning to an environmental-rural type. The interaction of landscape ecology with design and planning is clearly an important feature. For example, it has been noted (Golley and Bellot, 1991) that landscape ecology can provide designers and planners with information on abiotic and biotic features, describing dynamic processes in time and space. It is the understanding of these processes which allows the implementation of sound planning and design.

Whether ecology then can be considered more an attitude than a real contribution to planning is a matter of debate (Hackett, 1971; van Langevelde, 1994; Selman, 1981). The fact of putting ecological planning into practice, however, does not immediately follow the previous and easier acceptance of ecological principles. Selman (1981) assumes that problems of practical interface between ecology and planning arise from lack of agreement between the two professions and moreover from conflicts of objectives between ecologists and planners.

In any case, if placed in the framework of sustainability, ecological landscape planning should take into account both natural and social processes. The landscape coming from such an oriented design therefore has the potential to be beautiful and healthy, as well as productive and responsive to society's needs (van Langevelde, 1994). This, however, is not exhaustive. The ecology of landscape as illustrated by Hackett is formed by a collection of factors. Understanding the interaction of these factors is one of the roles of the landscape planner, who can thereby assess possible consequences of changes and formulate new solutions. It is the landscape plan in fact that sets up lines of action according to which landscape can be harmonised with ecological principles to meet the requirements of society.

What is more, planning has the ability to link actions on a small scale (e.g. a site) to a larger scale (e.g. a region). Hence it is important to go beyond the vision of planning as a mere tool or technique, seeing it as a philosophy for organising actions that enable people to predict the future of the territory, and in our case of the landscape. It is up to the planners to design with vision. 'Our responsibility is to retain what we treasure, because we are merely guests on these spaces of the earth that we inhabit. We should leave good impressions about our visit' (Steiner, 1991, p. x).

The ecological landscape planning process is specifically a logical sequence of activities developing within an organised framework which includes: identification of problems and opportunities; establishment of goals; classification and description of landscape; its inventory and analysis; design of policies and plans (Hackett, 1971; Turner, 1987; Beer, 1990; Steiner, 1991; Cook and van Lier, 1994). Ruzicka and Miklos (1990), moreover, describe Landscape Ecological Planning (LANDEP) as a system which includes a comprehensive landscape ecological analysis, a synthesis component, a landscape ecological evaluation of the territory and a final proposal for optimum land use.

Fig. 8.4 Procedures in ecological landscape planning

Nevertheless, the cycle is not complete. It is necessary to add planning implementation and administration, with community involvement through education and participation. These steps are still difficult to promote in south European countries where community involvement is rare; this is actually a more vested right in the US than in Europe in general.

A proposed procedure in ecological landscape planning is presented in Fig. 8.4 which shows the activities of the planning framework developing in sequence, as explained before, to form the ecological landscape planning process.

About the method

Besides the framework in ecological landscape planning just illustrated, it is necessary to develop a method. A common method is helpful but not convincing. Since planning is meant to recognise the dynamic of landscape, the method as suggested by Steiner (1991, p. 20) should be viewed as a living process: 'not a fixed score but a palette that invites improvisation'. This is a fundamental point in areas of ancient tradition where man has greatly changed the original features and where different societies have led to peculiar and often confusing situations. The method therefore should have a bias towards human ecology.

It has already been observed (van Lier and Cook, 1994) that in landscape planning new methods are required for a more sustainable development of the countryside. Several attempts have been made in the past in this direction (e.g. the creation of parks and protected areas). Recently the new tendency is to employ spatial concepts, generally at regional scale, which are useful in improving the balance between conservation and development. The understanding of the relationships between abiotic-biotic elements and humans is essential at this stage.

From the above, the need to take into account the cultural characteristics of a certain landscape emerges. These characteristics differ according to the place and some of the explanations for this can be found in the cultural background of each single country. Clearly, national strategies depend not only on administrative structures and legislative procedures but also on different ideas about nature and landscape conservation (Bischoff and Jongman, 1993).

All these assumptions have been taken as a principal point of departure for the development of the methodology used in this part of the book, as a tool to approach ecological landscape planning in Mediterranean rural areas.

Towards landscape dimensions

The considerations expressed in previous chapters have shown how Mediterranean countries have met difficulties in protecting their environment and managing natural resources. Besides, administrative, political and social problems have led to a static system which hardly allows a broad perception of landscape. If their environment and natural resources are to be protected, a method of planning the landscape is needed which is sustainable in the long term.

Nevertheless, a theoretical vacuum has previously been in evidence as well as confusion in the definition of terms and the ways to tackle research in the topic of landscape. The general methodology here proposed is an attempt to cover these gaps. It has been set up with a view to understanding the landscape process as a whole through the exploration of 14 landscape dimensions, grouped into five interrelated landscape aspects: natural, cultural, analytical, political and interventional as illustrated in section 3.3 (Table 3.1). The landscape dimensions, which are in turn interchangeable among the aspects according to the different landscape perspective, constitute the fundamentals of the proposed methodology. Precisely, it is meant to be a holistic interdisciplinary methodology for conducting landscape research as a necessary basis for the ecologically and culturally sound planning of Mediterranean rural areas.

A few main postulates have been considered for developing the above methodology. First, the awareness of all the processes which contribute to the formation of landscape should form a basis for ecological landscape planning. Second, historical analysis has to be employed in ecological landscape research, exploring the influence of past local culture on landscape. Third, sound landscape assessment is a tool to reach sustainable landscape planning, providing local planners and policy makers with data concerning the site. Fourth, analysis of ecosystems is a prerequisite to landscape planning, and their relationship and interaction in the landscape have to be studied taking into account the human factors too. Fifth, local landscape planning procedures have to be integrated into the general planning framework, which has in turn to devolve its power to the lower levels.

This research therefore follows the holistic approach of landscape ecology and the relevant European trends in landscape planning (chapter seven). In particular it is in line with the historical direction stressed in Italy, with the comprehensive planning proposed by the Dutch theory, with the landscape assessment strategy pursued in Great Britain and with the regional-local implementation of the planning process followed in Germany.

8.6 Conclusions

Addressing ecological landscape history

Since landscape is related not only to natural but also to cultural evolution, the present rural landscape is often a result of specific land use and land management activities. Therefore the understanding of past human influence on the natural environment is essential in order to plan future landscapes. The dilemma is that a proper understanding of the role of people as an ecological factor through history (Austad, 1993) has been lacking in landscape research. There is a need to further explore human impact on the Mediterranean natural environment, its influence on vegetation and animals, the farming techniques and above all the way in which man has maintained biological diversity in this part of the world.

Following this direction, a method for addressing the landscape history of Mediterranean rural areas has been presented here and then applied to Sardinia and to the Rio S. Lucia (chapter nine) as a contribution to theory in landscape research. Specifically the method derives from the assumption that in landscape history there are three parameters which play a fundamental role: space, time and society. Rural cultural landscapes are now threatened almost everywhere by the process of landscape change, mainly due to human agency. However, the previous discussion on methods for landscape history (chapter four) has shown a prevalence of studies following the scientific approach. As a consequence, the approach taken here for addressing landscape history is ecologically and anthropologically oriented and thus merges natural and human historical events. In particular the method developed is based on the seven main steps listed in Table 8.1. As such it aims to help in identifying the way in which the society has interacted during time with the landscape of a certain site. This can provide a clue to the awareness of the *genius loci and* the cultural characters of the landscape of Mediterranean rural areas, as well as of other regions of rural cultural landscape.

Addressing ecological landscape assessment

In the field of landscape assessment too the previous works, especially those on landscape classification and description, have shown a limitation due to the prevalence of the physical parameters which they have considered. For a successful result it is again necessary to take into account human features; among these land use is primary. Accordingly, human impact on the environment, such as erosion and land degradation, has to be noted in landscape description together with landmarks and architectural characteristics. In landscape evaluation, moreover, specific fields have to be considered, i.e. landscape elements, visual evaluation, aesthetic and psychological perception. Each of these fields should be studied, since only a complete landscape assessment can constitute the basis of successful landscape planning.

The method for addressing landscape assessment proposed here is based on five dimensions: landscape classification, description, history, legislation and evaluation. The procedure has followed the five stages illustrated in Table 8.2 and has been applied to the entire island of Sardinia and to the lowland of the Rio S. Lucia (chapter nine). The approach to the latter differs from past methods which have identified landscape structures based on environmental analysis because it classifies landscape character zones by using aerial photos. In this way particular aspects of landscape can be recognised, emphasising the local level of the assessment. This is the advantage of such an approach which can be directly used by local people and planners to acquire information on their landscape.

Nevertheless, it has to be added that a flexible, not universal landscape assessment has to be pursued, with the aim of a comprehensive approach which, in addition to the above five dimensions, includes a final analysis. It has to take into account both professional and public views, together with all the aspects inherent in landscape (i.e. functional, ecological, visual and cultural) related to their particular context. Only by doing so is it possible to direct this type of work towards the preservation of the *genius loci,* which is a preliminary in the planning and re-planning of any area of cultural landscape in the Mediterranean and elsewhere.

Addressing ecological landscape planning

On landscape studies and concepts

Landscape has been a source of inspiration for both artists and scientists since ancient times: painters and poets have used it in a large number of their works, travellers and geographers have described and enjoyed it and musicians have been inspired by it for their compositions. In Europe, scientific and philosophical studies on landscape have been carried out at the beginning of this century. While in Italy philosophers like Croce (1912, 1920) were fundamental in analysing the aesthetic and visual perception of landscape, in Great Britain geographers greatly contributed in that period to the morphological and naturalistic interpretation. The geographical approach, however, remains unconvincing and incomplete because it ignored the symbolic notion of landscape; that is to say it has not taken into account the cultural meaning invested in it. On the one hand, under the morphological method ‘landscape becomes a static, determinate object of scientific enquiry’ (Cosgrove, 1984, p. 18). On the other hand, the prevalence of aesthetics over science is also restraining. In Italy, for example, it directed efforts towards restoration rather than prevention, limiting the implementation of planning which could have been more efficient in stopping environmental degradation.

After the First World War, by contrast Germany and the Netherlands started to set up methodologies on landscape planning, concentrating mainly on landscape conservation in urban areas. In due course research relating to such topics spread also around Europe and North America, beginning to incorporate rural areas and addressing more attention to recreation and protection of natural resources.

Research in landscape ecology, on the other hand, has followed a different procedure. Its activity, started in the 1960s by geographers and ecologists, has now moved to studies on land evaluation, ecosystems and biogeography and to theories on the overall view of landscape ecology. The discussion on landscape planning and ecology presented in chapter seven has shown how far ahead northern European countries are in landscape planning and ecology compared to the southern ones. However, even in countries where landscape planning and landscape ecology originated, the development of the disciplines has met some obstacles. An explanation of this can be found in a lack of understanding of nature and a neglect of the topic at school (Nielsen, 1984). Another reason can be the mystification of the concept of landscape, which needs to be clarified and reconsidered.

Consequently, it has to be added that an essential preliminary to replanning any rural cultural area is the clarification of the concept of landscape. Mediterranean history shows that the transformation of the natural environment has mainly been caused by human influence. Landscape embraces indeed not only physical but also human features. Therefore, in addressing ecological planning *landscape* should be interpreted as the visible shape of the land constituting the product of the interactions between abiotic, biotic and anthropic processes developing through space and time. *Abiotopes, ecotopes* and *architopes* (Pungetti, 1996a) can be used as elements of such a landscape.

In places marked by historical events, the human agency becomes an important factor and accordingly the landscape becomes *cultural landscape.* In these places urbanisation has often taken over land from wilderness. Specifically, the landscape of the areas between urban and wild, used during time by man, is called *rural landscape.* Considering then the natural values of landscape, the scene moves to *landscape ecology* as a complex study of heterogeneous land composed of interacting ecosystems.

On ecologically sound landscape planning

Sustainable landscape planning should be supported by landscape ecology. The latter displays a transdisciplinary character underlined by the so called 'integrated look' (Zonneveld, 1994). Other disciplines in fact can be attached to this field: economic evaluation and the requirement for social benefits are just examples. For this reason an ecologically sound landscape planning has to be accomplished by an interdisciplinary team.

Holism is another topic to consider above landscape planning and ecology, although the term has lost part of its original significance because it has been used in various different meanings since. Holism, however, opens the possibility 'to use wholes as black boxes, without the necessity always and everywhere first to study the composing elements at the lowest level' *(ibid.,* p. 25). Landscape ecology accordingly should be concerned with the totality of the human experience in relation to both social development and nature conservation.

Two steps forward to landscape planning are landscape design and management. It is now recognised that the success of any landscape scheme depends on clear objectives and in turn on careful design and management to fulfil these objectives. Quality of design and effectiveness of management indeed can contribute to the long-term success of any landscape project. In order to accomplish this goal, however, it is necessary to consider many possible options since 'they lie outside the boundaries of a given designer's experience' (Bradshaw *et al.,* 1986, p. 163).

On sustainable landscape planning and strategy

It has already been observed (Beer, 1990) how site planning is not a process to stop or slow down land development as some politicians would like to believe. On the contrary, it aims to develop a site but with the least damage for the environment. This is the spirit of sustainability, a much discussed topic at the moment which will be further explored in chapter ten. Defined by the WCED (World Commission on Environment and Development) as a 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (IUCN/UNEP/WWF, 1991, p. 10), the notion of sustainability stresses both site development and the conservation of its natural resources. Hence it becomes an important goal in rural areas, especially if they retain cultural landscapes. Accordingly, land use and landscape planning should incorporate sustainability in both policies and implementation.

The meaning of sustainable planning, however, is becoming vague and complex at the same time. This encourages environmentalists, business people, politicians and even consumers 'to claim to be pursuing sustainable goals while failing to comprehend the conflicts and contradictions in their attitudes and actions' (Blowers, 1993, p. xi). Social anthropology can help in this comprehension, exploring the ways in which officials see both themselves and the community they are developing, and examining in turn how local people view their own relationships with officials (Robertson, 1984). The problem is whether the institutions which are in charge of the development are looking at planning with a realistic view of progress. In exploring the ways in which they succeed or fail in this task, it is possible to test whether these institutions are appropriate or not. It is necessary to search for new ways to conceive better solutions for sustainable planning.

All the above has implications for planning objectives, which can be attained only through effective, long-term and strategic planning. This is becoming a common concern between planning organisations, trying to build sustainability principles into planning practice. The concept of sustainable planning actually has to lead to a more comprehensive and strategic approach to landscape management that in turn should result from an ecologically sound type of planning.

A conflict, however, arises between developers and people, that is to say between a view on the means of development and a plurality of popular opinions. Such a conflict has determined different ideas not only on the content of landscape planning and policy but also on the responsibility for their execution. Consequently, 'officials complain of public inertia, apathy and stupidity, while people complain that they are the victims of bureaucratic force and folly' (Robertson, 1984, p. 5).

Landscape can indeed be seen as a political process within the pattern of relationships between state and population. This involves flux of power in both directions, seeking agreements on public and individual activities and interests. Thus landscape strategy becomes an act of mediation conducted by planners. The latter have a difficult role to perform which should be optimistic and authoritative at the same time. They also need availability of information, material resources and control in order to perform their task. The optimal condition therefore should be to enable them to count on efficient administration and public support. However, in many new states and unfortunately also in old states (e.g. the Mediterranean) these are lacking, causing obstacles to both the planning and management processes. Approaching a type of landscape planning which is ecologically and culturally oriented is a way to overcome these obstacles.

Chapter 9
Case studies: landscape development in Sardinia at regional and local level

Rural society has influenced the development of the Sardinian landscape, causing a far-reaching transformation of the island's fragile environment. In this section the characteristics of the two study areas, namely Sardinia at the regional scale and the Rio S. Lucia at the local scale, are outlined, linking their physical and natural features to human aspects. While the first case study is presented in summary form referring to previous publications (Pungetti, 1995, 1996b) for further particulars, a much fuller and more detailed treatment is given of the second case study, a Sardinian catchment subdivided here into upland and lowland. The latter specifically has been chosen for the application of the methodology in landscape assessment, while the whole Rio S. Lucia has been studied in the landscape history reconstruction. The island of Sardinia on the other hand represents a more appropriate scale for the illustration of the landscape planning process.

9.1
Introduction to Sardinia

The physical environment

Sardinia is the second largest island in the Mediterranean after Sicily, having a surface area of 23833km^2, or 24089km^2 including the minor islands. Mainly mountainous, it presents several isolated groups of mountains, the highest of which is the Gennargentu (1834 m), hilly lands, plateaux and a few plains (Fig. 9.1). Due to the geological structure of the terrain, dry summers and scarcity of rainfall, rivers have generally a torrential course, a feature of the Rio (river) S. Lucia too. Sardinia has very few lakes; by contrast there are a large number of coastal lagoons *(stagni),* some of which have been drained and transformed into fertile agricultural land, while others are still used for fishing and salt production. The climate is typically Mediterranean with hot, dry summers and cool winters.

The natural environment

Climate has a strong influence on the Sardinian vegetation. Except for numerous endemic species which developed because of isolation, the vegetation is on the whole of the common Mediterranean character. Over two-thirds of the island is covered by

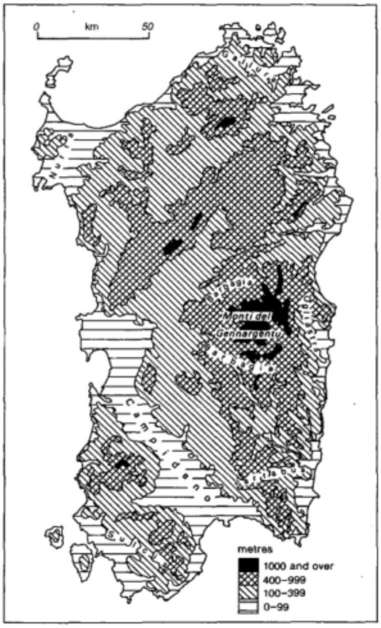


Fig. 9.1 Geographical map of study area I.

spontaneous vegetation, i.e. forest, and by coppice woodland and pastoral range land with associations of garigue and maquis. The latter is the most characteristic vegetation mantle. Several herbs and ground plants growing under the maquis are still collected for cooking or cultivation.

Around 800m is the upper limit of deciduous trees and bushes, whereas higher altitudes are the domain of the coniferous forest. The Sardinian woodland, however, is not dense because of strong winds, fire and deforestation. The prevalent trees are sweet chestnuts and several types of oak such as cork, holm and sessile oak, which are typical at higher elevations on non-limestone soils.

Isolation has resulted in some unusual varieties of fauna; some species in fact reached Sardinia before its separation from the continent and have since evolved differently. Many of the Sardinian species for example are smaller than the continental average. Unique to the island are the albino donkey, the mouflon and the Sardinian deer, while the wild horse and the wild hairy pig are among other characteristic animals. There is also a large variety of birds, the most considerable of which are found in the lagoons and in the mountains.

The human environment

Until the Second World War, the two main economic activities were sheeprearing and mining. This pattern changed during the 1950s with the use of imported oil for industrialisation. However, much of the development in the island in the period between

1955 and 1975 was only a veneer or, as King puts it (1975, p. 155), 'a case of modernisation rather than true development in the economic sense'.

The Sardinian agricultural area at present comprises wood and pastoral land, orchards and cereal and vegetable crops. Despite the fact that agricultural production has been partly mechanised, Sardinia still lags behind the other Italian regions and its unit yields per hectare are the lowest in Italy. Three-quarters of the Sardinian forest was destroyed in the nineteenth century by exploitation from the mainland, i.e. Italy, and the present woodland area of about 300000ha plus a great extent of maquis is of little economic importance. Cork is the most considerable product while timber is used for railway sleepers and pit props.

Livestock products, unlike in other parts of southern Italy, occupy a relevant place in the economy, having represented more than half of the island's agricultural production in the 1970s. The pascolo *brado,* a semi-wild system of livestock farming, was the most widespread practice of past times. Nowadays sheep are the backbone of livestock farming, while goats and cattle are still locally important although in decline. Fishing, by contrast, seems never to have been one of the principal activities of the Sardinians, despite the good supply of fish in the surrounding sea.

Tourism is one of the most important economic sectors of Sardinia, having grown considerably in the post-war period. However, most of the tourist development has been left in foreign hands. This shows again that Sardinia is an exploited land rather than a region of enterprise. Because of the pre-eminence of natural over cultural resources, moreover, Sardinian tourism has a seasonal (summertime) and local (coastal) character. However, recent improvements, like the creation of national parks and protected areas, are contributing to a new configuration of the tourist industry, closer to culture and nature and more concerned about the environment.

Sardinia is administratively divided into four provinces: Cagliari (capital), Sassari, Nuoro and Oristano. With a demographic density of 69 inhabitants per km^2 in 1992, Sardinia is underpopulated in comparison with the other Italian regions. The distribution of population reflects historical factors. The pirate raids, which lasted for centuries, caused for example the abandonment of coastal areas and the concentration of inhabitants in the mountainous interior. Over time some of the mountain people moved down to settle on hilly and flat pastoral land, forming isolated homestead settlements. In recent decades, however, the most rapid growth has occurred in the largest towns due to economic development, in the lowland plains due to agricultural development and along the coast due to tourist development. By contrast, the mountain villages have continued to lose population.

Sardinian civilisation has been generally identified with a mountain society where the strong nationalistic resistance did not allow any continental influence but supported autonomous Sardinian aspirations. These induced the Italian Constituent Assembly after the Second World War to declare Sardinia an Autonomous Region with a Special Statute *(Regione Autonoma a Statuto Speciale).*

This peculiar character of Sardinian history is found not only in its insularity but also in the way in which its social elements are organised. Within this context, the landscape itself is another feature which reveals Sardinia as a land of contrasts. It is not unusual for example to see shepherds leading their flock to pasture near oil-refining industries, flamingos flying over the lagoon just near the foot of high residential buildings of a big town and modern tourist settlements being built very close to vernacular buildings like the antique *stazzi*. All these sights are significant as they show to what extent external developments can occur within Sardinian society without causing a loss of identity.

In Sardinia regional identity indeed is not just a tourist fiction but something alive. In some island villages people still wear ancient costumes daily and not only on special occasions such as folklore festivals, marriage and religious holidays, while festivals are really an expression of the islanders' history and ethnicity.

9.2
Changing rural landscape in Sardinia

Methodology

The study of landscape history in Sardinia is based on the relationship between man and landscape. The methodology proposed in chapter eight has been applied with the aim of initiating a process for a new understanding in landscape history. The approach accordingly is both ecology and anthropology oriented, intending to explore the interactions between the natural and cultural processes which have modified the Sardinian landscapes. This type of study in addition has assessed which past land use policies were determinant in changing the landscape. Specifically, it has assisted towards a comprehension of the events that caused positive or negative impacts on landscape and in turn has identified appropriate or inappropriate use of the land in a particular space over time. The aim is that the study of the past should be turned into a lesson from which we can advance a sustainable and thus ecologically sound planning of the future of the rural cultural Mediterranean landscape.

The study has to be considered as a preliminary investigation of landscape history in Sardinia. As such, it is based on published literature. Initially particular attention has been given to issues relating to biotic aspects of vegetation, wildlife and agriculture. Then the Sardinian economy and society have been explored, concentrating on land use, local culture and attitudes towards the environment. The complexity and the amplitude of the subject however did not allow all the steps set out in Table 8.1 to be followed. Specifically, steps three (remote sensing) and five (interviews) have been omitted, since they appeared more pertinent to small-scale studies carried out later (e.g. the Rio S. Lucia). Therefore the procedure has followed the five steps described below.

First, recent literature on the past Sardinian environment has been reviewed and old volumes from Sardinian archive libraries have been explored. Second, historical maps and pictures have been viewed in public archives both in Sardinia and in Tuscany (IGM Archive). Third, past researches on physical, biological and anthropic attributes of the island have been examined in university and regional libraries. Fourth, investigation in the field of the collected material allowed a check on the validity of the work. Fifth, final analysis has furnished a delineation of the landscape history of the island, which has already been presented in previous publications (Pungetti, 1995, 1996b). For this reason, we refer readers to those for the history of Sardinian landscape. Hereafter, however, a discussion on the past Sardinian cultural environment is given, useful for understanding the main features of that society where rural landscapes developed.

Anthropological background

The link between man and landscape has strong implications for Sardinian history. Here landscape is deeply connected to society, which developed differently from the rest of Italy. Sardinia is pre-eminently an island: it is one of the few Mediterranean regions which have conserved their own character. Unlike other big islands such as Sicily or Crete where the sea was a vehicle of cultural influence and change, for Sardinia the sea proved an obstacle to cultural interchange, but nevertheless provided a passage for foreign enemies who dominated and exploited the island (Le Lannou, 1941). The need for survival resulted in a concentration of population inland rather than on the coast, leading to the development of an original pastoral culture. Thus for centuries Sardinian society was static, behind its time and nowadays is still a society 'out of every time' as Mattone (1984, p. 22) puts it.

The antagonism between sheep-farming and agriculture has marked Sardinian history for centuries. It derives from the shortage of both fertile and pastoral land. Shepherds were forced to find pasturage through the practice of transhumance, with the resulting development of a nomadic and warrior class characterised by a closed mentality and confined to the mountainous inland. Peasants by contrast were sedentary and pacific and practised an archaic type of agriculture close to the villages.

Historical events, however, were not the only determinant of change in Sardinian society. In the post-war period, for example, society underwent such a rapid shift from rural to urban as to constitute an 'anthropological crash' (Brigaglia, 1984). It deranged the structure of productive sectors and territorial organisation and above all it deranged culture. This shift also had a strong impact on natural environment, transformed by agricultural land use and urban expansion. Since that period Sardinian landscapes have undergone rapid modification. Agricultural improvement has produced the widespread establishment of greenhouses, hence changing rural lowland landscape. Industrial and residential spread in addition has encroached on fertile land, affecting agricultural ecosystems, while tourist expansion has often destroyed seaside bushland, affecting coastal ecosystems.

Conclusions

This sketch of landscape history has confirmed the correlation between site, society and land use evidenced also at local level. This correlation persisted over many years and was a determinant of landscape changes. Land use patterns in addition were modified according to both geographical location and type of local community. In particular, the original trends resulted in the development of two cultures, namely the shepherds' and the peasants', which were nonetheless correlated with geographical locations (i.e. upland and lowland) and with different land uses (i.e. pasture and cultivation). Nowadays the situation is different, although there are still signs of this unique culture in life-style, policies, land management and landscape as well.

Previous studies of historical developments and landscape changes in Sardinia (Pungetti, 1995, 1996a, 1996b) demonstrate the link between people and land. This link is a preliminary to any study of cultural landscape and should therefore be taken into account in approaching sustainable planning of Mediterranean rural areas.

9.3
Landscape assessment of Sardinia

Methodology

Sound landscape assessment is a preliminary to sustainable landscape planning. In Sardinia, however, only a few attempts have been made in this direction (e.g. Pungetti, 1996a, 1996b) which presented applications of the method for addressing rural landscape assessment proposed in chapter eight. We refer to those for the landscape assessment of Sardinia, offering here just a brief overview. This method in landscape assessment is based on landscape classification, description, evaluation and final analysis.

Classification of Sardinian landscapes

It has been proposed (Pungetti, 1996b) that a simplified but valid landscape classification of Sardinia should consider different types of rocks and soils. Following this method, it is possible to classify 13 types of landscape for the entire island:

1. Landscapes on limestones, dolomites and dolomitic limestones of the Palaeozoic and Mesozoic
2. Landscapes on metamorphic rocks of the Palaeozoic
3. Landscapes on intrusive rocks of the Palaeozoic
4. Landscapes on acid and intermediate effusive rocks of the Cenozoic
5. Landscapes on basic effusive rocks of the Cenozoic and Neozoic
6. Landscapes on organogenous limestones, calcarenites, sandstones and conglomerates of the Cenozoic
7. Landscapes on marls, sandstones and marly sandstones of the Cenozoic
8. Landscapes on sedimentary formations of the Cenozoic of Cixerri and Ussana
9. Landscapes on alluvial deposits and aeolian cemented sandstones of the Neozoic
10. Landscapes on alluvial sediments, conglomerates, aeolian sandstones and calcareous crusts of the Neozoic
11. Landscapes on aeolian sands of the Neozoic
12. Landscapes on littoral sediments of the Neozoic
13. Urbanised landscapes: residential, industrial and tourist settlements

The model followed has been based on three parameters: lithology, altitude and land cover. In this way 12 different groups of rocks and sediments have been defined (the first parameter), to which is added the urbanised area (landscape type No. 13). Each group is associated with a particular type of soil and each of these with a landscape type. Each landscape type is in turn composed of landscape character zones and varies with morphology (the second parameter) and land cover (the third parameter).

The previously collected data have been assessed through their analysis and mapping. Maps have been divided into five categories: (a) landscape regions, (b) landscape types, (c) landscape character zones, (d) landscape parcels and (e) landscape elements. The *landscape regions* are areas where landscape presents similar climatic, physiographic, biological, economic, social and cultural characteristics. The related maps are at the scale 1:50000. The *landscape types* are general categories supporting the physical elements of landscape, such as geomorphologic features (e.g. rocks, relief, altitude and soils). Maps of these elements have been produced on the basis of map data collection at the scale 1:25000. The *land character zones* are units of landscape that can be defined as part of a landscape type, showing the pre-eminence of a particular feature and making up a homogeneous type of landscape, for example the upper part of a mountain, a cliff, a part of the plain, the coast, the lagoon and the historical centres. These maps have been produced on the basis of field data collection at the scale 1:10000.

The landscape, lastly, is made up of *landscape parcels* and *landscape elements.* The first are different patterns of soil, vegetation and cultivation (e.g. an extent of bare soil, a maquis, a woodland, an orange grove) as well as constructions, villages and historical sites. The second are single elements (e.g. an outstanding tree, a villa, a nuraghe). Landscape parcels can be mapped on the basis of the field data collection at the scale 1:5000–1:1000 and the landscape elements can be overlaid on these maps. At this stage the use of a computer system for geographic information management can help to analyse the data more clearly. For easily accomplishing this task, a Macintosh-based program such as MapGrafix has been used.

Description of Sardinian landscapes

The above landscape classification was indispensable for setting up a basis for a type of landscape description which takes into account not only relief and land cover but also scenery, threats, values and above all ecology. The scenery is determined by the visible landscape features, the threats by the risk of destroying landscape and the values refer to the reasons which make a landscape interesting. There has to be added the ecological component, which is the most important feature in the context of this study and therefore requires particular attention.

In the description of Sardinian landscapes, therefore, eight components have been considered: lithology, topology, soils, land cover, land use, scenery, threats and values. The intention of such a description, which follows the classification proposed above, is to provide an overview of the various Sardinian landscapes already offered in a previous work (Pungetti, 1996b).

Evaluation of Sardinian landscapes

An attempt was made to evaluate Sardinian landscapes in Darwin College, Cambridge with an audience coming from different backgrounds and hence appropriate for discussing such a broad topic as landscape. It was also an opportunity to elicit responses on visual perception.

The experiment consisted in showing 24 slides on different types of Sardinian landscapes grouped in six categories: history and culture, land and water, lowlands, uplands, built environment, degraded landscape. Everyone was given an evaluation card and asked to evaluate, between one and three, each of the images, choosing attributes from six groups provided on the card (Table 9.1).

The evaluation was based on landscape perception as a matter of instinct. On purpose in fact no definition of the attributes that the audience had to evaluate was provided, only a general overview on the topic of landscape

Table 9.1 Card for landscape evaluation used to obtain responses in visual perception

EVALUATION CARD

Gender	female	___	male	___
Slide	No.	......	subject	....
Landscape evaluation	1. beautiful	___	ugly	___
	2. interesting	___	uninteresting	___
	3. harmonious	___	discordant	___
	4. open	___	enclosed	___
	5. colourful	___	monochromatic	___
	6. safe	___	threatening	___
Comments	....			

psychology and evaluation focusing on visual perception, landscape experience and interpretation. In addition, an outline of Sardinia was offered to introduce the environment where the images were located, together with a brief objective description of each slide.

A positive response was offered by the audience which generally appreciated the types of landscape shown. Women showed more sensibility and interest in the images and greater willingness to comment. They also made different evaluations from the men, choosing more easily to identify what they termed beautiful types of landscapes and tending to dislike what they termed unpleasant views. In general the most chosen attributes were beautiful, interesting and harmonious, while the least chosen were enclosed and uninteresting. Moreover, the images of the first two groups of slides, namely history and culture and land and water, were the most appreciated types of landscapes. Details of the analysis are provided in a previous work (Pungetti, 1996a). Ideally the exercise should be repeated in Sardinia but resources did not allow this, and further research is required to examine the local people's understanding of their landscapes.

Analysis of Sardinian landscapes

Today the Sardinian lowland landscape is typical Mediterranean open land, being used for cultivation and mainly for cereals. The upland landscape on the other hand presents steep hillsides with thin soils, used for sheeprearing and afforestation or simply left in their natural state. In the open land the eye sweeps the horizon, since this area is always treeless, as is a large part of the Italian agricultural area. The monotony of the flat view is sometimes interrupted by gentle slopes (up to 100 metres high), fruit and olive trees, vineyards and orchards. The landscape radically changes with the appearance of greenhouses which bring discordance to the traditional Sardinian rural patterns. Such a discordance is reinforced when greenhouses are just covered by plastic instead of proper glass. This is partly due to the fact that in this temperate region glass is not required all year long. Moreover, it is a reflection of the Mediterranean culture, where developments are often carried out by individual initiative rather than by a general scheme of public planning.

The Sardinian rural landscape of the plains differs from the rest of Italy in the way in which the settlements are concentrated. Farmhouses for example are not scattered over the territory but rather grouped in small villages. This is especially connected to the Sardinian peasant character which prefers a life-style characterised by social events.

By contrast, the rural landscape of the inner island is scattered with hamlets, each surrounded by a small area of orchards and tree cultivation (e.g. vineyards, olive and almond trees). Shepherds' houses are generally isolated as a reflection of the individual character of this social group which prefers the solitude of the countryside. Beyond those there is the open land with large fields bounded by stone walls delimiting the properties. This is the zone of cereal growing and sheep-rearing which does not require buildings apart from shepherds' sheds.

This antithesis between plains and mountains underlines the link between man and landscape in the Sardinian rural areas. It also illustrates the distinction between lowland farmers and highland shepherds. As history teaches us, co-operation between the two groups has always been a problem. An exception is the system of *communellas,* which is a sort of organisation between shepherds and farmers that still persists. It is used for example to control the rotation system so that the land can be utilised in turn for both cultivation and sheep-rearing. Rural life clearly is an expression of Sardinian culture and society that emphasises a particular pattern of thought and life as a common heritage of those people and characterises patterns of landscape too.

9.4
Planning rural landscape in Sardinia

Methodology

Policy issues and implementation reflect the culture of the place where they originated. The course of landscape policy, planning and management in Sardinia during recent decades has been described already in previous works (Pungetti, 1996a, 1996b). Their shortcomings are, however, pointed out below. Because of the scarcity of literature available on landscape policy, planning and management in Sardinia, moreover, the material previously presented comes from a study carried out during fieldwork in the island interviewing experts from different sectors, mainly from regional offices, and analysing legislation and material relevant to the topic.

Landscape policy is an essential preliminary to planning any area of landscape. Although the State has the task of issuing acts and defining general policy on landscape protection, any sustainable development of the land actually takes place at the local level. In this regard the Region can be identified as the intermediate level between the national and local, with the task of setting up guidelines for physical, environmental and landscape planning. The special status of the Autonomous Region of Sardinia in particular gives it legislative power in the field of town and physical planning, as well as in landscape and environmental planning. The regional legislation on these fields has been examined in the above-mentioned study, considering those aspects pertinent to the rural landscape.

Environmental policy and planning procedures in Sardinia

The exploration of environmental policy and planning procedures in Sardinia (Pungetti, 1996b) indicates to what extent the Region has tackled the problems related to landscape. The transfer of power on environmental matters from the State to the Region and in turn from the latter to its departments was aimed at distributing control among sectors and co-ordinating them. Unfortunately the Region did not succeed in this task and accordingly friction was rather common at departmental level.

Regional programming lacked defined objectives and, what is more, clarity in the division of control between different departments. Sometimes for instance there were discrepancies between annual and long-term budgets, as well as between programming and planning. The local level is no more promising. An example is the development plans strictly connected with the socio-economic regional programmes, which could have made a contribution to environmental and landscape planning but this did not altogether happen because their objectives were not implemented.

The delay in approving legislation in relation to town planning and environmental protection is another cause of a situation fraught with difficulties. In its attempt to solve problems, however, the Region posed other questions, often bigger than the existing ones. Most of the coastal Sardinian municipalities for instance intended to solve part of their economic problems by creating coastal tourist zones, namely available sites for tourist development which were found along the coast and later were built. Since such a development did not follow preordained programmes, the consequence has been a general destruction of the natural features of the coast.

The paradox is that the Autonomous Region of Sardinia has produced many laws on environmental protection as far back as the 1950s. Despite all these laws, the present environmental situation in Sardinia is worrying. As an example, most municipalities are throwing away solid wastes in unregulated waste dumps. The situation cannot be expected to improve in the future despite the request for financial support for the design and the establishment of new waste dumps. The situation of disposal sites for liquid waste is more acceptable but quality control is rather scarce and industrial disposal sites are insufficient. Although acts and even plans (e.g. the Water Plan) have been issued on the matter, they have failed in both planning and controlling the problem. The Water Plan for example identifies neither the traditional resources and their use, nor the environmental impact of the proposed solution. Therefore, there is an urgent need for more advanced environmental laws and their appropriate implementation, as a preliminary to nature and landscape protection.

Lastly, in the island there are a few cultural environmental groups interested in nature conservation. They have made many appeals and recommendations, but in such a setting every attempt requires twice the normal effort. Although increasing attention is nowadays paid to environmental issues, much has still to be done in order to meet the task of developing sustainable landscape planning strategies and policies in Sardinia.

Landscape planning in Sardinia

Some progress has been made by the Autonomous Region of Sardinia in the field of landscape planning. First, the Regional Town Planning Law (L.R. 45/89) has ensured protection of landscape within two kilometres of the sea water line. Second, the implementation of the Galasso Act (chapter seven) has proved essential in providing a *modus operandi* for landscape planning in Sardinia. To accomplish landscape protection the Region chose to intervene in 14 areas of particular landscape value instead of developing a single plan for the whole island (Fig. 9.2), causing a fragmented type of planning characterised by heterogeneous landscape protection. The Rio S. Lucia catchment, illustrated later, is partially involved in the Landscape Plan of Marganai-Montiferru.

The 14 landscape plans make up the Landscape Territorial Plan of Sardinia (1993). The environmental-landscape unit has been chosen as a basis for landscape planning. Since the plan considers natural resources, ecosystems and historical transformations of the island, it might act as a basis for environmental and landscape control.

Landscape management in Sardinia

The idea of developing a series of protected areas was proposed as early as 1956 at a meeting of the IUCN in Copenhagen, where protection of Sardinian fauna and environment was discussed for the first time. From that period a few scientific studies by CNR (National Council for Scientific Research), SBI (Italian Botanical Society) and others have made a contribution to a knowledge of the ecological characteristics of Sardinian

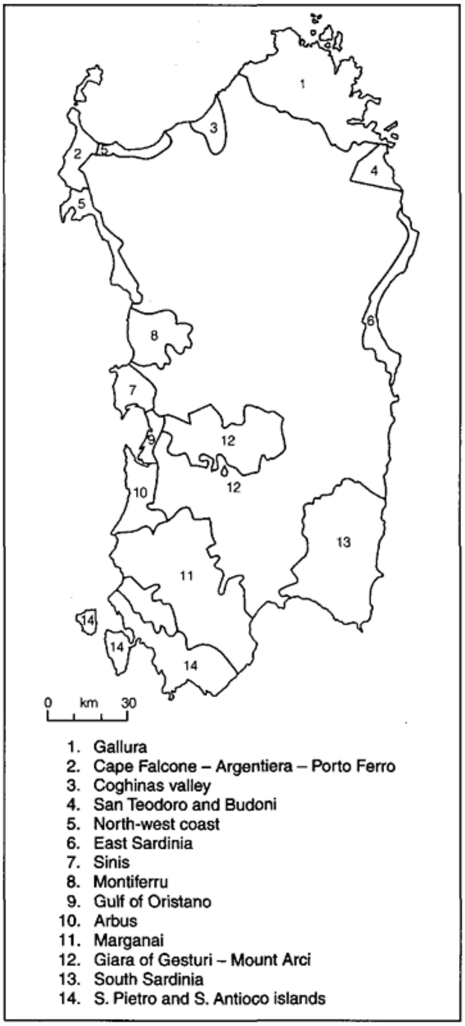


Fig. 9.2 The 14 areas of the landscape plans in Sardinia.

landscapes (Pungetti, 1996b). These studies led to projects for the management of biotopes and the protection of wetlands and, last but not least, to proposals for a system of Sardinian parks.

The latter became decisive in setting up a regional law on parks (L.R. 31/89) as an attempt to define a policy for regional re-planning between 'strong' and 'weak' areas linked to economic and social development. Co-operation between different institutional levels and between institutions and citizens is clearly essential for the implementation of such a policy. The law defined nine natural parks, 60 natural reserves, 24 natural monuments and 16 areas of outstanding natural value (Fig. 9.3).

The implementation of the law was defined in three main steps. First, setting out a plan for each natural park, including financial and management

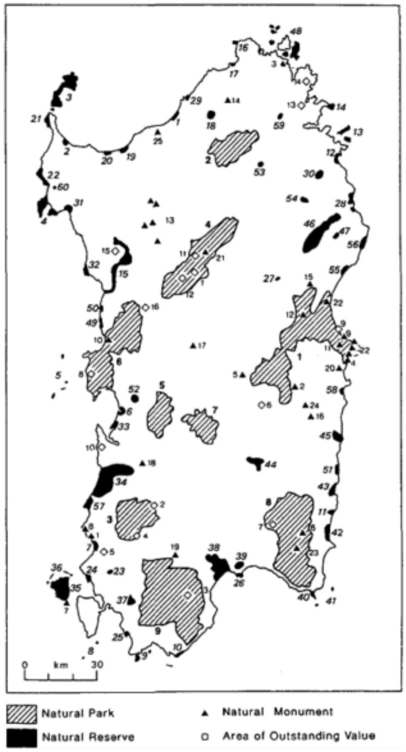


Fig. 9.3 Areas of outstanding natural value in Sardinia.

proposals. Second, drawing up plans for a new coastal disposition, mainly for areas of outstanding natural value. Third, a new procedure for identifying and establishing natural monuments. However, the implementation has been weak and the Region is still far from achieving ecologically sound landscape planning and management. Further discussion on the topic is provided in section 9.9.

9.5 Introduction to the Rio S. Lucia

Abiotic features

The Rio (river) S. Lucia is situated in the Sulcis peninsula in the southern part of Sardinia (Fig. 9.4). The area of the Rio S. Lucia watershed is nearly 110km^2, developing from

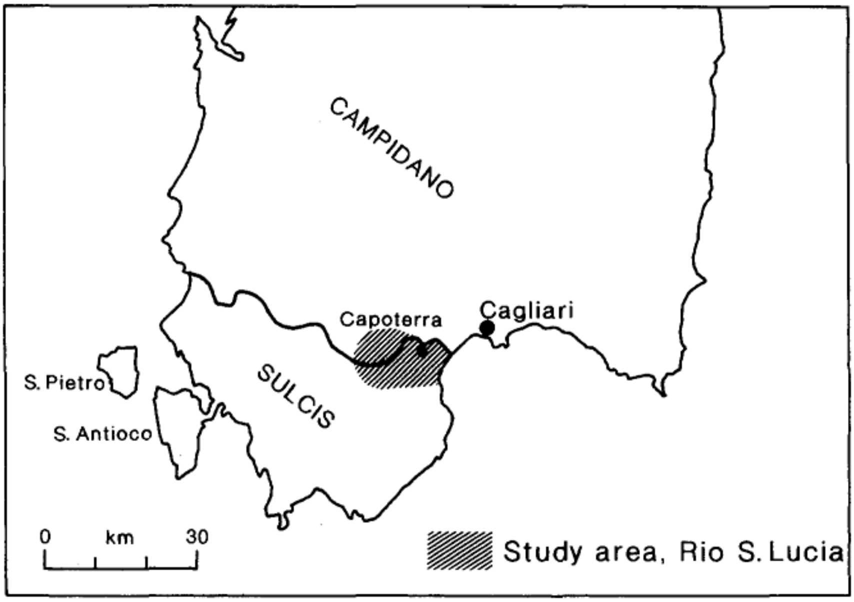


Fig. 9.4 The Rio S. Lucia in the Sulcis peninsula.

Mount Lattias to the S. Gilla Lagoon, and belongs to three municipalities: Assemini, Capoterra and Uta, all in the province of Cagliari (Fig.9.5).

From a geomorphologic point of view the area can be divided into two districts: the upland and the lowland. The upland, of about 83 km2, is characterised by Palaeozoic bedrock with sharp relief and deep valleys, and presents two sub-basins: Gutturu Mannu and Guttureddu. They meet in the lowland, forming the Rio S. Lucia which after 22 km flows into the southern part of the S. Gilla lagoon. The plain covers an area of about 27 km2, including the lagoon and the town of Capoterra. The coastal plain has a considerable aquifer system, but unfortunately the original water table has been changed by man, and ground water exploitation has produced salt intrusion both in the aquifer and in the soil.

Two main geological periods can be distinguished: Palaeozoic and Quaternary. The former is present in the western part of the upland and is represented by metamorphic

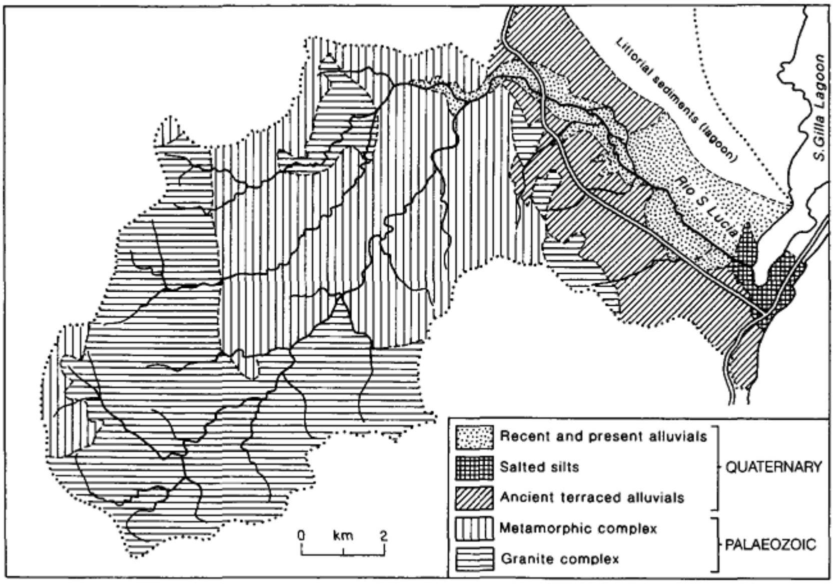


Fig. 9.6 Hydrogeological map of study area II.

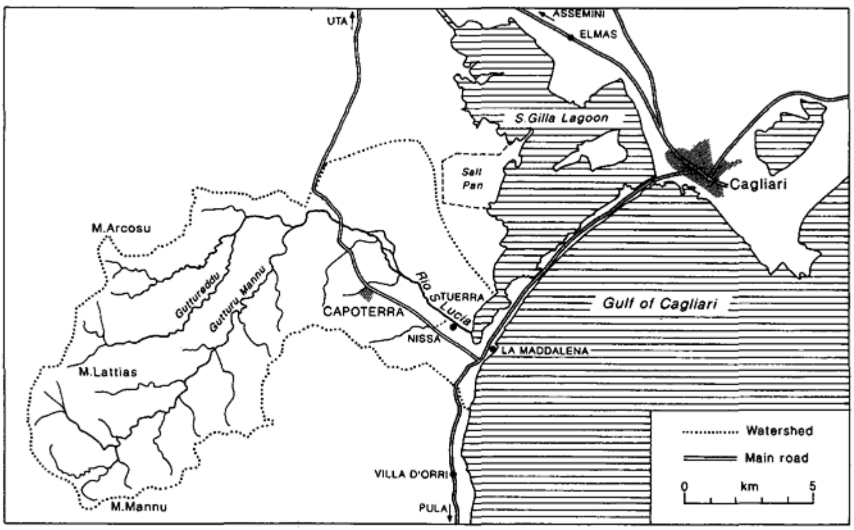


Fig. 9.5 Geographical map of study area II.

rocks, while the latter can be found in the lowland (Fig. 9.6).

Biotic features

In the highest part of the river basin where morphology and exposure lead to a colder and more humid climate, woods of holm oak *(Quercus ilex)* are present with underwoods of oleaster (in particular *Phillyrea latifolia),* laurustine *(Viburnum tinus),* butcher's broom *(Ruscus aculeatus)* and sarsaparilla*(Smilax aspera),* all typical species of the climax series of the ilex forest. These woods, widespread up to 1200/1400 m, always have a modified structure due to human intervention (e.g. the practice of clearance by fire). Where this has happened the vegetation is more sparse and there is a prevalence of strawberry tree *(Arbutus unedo),* heath (in particular *Erica arborea*), juniper (in particular *Juniperus oxycedrus*) and asparagus (in particular *Asparagus acutifolius),* while on the granitic substrate the dominant species is cork oak *(Quercus suber).*

At lower altitudes where slopes are gentle and exposure is warmer, the ilex wood degenerates into sclerophyll brush. Here the ilex is no longer dominant and the mixed forest of evergreen sclerophyll takes its place with oleaster, strawberry tree, heath, juniper, olive tree (Olea *oleaster*), lentisk *(Pistada lentiscus),* myrtle *(Myrtus communis)* and the typical holm oak. This type of vegetation forms a quite high and widespread maquis which constitutes a good protection for the soils.

Finally, in the last and more open part of the catchment the maquis becomes lower and more degraded. This is the area of brush and coast maquis made up of helio/xerophile species, such as juniper (in particular *Juniperus phoenicea*), carob tree *(Ceratonia siliqua),* oleaster (in particular *Phillyrea angustifolia*), broom *(Calicotomespinosa),* euphorbia (in particular Euphorbia *dendroides*), rock rose *(Cistus)* and asphodel *(Asphodelus).*

Unfortunately there is a scarcity of specific information about fauna. General data on the upland tell us about the presence of the Sardinian deer, mouflon, fallow deer, wild hairy pig, fox, hare, wildcat, wild rabbit, hedgehog, viper, sparrow, crow, partridge, royal and Bonelli eagle and many migratory birds (Olita and Oppes, 1990). The lagoon is characterised by the typical fauna of Sardinian wetlands (Casu *et al.,* 1984), that is, amphibians, reptiles, numerous insects and migratory birds. Among the latter there are many pink flamingos, ducks, coots, purple gallinules and pink gulls.

Human features

The population dynamic of the catchment area is now resulting in an increasing number of inhabitants, causing the spread of urban sites (Aru and Barrocu, 1993) especially after the 1960s when Capoterra became a 'dormitory town' for Cagliari. This increase is a common trend of the countryside around the city, whereas the hamlets of the study area have shown a gradual decline. The uplands, in addition, are no longer a favourable location because the resources they can offer (e.g. game, charcoal, wood, mines) cannot compete any more with the more attractive resources (e.g. tourist) of the coast lands. These trends can be better understood through the excursus on landscape history, assessment and planning in the area as illustrated in the following sections.

9.6
Changing rural landscape in the Rio S. Lucia

Methodology

The methodology used for addressing landscape history in the Rio S. Lucia has been founded on the concepts described in chapter eight. It is thus aimed to be an ecologically and anthropologically sound approach based on the steps: written records, iconography, past research, interviews, field check, final analysis.

The landscape history of the study area has been conceived within the historical framework of Sardinia, considering human impact on the environment and related landscape changes. Therefore, policies on land use have been explored within their socio-cultural and economic setting and their interference with landscape has been documented. Other information on land use, in particular on agriculture, forestry and grazing, has been collected and examined, as well as statistics on vegetation and wildlife.

The difference between this approach and the previous one employed for the landscape history of the entire island (*cf.*section 9.2) is the use of informal interviews with local people, especially the aged, who added elements to the history of the site and helped to clarify several events of this century. This has provided an outline of the landscape changes through the interrelation between site, society and use of the land.

Ancient times

The Rio S. Lucia is situated in the Sulcis peninsula, an area populated since ancient times. During early prehistory, the original Mediterranean forest was the dominant aspect of the landscape, changing in the Nuragic period (1500–238 BC) with the early development of agriculture, animal breeding and monumental architecture (e.g. the *nuraghi*).

At that time contacts between the pastoral Nuragic culture of the island and the east Mediterranean intensified. Accordingly, trade and demand for timber and building material increased (Atzori, 1985), inducing exploitation of minerals, sand and gravel. It was also the period of the first contact between locals (Sardinians) and foreigners (Carthaginians), limited however to the coastal area of the catchment. This contact influenced land use and consequently brought changes to the lowland landscape (Meloni, 1975). The Carthaginians (509–238 BC) for example transformed the usable lowland into wheat and barley fields (Mattone, 1984), but controlled the wood cutting in the hills, especially of the vineyards and olive trees (Barreca, 1974).

A more notable landscape modification happened during the Roman period (238BC-AD 456) with new settlements and construction of roads, while agriculture consisting mainly of cereal fields and vineyards was improved using Roman techniques based on centuriation. The Romans too did not reach the inland areas, where the forest maintained its original features (Bresciani, 1850). The land reorganisation imposed by the Roman legions, with land subdivision through *latifundia* and inland fields taken away from the natives for cultivation, restricted the local pastoral economy. It was at this time that rivalry started between upland shepherds (representing the natives) and lowland peasants

(Roman slaves) (Meloni, 1975), resulting in a problematic relationship between the two groups which has persisted through history.

The Middle Ages

Under the Byzantines (533–900) after the fall of the Roman Empire, agriculture was influenced by the religious orders who introduced the rotation system, alternating cereals with legumes for improving fertility (Brigaglia, 1982). The appearance of monasteries surrounded by agricultural fields modified the rural landscape of the study area.

Between the eight and the tenth century, the recurrent Moslem attacks caused a decline in both commerce and cereal production as well as forcing the lowland population to move to the upper inland for more security. Hence citizens turned into peasants and shepherds, and terraced cultivation was a common feature of the inner landscape. In addition, the diffusion of malaria caused a further abandonment of a great part of the Sulcis (Olita and Oppes, 1990), including the mountains. Accordingly, semi-natural vegetation prevailed again, with bushes and woods covering the once cultivated upland fields and with the Mediterranean maquis spreading at lower altitudes.

The Moslem threat led to the appointment of four judges *(giudid)* with both military and religious power (900–1420). The island was thus split into four regions *(giudicati)* subdivided into territorial districts *(curatorie).* The latter were managed by the administrator *(curatore)* who had control over land use and land property, assigning land to peasants and shepherds for agriculture and animal breeding (Atzori, 1985). The prevalence of extensive cultivation, moreover, encouraged the persistence of the *latifundia,* a common feature of the lowland landscape of the Rio S. Lucia and the Cagliaritano, together with scattered *villae* made up of small rural centres and *corti* made up of farmhouses. The study area furthermore was populated by peasants and citizens, while the mountains were dominated by shepherds with a generally aggressive attitude (Boscolo, 1978). This induced the peasants to choose cultivated lands close to the safer urban areas (Mattone, 1984) with a further modification of landscape in the surroundings of rural villages.

The *pauperile* (i.e. open lands) and the *cunjadus* (i.e. enclosed lands) were typical patterns in the mediaeval agricultural landscape of the Rio S. Lucia (Pungetti, 1996a). The open lands were cultivated with cereals using the above-mentioned rotation system and were often invaded by livestock which lived wild in the field. The enclosed lands were planted with vineyards and orchards, with limited cultivation of olives later encouraged by the Spanish. These lands were generally bounded by a ditch or a fence while the open lands were simply delimited by a few big stones (Boscolo, 1978).

In the thirteenth century the Marine Republic of Pisa, which helped the Sardinians to defeat the Moslems, expanded in the Sulcis, intending to gain ports and to exploit the coastal saline. Trade and the demand for timber increased and accordingly the forests of the upland were exploited (Atzori, 1985). In the fourteenth and fifteenth centuries the population movement from the countryside to coastal settlements brought about a further change in the rural landscape, which was enriched by open lands valuable for agriculture.

It also affected the S. Gilla lagoon which was crossed by boats loaded with wood from the nearby forests.

At the end of the Middle Ages several events caused a further decline of the local agriculture with diminishing of cultivated areas, especially vineyards and olive trees, and unavoidable landscape degradation.

The House of Savoy

At the beginning of the eighteenth century the House of Savoy (1718–1861) started to rule the island which was facing lean harvests, scanty trade and decrease of population. The lowland of the Rio S. Lucia was predominantly agricultural and pastoral land, the wetland was cultivated with bulrushes and leeches and the upland forest was exploited for charcoal and wood production as well as used for hunting and wild grazing. The hills in particular were covered by maquis with prevalence of lentisk, arbutus and rock rose (Casalis, 1833).

At the beginning of the nineteenth century when the Royal Family went in exile to Sardinia, there was the opportunity to put forward a policy for the economic transformation of the island. This was based on two main ideas: the predominance of agriculture over sheep-rearing and the link between land property and land use (Scaraffia, 1984). In the lowest part of the Rio S. Lucia a few reclamation works were carried out, aiming at reducing malaria and regenerating marshes, together with the partial drainage of the S. Gilla lagoon and the diversion of small stretches of the river.

This development was helped by Stefano Manca di Villahermosa (1767– 1833), one of the few islander agricultural experimenters of that time. After having gained rapid military advancement in Turin, he went back to Sardinia, where he inherited the Villahermosa estate between Capoterra and Sarroch, becoming marquis and receiving several appointments from the Savoy. In the estate the marquis planted a great number of olive trees, vineyards and fruit trees, introducing new agricultural techniques previously learnt in Turin such as the practice of irrigated citrus and the grafting of oleaster (Scaraffia, 1984). Helped by a great enterprise ability, he created a model estate, leading the Sardinians towards cultivation rather than grazing development. In that period, in fact, modern farmlands with cultivation of carob trees, vineyards, olives and oranges spread in the plain of our study area (Atzori, 1985).

The land development attempted by the Marquis of Villahermosa transformed the scene of the entire area. A large number of fields were turned from forestry and stock-rearing into cultivation. Thus the landscape changed from wood and pastoral land to open cultivated land. The introduction of the first agricultural machinery and the English iron plough moreover brought about a new cultivation system, and consequently new elements and patterns of fields appeared in the lowland landscape. Furthermore, the river Bau Mannu in the region of Tuerra (meaning lowland) was partly diverted for irrigation purposes, while on the coast, where unhealthy lands were converted to cultivated or grass fields, the scenery drastically changed from water to land domain. Land use in the upland on the other hand was almost limited to hunting, allowing the semi-natural landscape to reappear and the maquis to spread on the slopes.

The policy of the House of Savoy for tackling the second idea, namely the link between land property and land use, was directed at increasing private property through the creation of a diffused middle class of landowners. This was carried out following three main steps: the edict of the *chiudende,* the abolition of feudalism and the compilation of the first land register (Scaraffia, 1984).

The edict of the *chiudende* (fences) of 1823 allowed the enclosure of the municipality lands with fences and the consequent identification of this procedure with ownership of property (Pungetti, 1996b). The *chiudende* had a noticeable impact on the agricultural landscape of the study area which became characterised by a predominance of enclosed lands. Ditches, shrubs and prickly pears were used to fence the fields in the lowland, while stone walls were generally used in the upland. At the edge of the town of Capoterra there were several market gardens and vineyards. Beyond them the cultivated fields were made up of wheat, barley, broad beans and flax. In the Tuerra between Capoterra and the lagoon, the landscape was dominated by wild fields used for forage while close to the marsh reeds were exploited by the fish-ponds' contractors (Casalis, 1833). In this period an important source of income was the production of faggots from the upland and bulrush from the wetland, both sold in the market of Cagliari for fuel and handicrafts (Atzori, 1985).

The reforms of the Savoy brought about radical changes in society, culture and above all landscape. The point is that the rulers attempted an incisive land and economic transformation without the necessary structural changes in social life. They did not take into account the complexity of the Sardinian culture, based on pastoral families and the concept of communal lands. In particular, the Savoy did not realise that they were going to seriously modify a society based on that equilibrium between man and land, sheep-rearing and agriculture, individuality and collectivity, which had persisted throughout the ages. Because of these changes, landscape was significantly threatened.

This policy left behind a disastrous agricultural situation; only a few estates like that of Villahermosa lived up to the ideals of the House of Savoy, while elsewhere agriculture was mainly practised by poor farmers who continued to use their old systems and to live grouped in villages (Atzori, 1985). In addition, the behaviour of that original aggressive pastoral society, still based on family clans, had repercussions on the landscape too. Trespassing on pasture, disregard of agreements, robberies and murders, feuds and revenge were common and also had implications for the land by way of fire, deforestation and destruction. The political and social circumstances of this period provide a lesson for us to learn.

The twentieth century

Before the twentieth century the middle part of the S. Gilla lagoon was already deliberately converted into salt flats, the lowland of the Rio S. Lucia had undergone agricultural expansion without any planning scheme and the woods of the upland, full of acorns, were used for pigs' pasture. The flocks of sheep in addition grazed in turn the upland in winter and the lowland in summer (Atzori, 1985).

The twentieth century started with an agricultural catastrophe for the area of Capoterra: plant diseases like phylloxera destroyed many vineyards, drought reduced harvests and livestock and the First World War caused a shortage of labour. This agricultural situation, common to the entire island, led to unavoidable economic crisis (King, 1975).

At this moment the fascist dictatorship largely imposed its ideology on the island (Le Lannou, 1941), considering, like the Savoy earlier, fragmented property an obstacle to the progress of Sardinian agriculture (Seghetti, 1928). Moreover, public works and reclamation schemes, including malaria eradication and river control, were attempted within a policy directed to agricultural development. Accordingly, further changes appeared in the lowland landscape of the Rio S. Lucia where agriculture intensified and new drainage channels for land reclamation were constructed. In particular, in 1927 the Conti Vecchi Society converted a great part of the S. Gilla lagoon to new salt flats. This policy, although economically beneficial in providing labour for local people, has caused disturbance to the wetland ecosystems which lost their dynamics and biodiversity. Fortunately, in 1936 the regime, which was failing in its objectives, stopped the reclamation of the zone in favour of more promising areas of the island. In this period part of the income of the hills of the study area came from mining production, which waxed and waned from the last century until the post-war period and finished at the end of the 1960s. Charcoal production, very active in the nineteenth century, ended during the Second World War.

The post-war period was distinguished by agricultural development, directed mainly at the complete eradication of malaria and land reform in the lowland and at the construction of small dams for irrigation water in the upland. Moreover, the early spread of greenhouses in the arable land and quarries for the extraction of sand and gravel along the river modified the local environment to a considerable extent. To add to this, there was the construction of an industrial complex in the plain and the canal-port in the S. Gilla lagoon.

At present the lowland of the Rio S. Lucia is cultivated with cereals, vineyards, citrus groves and market gardens, together with olive, carob and almond trees. Greenhouses and quarries characterise the area, while waste disposal sites are encroaching on abandoned lands. In addition, the development of the town of Capoterra, as well as other small settlements in the hills and on the coast, has had a further impact on the environment. Along the coast, for example, roads have been built to connect the urban zones, upsetting the equilibrium between fresh and sea water.

Furthermore, the development of the hills for residential and recreational purposes has given rise to the demand for nature protection which is partly fulfilled by increasing controls over grazing and by regulations for the practice of fire. Hunting is now controlled by a regional law and is still practised for commercial gain, while the forest is managed by the Regional Forest Agency which acquired it in the 1980s.

The present landscape of the study area is of the type of a Mediterranean catchment, with forest and maquis in the upper part and agricultural open land in the lower part, as described in the following section.

9.7
Landscape assessment of the Rio S. Lucia lowland

Methodology

The procedure used in this study is an attempt to link subjectivity and objectivity in landscape analysis, starting with a descriptive approach and moving to the quantitative through the use of GIS. Landscape character zones are proposed as basic units for collecting and analysing the data. The descriptive approach consists of five main steps, i.e. landscape classification, description, history, legislation and evaluation, while the quantitative approach involves three main steps, i.e. database, mapping and spatial analysis.

The methodology used has been based on the ecological landscape assessment illustrated in section 8.3 and it is therefore advisable to refer to Table 8.2 for a better comprehension of the procedure. For the application of such methodology, the lowland of the Rio S. Lucia has been chosen.

Reconnaissance survey

The reconnaissance survey has followed the five main steps employed in the descriptive approach, i.e. landscape classification, description, history, legislation and evaluation.

Landscape classification

In classifying landscape, the study area has presented that sort of complexity which has suggested a particular subdivision, as outlined in Table 9.2, leading to four main stages. First, the entire catchment has been divided into two *landscape regions* (a) delimited by geographical boundaries, namely upland and lowland (Fig. 9.7). They are rural areas with seminatural environment in the former and agricultural environment in the latter. Second, six main *landscape types* (b) have been identified in the lowland (Fig. 9.8). They have been classified according to present land use and ecological features of the site. Third, the generic nature of the landscape types has led to their subdivision into 12 *landscape character zones* (c). Here the landscape presents homogeneous characteristics so that it can be seen as a unit (Fig. 9.9). Fourth, different shapes of fields combined with differences in land use have been added to the above characteristics, leading to the identification of 29 types of *landscape parcels* (d) defined by an evident border, e.g. road, path, water, hedgerow, trees (Fig. 9.10). Table 9.2

Table 9.2 Attributes for the classification of the lowland landscape of the Rio S. Lucia

Landscape classification – lowland	
Landscape region	lowland
Landscape types	wetland river foothill cultivated land flat cultivated land settlements mixed use
Landscape character zones	lagoon and coast riverside foothill open land enclosed land reclaimed open land reclaimed enclosed land greenhouses residential area industry mixed use infrastructure
Landscape parcels (examples) *open land*	 rectangular field open land polygonal field open land narrow field open land
residential area	urban area suburban flat area suburban hilly area suburban coastal area
Landscape elements *ecotopes*:	 abiotopes biotopes architopes

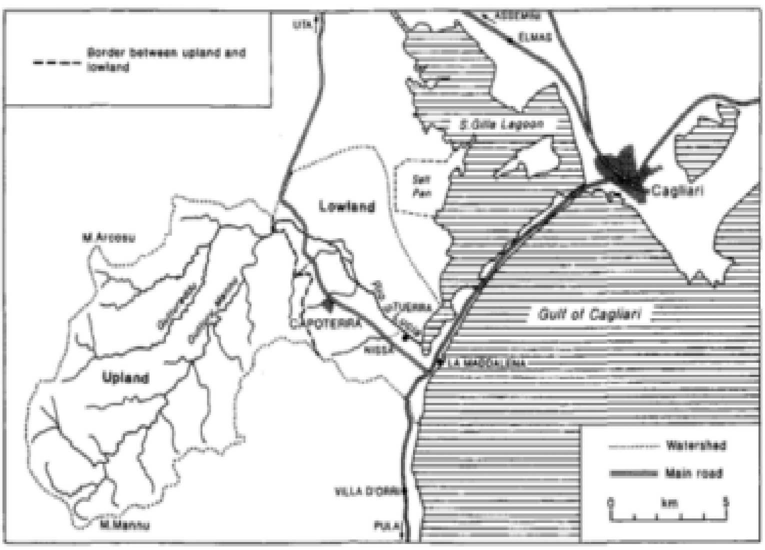


Fig. 9.7 The two landscape regions of study area II.

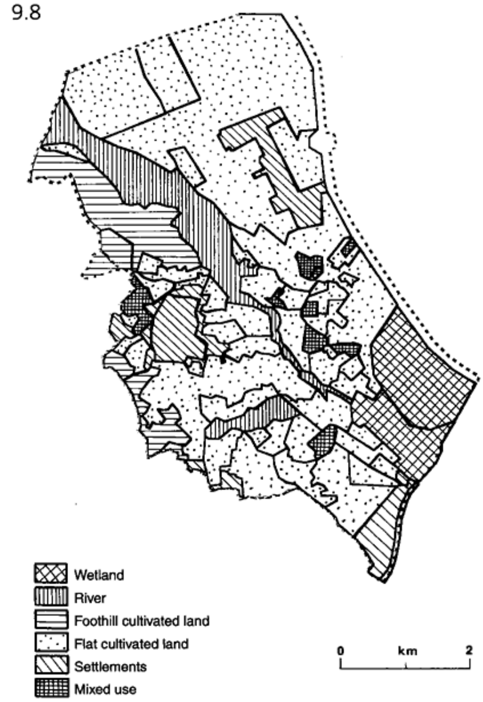


Fig. 9.8 The six landscape types of the Rio S. Lucia lowland.

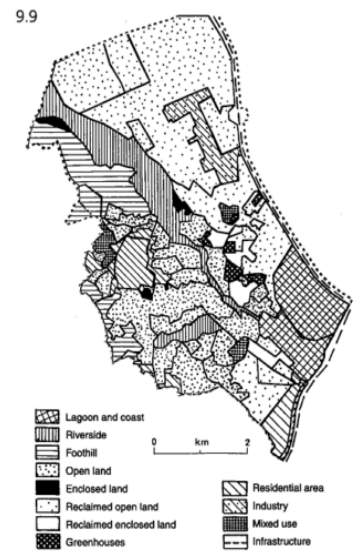


Fig. 9.9 The 12 landscape character zones of the Rio S. Lucia lowland.

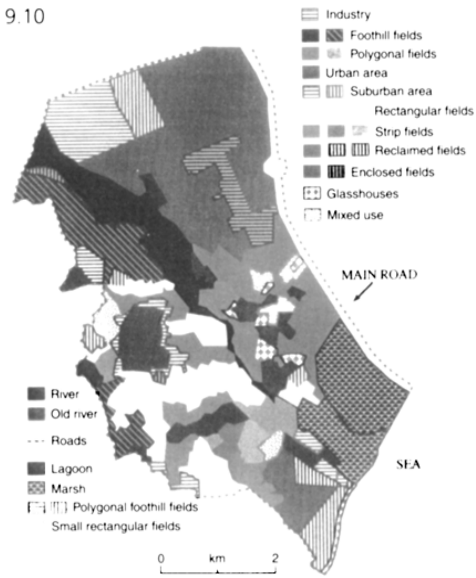


Fig. 9.10 Types of landscape parcels in the Rio S. Lucia lowland.

9.2 shows examples of landscape parcels grouped into two categories: open land defined by field patterns; and residential area defined by settlement patterns. The landscape parcels are made up of *landscape elements* (e), namely the ecotopes, which can be divided into abiotopes with abiotic attributes, biotopes with biotic attributes and architopes with human attributes.

Landscape description

According to the above landscape classification, the landscape description of the study area has taken into account three types of features: *abiotic* (a), *biotic* (b) and *human* (c). Table 9.3 shows the different attributes belonging to each. Specifically, human attributes are linked not only to characteristics like architecture or infrastructure, but also to degradation and use of the land. Most of the data for landscape description derived from existing and collaborative Sardinian works, especially those carried out within the EU MEDALUS II project in Cagliari.

Landscape history and landscape legislation

Human attributes, coupled with the 'spirit of the place', have been added to physical and natural attributes of landscape, giving the assessment a more anthropological orientation.

Hence two subdivisions have been introduced: landscape history and landscape legislation. The attributes gathered for landscape history (Table 8.3) are related to past use of the land, cultural heritage of the place and old elements present in the site, e.g. historical ecotopes and architopes. These elements are of the type of natural, archaeological and architectural monuments with vernacular importance.

Table 9.3 Attributes for the description of the lowland landscape of the Rio S. Lucia

Landscape description – lowland	
Abiotic features	climate morphology elevation slope geology bedrock soils surface water ground water abiotopes
Biotic features	vegetation wildlife biotopes
Human features	land use land degradation settlements transport corridors architopes

On the other hand, a way to grasp what kind of management has been attempted in the study site is to examine landscape legislation (Table 8.3). Landscape-environmental laws and plans indicate the policy that has been adopted. Similarly the number of parks, nature reserves and protected areas indicates the extent to which the manager institutions have dealt with the site.

Landscape evaluation

Landscape evaluation is the last section of the reconnaissance survey. It is the phase of first recording the landscape elements of the site and then identifying specific categories of perception which help us to understand the meaning of that landscape (Table 9.4). The first category is visual perception, using techniques of visual evaluation. The second is aesthetic perception, evaluating the beauty of the place according to landscape experience. The third is psychological perception, estimating the characteristics of the site. The choice of these categories is supported by the discussion proposed in chapter four, while the methodology is based on the trends analysed in chapter five.

Table 9.4 Attributes for the evaluation of the lowland landscape of the Rio S. Lucia

Landscape evaluation – lowland	
Landscape elements	treeline hedgerow power line low tension power line high tension wall building tree and copse glasshouse other linemark
Visual perception	visual scale enclosure visual evaluation view beyond
Aesthetic perception	variety harmony texture colour
Psychological perception	security stimulus pleasure unpleasant sounds pleasant sounds smell

Desk survey

After the reconnaissance survey, the desk survey has been carried out for the assessment of the Rio S. Lucia lowland (Table 8.2). The desk survey has actually constituted a determinant in the present methodology for the assessment, showing differences with other approaches. Whereas previous methods have used GIS to identify landscape structures from an analysis of the environmental data held in a previous database, this approach has started with the identification of landscape character zones by particular aspects, visible in the air photographs. In addition, it puts an emphasis on the local level.

The advantage of this method is that it can be easily undertaken by local people too. Using landscape character zones, moreover, it is possible to build a database of a small range of environmental variables grouped in a list. Through the use of GIS, furthermore, the differences between each landscape character zone can be examined in an exhaustive way. By these means the data can effectively inform the planning process at the very local level.

The procedure of the desk survey has followed three phases: archive exploration, first mapping and database creation. The exploration of the study area's environment has been carried out in Sardinian archives and libraries, being based on existing literature and research. A first mapping, hand drawn, has been accomplished afterwards in order to provide the basis for the field work. Finally, a database program has been chosen and its display has been outlined according to the headings of the card for field survey (Table 9.5). Since the first phase of the desk survey has already been thoroughly dealt with, the following subsections provide illustrations of the second and third phases.

First mapping

Eight pilot sites have been selected to demonstrate the field work (Fig. 9.11). They vary from 50 to 150 hectares in area and are delimited by physical borders. Though they belong to just one landscape type, they can retain more than one landscape character zone or part of it and are made up of several landscape parcels. Each parcel, which constitutes a single sample, presents just one type of land use and has an ID number for its identification. The ID is quoted on its corresponding card for field survey.

Twelve types of landscape character zones, as explained before, have been distinguished in the study area (Fig. 9.9). The same type of landscape character zone, however, has been found several times in the area, thus all the lowland has been divided into a total of 77 landscape character zones (Fig. 9.12). They represent just one type of landscape each.

Database

The third stage involves the database, which includes a section on the identification of the site, landscape classification, description, history, legislation and evaluatton, with a total of 82 fields as listed in the card for field survey. A relational database is essential to allow for six data types (character, numeric, date, logical, memo and picture) to be ascribed to each field.

Field survey

Desk survey completed, the field survey follows with the aim of establishing the technical feasibility of the above assessment. It is therefore not to be considered exhaustive, but just a means to illustrate the feasibility of the proposed method.

The field survey has been conducted using field survey cards. The card follows the steps previously explained. In particular it contains an identification part where each landscape sample is located in the corresponding map and air photo - i.e. section (a) identification - and classified according to the classes previously identified - i.e. section (b) classification.

Before starting the field survey, all the useful maps and the field survey cards were prepared, filling in the information pertinent to the attributes collected in the archive exploration during the desk survey. During the field survey, all the previous listed attributes were checked and new data were gathered following objective data collection and subjective evaluation as in Table 8.2.

Table 9.5 Card for field survey

CARD FOR FIELD SURVEY

1.1.1999

Identification

1. ID No.
2. Pilot site No.
3. Card No.
4. Date
5. Air photograph No.
6. Map No.
7. Map reference

Landscape classification

8. Landscape type
9. Landscape character zone No.
10. Landscape character zone type
11. Landscape character zone %
12. Landscape parcel category
13. Land use type

Landscape description

Abiotic features

14. Morphology
15. Minimum elevation
16. Maximum elevation
17. Slope aspect
18. Slope suitability
19. Geology
20. Soils type
21. Land capability class
22. Soils fertility
23. Soils water availability
24. Surface water type + %
25. Ground water table

Biotic features

26. Vegetation + %

Human features

27. Degradation type (abandoned house, disused quarry, waste disposal site, discarded furniture, uncultivated, mixed, others:...)

28–48 Land use %
(40 Tourist %
(47 Degraded %
48 Mixed %

49. Land use group + % (almond tree, pine, sheep, goat, cattle, pig, fowl, wheat, barley, eucalyptus, carob, potato, artichoke, others:...)
50. Erosion: yes, no
51. Transport corridors type + No. (railway, highway, motorway, road, track, shepherd path, footpath, others:...)
52. Architopes type + No. (outstanding building, factories, villa, bridge, church, shepherd shed, house. others:...)

Landscape history

Historical features

53. Past land use

Computer collation

After the field survey, computer collation was pursued linking the database to a graphic computer program. A first approach to the use of GIS through the Arclnfo program,

54. Historical ecotopes + No. (natural monument, old vegetation, old cultivation, old hedgerow, others:..)

55. Historical architopes + No. (ruin, nuraghe, old settlement, old villa, old bridge, old railway, old church, chapel, tower, fortress, castle, old wall, others:..)

Landscape legislation

Protection

56. Laws
57. Plans
58. Protected areas
59. Manager institution

Landscape evaluation

60	61	62	63	64	65	66	67	68
treeline	**hedgerow**	**powerln-lt**	**powerln-ht**	**wall**	**building**	**tree&copse**	**greenhouse**	**otherlmark**
very high	very high	yes	yes	yes	yes	yes	yes	. . .
high	high	no	no	no	no	no	no	. . .
medium	medium							
minor	minor							
none	none							

69	70	71	72	73	74	75	76
visualscal	**enclosure**	**visualeval**	**viewbeynd**	**variety**	**harmony**	**texture**	**colour**
intimate	tight	beautiful	beautiful	uniform	harmonious	very smooth	monochrome
small	enclosed	interesting	interesting	simple	balanced	smooth	muted
large	open	indifferent	indifferent	varied	discordant	rough	colourful
vast	exposed	ugly	ugly	complex	chaotic	very rough	garish
		very ugly	very ugly	very complex			

77	78	79	80	81	82
security	**stimulus**	**pleasure**	**unplsounds**	**pleasounds**	**smell**
comfortable	uninteresting	high	very disagreeable	very pleasant	very pleasant
safe	bland	low	disagreeable	pleasant	pleasant
unsettling	interesting	none	medium	medium	medium
threatening	very interesting	disagreeable	some	some	bearable
		very disagreeable	none	none	unbearable

however, showed a few inadequacies: first, the long time required to become familiar with it; second, the excessive specificity for general use in landscape planning policies; third, the difficulty of using the program in a field site where no station was available. Thus the choice moved to small portable computers which allow handy and on-site input of data. MapGrafix specifically has been chosen as the computer program to access GIS via Macintosh in a flexible and general way.

The first step to take in the computer collation is the second mapping (Table 8.2), digitising the boundaries of the landscape character zones identified in the first mapping, with more detailed digitising of the chosen pilot sites and their subdivision in parcels. The procedure starts with the data capture by digitising the cartographic data sources with points, lines and polygons. A refining of the drawing should be done later with the help of the editing functions.

The second step is the database completion, that is, the input of the data gathered in the field into the database program. Then the linkage between the database and the computer program can follow.

The third step is the third mapping, where the information listed in the database file has to be associated with a specific geographic location of the study site. Through this joining, several maps can be created with the possibility for them to be plotted or printed, transformed into other cartographic projections or translated into CGDEF files for linkage with other GIS programs.

Fig. 9.11 The eight pilot sites selected for field work in the Rio S. Lucia lowland.

Fig. 9.12 Landscape character zones in the Rio S. Lucia lowland.

Data analysis

Data analysis is the last phase in ecological landscape assessment. While GIS has been omitted here, a discussion on the landscape analysis of the Rio S. Lucia lowland is provided below, following the five stages of the reconnaissance survey illustrated in Table 8.2.

Landscape classification of the Rio S. Lucia lowland

For the landscape classification of the Rio S. Lucia lowland, refer to the subsection 'reconnaissance survey' at the beginning of this section. Here a brief outline is provided of the two landscape regions identified in the entire catchment: upland and lowland.

The *upland landscape* is characterised by forest, maquis and garigue. The maquis is particularly attractive, both for its aesthetic and for its ecological value (Fig. 9.13). However, a few threats have resulted from land development and the practice of fire setting, that is, burning off the ground cover to provide pasture. Grazing, recreation and hunting are today the main activities of this landscape region.

Fig. 9.13 The maquis in the catchment of Rio S. Lucia.

The *lowland landscape* is marked by agricultural fields, wetlands, riverside and seaside areas and the spread of urban and industrial sites. The land is used for cultivation, pasture, timber production, industry, quarrying and settlements. Agriculture is characterised by cereals, orchards, market gardens, greenhouses and pastoral land. Industrial activity consists mainly of quarrying along the river and salt production in the S. Gilla Lagoon. The future industrial development plan of the Cagliaritano is going to have a great influence in the area, while quarrying has already made a strong impact in the lowland landscape. Unfortunately, the lack of specific regulation in recent decades has allowed the over-exploitation and illegal use of river sediments, which generated a high income for the local industries.

Landscape description and evaluation of the Rio S. Lucia lowland

As illustrated at the beginning of this section (reconnaissance survey—landscape classification), six landscape types have been identified in the Rio S. Lucia lowland: wetland, river, foothill cultivated land, flat cultivated land, settlements, mixed use. Their description and evaluation are offered below, taking into account not only abiotic and biotic features, but also human impact. In addition a glance is cast over the whole panorama, the major threats to the landscape are outlined and the type of intervention needed is anticipated.

The *wetland landscape* is located at the mouth of the Rio S. Lucia and retains the typical features of a small Mediterranean delta. The area, on marsh and littoral sediments of the Holocene, is characterised by a low terrain with valuable natural resources and strong usage limitations, thus determining a self-sustainable landscape type. Agriculture can be established at the cost of expensive reclamation and desalination works and above all of the destruction of natural values. This landscape presents in fact a permanent resistance to cultivation; the only relevant activity is salt production. There is, however, the threat of the industrial development plan of the Cagliaritano, which has the goal of constructing the biggest harbour on the island. This is obviously in conflict with the valuable wildness of the area and with the international conventions on nature conservation (e.g. Ramsar). This outstanding type of landscape consequently demands more attentive protection, especially in the case of the S. Gilla Lagoon (Fig. 9.14).

The *river* is used partially for quarrying and partially for grazing and agriculture. Here sheep graze close to cereal fields, in the orchards or under citrus groves. Excavation works have a strong impact on the lowland landscape where disused quarries are often abandoned without restoration. This type of landscape, on alluvial soils of the Holocene, is characterised by riverside vegetation, willow trees and oleanders which range in colour from white to purple (Fig. 9.15). The high scenic and ecological value of the river needs to be preserved from further threats by an immediate intervention.

The *foothill cultivated lands* are on both slope deposits and alluvial soils of the Pleistocene. In the first, pasture alternates with olive trees but problems of erosion and degradation are reducing land fertility. In the second, the land has good agricultural potential; it is the landscape of cereals, olives and almond trees, alternating with flatter fields of grass culture or pastoral land (Fig. 9.16). The great variety of possible land use of this landscape type lends it a high economic value. Strong human pressure causing lower productivity is, however, threatening these lands, implying the need for advanced directives on land development and management.

The *flat cultivated landscape* is on both alluvial deposits of the Pleistocene and alluvial sediments of the Holocene. On the first, irrigated cultivation of grass, fruits and vegetables makes up the landscape together with notirrigated olive trees and cereal fields. On the second, the land presents the highest capacity for use of all the study area due also to the several streams which run through it. The result is a flat landscape made up of intensive agricultural fields which are often irrigated, sometimes alternating with fruit trees and vineyards and elsewhere separated by windbreak bands of eucalyptus. This landscape type

Fig. 9.14 The marsh of the S. Gilla lagoon.

is threatened by flooding and erosion of superficial layers and thus requires more careful regulation of agricultural development.

Fig. 9.15 Riverside vegetation in the Rio S. Lucia.

The *settlements* consist of the town of Capoterra, a few hamlets, only a few vernacular buildings, and constructions (e.g. roads and dikes). One of the most important buildings is Villa d'Orri in the estate of Villahermosa described in section 9.6. The question of Capoterra, being the biggest settlement, is relevant to the study area, considering also

Fig. 9.16 Foothill cultivated land in the Rio S. Lucia.

Fig. 9.17 A panoramic view of the Rio S. Lucia lowland showing the mixed use of land.

that the urban spread here has been largely influenced by the city of Cagliari. The lack of landscape plans has brought about a chaotic development which has reduced the quality of the area. A more regulated and ecologically oriented planning should be implemented specifically for the urban context.

The *mixed use* is a type of landscape which can be found on both Pleistocene and Holocene soils. It presents different aspects such as: pasture, cultivation, greenhouses, marginal urban area, abandoned lands and seminatural vegetation (Fig. 9.17). This landscape has a discordant appearance and often presents degradation caused by land abandonment or illegal land use. The need of re-planning schemes is urgent in this area.

Landscape history and legislation in the Rio S. Lucia lowland

In the study area an old sacred site and railway track still remain, together with vernacular buildings, an ancient bridge, a church and a chapel, while the archaeological sites are here of minor importance. Having previously discussed the landscape history of the Rio S. Lucia (section 9.6), we can here add that grazing, burning and hunting, which have already damaged the landscape of the lowland, are now under legislative control. Nevertheless, fire remains a threat and poaching is still quite common. Stronger controls are required in this area to protect its cultural and natural heritage.

Regarding legislation, a national act of particular relevance for the landscape of the study area is the Galasso Act, i.e. L. 431/85 (section 7.3). To add to this, there are regional acts (Pungetti, 1996b) like those on quarrying regulation (L.R. 30/89), parks protection (L.R. 31/89) and physical planning (L.R. 45/89). In the area, the only official designation is the Regional Natural Reserve of S. Gilla. The lagoon is actually protected in theory by international legislation (i.e. the Ramsar Convention and the IUCN Wetland Convention), by national legislation and by regional legislation while the river and the coast are protected by the State. The reality is different, however, since this 'written' protection has not been put into effect yet. Managers have, however, been appointed: the manager institution of the S. Gilla Lagoon is the Environment Department of the Autonomous Region of Sardinia, while the Regional Forestry Department is in charge of the forest and the State manages the river and the lagoon. The type of management carried out in this area is generally rather weak with the exception of that of the forest.

Final landscape analysis of the Rio S. Lucia catchment

From the above data analysis, it appears that the land use of the lowland of the Rio S. Lucia is as shown in Fig. 9.18. Agriculture is the predominant feature of the lowland landscape although quarrying, industry and urbanisation also play important roles. The agricultural landscape has undergone many changes not only in land use but also in the pattern of the fields, modified through subdivision of the land for inheritance. Quarrying, mainly of sand and gravel, has damaged both landscape diversity and river dynamics. Lastly, industrial expansion and urban development have taken place and decrease the values of the agricultural landscape.

Both in the lowland and in the upland fire is still a serious problem, since it causes soil degradation and leads sometimes to a bare rock area in places once covered by woods. Nonetheless, human impact on the vegetation has been rather strong in the entire catchment, through not only fires but also overgrazing and indiscriminate wood cutting.

The upland area is undergoing landscape modification as a result of changes in demography and land ownership. Among these are the preference of younger generations for urban over rural life-style and the shift in the forest from private ownership (i.e. by shepherds and companies) to public (i.e. by the Forestry Department of the Sardinian Region). The result has been a continuous abandonment of the 'old fashion' upland in favour of the 'modern' lowland.

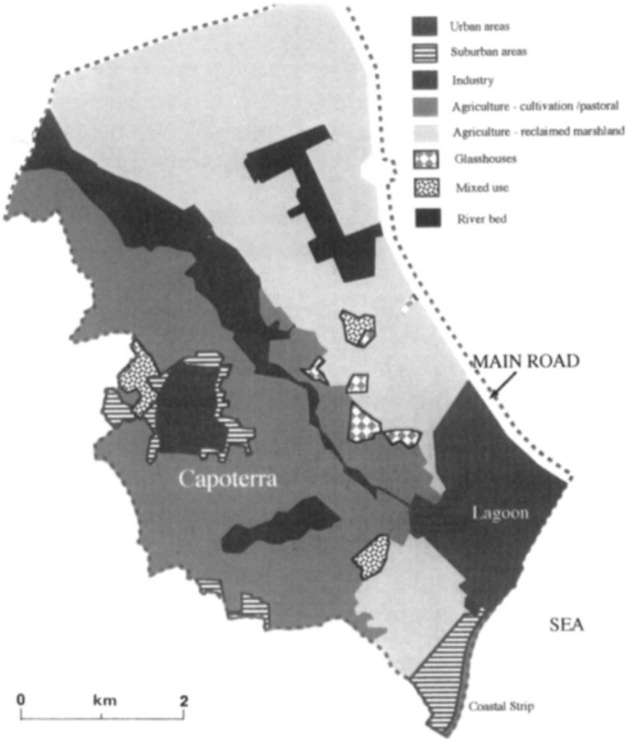


Fig. 9.18 Land use map of the Rio S. Lucia lowland.

All these factors contribute to a transformation of the semi-natural environment that now preserves evolved climatic features (e.g. ilex woods) and para-climatic features (e.g. cork oak woods) only in the area belonging to the Forestry Department. Furthermore, the link between land and people is becoming weaker and weaker and the new management is no longer self-sustainable. In addition, the relationship of the local people with their land has been switched from that of actors to spectators, that is, from action to observation; in other words from the inside to the outside perception of landscape. Accordingly, alternatives to landscape policy should be advanced for the sustainability of this vanishing rural cultural landscape, and a protection of its natural ecosystems should be reached with special regulations directed towards active nature conservation.

9.8
Planning rural landscape in the Rio S. Lucia

After the Second World War the pressure of the agricultural development brought about agricultural intensification in the Rio S. Lucia lowland. As a consequence the over-exploitation of ground water for agricultural, industrial and drinking supply was unavoidable, increasing in turn the salinity of the soil. Conversion of extensive areas to quarrying and salt flats made the situation worse. The present trend is the abandonment of the damaged lands, determined also by recent EU agricultural policies. To add to this, there is the spread of activities which degrade landscape values, among which are unauthorised dumping and ceasing quarrying without restoration.

Despite this situation there are no particular landscape plans for the area, though it is partly included in the Landscape Plan Marganai-Montiferru mentioned in section 9.4. It is also part of the Sulcis natural park (68868 ha), the S. Gilla Lagoon nature reserve (5674 ha) and the Bidda Mores area of outstanding natural value. This nature protection is, however, weak: regulations without implementation cannot support landscape conservation.

Not only landscape planning but also landscape management failed to receive particular attention from the local bodies responsible for the Rio S. Lucia catchment, especially in the lowland. A reason for this can be found in the fact that the latter, consisting mainly of agricultural fields, settlements, quarries and industry, does not present outstanding natural or cultural features. The situation is different in the upland, where the Forestry Department of the Region of Sardinia is managing a large part of the catchment of the Rio Gutturu Mannu with the aim of preserving and restoring the forest, which is still characterised by considerable cork oak wood productivity. Here, precisely in the upper part of the Rio Guttureddu, is where the nature reserve of Mount Arcosu is located. The reserve, owned and managed by the WWF, is under hydrogeologic and landscape restriction and is an oasis for fauna protection, especially for the Sardinian deer.

9.9 Conclusions

Human impact on Sardinian rural landscapes

One of the most relevant events of contemporary Sardinian history has been the shift of society from agro-pastorai to urban. This has had a relevant retro-action in the rural landscape (Pungetti, 1995, 1996b): while originally the lowlands were covered by natural forests and later by agricultural land, nowadays the latter is mixed with urban, industrial and tourist settlements.

The present rural landscape of the Sardinian lowlands is a typical Mediterranean open land characterised by an extended vista over treeless fertile valleys. Agriculture is still the activity which imprints the rural landscape. The present trend shows cultivated fields of cereals and market gardens, together with vineyards, olive and citrus groves encroaching on an increasing amount of uncultivated land, sometimes transformed into meadows. Many changes in landscape patterns have occurred because of subdivision of the land by inheritance, splitting cultivated areas into smaller parcels. Further changes have been brought about with the introduction of new elements like greenhouses, quarries and dumping sites that have had, with their rapid spread, a devastating effect on the Sardinian rural landscape. In the case of intensive farming, moreover, large quantities of pesticide, fertiliser and water are needed. The water demand for irrigation in turn has often led to over-exploitation of ground water and has consequently caused increased soil salinity, one of the steps towards desertification. More careful water, agriculture and land management is required in this area in order to preserve the value and diversity of the rural cultural landscape.

The coast is one of the most fascinating landscapes of Sardinia. It is the place where the still uncontaminated and clear Mediterranean Sea meets the island sand, rocks and maquis. This interaction between water and land is surely one of the keys with which to read and hopefully understand the Sardinian landscape. The high scenic and natural values of such a landscape understandably attract many people. As such, tourist development becomes here a prominent threat to landscape. A way to control it is to include it within the programmes of physical and landscape planning. Initiatives like international directives (e.g. EU, IUCN) or international research (e.g. EU, UN) are useful in both understanding this matter and guiding landscape development.

The uplands present a different scenery: enclosed fields are still present, hills are covered by garigue and maquis and mountains by woods and forests. In the last thirty years, however, the increase of livestock has required more pastoral land, inducing shepherds to burn large areas. Though fire is still part of the traditional method of managing the land, burned areas are nevertheless exposed to erosion, thus giving rise to dangerous threats to the Sardinian landscape. Fire has also temporarily changed the ecosystems of a few parts of the island. To add to this, there have been attempts at reforestation with exotic tree species (e.g. eucalyptus), which have failed since they resulted in intense soil degradation, economic loss and diminishing of aesthetic landscape values (Aru and Barrocu, 1993).

In particular areas of the island disused mines have contributed to the creation of fascinating industrial archaeological landscapes but have simultaneously brought about environmental threats, like collapse of rock masses, dumps of aggregated flotation mud, and soil and water pollution. Other kinds of problems are caused by quarrying managed in a not environmentally friendly way, thus damaging ecosystems, river dynamics and above all landscapes.

A transformation of the natural environment can be generally noted all around the island. Ecosystems are threatened by intense agriculture, overexploitation of forest, overgrazing, tourism and urban development. Highly degraded landscape, moreover, is all too often apparent. It is especially caused by unauthorised land use and building, increasing land abandonment, cessation of quarrying and mining without site restoration, illegal waste disposal and household dumping. All these circumstances have brought about a loss of Sardinian cultural landscape, threatening its ecotopes which are sometimes irremediably damaged.

Landscape planning attempts in Sardinia

Previous studies on environmental and landscape planning in the island (Pungetti, 1996a, 1996b) show the attempts of the Autonomous Region of Sardinia to confront environmental and landscape issues (section 9.4). Within this setting, however, a planning policy technically and urbanistically oriented has prevailed, based on academic recommendations transformed later into laws. This *modus operandi* was a failure because the resulting theoretical choices were inflexible and difficult to modify.

This failure has been due to other causes, among which is the delay in approving fundamental legislation governing both territorial development and nature conservation. Yet landscape policy in Sardinia, on the one hand, reveals efforts to make the Region conform with standard Italian and European procedures, but on the other hand it underlines the inadequacy in addressing the environmental question. Only in recent years, under the pressure of the directives coming from the EU and the national government, has the attention given to nature and landscape concerns increased. It was for this reason that the Sardinian Region passed several laws at the end of the 1980s on town and environmental planning, nature and landscape conservation.

Despite these efforts, the landscape protection expressed by both national and regional legislation was already weak at the date of the approval of the 14 regional landscape plans, in 1993. Tourist settlements for instance were being built along the coast under special permits granted by the Region and the Municipalities, which allowed exceptions to the laws. Such a bypassing of the rule has made all the efforts at landscape protection in vain.

This framework shows clearly to what extent Sardinia fits into the Mediterranean context described in previous chapters. Here the prevalence of the microcosm over the macrocosm allowed building to dominate nature. The point is that, as in other Mediterranean countries, traditional landscape planning has been mainly related to physical planning. Fortunately, however, a new model is emerging inside academia, changing the view towards a more environmentally concerned approach (e.g. Maciocco, 1991). Increasingly, attention is being paid to landscape planning and ecology; and even at the level of public administrations (e.g. the Region) the trend is now more oriented to environmental protection than before. This new trend, just started in recent years, is, however, still far from the holistic approach required for ecological landscape planning.

Pursuing sustainability in the future of Sardinian rural landscapes

Traces of human use are evident over almost all the Sardinian landscape. Here, more than in other Mediterranean areas, the balance between man and nature was maintained until half a century ago (Pungetti, 1995). Hence the 'desirable ecological function' sought by ecologists (e.g. Meeus *et al.,* 1988) has persisted and still persists nowadays in part of the island.

Sardinia has an excellent location in the middle of the west Mediterranean, an area of crucial historical events. Despite this, the island was never a protagonist in Mediterranean history but was either dominated by other cultures, or independent and isolated. The fact that Sardinia's destiny has often been decided by outsiders still stands today. An example is the tourist pressure on the Sardinian coast, exerted by rich companies or entrepreneurs from northern Italy or abroad (e.g. the Aga Khan in Costa Smeralda).

In this framework, the study of Sardinian landscape history demonstrates that not only physical and natural features but also human activities are essential in determining the landscape characteristics of a cultural area. The process of landscape changes can also be used as a lesson to better understand how the present landscape can be managed. Nevertheless, in sustainable planning the environment should never be irreparably damaged. Therefore in meeting social and economic requirements only land use changes that occur in sympathy with nature can be acceptable. These changes in addition have to fit into the national and local planning systems in order to meet social and economic needs. By doing so, it is possible to recognise the ways in which the present use of the land can contribute to the maintenance of the ecological and cultural values of landscape.

The Sardinian situation, however, presents a different reality. Policies related to the rapid economic and urban development of the last decades did not meet environmental requirements, resulting in a general decay in and threat to the island's natural heritage. Hence the loss of agricultural area due to urban and industrial expansion is still a problem to solve. Accurate town and physical planning can help in this, locating new settlements in the least productive lands.

Paradoxically, however, the delay in approving regional legislation on physical, environmental and landscape planning in Sardinia created difficulties in controlling the entire territory. The general town planning law for instance was approved only in 1989, thus allowing building speculation to spread with great damage, especially to the coast. In this area there is an urgent need to draw up a regional plan for both coastal protection and creation of coastal parks. This could be done on the basis of studies on areas with high natural, scientific, cultural and aesthetic values.

Another question to solve in the anthropic landscape is the abandonment of mine and quarry activities without restoration, causing degradation and, what is more, causing the spread of illegal waste disposal sites and even discarded furniture sites. To add to this there is the damage that overexploitation of sand and gravel causes to the semi-natural environment, especially along rivers. Specific legislation on mining and quarrying, stronger than that existing, is urged both at regional and local level and its further implementation is required in order to succeed not only in economic development but also in nature conservation.

Ground water exploitation is a further point to be covered. Ground water demand has increased in the last few years of drought especially for agricultural, industrial and drinking supply, causing salt intrusion in the coastal plains. More attention should be paid to irrigation techniques, while exploitation of ground water should be controlled by effective regulation. Increased demand for water has also been caused by tourist development. As shown before, however, unsuccessful legislation on this matter allowed spread of tourist building construction along the coast and made the situation worse.

Tourism needs roads, residences, infrastructures, services and space, therefore it needs to fit within town and physical planning and be controlled through landscape planning. Research, initiatives and environmental impact evaluations for future development schemes can be useful at this stage not only to conserve the cultural landscape but also to help us understand and eventually manage the relationship between tourist and landscape. There is in addition the need to stimulate tourism in the inner areas of the island, where environmental resources and cultural landscapes are so high in value, but conservation is so poor and population density so low. Environmental policy in sympathy with nature has to be immediately pursued here in order to avoid the increasing risk of land degradation and abandonment.

In the hills, their use for residential and recreation purposes has given rise to the demand for nature protection. This is partly fulfilled by increasing controls over grazing and by regulations for the practice of fire setting and hunting. The practice of fire setting, specifically can lead, as already mentioned, to erosion. The latter is due also to overgrazing, ploughing on deep slopes, felling of the forest and incorrect reforestation. Dense vegetation cover, careful fire practice, moderate grazing, advanced agricultural techniques and well managed wood-cutting would solve this problem.

Yet in Sardinia the debate about environmental concerns has recently initiated new interest in both social and political sectors, leading to a stronger consideration of the value of natural resources. The regional legislative framework, however, shows a legal system quite productive but not operative on the ground. Laws and regulations were not just unable to solve the problems of environmental and landscape conservation but were not even implemented. This legal system therefore cannot support sustainable environmental and landscape planning. Other solutions have to be attempted for managing this sector.

First of all, the different landscape aspects should be more vigorously integrated with each other in Sardinia, aiming at a better interaction between the different programmes involved and consequent co-operation of the different related bodies in charge. Landscape sustainability then could be pursued through an ecologically sound type of planning, sensitive to past, present and future ecological and cultural issues, aware of the impact of modern economic life and attentive to the local ecosystems and population. Moreover, continuity in land use has to be encouraged when possible, keeping the linkage between society and land. At the same time there is a need to work out the actions required to allow long-term landscape sustainability to be achieved; education, awareness and involvement of local people in the planning process can also help in this. Last but not least, a more efficient procedure should be pursued in Sardinia, controlling the implementation of regulations and plans and their management on the ground. Without these attempts, any type of landscape planning will inevitably fail in its task.

Part Three:

The search for an ecological landscape design paradigm

Jala Makhzoumi

Pyramidal cypress (Cupressus sempervirens) 100 yrs.

Introduction to Part Three

Traditional landscapes in the eastern Mediterranean exemplify the historical struggle between the fertile land created for human habitation and the ever present threat of encroachment from the vast barren steppes. It is the story told of the battles fought by gods at the dawn of time which brought light out of darkness and order out of chaos. The battle was never complete: the frightening power of Chaos was a perennial possibility; gods arid men had to join forces and fight an endless battle against Yam, the god of seas and rivers, and Mot, the god of sterility and drought (Armstrong, 1997).

The environmental reality of the twentieth century Mediterranean has changed little in the last five thousand years; arid and semi-arid ecosystems are just as fragile and the resources even more limited. Traditional Mediterranean cultures, realising the environmental constraints, developed the landscape within a clearly defined ecological framework, made efficient use of the natural resources and accepted the wisdom and prudence of past generations. In the wake of modernism, however, traditional prudence has given way to over-exploitation and a desperate and uncritical need for development. This contemporary 'power of chaos' is transforming landscape, environment, society and cultural values and threatening to destroy what is left of the balance between man and the Mediterranean environment (Henry, 1977).

Ecological determinism in the Mediterranean, whether in the past, the present or in the future, is inevitable. It is our conviction therefore that ecology should necessarily form the basis for alternative design frameworks in architecture, landscape architecture and planning if future environmental sustainability and ecological stability are to be achieved. The ecological landscape design paradigm is the outcome of an ongoing search for alternatives that are appropriate to the environmental, cultural and aesthetic context of the semi-arid Mediterranean.

In developing the paradigm two lines of investigation were pursued. The first is an exploration of ecology and its development. Since the 1960s, ecology has increasingly influenced the design professions, providing for a holistic and dynamic outlook on nature, environment and landscape. The different dimensions of ecology have come to imply the ability to think broadly, to search for patterns that connect and to observe nature with insight. Alternatively, ecological knowledge allows a comprehensive understanding of landscape as the outcome of interacting natural and cultural evolutionary processes which account for pattern, diversity, sustainability and stability.

The second line of investigation explores design and its potential as a creative problem-solving activity. The interface of design with ecological concepts forms the framework for ecological landscape design. The potential of design, however, is increasingly determined by accepting intuition as a prerequisite to creative design and by recognising the need to formulate design values and objectives that transcend present individualism and anthropocentrism.

The ecological landscape design paradigm is founded on the complementarity between design and ecology. While ecological sciences provide the knowledge and guidance, design provides creative solutions. As David Orr (1992, p. 94) notes, 'the study of environmental problems is an exercise in despair unless it is regarded as only a preface to the study, design and implementation of solutions'. Similarly design that is preoccupied with form and aesthetics of 'style' cannot fulfil its role in creating sustainable, healthy and interesting places that are fit for human habitation and enjoyment.

The first three chapters in Part Three deal with the two lines of inquiry mentioned above and the proposed paradigm. Chapter ten explores ecology in all its dimensions and in the context of its contribution to nature, environment and landscape. Chapter eleven discusses the interface of ecology with the environmental design professions, namely architecture, landscape architecture and urban landscape design, leading to the formulation of a framework for ecological landscape design. Input from these two chapters is integrated in chapter twelve, in order to develop the ecological landscape design paradigm and formulate its values, objectives and methodological framework. The last three chapters apply the proposed methodology to the Kyrenia Region in North Cyprus. In chapter thirteen the Ecological Landscape Associations methodology is used as a investigative framework establishing a comprehensive understanding of the regional landscape. This understanding is then used as the foundation for developing ecological landscape designs at regional and local levels, chapters fourteen and fifteen respectively.

The paradigm and its methodological framework are not meant as finalities. Rather they can be seen as an approach that deserves testing and further exploration or it can raise objections and disagreement. In such a case the work would have succeeded in being a provocation, generating the long due interest and inquiry into design theory and method in landscape architecture.

Chapter 10
The interaction of ecology, environment and landscape

In chapter one the dimensions of ecology were introduced and several aspects of ecology *the science* discussed. In the course of its development, however, the scope and meaning of ecology developed and extended beyond the strictly scientific. This chapter will investigate the other dimensions of ecology and evaluate their direct and indirect impact on environment and landscape. Key developments and concepts in nature conservation, environmentalism and sustainable development will also be reviewed in the context of input from ecology. This, it is hoped, will establish ecology's potential to provide a comprehensive understanding of landscape and to form the foundation for alternative approaches to landscape design and planning.

10.1
Definitions

Before embarking on a review of ecology's interaction with nature conservation and the environmental movement it is necessary briefly to identify certain key concepts that recur in the course of the present discussion. These include the concepts of nature, culture and environment, landscape having been defined in chapter one. Like landscape, the three concepts are complex, highly debatable and have come to acquire a number of meanings in western literary, scientific and philosophical thought. The four concepts are also overlapping and, as will be argued, related within the holistic framework of ecology.

The meanings of nature

Nature is a term with various meanings, three of which are worth noting for our purpose (Honderich, 1995). The first embraces everything that there is in the physical world of experience, broadly construed (e.g. the universe and its contents). It is difficult to maintain a reasoned belief in a dimension of existence beyond this broad definition of nature. The second sense of *nature* identifies with the living world past and present, as opposed to the non living. The difficulty here lies in definition and demarcation, i.e. of what is or is not living. From an evolutionary point of view the distinguishing mark of organisms lies in their high degree of organisation rather than anything physical as such *(ibid.)*. Ecologists and biologists disagree as to whether value emerges from the living world because organic organisation permits an ordering according to some scale of progress. And while some believe that such values are increasingly linked to ethical issues, others see the necessity for a spiritual reformation in approaching nature and solving ecological and environmental problems (Bateson, 1988; Passmore, 1974; White, 1967). The latter viewpoint is expressed for example by the Sufist Sayed Hossein Nasr (1993), who argues that modern man needs to learn of the spiritual significance of nature by recognising the moral lessons which nature teaches man provided he is willing to observe, comprehend and contemplate. The precursors of ecology, the Romantics, the natural history essayists and more recently the 'deep ecologists' have sought to revive this spiritual heritage.

The third meaning, one that is common to western environmental thought, sees nature as that part of the physical world other than humanity and its constructions, while *natural* commonly implies phenomena taking place without human involvement (Mclntosh, 1991). Within this last definition nature is also referred to as *wilderness,* implying a pristine landscape that is undisturbed and beyond human influence. This third definition of nature raises the philosophical controversy of whether value lies in raw pristine nature or in nature as altered and cultivated by man. This ongoing nature/culture debate has been central to the different approaches to nature conservation and as such will be discussed later in further detail.

Culture, society and the cosmic dimension

Nature in its physical sense can be viewed as a foundation and a constraint for human society and culture. *Culture* is the collection of meanings, symbols, values, morals, modes of thinking and patterns of behaviour shared by a particular society in its attempt to make sense of its world or to organise and represent experience (Longman Encyclopaedia, 1990). Art, religion, literature are forms of discourse that embody such interpretative frameworks. They explain, contemplate and express the human relationship to the whole, i.e. the cosmic dimension, to the totality of what *is* (Bohm and Peat, 1987).

In traditional and pre-industrial societies the cultural construct of the universe, i.e. the interpretative framework of such societies, was obtained through direct contact with nature. Art, religion and science in these early cosmologies were united in a general vision of the world, humanity and the place of man in the whole. In modern times, however, this holistic view has been gradually eroded. This is partly because the immediate contact with nature has grown more tenuous but also because religious beliefs and spirituality have been increasingly obscured by science. As a result, the sense of belonging to a larger order has been destroyed in the modern world at a time when the individual and society need it more than ever (Bohm and Peat, 1987; Orr, 1992). Furthermore, the loss of a unifying cosmology has in effect emphasised the differences between the natural world and the socio-cultural world of man's creation, thus adding to the nature/culture polarity.

The concept of environment

Environment comprises our surroundings, especially as influencing the conditions and circumstances of living. As such, environment combines two mutually complementary notions of a home for mankind and a sustenance base for society (Schnaiberg, 1980). Historically, eighteenth century French naturalist Buffon is credited with introducing the concept to the field of legitimate science by proposing that environment influences the form and behaviour of organisms. Hillier arid Leaman (1973) argue that Buffon's scientific formulation was not only a major event in the history of biology but also conceptually a step away from fixed species taxonomy towards evolutionism. In the course of its development the concept has come to be closely associated with a number of complex ideas, the most prominent of which is the concept of *organism.* Thus, 'together they constitute the paradigmatic notion that realities involving living structures could best be looked at in terms of the relations between organism and environment' *(ibid.,* p. 507). The roots of ecology in the latter part of the nineteenth century, as well as its original definition by Haeckel, are founded on this association. The association moreover represents an early scientific version of the much used 'manenvironment paradigm' which emphasises the same polarity found in the nature/culture relationship. Both concepts, as argued by Hillier and Leaman *(ibid.),* stress 'the underlying paradigmatic notion of a division into a mutually exclusive world of subjects and objects, organisms and environments'.

Like the concept of landscape, environment implies a spatial hierarchy (e.g. global, regional, local) and can be equally applied to the rural and urban context. Further, environment simultaneously encompasses a geographical space which provides a habitat for man and a conceptual space which is the realm of the human mind, feelings, imaginations and perceptions.

The integrating role of ecology

Ecology, as will be argued in this chapter, has the potential to provide a conceptual framework that can relate nature and culture and assist in understanding landscape and environmental change. Of specific interest is the concept of ecohistory and its approach in relating nature and society. The aim of ecohistorical inquiry, according to Haila and Levins (1992, pp. 182–183), is threefold: to explain how humanity changes; to explore the 'carrying capacity' of nature relative to human populations, which is not a constant but a historical variable; and to distinguish between the inadvertent changes that result from human activity and intentional change.

Natural conditions set boundaries for social development, just as sociocultural attitudes impinge upon nature. Haila and Levins (1992) propose two conceptual tools for evaluating ecohistory, *ecohistorical period* and*ecohistorical formation (ibid.).* While the notion of ecohistorical period refers to changes in nature as a consequence of human activities, the complementary notion of ecohistorical formation allows for the recognition of distinct ways in which societies relate to nature.

Ecohistory can be used as a framework for constructing a conceptual model relating nature, culture, society, landscape and environment (Fig. 10.1). The model reflects the reciprocal interaction of nature, culture and society and shows landscape and environment as the physical context within which this interaction takes place. However, landscape and environment can also be viewed as the by-product of the nature-culture interaction. The complex mutual relations that bind the components of the construct provide a broad context for reviewing the development of nature conservation and environmentalism.

10.2
Ecology, nature conservation, protection and restoration

Conservation embraces a complex range of social practices that have come to refer to the management of renewable resources and to particular concern with 'wild' species and their associations—the conservation of 'nature' (Adams, 1997). In the United States nature conservation developed from the gradual realisation that unrestrained capitalist expansion was undermining the very resource base of national prosperity (Baldwin *et al.,* 1994; Koppes, 1991). In the United Kingdom nature conservation reflected an intellectual reaction against industrialisation, urbanisation and the subsequent loss of nature and the countryside (Adams, 1997; Mclntosh, 1991; Sheail, 1976).

The intellectual history of nature conservation and preservation in great part parallels

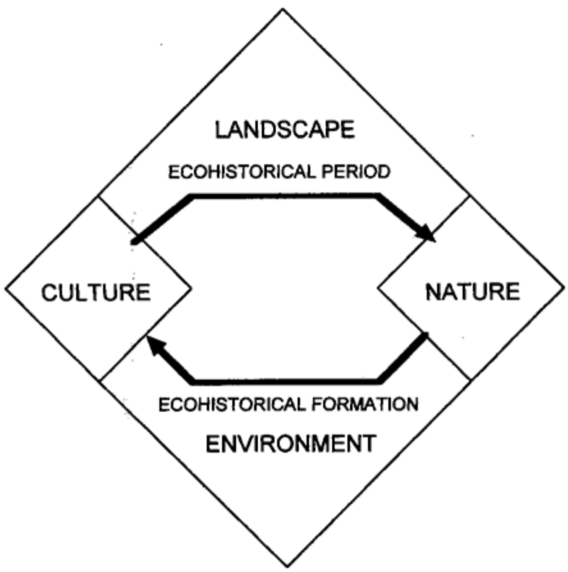


Fig. 10.1 Ecohistory as a means of relating the reciprocal interaction of nature and culture. Environment and landscape are the physical context within which the interaction takes place, as well as its by-products.

the development of the science of ecology (Fiedler and Jain, 1992). By the early decades of the twentieth century, ecology was increasingly establishing the scientific foundation for understanding nature and assisting in the formulation of preservation and conservation strategies. Alternatively, nature conservation was providing ecology with the opportunity of field applications. Adams (1997, p. 280) for example outlines three main areas of input from ecology that directly influenced nature conservation in the UK: the establishment of government conservation in the 1940s; an intellectual strategy for classifying and objectifying nature; and the knowledge that underpinned an increasingly complex set of techniques for controlling and managing nature.

Shifting ecological paradigms and their implication in nature conservation

Early attempts in conservation adopted a static and compartmentalised view of nature, implying that a unit of nature can be understood by studying the dynamics that arise within it, that any such unit is conservable and that humans are not regular ecological agents (Mclntosh, 1991). This viewpoint can be seen as a direct consequence of the classical 'equilibrium paradigm' which considered ecological systems to be closed, self-regulating and existing at or close to the point of stability (Pickett *et al.,* 1992, 1994). The equilibrium paradigm is often referred to by the cultural metaphor of the 'balance of nature' which has deep roots in western culture (Botkin, 1990; Worster, 1992). The paradigm has underwritten two opposite views that can both lead to inappropriate management and conservation strategies for ecological systems (Pickett *et al.,* 1994, p. 179): that the 'balance of nature' idea can be used to justify any sort of human impact if nature is considered to be able to return to balance; and that the balance of nature can be used to suggest that no human change is justified since it will upset the balance. Empirical problems in the classical paradigm, the recognition that natural systems are subject to physical disruption from a wide range of natural events outside the system and a shifting in the scale and focus in ecology all contributed to the development of an alternative. As such, the contemporary 'non-equilibrium paradigm' suggests a new metaphor, the 'flux of nature', reflecting the multiplicity of control, lack of equilibrium and intimate involvement of humans that characterise so much of nature *(ibid.)*.

This paradigm shift in ecology had three fundamental consequences to approaches in nature conservation. First, there was a change in emphasis from the conservation of an end product to a conservation of processes. Second, new emphasis was placed on the conservation of context as it was realised that resources, shelter or sources of propagules for a target species may often lie outside the area under consideration. Emphasis on context has brought the contemporary paradigm closer to the domain of landscape ecology, which has traditionally focused on 'landscape'. Emphasis on context has also contributed towards new approaches that embrace the landscape as a basis for conservation strategies (Adams, 1997; Jackson, 1992). Third, by emphasising process rather than end product, the contemporary paradigm has accepted man as an integral part of the ecosystem/landscape to be preserved. This has prompted the realisation that certain categories of managed landscapes can be equally valuable as a natural and cultural resource.

The World Conservation Strategy and the concept of protected landscape

With the establishment in 1956 of the International Union for the Conservation of Nature (IUCN), conservation was undertaken on a global scale. In 1980 the IUCN advanced the World Conservation Strategy (WCS), the culmination of more than two decades of thinking by conservationists. The WCS offered both an intellectual framework and practical guidance for conservation with ecology and ecosystems carefully selected as setting limits on human action.

The WCS aimed to manage human use of the biosphere in order for it to yield the greatest sustainable benefit to present generations while maintaining the potential to meet the needs and aspirations of future generations (IUCN, 1980). As such the strategy was the first to advance the concept of sustainable development. Three objectives were identified by the WCS *(ibid.)*. First was the need to maintain essential ecological processes and life-support systems on which human survival and development depended. Essential processes, those that are governed, supported or strongly moderated by ecosystems, were seen as being essential for food production, health and other aspects of human survival and sustainable development. Second was the need to preserve genetic diversity—defined as the range of genetic material found in the world's organisms—on which depends the functioning of many of the above processes and life-support systems. And third, the need to ensure the sustainable utilisation of species and ecosystems which support millions of rural communities as well as major industries. The objectives of the WCS are seen as fundamental to ecological landscape design and planning and as such will be embraced in the case study application (chapter fourteen).

The paradigm shift in ecology was one of the factors effecting a change in conservation strategies towards a dynamic and more integrative approach. Further, past concern with strictly 'natural' landscapes was proving too narrow an approach, especially with the increasing scarcity of wilderness areas. The concept of *protected landscapes* was developed by the IUCN (1990) in response. Protected landscapes are classified as 'nationally significant natural landscapes which are characteristic of the harmonious interaction of People and Land, while providing opportunities for public enjoyment through recreation and tourism within the normal life-style and economic activity of these areas' (Lucas, 1992, p. 5). The concept differs from earlier categories of protected areas (e.g. national parks) not only in that the landscape *is* altered by man but also that it is inhabited and in productive use. Above all, in linking conservation of natural resources with economic development, the concept of protected landscapes demonstrated in a practical way the aim of the WCS (IUCN, 1980) in promoting sustainable development.

Protected landscapes are of special significance in the Mediterranean because millennia of natural and cultural evolutionary changes have left little of the original Mediterranean landscape, i.e. the sclerophyll forest, to conserve. The original landscape, however, has been replaced by rich and diverse semi-natural and rural cultural landscapes which are just as worthy of protection and conservation as the original natural one.

The concepts of restoration ecology

The interaction of conservation and ecology has led to a range of intellectual and cultural attitudes towards nature and the management of natural resources. The most common are those of the conservationists and the preservationists: while *conservation* sees nature as a vast resource, physical and spiritual, that needs to be wisely husbanded to ensure its continued yield, *preservation* sees nature as of intrinsic value, the greater for being untouched by humankind, and seeks to keep it unpolluted (Turner, 1994). A third approach that is gaining in popularity is restoration ecology, which straddles the widely acknowledged philosophical rift in the view of nature as a pool of natural resources for human use *versus* something with intrinsic value (Jackson, 1992).

Restoration ecology is based on the conviction that action can and should contribute to restoring and actually reconstructing landscapes with creative ecological ends in mind (Jordan *et al.,* 1987). Restoration challenges our understanding of the ecosystem being restored and so is an effective research technique, a way of raising questions and testing ideas about the systems under construction, the processes affecting them and our relationship to them. The challenge lies in providing the basis for a healthy relationship between nature and culture, as restoration re-enters nature from the vantage point of culture and works out a new relationship in practical and conceptual terms (Jordan, 1994). Applications in restoration ecology include a wide range of projects with different histories, motivations, sources of funding and institutional constituencies (Jackson, 1992). Among these are prairie restoration, wetland mitigation, mine spoil reclamation, range and timber management, urban landscape and sustainable agroforestry projects in developing countries.

The significance of restoration ecology is that it represents a trend that relies not only on the scientific knowledge of ecology but equally on the old empirical wisdom of peasants, farmers and gardeners and the artistic and aesthetic influence of contemporary garden and landscape design. As such, it exemplifies a broad integrative ecological approach that lends itself readily to landscape architecture in arid and semi-arid regions.

10.3
Ecology, environmental ethics and a new theosophy

By the early twentieth century, global ecohistory entered a new stage characterised by a dramatic increase in human capacity to cause irreparable destruction in nature. The ‘ecological crisis’ was the metaphoric expression used to refer to the multitude of environmental problems accumulating all over the world (White, 1967). By the 1960s and 1970s the seriousness of these problems was slowly and inexorably pushing human society beyond the limits of the Earth’s support system, i.e. its sustainability. The manenvironment relationship became the focus of what was later to be known as the ‘environmental movement’ or ‘environmentalism’ (Anderson, 1981; Kormondy, 1969; Ward and Dubos, 1972; Moos and Brownstein, 1977; Ehrlich, 1986). Environmentalism was and continues to be a political movement prompting the exploration of ethics, economics and government politics. The political perspectives explored in the 1970s materialised through a gradual consolidation of environmentalist organisations and journals and by the 1980s led to the establishment of green parties in electoral politics (Haila and Levins, 1992; Adams, 1990). The political dimension of environmentalism today continues through the ideas of social *ecology* and *deep ecology:* the former is concerned with the human domination of humans and the latter with the human domination of nature (van Wyck, 1997).

The United Nations Conference on the Human Environment in Stockholm in 1972 was the first reflection of crisis thinking on a global scale. The Conference formed the frame for ideas of sustainable development that were later to be proposed by the WCS (Adams, 1990). The United Nations Environment Programme (1978) and the Man and Biosphere Programme (Di Castri et al., 1981; Giacomini, 1978) were initiated in the years that followed.

The development of environmental ethics

Viewing environmental issues within a social and political context initiated an exploration of alternative ethical and philosophical perspectives. Concern with the fundamental basis of humanity's relationship with and moral obligations to the earth community has alternatively been termed 'environmental ethics', 'environmental philosophy' and 'earth ethics' (Martin and Beatley, 1993).

The subject of environmental ethics is broad, embracing a variety of concepts. Obligation to future generations, the basic rights of various life and land forms, both individually and collectively, and the intrinsic and instrumental values of nature are just a few *(ibid.).* The spiritual and religious dimensions represent another category of ethical concepts which includes concepts such as stewardship, dominion and oneness with creation or the cosmic dimension.

The collective values of ethical concern dominating environmental thought in the 1960s and 1970s were distinguished by a characteristic polarity with an *ecocentric* ideological theme at one end and a *techno-centric* theme at the other (O'Riordan, 1976). O'Riordan argues that ecocentrism is based upon ecological principles and that it advocates the virtues of reverence, humility, responsibility and care; while technocentrism is identified by 'managerial efficiency' and by a sense of optimism in the ability of man, his science and technology. The polarity of these views should be viewed in the context of environmentalism's reaction against the long history of nature exploitation in western civilisation. A moralistic view that denies humans the right to intervene with nature, however, is the other extreme and is equally unintelligible. Although such extreme views still persist today, the contemporary paradigm in ecology, landscape ecology and restoration ecology has come to offer a more tempered, holistic and integrative approach.

Deep ecology and the search for a new theosophy

Environmentalism's search for alternative ethics at times took on the quality of a religious awakening and a search for a more 'spiritual' outlook. The search was prompted by a general disillusionment with the increasing domination of scientific objectivity which had led to the loss of the spiritual significance of nature from ecological sciences, as indeed from most aspects of modern life. 'Deep ecology' as initiated by Arne Naess (1973) was an attempt to find a new dimension in ecology that had the potential to address the emotional and spiritual vacuum and to rectify its inability to provide for value priorities. Deep ecology was essentially a critique of mainstream environmental thought and its short-term, economic, scientistic, resource-oriented position (van Wyck, 1997). In contrast to the limited scope and remedial contribution of 'shallow ecology', 'deep ecology' rejects the man-in-environment image in favour of *the relational, total-field image,* which necessitates a view of humanity as inseparable from nature. This makes the wanton injuring of nature no longer possible as this would mean injuring an integral part of ourselves (Naess and Rothenberg, 1991).

Utilising basic ecological concepts such as complexity, diversity and symbiosis, Naess developed his personal philosophy of 'ecosophy', which attempts to clarify the place of our species within nature through the process of working out a total view (Naess and Rothenberg, 1991). Ecosophy was seen by Naess as leading in two directions: it can either be used to develop a deep ecological philosophy; or it can lend support to a growing international deep ecology movement which includes scientists, activists, scholars and artists who work towards a change in the prevailing political and social structure. The deep ecology movement in North America (Devall and Sessions, 1985) exemplifies the latter.

It is unfortunate, however, that many of Naess's concepts, such as the intuitive link between ethical principles and decision, were not developed sufficiently to offer deep ecological solutions. This was partly due to the fact that the terms and concepts of deep ecology were far 'removed from the language that planners are accustomed to working with' (Naess and Rothenberg, 1991, p. 13). Planners and designers are generally dominated by the same objectivism that automatically excludes the intuitive and spiritual as being subjective, i.e. irrelevant.

10.4
Sustainable development and landscape sustainability

The concept of sustainable development materialised as a political and economic reality with the publication of *Our Common Future* (Brundtland, 1987). The study stressed the possibility of achieving a path for economic development which meets the needs of the present generation without compromising the chances of future generations to meet their needs. In application the economic underpinnings of sustainable development require a shift in the way economic progress is pursued and evaluated. In short, it dictates a need to define development in terms other than the conventional ones, e.g. rising *per capita* income (Pearce *et al.,* 1991). The underlying theme is that environmental policy matters not just for the quality of life in general, not just because natural environments have values 'in themselves', but because environments and economies are not distinct. Treating them as if they were is the surest recipe for disaster and lies at the foundation of the 'ecological crisis'.

Sustainability is not a single movement or approach, but simultaneously the province of global policy makers and environmental experts and the domain of grassroots environmental and social groups. Orr (1992) differentiates between two trends in sustainable development, *technological sustainability* and *ecological sustainability*. The former adopts a global stance and embraces a view of problems as having either a technological answer or a market solution. In contrast, ecological sustainability accepts human limitations in comprehending and managing large scale and complexity, realising that we have the ability to think globally but can only take action locally. Further, ecological sustainability can only be achieved from the bottom up and is rooted in past practices, the vernacular and traditions that evolve out of culture and place.

Sustainable development and the North/South divide

The emphasis in environmentalism upon the wholeness of the globe (e.g. 'Ecosphere' and 'Spaceship Earth' metaphors) was intended as an appeal to the reality of the planet and an invitation to embrace humility. However, rapid trends towards globalisation, the emergence of 'global ecology' and a view of sustainability as a challenge for global management have in the last decade distorted these early intentions (Sachs, 1995). Whether intentionally or unintentionally, global management transfers northern perceptions and potential solutions to the South, often with a 'messianic and pedagogic stance' (Gudynas, 1995). As a result, the purpose of global management is seen by developing economies as nothing less than control of a second order *(ibid.)*.

The tendency demonstrated by the industrialised North to teach the developing South how to attain sustainable development has been criticised because it fails to realise that development does not come with western experts, nor does it come with foreign science, technology and investment. Rather, sustainable development must be created by the people in the process of living in harmony with nature, especially 'in a situation where this environment has been either destroyed or profaned because of decades of colonial rule' (Tandon, 1995, p. 219). In this context sustainable development becomes sustainable economic growth where a new ecological wisdom becomes the tool to open a new era of welfare and growth. This encourages the mobilisation of local communities to develop self-reliant and self-resourced projects.

Many of the issues relating to the North/South divide in sustainable development are paralleled in landscape architecture and planning, as discussed in chapter seven. Here too it is necessary to interpret traditional responsibility (stewardship) towards nature in the context of the regional landscape and to encourage communities to develop answers that are appropriate ecologically and culturally. Such an approach is embraced by ecological landscape design and planning and will be discussed further in the case study applications.

Investigating landscape sustainability

Even though *landscape* has been indirectly implied in some works on sustainable development (Jacobs, 1985; Adams, 1990), referred to extensively in eco-development (Dasman, 1985; Martinez-Alier, 1987) and in environmental sustainability (Blowers, 1993), the concept of *sustainable landscape* is relatively recent and eludes a comprehensive definition. However, it is increasingly becoming evident that landscape is a highly promising scale for sustainable development in view of its 'relatively distinct boundaries and the commonality of ecological process over its area' (Forman, 1990, p. 273). Landscape is a tangible scale to which individuals and society can relate. As such it serves as a medium which, through the process of thinking and planning, increases the awareness of sustainable alternatives on the part of designer, user and society at large. The landscape design in turn can help to re-orientate societal preferences and contribute to the formulation of alternative values.

Natural landscapes derive their sustainability from the assemblage of natural ecosystems within them. Chiras (1992) explains nature's sustainability as a result of five factors: conservation, recycling, reliance on renewable resources, population control and restoration or self-healing. Man's longterm survival depends on these processes and their potential to recycle vital resources and eliminate waste, thus ensuring the sustainability of the biosphere that supports him. Man-made landscapes in contrast are often unsustainable. In the process of accommodating his needs, man modifies and gradually replaces natural ecosystems. It is possible to imagine a continuum with the sustainable natural landscape at one end and the unsustainable man-made ones at the other end, those that are totally dependent on input from the outside (Fig. 10.2). Traditional rural cultural landscapes such as those of the Mediterranean are a good example of sustainable man-modified landscapes. As such they have the potential to serve, as we shall contend, as an inspiration to landscape designers and planners in their objective of achieving landscape sustainability.

10.5
Ecology, landscape and the discourse of nature and culture

Ecology's association with nature conservation and the environmental movements has demonstrated its potential to provide not only a scientific but also an ethical and spiritual approach in dealing with landscape and environment (Fig. 10.3). Ecology prompted the questioning of western man's abuse of nature, and became the means for developing an environmental ethic and an inspiration for political action to promote a symbiotic relationship between man and environment. The concept of landscape sustainability is another outcome of the association and is central to the development of an ecological approach to landscape design and planning.

In many ways, explicit and implicit, nature conservation and the environmental movement can be seen as attempts to address the nature-culture relationship in the context of changing scientific, technological, informational and socio-cultural developments. It is an essential although complex and difficult task to understand this relationship because it forms the basis within which attitudes towards nature are formed and ideas about design, planning and management of landscape are formulated. The following is a brief discussion of aspects of the nature-culture relationship in the light of the concepts discussed above.

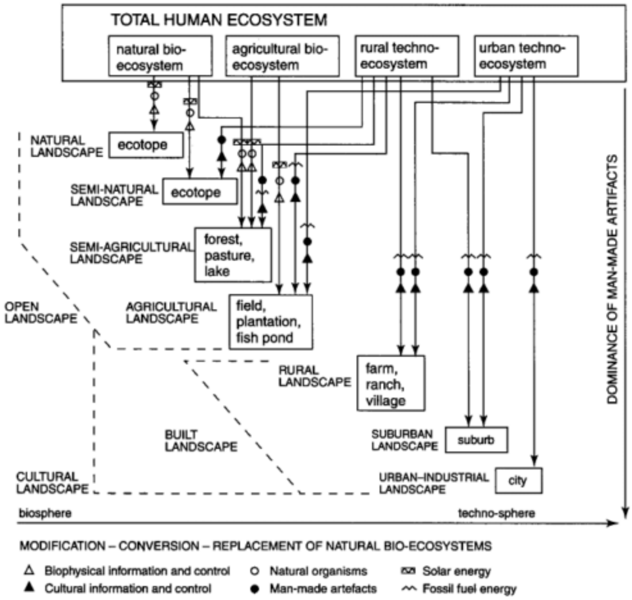


Fig. 10.2 Varying degrees of sustainability in landscape ecotopes according to energy, matter and information inputs. Natural and semi-natural landscapes (left) are sustainable, while industrial, suburban and urban landscapes (right) are not. (Source: Bakshi and Naveh, 1980.)

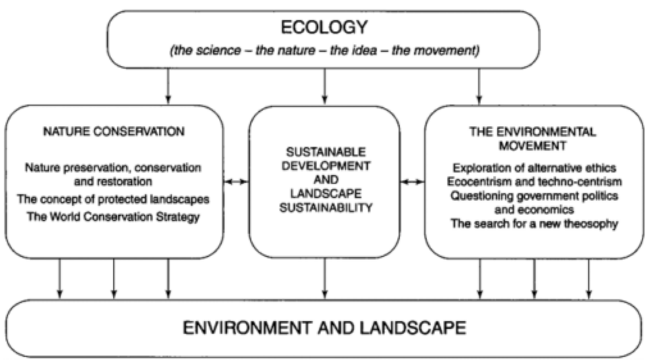


Fig. 10.3 The interaction of ecology, environment and landscape through ecology's association with nature conservation and environmentalism.

Ecology and the changing perception of nature

Ecology has the potential to enhance our understanding of nature not only by alerting us to the dynamic properties of the earth and its life-support systems, but also by cautioning against a static view of nature as still-life or scenery. We must also accept and can benefit from viewing nature as characterised by chance and randomness, even if this view is less comforting than the predictable, clockwork world of a deterministic view (Botkin, 1990). These new perceptions of nature have significant implications to landscape aesthetics that will be discussed in the following chapter. Changing our perception of nature can only be done by moving to a deeper level of thought and by confronting the very assumptions that have dominated perceptions of nature for a long time. This will allow us to find the true idea of a harmony of nature, which is in its very essence discordant (Botkin, 1990).

Ecology and the nature/culture complex

Ecology as a science provides significant insight into nature and its transformation as a result of human action. It is, however, ambiguous about the social and cultural motivations that generate these actions. Failure to acknowledge the matrix of social, cultural and historical conditions has been criticised by Haila and Levins (1992), who argue that environmental problems are not primarily problems to be solved by science and technological means, but risks to be coped with in the whole cultural and social sphere. Ignoring the social and cultural influences in the environmental debate, as for example in deep ecology and North American radical environmental thought, results in an over-emphasis on 'nature' and 'wilderness' at the expense of denying culture (van Wyck, 1997). Furthermore, the denial not only encourages a romantic longing to return to a pre-modern primitivism but also rules out the alternative of critically apprehending possible relationships between culture and nature.

The problem has been further compounded by globalisation and an increasing reliance on the impersonal language of satellite imaging and international data processing, all of which contribute to the alienation of culture. Globalisation allows scientists, administrators and environmentalists to speak and conceive of humans as a single unified category, thereby not only reducing the complexity of political and social differences but also consigning the aspirations of cultural rights, democracy and self-determination to oblivion (Sachs, 1995). The rich areas of thought in the humanities and social sciences need to be combined and taken into account in formulating an ecological approach to landscape. Similarly the heritage of shared meaning that represents a culture should be viewed as an integral part of such an approach because it offers a rich source of experience and interpretation of nature. This is especially true in the Mediterranean, where natural and cultural processes have shaped the landscape for millennia and are so intertwined that it would be impossible to understand them independently. Consequently, the sharp boundaries that separate nature from culture, which are characteristic of contemporary western thinking, cannot be afforded in the context of the Mediterranean. Like the sharp distinctions between life and non-life, human and machine, physical and non-physical, they are increasingly being challenged (Botkin, 1990; Haraway, 1991) and their repercussions in landscape architecture and planning criticised (Meyer, 1997).

Since it integrates the natural ecosystems of the biosphere and the man-made systems of the techno-sphere, the holistic approach of landscape ecology, specifically the concept of Total Human Ecosystem as discussed in chapter one, oversteps the boundary that separates the purely natural realm of bio-ecological sciences from the human-centred fields of knowledge. Another way of breaching the boundary is by reconciling man's dual relationship to nature: his self-transcendent and self-assertive tendencies.

Self-transcendence and self-assertion

Man occupies a dichotomous position in nature because he is simultaneously part of two worlds: the natural, evolving, organic biosphere which he shares with other organisms; and the noosphere of his mind which places him apart from and above the rest of the world (Naveh and Lieberman, 1990). This relationship can be presented by a cybernetic view of man as occupying a position of mutual causality as receiver of vital input from the biosphere and geosphere but, at the same time, as a modifier of the biosphere and geosphere through the outputs of his techno-sphere *(ibid.)*.

Design professions that deal with environment and landscape exemplify the relationship of man the affecter and man the affected. Although their attitudes, approaches and biases unavoidably draw on the socio-cultural sphere within which they exist, their professional framework has the potential to effect change. Striking a balance between the positions of man as the affected and the affecter is only possible by recondling two of his inherently opposing tendencies: a tendency towards integration or *self-transcendence* whereby he functions as part of the larger whole; and a tendency towards *self-assertion,* seeking to preserve his autonomy (Koestler, 1989). During the earlier stages of cultural evolution, these two tendencies were somewhat balanced. Modern technology and scientific reductionism, however, disrupted earlier cybernetic adaptations. For landscape design and planning to reclaim the cybernetic symbiosis between man and nature it is essential that the self-assertive and self-transcendent tendencies be reconciled in approaching landscape. Such reconciliation, according to Naveh and Lieberman (1990), entails a higher level of conceptual complexity, which in turn yields a higher level of integration with emerging qualities of diversity, stability, productivity, utility and beauty.

10.6
Approaching an ecological understanding of landscape

This last section will discuss the implications of ecology *the science* in establishing an ecological understanding of landscape. For this purpose a number of ecological concepts will be reviewed. The discussion is not intended to be a comprehensive review of the subject since this has been sufficiently dealt with elsewhere (Farina, 1998; Odum, 1959, 1969; Zonneveld and Forman, 1990; Naveh and Lieberman, 1990; Vink, 1983). Rather, the aim here is to illustrate how these concepts contribute to a more dynamic and comprehensive understanding of the landscape (Table 10.1). The concepts are also intended to establish a framework for reviewing ecology's interaction with architecture, landscape architecture and urban

Table 10.1 Selected ecological concepts and their implications in understanding landscapes

Selected Ecological Concepts	Ecological Understanding of Landscape
Complexity and interrelatedness in ecosystems	Landscape a mosaic of ecosystems; Web of connections integrating abiotic, biotic and man-made components over spatial and temporal scales
Self-organisation and regulation in ecosystems	Natural and semi-natural landscapes maintain a dynamic balance through reciprocal regulation mechanism
Biological diversity and landscape heterogeneity	Diversity and heterogeneity allow landscapes to maintain structure and ensure resilience and long-term sustainability
Hierarchical organisation of ecosystems	Landscape continuity from the ecotope to the ecosphere; 'Scale-linking' the levels of the spatial hierarchy explains patterns and processes
Evolutionary development	Landscape evolves toward greater organisation, integration and diversity; Landscape patterns are the outcome of natural and cultural evolutionary processes

landscape design (chapter eleven) and for developing the ecological landscape design paradigm (chapter twelve).

The complexity and interrelatedness of ecosystems

Ecology informs us of the complexity of natural processes, of the vast webs of interactions and the intricate chains of connection that take place over varying spatial and temporal scales. Although ecological sciences cannot always explain this complexity, they can contribute to our understanding of the interrelationships between the different processes and patterns (Farina, 1998). The holistic approach of landscape ecology represents a revolt from Cartesian reductionist logic and the fragmentation of knowledge that results from specialisation. Holism is concerned with the study of whole systems, linkages, processes, patterns, context and emergent properties at the level of higher systems. Viewed as interaction systems, the components of an ecosystem—abiotic, biotic and cultural—are connected by direct reciprocal influences; hence they behave as a connected whole. A view of the landscape 'as a mosaic of local ecosystems' prompts an appreciation of the interrelatedness and the synergy among the various landscape components and focuses attention on the relationships, not only on the components themselves (Forman, 1990).

Dynamic equilibrium and self-organisation in ecosystems

A self-organising system may be defined as one in which structures and processes reinforce each other (Farina, 1998). Such a system can maintain order through internal interactions. Living systems respond to internal processes and to external perturbations or stresses that are 'normal' to the system. 'Normal' implies that the stress has a long history of recurrence and that it is desirable in that the system's long-term self-integrative strategy has internalised a need for such a stress, at least periodically (Regier, 1993). The characteristic ability of an ecosystem to maintain structure not only despite but also because of external perturbations, its capability to recover towards an end-state that is 'normal' for the system, is referred to as *ecological integrity* (*ibid.,* p. 3). An end-state other than pristine or naturally whole (e.g. semi-natural and managed ecosystems) may also be taken as 'normal'.

Landscapes generally evolve towards greater organisation, integration, diversity and complexity. They change because of natural and human-induced perturbations. Natural perturbations like flooding and fire have profound influence on the historical evolution of landscapes, but human influences by far exceed these natural processes because of the higher frequency of occurrence (Farina, 1998). The Mediterranean landscape exemplifies this concept since it is itself the product of regular cyclical perturbation, both anthropocentric and natural. The result is a human-maintained dynamic long- and short-term flow equilibrium between forests, woodlands, shrub lands and grasslands.

Biodiversity, landscape diversity and ecodiversity

Biological diversity—biodiversity—is the property that makes resilience possible and allows for the dynamic balance of ecosystems. Decline in biodiversity is measured at three levels: in ecosystems, in species and in the genetic variety within species (Draggan *et al.,* 1987). The inevitable fragmentation of the landscape, whether natural or managed, depresses biodiversity. Conserving biodiversity therefore is dependent on the size and the distribution pattern of the fragments, i.e. the *patches.* Although area counts in the build-up of diversity, i.e. the larger the habitat the greater the number of species, the spatial distribution of the patches is just as significant (Kim and Weaver, 1994; Forman, 1990, 1997). Linkages through natural corridors, greenways and proximity are further positive assets for biodiversity conservation (Forman, 1997; Flink and Searns, 1993).

Diversity and heterogeneity are two related concepts in landscape ecology. Heterogeneity is an inherent character of the land mosaic; it exists at any scale of resolution and can be considered as the structural substrate on which biological diversity can develop (Farina, 1998). Within the specific context of the Mediterranean, Naveh (1995a) proposes the broadening of conservation efforts from species and ecosystem levels to landscape levels and from biological diversity to ecological landscape heterogeneity and diversity. He sees the aim of this total 'ecodiversity' as the preservation and restoration of the 'total biological, ecological and cultural landscape diversity, and its intrinsic and instrumental values in highly valuable, semi-natural, agricultural and rural landscapes' (Naveh, 1995a, p. 14). The concept of protected landscapes is one alternative that has the potential to conserve the biological richness of traditional Mediterranean rural cultural landscapes, maintaining their ecological stability as well as their cultural wealth and scenic beauty.

The hierarchical organisation of ecosystems

The hierarchy theory as discussed in chapter one sees the landscape, depending on its scale, as consisting of one or more ecosystems with the relationship between them determined by two ecological principles (Pickett *et al.,* 1994). First, that all scales are interrelated and interacting with no rigid divisions separating them. Second, that the hierarchy in their ordering dictates that higher levels depend upon the lower level and the lower levels are directed by the higher. Thus the causal explanation of the pattern to be explained resides in a particular hierarchical level, while the mechanism resulting in the pattern is often found at one level below.

While the hierarchy theory explains the organised complexity and heterogeneity of the landscape, the interplay across hierarchical scales is referred to as *scaling* (Farina, 1998). Scaling allows for the appreciation of the repetition in landscape patterns at an infinite variety of scales. In nature, patterns at one scale often resemble those at a higher or lower scale because the processes shaping them are essentially identical across those scales. Thus scaling provides a useful metaphor for parallel attempts in the design disciplines to bridge the different scales (van der Ryn and Cowan, 1996). Landscape classification is one example of a hierarchical framework. As discussed in chapter one, the ecotope is the smallest landscape unit of concrete bio- and techno-ecosystems and the ecosphere the largest global landscape.

The necessity of a historical evolutionary approach

Change in ecosystems at all levels of complexity results from evolutionary processes, whereby process and structure become complementary aspects of the same evolving totality. An understanding of evolutionary adjustment contributes to the overall understanding of ecosystem dynamics (Collier et *al.,* 1973). History informs about landscape changes caused by biological and non-biological factors as well as anthropocentric ones, independently or in combination over an evolutionary time scale. It succeeds in establishing a dynamic understanding of the landscape, which cannot be attained by observations or through a survey of the existing landscape. Evolutionary changes can be loosely separated spatially according to their scale and temporally according to their evolutionary time of occurrence (Haila and Levins, 1992). The rate of change is as significant as the scale/time span; the slowly changing, usually cyclical variables or foundation variables are the underlying regulatory foundation determining whether landscape development is sustainable or not (Forman, 1990).

10.7 Conclusions

This chapter has attempted to demonstrate ecology's potential to provide a scientific, ethical and spiritual approach in dealing with landscape and environment. In the hundred years since its inception, ecology has increasingly provided for a holistic and dynamic understanding of natural processes, ecosystems and natural resources, while shifting ecological paradigms have influenced cultural attitudes and beliefs about nature. Ecology's association with nature conservation and environmentalism has broadened its scope beyond the strictly scientific. As a result, ecology has become instrumental in countering modern man's fragmentary view of nature. Its holistic approach, integrating both nature and culture, has come to reflect a new spiritual holism and guide the re-establishment of man's relationship to the cosmos.

In combination the different dimensions of ecology have great potential to alter the outlook of designers, deepen their understanding of landscape and environment and assist in the development of an integrative and dynamic design methodology. While ecological sciences provide a holistic, dynamic and evolutionary understanding of landscape, ecology *the idea* inspires through its search for connecting patterns a search for ethical and spiritual dimensions, both of which have been increasingly absent from current design and. planning approaches. Lamenting the loss of a unified view of our world which existed in religious thinking and pre-industrial cosmologies, Bateson (1988, p. 18) sees in ecology the potential for reclaiming it, as expressed in the following caption: 'We are beginning to play with ideas of ecology, and although we immediately trivialise these ideas into commerce or politics, there is at least an impulse still in the human breast to unify and thereby sanctify the total natural world, of which we are.'

Chapter 11
Ecology and the environmental design professions

Ecology's association with the environmental movement popularised the science and introduced it to the design professions. The outcome was a wide range of concepts, ideas and design approaches which reflected awareness of ecosystems, environmental processes and natural resources. This chapter investigates these ideas and concepts by reviewing ecology's interaction with the environmental design professions, namely architecture, landscape architecture and urban landscape design (ecology's influence on landscape planning has already been discussed in Part Two). Concepts resulting from the interaction contribute to the formulation of a broad definition of *ecological design* and to the establishment of a foundation for *ecological landscape design*.

11.1
Landscape architecture, the environmental design professions and ecology

Despite the outstanding examples of man-made landscapes past and present, *landscape architecture* as a profession is only a little over a hundred years old. The coining of the term 'landscape architect' is traced by Turner (1982) to the early nineteenth century, to the writings of Gilbert Laing Meason and to John Claudius Louden. The term appeared as a professional title when used by Frederick Law Olmsted and Calvert Vaux in 1858 (Newton, 1971). The American Society for Landscape Architects was founded towards the end of the nineteenth century.

The first British designer to employ the title of *landscape architect* was Patrick Geddes, who was impressed by its use when visiting America. It was, however, T.H. Mawson, a 'park and garden architect', who established the title in 1929. Mawson became the first president of the British Institute of Landscape Architects (University of Lancaster, 1976) which in 1978 changed its name to the Landscape Institute, broadening its membership to include 'the additional divisions of landscape sciences and landscape management on equal footing with landscape architecture' (Landscape Institute, 1994).

The scope of landscape architecture

Changing the landscape is an action increasingly associated with our civilisation. At first this must have been guided by the need to fulfil practical requirements to make the land more productive, comfortable and protective. Human self-consciousness eventually led, however, to an appreciation of the emotional impact of landscape and the potential of evoking emotional responses through landscape design (Moggridge, 1986). To designers, therefore, landscape represents a field of action across which their imagination, creativity and expertise are exercised *(ibid.)*. Accordingly, landscape design can be seen as art in that it is a creative process of giving shape and evoking an emotional response; and as science in that it requires knowledge of the physical components of soil, topography, climate and vegetation. As a profession, landscape architecture's 'primary societal role is the synergism of art and science for the management, planning, and design of the entire physical and cultural landscape, including its vestal wilderness and its growing urbanness' (Motloch, 1991, p. 2).

Landscape architecture and architecture

The association of landscape architecture with architecture is a subject of much debate (Eckbo, 1983; Marx, 1991; Turner, 1982). Although both combine aesthetics and functionality, architecture's professional seniority places it in a dominant position in relation to landscape architecture. As a result, landscape architecture has been relegated to a subordinate position which often compels it to take up 'where architecture leaves off, usually by beautifying (hiding) with vegetation the excrements of architecture' (Bourassa, 1991, p. 18). This inevitably limits the intellectual and professional potential of landscape architecture. Further, a preoccupation with superficial aesthetics, i.e. styles, has come to focus the attention of both professions on the physical elements being designed rather than the effect of the design on the environment, the health of the people who experience it and the health of the natural systems involved (Motloch, 1991). Alternatively, a holistic ecological approach, it will be argued, makes possible a view of architecture and landscape architecture as two of the more important ways in which man shapes and experiences inhabited space (Marx, 1991) and creates a setting for human activity (Bourassa, 1991).

The relationship between the two professions is of interest to the present work for three reasons. First, the polarity that has come to characterise the relationship between the two professions need not be stressed but rather the complementary aspects emphasised, especially when considering that the professional, academic and legal boundaries that have created the intellectual separation do not exist on the ground (Eckbo, 1983). Second, landscape architecture, whether intentionally or inadvertently, has in the past used architectural design theory, research methods and design attitudes and approaches. Until it achieves a stronger professional and academic status, landscape architecture needs to keep abreast of developments in architectural theory and practice. Third, as landscape architecture is a new profession in many Mediterranean countries, the task of landscape design is often undertaken by architects. It would therefore be beneficial to address architects as well as landscape architects when introducing alternative approaches in design, i.e. ecological landscape design.

Ecology and the environmental design professions

The professions that contribute to shaping the environment, i.e. architecture, landscape architecture, urban design and landscape planning, are often referred to as the *environmental design* professions. Initially, use of the collective term reflected a shift in focus and concern from independent 'form' to the larger context of 'environment' (Koh, 1988). More recently, however, the use of the term has come to indicate the emergence of a new 'environmental design paradigm' emphasising a holistic design approach that can benefit both people and the environment (Motloch, 1991). In addition, the term has also come to reflect a move towards an 'environmental aesthetics' (Porteous, 1997). The term 'environmental design professions' is used here in an attempt to breach the contrived boundaries that have come to separate these disciplines.

Increasing awareness of environmental degradation, resource scarcity and the aesthetic blight characterising the contemporary landscape means that we should co-ordinate our efforts to produce efficient and sustainable design. This commonality of intention would mean that the responsibility for design is equally shared between architecture, landscape architecture, landscape planning and urban design. Ecology can simultaneously inform, guide and inspire such new directions in environmental design.

It is of significance here to mention that the meaning and potential of ecology is not uncommonly misinterpreted by some of these professions. This is partially the result of ecology's link with the environmental movement which has come to associate ecology with environmental problems, i.e. difficulties to be solved (Vink, 1983). Misinterpretation in the context of landscape architecture has resulted in ecology being increasingly associated with a 'natural style' of design that is limited to the utilisation of indigenous plant species and as such seen as limiting the designer's creativity (Corner, 1997; Lyall, 1991; Ruff, 1979). The term *natural* itself is open to a variety of interpretations. While scientists and designers define 'natural' as unaltered by humans or as being in harmony with natural processes, to users 'natural' implies *natural-appearing* (Lyle, 1985).

These misconceptions have generally undermined the potential of ecology in contributing to design creativity, efficiency and environmental sustainability. To overcome this, the interface of ecology with three of the environmental design professions —architecture, landscape architecture and urban landscape design—will here be reviewed. The review will concentrate on key contributions and their potential in developing ecological approaches to design.

11.2
Ecology and architecture

The interface of ecology and architecture was somewhat limited, mainly because it was viewed by a large number of architects as limiting design 'individuality' and 'creativity'. Nevertheless, the influence has been considerable in its early stages in the 1970s and more recently in the 1990s. Two broad lines of inquiry can be discerned: research into energy-efficient design, bioclimatic architecture and earth-sheltered architecture; and research into vernacular architecture and vernacular settlement patterns. While the former developed from concern for the environmental consequences of excessive energy use in buildings, the latter provided insight into environmentally responsive design and the need to define and emphasise the regional character of place.

Energy-effident and bioclimatic design and earth-sheltered architecture

The early beginnings of energy-efficient design can be traced to the energy crisis in North America in the early 1970s. Although much of the initial enthusiasm and funding waned as the crisis came to an end, research in active and passive solar design continued, albeit at a slower pace. The scope of passive solar design was wide, embracing architecture as well as the landscape. Of the wealth of literature, the Passive Low Energy Architecture (PLEA) series of conferences are of special interest (Bowen and Vagner, 1982; Holm, 1983; Yannas, 1983; Fernandes and Yannas, 1988).

Of direct relevance to landscape architecture is research into lowenergy site design in semi-arid regions (McPherson, 1984; Robinette, 1972; Wright, 1984). Here the objectives of low-energy landscape design were threefold: energy conservation in building that results from appropriate orientation and shading the building facade and roof through the use of trees, pergolas and trellises (Makhzoumi, 1982; Makhzoumi and Jaff, 1987); improving the site's microclimate (Makhzoumi, 1983); and energy saving at the settlement level (Golany, 1982; Gupta, 1984; Knowles, 1975; Lesiuk, 1983; Saini, 1980).

Bioshelters (Todd, 1977) constitute yet another related concept with an ecological intention of integrating architecture with biological systems. The design aims for an autonomous or semi-autonomous building in its use of environmental resources, i.e. a sustainable design. Beyond shelter, it provides its own heating and cooling requirements, its own electricity and/ or water.

The concept of earth-sheltered architecture can be seen as an extension of bioshelters. It combines energy-conscious design with selected vernacular design concepts (Baggs *et al.,* 1985; Frenette, 1981; Carmody and Sterling, 1993; Golany, 1983). Earth-sheltered architecture adopts a new approach that embraces both building and site and that necessitates a close collaboration between architect and landscape architect. Wells (1982) sees earth-sheltered design as the response of some architects, such as himself, to the destruction and fragmentation of the landscape resulting from irresponsible design in architecture. Despite the research input, however, built examples of earth-sheltered architecture remain limited. This is partly due to the increased area requirements dictated by earth-sheltered buildings but also because they offer limited scope for an individual architectural expression. This is also argued by Watson (1979), who believes that the main impediment to innovative and ecologically responsive alternatives in architecture is cultural.

Research on vernacular architecture

Research into the vernacular was initially undertaken by geographers, social historians and archaeologists. The term gained popularity in the 1960s and 1970s when it was reintroduced by architectural scholars in their quest for original and more enduring building forms (Oliver, 1969, 1975; Rapoport, 1969; Rudofsky, 1965, 1977). *Vernacular* in architecture has come to signify traditional building forms that are responsive to environmental and ecological constraints and potentialities. Typically they have evolved over generations through a process of trial-and-error in the course of accommodating social and cultural needs.

Research undertaken on vernacular settlements is of relevance to landscape architecture since it encompasses both buildings and their surrounding open space (Oliver, 1997; Rapoport, 1977). In addition, such research has enlightened architects to a new design outlook that is responsive to the environment and interactive ecologically, socially and culturally (Fathy, 1976, 1986; Makhzoumi, 1988a, 1988b; Turan, 1990). The significance of such a new approach can only be appreciated when viewed in the context of the then prevailing 'international style' and its disregard for environmental and regional contexts.

Christopher Alexander's inquiries into vernacular forms can be seen as the strongest reflection yet of architecture's adoption of an ecological approach. Rather than the arbitrary imposition of form, Alexander (1977) advocated design solutions that developed from an appreciation of the 'field of relationships' of a specific context and as exemplified by the adaptation of vernacular patterns. As such, 'good' patterns were those that possess a holistic completeness and the ecological balance found in natural forms. Alexander's focus on 'patterns of relationship' rather than form in itself is the very essence of an ecological approach to design.

11.3
Ecology and landscape architecture

Ecology's association with the landscape profession has a long and continuing history. Of special significance is,the collaboration between landscape ecology and landscape planning which is discussed in Part Two. The outcome, ecological planning, has become part of the 'conventional wisdom' widely accepted as a rational planning approach (Giliomee, 1977; Haber, 1990; Hills, 1974; Selman, 1981; Steiner, 1991).

In landscape architecture ecology's emphasis on natural processes and the interrelatedness of landscape components influenced outlook and method (Lyle, 1985; McHarg, 1969; Manning, 1982, 1995; Woodward, 1997) and prompted an ecological approach to design (Franklin, 1997; Motloch, 1991; Vroom, 1997). The change from the equilibrium to the non-equilibrium paradigm in ecology (section 10.2) challenged the static and pictorial aesthetics, prompting a move towards a new more dynamic aesthetic theory (Corner, 1997; Howett, 1987; Koh, 1988; Thorne and Huang, 1991).

Among the many contributions, three have been selected and will be reviewed here. First, Patrick Geddes (1971), because he is the initiator of an ecological approach in design and planning and because he offered an integrative view of the environment that embraced urban design, landscape design and planning. Second, lan McHarg (1969) who, perhaps more than any other, popularised ecology in landscape architecture. Third, John Tillman Lyle (1985, 1994), because he offers a comprehensive approach embracing theory, practice and method.

Patrick Geddes: the initiator of an ecological approach

The early influence of ecology can be traced to the work of late nineteenth century visionary biologist Patrick Geddes, the conceptual initiator of an ecological approach to urban and landscape design and landscape planning (Kitchen, 1975; Meller, 1990; Tyrwhitt, 1947). The ideas and concepts of Geddes directly influenced the first generation of planners in Britain (Meller, 1990) and formed the foundation of contemporary regional and environmental thinking in the USA (Kitchen, 1975; Lyle, 1985). His concepts were embraced by designers, planners and theorists including Lewis Mumford, Howard Odum and Benton MacKaye.

Patrick Geddes (1971) had a clear, overall conceptual strategy for improving the man-made environment and for advocating a sympathetic coexistence with the natural environment. He saw man as an integral part of nature and believed in applying a sympathetic and holistic conceptual framework, that of 'the web of life', in improving the social and spatial environment of cities. He promoted the idea of the region as a representative section of the universe and as the only appropriate 'unit of study' for the city. He was also the first to view economics as a matter of resources and not of money. In his 'biological principles of economics' he came closest to the present day concept of sustainability. In his thought and action Geddes transcended the superficiality of 'style and fashion'.

lan McHarg: an ecological method in landscape architecture

By the 1950s planning in the US had shifted its emphasis away from the holistic, regional approach emphasised by Geddes, MacKaye and Mumford to a highly analytical approach, growing largely from the mathematical constructs of the neoclassical economics (Lyle, 1985). Ecological thinking was only resumed with the publication of lan McHarg's (1969) *Design with Nature.* His 'overlay method' (section 5.6) whether in its earlier or later, more sophisticated versions has come to dominate the repertoire of landscape analysis (Simpson, 1989; Lee, 1982).

The overlay method, however, has several limitations, which are partly due to the fact that knowledge of ecological theory and of human ecology at the time was not sufficiently developed (Ndubisi, 1997). The limitations are also due to the restrictions of the graphic means of representation, i.e. each landscape component is presented on a separate two dimensional map which is in itself a form of compartmentalisation (Simpson, 1989). As a consequence and despite the method's emphasis on process, it inevitably represents landscape elements such as soil and vegetation as if they were separate and independent features (Ndubisi, 1997). This compartmentalisation was also influenced by the dominance of scientific rationality in design method that was characteristic of the 1960s, as will be argued in the following chapter.

The significance of McHarg's work, however, lies elsewhere, namely in introducing ecological understanding to the profession. McHarg believed that ecology had the potential to emancipate landscape architects from the static scenic images of ornamental horticulture by steering them away from arbitrary and capricious designs (McHarg, 1967). This is as true today as it was when the work was conceived, almost three decades ago.

John Tillman Lyle: the design of human ecosystems

John Tillman Lyle's (1985) *Design for Human Ecosystems* is a comprehensive integration of ecological concepts and landscape design. The term *human ecosystems* is proposed by Lyle to signify the totality of the landscape at hand as a warning against a strongly visual notion of landscape assessment and as a reminder that the landscape needs to be evaluated as the outcome of natural and cultural processes. Lyle argues the necessity of making full use of ecological understanding in the process of designing ecosystems; only then can 'we shape ecosystems that manage to fulfil all their inherent potentials for contributing to human purposes, that are sustainable, and that support nonhuman communities as well' (Lyle, 1985, p. 16).

Three aspects of Lyle's (1985) work are of direct relevance in establishing the conceptual foundation for ecological design. The first is that he attempts to tackle the complexity of design method and offers a critical investigation of the design process in the context of ecosystem, its function, structure and ecological (rather than economic) rationality. The method he proposes, however, does not differ radically from the analysis/synthesis method. The second is that he includes 'management' as an integral part of ecosystem design, arguing that ecosystems like any organic entity have a variable future and as such, their design should be probabilistic; it is difficult to predict the changes that will take place. The implication here is that design is an ongoing process and that the final product of design is only one stage in this process; it should not be the objective. It also implies that design is interactive because it takes into account future change resulting from the designed system's interaction with its environment.

A third aspect of Lyle's work is that he breaches the professional categorisation of landscape architecture and landscape planning. The terms 'landscape design' and 'landscape planning' are often used interchangeably (Beer, 1984; Cook and Hirschman, 1991; Vroom, 1976). Lyle (1985, p. 17), however, uses 'design' as giving form to physical phenomena 'to represent such activity at every scale'. In this he follows others (Steinitz, 1979; McHarg, 1969) who refer to the regional planning scale while using 'design'. Lyle viewed landscape planning's focus on the rational as inevitably excluding the intuitive. This broadening of the scope of landscape design suggested by Lyle is embraced throughout the chapters of Part Three of this book.

11.4
Ecology and urban landscape design

McHarg's early attempts at 'ecological design' gathered momentum in scope and application, influencing an early generation of landscape architects and environmentalists to reassess the sterile urban landscape (Spirn, 1984) and to investigate the potential of reintroducing nature in cities (Fairbrother, 1970; Laurie, 1979; Manning, 1979; Sukopp and Werner, 1982). Ecological approaches to urban landscape design have since developed and now embrace ways of protecting and enhancing natural features and processes which can then be experienced and enjoyed by city dwellers.

Two prominent ecological concepts are *greenways* (Flink and Searns, 1993) and *ecological networks* (Nowicki *et al.,* 1996). Both of these concepts are based on research in conservation biology and landscape ecology that stresses the necessity of linking fragments of protected landscape to form a system, i.e. network, if long-term conservation efforts are to be successful. Ecological networks therefore overcome the limitations of traditional conservation approaches which are dedicated to protecting isolated sites and species. In addition, they provide for a more powerful experiential and aesthetic impact in cities and in the surrounding countryside. Other ecological concepts in the urban context include *wildlife reserves* in cities (Adams and Dove, 1989), the development of *urban forestry, naturalising parks* and *urban farms* (Gordon, 1990). Gilbert (1984, 1991) furthermore explores the significance of developing mutually beneficial links between people and urban wildlife in wasteland, cemeteries, railways and the surviving vestiges of nature in the city.

Enthusiasm for ecological landscapes was also prompted by the failure of contemporary landscape architecture to find a convincing theoretical and practical basis for dealing with urban landscape problems. In the UK this was argued by Ruff (1979) and by Ruff and Tregay (1982). The authors have criticised the urban landscape as having an aesthetic viewpoint that reduces nature through impoverished artificial landscapes that are not sustainable. They find the landscape industry guilty of insisting upon an imagery of intensively managed landscapes achieved by the use of equipment and herbicides and demanding energy and funds to maintain.

The symposium jointly organised by the British Ecological Society and the Landscape Institute (Bradshaw *et al.,* 1986) is of special significance because it signified awareness for interdisciplinary professional collaboration between ecologists, landscape designers and landscape managers.

An alternative approach is developed by Michael Hough (1984) who argues that natural processes within cities, no matter how altered, have the potential to form the foundation for developing appropriate urban landscapes. Hough also argues that 'cultural and natural forces are responsible for creating a distinctive regional identity' (Hough, 1990, p. 58) and that 'landscape literacy' lies at the heart of understanding this character of place. Landscape literacy, he explains, begins at home and forms the basis for a wider understanding of ecological issues. As such he recognises the natural and cultural variability of place as central to the formulation of landscape character and in developing a new ecological aesthetics of place (Hough, 1991).

11.5
Landscape architecture in the arid and semi-arid Mediterranean

Landscape architecture is a new profession to many Mediterranean countries, especially those in the southern and eastern littorals (the arid and semi-arid regions, respectively). Historically, considerations of defence, economy and climatic sheltering limited the scale and extent of public open space in settlements. The profusion of orchards and olive groves that surrounded the towns compensated for the absence of parks and gardens in them. However, the introduction of western styles of architecture and planning at the turn of the century gradually transformed the traditional pattern and led to an accumulation of urban open spaces. Local architectural and landscape expertise proved inadequate to the problem of design raised by these open spaces, however, since their scale and form were at odds with the vernacular urban vocabulary. Eventually, western style landscapes were introduced with a total disregard to the local context.

The contemporary landscape in the Mediterranean generally falls into three categories: landscapes associated with modern buildings where the landscape consists of large stretches of manicured lawns and is intended as a backdrop for the architecture; the exotic gardens of detached modern houses; and the commercial landscapes of tourist projects. All three categories are preoccupied with the strictly visual aspect of landscape, which entails significant economic and environmental costs for their establishment and long-term upkeep. The contemporary landscape in addition requires intensive irrigation, thus adding to the problems of water shortage in these regions. The adverse impact of the contemporary landscape, however, is not only ecological but also aesthetic and social. As it replaces the traditional landscape the contemporary one destroys the regional landscape identity, erodes local distinctiveness and alters local values and aesthetic priorities.

Given the absence of a well-established professional body and the extremely limited research into landscape issues, the development of alternative approaches to current landscape problems poses a difficult undertaking. The search for more sustainable alternatives is also hindered by the, at best, only rudimentary environmental legislation and the absence of local awareness of environmental resources and of landscapes issues in general.

An ecological approach to landscape design and planning in the arid and semi-arid Mediterranean is a necessity: ignoring the ecological reality can have dire and often irreversible environmental consequences. The point of departure is to realise that the nature-culture relationship in the Mediterranean is fundamentally different in comparison to temperate regions. Nature is at once fragile and easily disturbed but also aggressive and threatening. Culture on the other hand has been shaped by a long co-evolutionary history with this aggressive and threatening nature. This is clearly reflected in the portrayal of nature in poetry and in religious metaphors, myths and vernacular symbolism. Traditional Mediterranean landscapes exemplify cultural adaptation to natural constraints but also illustrate the way that a threatening nature has been harnessed and tamed. An ecological approach to landscape design has the scientific and philosophical framework that can assist the designer in understanding the complex interaction of natural and cultural processes and their role in shaping Mediterranean landscapes.

11.6
Evaluating the contributions

Reviewing ecology's interaction with the environmental design professions reveals a wide range of concepts, solutions and approaches (Fig. 11.1). The contributions in architecture and the urban landscape design include practical strategies (e.g. energy conservation, ecological networks) and design solutions to specific problems (e.g. earth-sheltered architecture and bioclimatic design). The interaction of ecology and landscape architecture has been more extensive, leading to a holistic approach to landscape design. All the contributions, however, find inspiration in nature and aim to shape man's environment sustainably and 'beautifully' (Tregay, 1990).

The scope of the contributions establishes the potential of ecology to inspire different philosophical outlooks and to contribute practical solutions to a wide range of environmental design problems. Equally significant is ecology's role as an integrating agent, i.e. ironing out professional

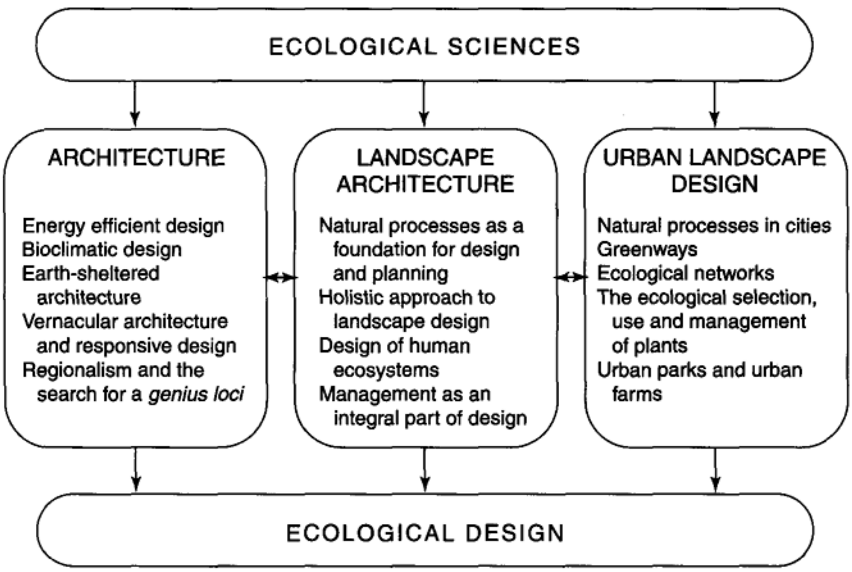


Fig. 11.1 The interface of ecology with architecture, landscape architecture and urban landscape design.

differences. This is partly the result of ecology's holistic view of man and the environment but it is also the outcome of the deeper and more comprehensive understanding of natural processes and resources that ecology offers. Increased awareness of site and context (e.g. Alexander, 1977), the fragmentation and destruction caused by irresponsible design (e.g.

Watson, 1979; Wells, 1982), efficient energy use in buildings (Gupta, 1984; Knowles, 1975) and the significance of place (e.g. Hough, 1990; Norberg-Schulz, 1984) indirectly contributed to lifting the boundaries separating architecture from landscape architecture and urban landscape design.

Despite landscape architecture's close association with ecology, however, a creative and integrated ecological landscape design method failed to materialise. This has been noted by Walmsley (1991), who argues that the increase in the quantity of literature on ecological landscape design has not resulted in a well-defined theoretical thesis nor has it produced a workable ecological design method in landscape architecture. Two reasons account for this failure. The first is the result of contemporary landscape architecture's reliance on objectivist and instrumental models of ecology, often at the expense of design creativity. This had all too frequently been reduced to 'dimensions of environmental problem solving (know-how) and aesthetic appearance (scenery)' (Corner, 1997, p. 82). The second reason lies in the limitations of current landscape design methodologies. Without a flexible methodological framework that allows for an integration of ecological concepts into the design process the potential for a comprehensive ecological approach is difficult to envisage. This, however, does not deny the intuitive work of designers who are sensitive to the potential and the limitations of the site. They have developed creative solutions with or without knowledge of ecology and without necessarily following an explicit method, e.g. the creative works of George Hargreaves (1991), Luis Barragan (Ambasz, 1976) and Geoffrey Jellicoe (and Susan Jellicoe, 1968, 1983). These designers, however, are exceptional; their work does not render the search for an ecological landscape design method any less necessary an undertaking.

The failures of design in landscape architecture

The addition of the term *architecture* to imply the design activities associated with shaping the landscape carried with it a set of design approaches and attitudes inherent to the architecture profession and not always suitable to the nature and essence of landscape design (Colvin, 1948). Even though landscape architecture has its roots in art and science, landscape architects were eager to associate with architecture and quick to draw on the similarities between the two professions (Shepheard, 1953). Landscape architecture has come to have 'so much in common with the methodology of architecture that one is tempted to see it simply as an extension of architectural principles and practices into landscape' (Appleton, 1975, p. 13).

One implication was that 'architectural design' was transported into landscape architecture without regard for the contextual differences between the two professions. The living and dynamic nature of the landscape is very different from the inanimate building materials that architects use to structure space. Nor can the landscape components be dealt with independently from the dynamic processes that maintain their integrity. Further, architecture is anthropocentric; its main function lies in containing man's activities and sheltering him from 'nature'. Landscape design on the other hand is rooted in nature; the landscape architect should be knowledgeable and sympathetic towards the natural components and not a detached manipulator. Finally, in dealing with the landscape the spatial dimension in architecture should be complemented with a temporal one. Just as architectural design deals with the range of spaces from a building's interior through the design of its shell and its outer expression, landscape design has to take into account how the design matures and changes with seasons and over the years.

It is our contention that the application of architectural design and its related approaches, attitudes and method in landscape architecture has been a limiting factor to the development of an ecological methodology in landscape architecture.

The need for theoretical inquiries

Theoretical inquiry in landscape architecture is generally limited, especially in comparison to architecture. The available literature falls into two main categories (Appleton, 1975): one that includes those works which relate to the landscape architecture of the past (pre-twentieth century) and another that is aimed primarily at the instruction and guidance of persons concerned with present-day problems of landscape design. In placing emphasis on the techniques basic to a professional training, the field of inquiry is ultimately limited by what is practically attainable. This increasingly practical orientation has also been noted in the teaching of landscape architecture, both in the UK (Beer, 1984) and in the USA (Laurie, 1984).

Theoretical inquiries are essential to the enrichment of the intellectual foundation of landscape architecture, academically and professionally. A suggested line of inquiry is to develop the framework that can be used to acquire knowledge, i.e. epistemology, which has not yet been undertaken in landscape architecture (Hamed, 1991). Another would be to instigate a critical inquiry into the historical development of twentieth century landscape architecture because 'in the absence of a critical mechanism for confronting the past, the progressive future remains elusive' (Krog, 1991, p. 102). Above all, landscape architecture's historic isolation from the central philosophical, ideological, literary and artistic debates of the time must be overcome if landscape design is to develop and to express cultural values and aspirations (Howett, 1987).

11.7
Establishing a foundation for ecological landscape design

Recent attempts to integrate ecological concepts in design include a wide range of contributions: deep design (Wann, 1996); green design (Farmer, 1996); green architecture (Vale and Vale, 1991); ecologic architecture (Crowther, 1992); and ecological design (Papanek, 1985, 1995; van der Ryn and Cowan, 1996; Thayer, 1994; Thompson and Steiner, 1997; Yeang, 1995). Even though they differ in name, these approaches are all concerned with developing an alternative philosophical outlook in environmental design by drawing on ecology in its broadest sense.

The most common characteristic to all these approaches is the adoption of a holistic system's approach in design with increased awareness of the design's impact on the environment. Architect Ken Yeang (1995, p. 83) defines *ecological design* as an anticipatory approach to design 'that is critical of its influences over the earth's ecosystem and resources and one that is responsive to their inherent constraints and opportunities'.

Van der Ryn and Cowan (1996, p. 8) view design as the 'hinge that inevitably connects culture and nature through exchanges of materials, flows of energy, and choices of land use'. They attribute the current problem in architecture to design epistemologies that are incompatible with nature's own and see them as the consequence of a shortsightedness in design that has served narrowly defined human interests. Alternatively, ecological design is any form of responsible design that minimises environmentally destructive impacts by integrating itself with living processes.

Another characteristic of an ecological approach is the necessity to design for efficiency and endless cycling of materials, i.e. to design sustainably and to think of long-term consequences. In proposing deep design Wann (1996) aims to meet basic human needs with designs that consume little energy, waste no resources and are culturally informed and biologically compatible. Drawing on Naess's concepts of deep ecology, he compares the shortsightedness of shallow design with the long-term outlook of deep design.

In the context of this book, the terms 'ecological design' and 'ecological landscape design' will be used to refer to design that embraces a holistic system's approach to the environment and that aims for sustainability. Three characteristics are seen as central to such an ecological approach to design: these can be identified as follows.

Ecological design: changing design attitudes

In an environmental context *design* is often viewed as the activity that has to do with *moulding,* i.e. giving shape (Archer and Baynes, 1977; Rowe, 1987). This view has two implications. The first is that design is increasingly thought of as an activity with a compulsion for *doing* and less as a tool for constructive *thinking.* The second implication is that design is viewed as an end product and consequently as the result of a one way process rather than an interactive one. There is a need for design to shift towards a more participatory and interactive attitude, taking into account the needs and preferences of the local culture and adopting a responsiveness to the local and regional context. Accordingly, ecological design can be viewed as the conscious and intuitive effort of responding to conditions in an attempt to impose a meaningful order and concentrate meaning (Lyle, 1985; Motloch, 1991; Papanek, 1985).

Creativity: exploring the inner world of intuition

Creativity in design is increasingly viewed as the instance in which 'the boundaries between rationality and intuition fade away in a new liberating synthesis' (Foque, 1979, p. 113). It is through intuitive insight that we bring into play impressions, ideas and thoughts that we have unknowingly collected on a subconscious, unconscious or pre-conscious level. These levels represent the *inner world* of visions, emotions, objectives, values and beliefs (De Bono, 1994). In this inner world possibilities exist; just as memories go backwards in our minds, so possibilities go forwards in our minds. Even though it contributes greatly towards creative thinking ability in terms of hypotheses, possibilities, concepts and metaphors, the inner world has been much neglected in favour of the objective world of truth *(ibid.)*. Designers need to recognise the significant contribution of the inner world and to develop better ways of dealing with it.

The process of creativity is open-ended. It is open to the environment, to feeling and to chance inspiration with no *a priori* defined goal. This openmindedness embodies the link between creative process and the aesthetic experience (Koh, 1988). Further, creativity does not proceed from a blank mind; it derives from a reservoir of information and experience and through analogies and metaphors many of which reside in the inner world of intuition. It is therefore essential for design method to draw on these resources.

Creativity, whether in architecture or in landscape architecture, has often come to represent an egocentric, individualistic expression in design. This 'false' creativity submits the design to a never-ending search for novelty until newness-for-the-sake-of-newness becomes the only measure (Papanek, 1985, pp. 40–42); creativity becomes synonymous with 'formal novelty' or 'style'. The contribution of the designer, i.e. in landscape architecture, does not necessarily mean producing a *new* landscape; rather it is to offer his constructive and creative thinking abilities in the attempt to adapt the existing system to the required development.

Establishing an ecological aesthetics

Contemporary landscape architecture's preoccupation with the appropriation of images from modern art, idyllic pastoral parks, or other formal vocabularies (Krog, 1991; Tregay, 1986; Zevi, 1964), whether out of ignorance, convenience or deliberation, has had significant implications in landscape aesthetics. Identifying landscape design with pictorial composition has given priority historically to the visual experience as compared with all other possible kinds of human responses to the landscape (Howett, 1987). This trend has simultaneously 'deprived our other senses, our minds and souls of a potentially richer and more profound experience' (*ibid.,* p. 7) and limited the potential of landscape design as a tool for exploration and creativity. Not only is aesthetic perception identified strictly with visual modes of experience, but the landscape has been denuded of its symbolism and sacredness. It no longer serves, as it had in pre-scientific cosmologies and eastern cultures, to illuminate our place within the cosmic order.

Historically, however, landscape design has derived social value and artistic and spiritual strength from three aspects of its endeavour (Olin, 1988, p. 149): the richness of the medium in sensual and phenomenological terms; the thematic content concerning the relationship of society and individuals to nature; and the fact that nature is the great metaphor underlying all art. Ecology, because it reinterprets the natural world and humankind's place within its complex systems, has the potential to contribute towards a new landscape aesthetics. This is in fact proposed by Koh (1988), who succeeds in developing an ecological theory of environmental design that deals with the total perceptual experience rather than the exclusively visual one. Koh's ecological theory of design is built on current theories of conscious and unconscious creativity, which provide an inclusive descriptive foundation for a new theory of aesthetics that serves both architecture and landscape architecture *(ibid.)*.

Ecological aesthetics is seen by Koh as being associated with three general principles of creativity: inclusive unity, dynamic balance and complementarity. *Inclusive unity* leads to a 'relative evolutionary view of beauty: beauty as relative to context and purpose and to people and place, and beauty as a reflection of fitness to purpose and context' (*ibid.,* p. 182). *Dynamic balance* implies an acceptance of chance happenings and the unpredictability of nature, while *complementarity* stresses the relations within natural systems and between our subjective 'selves' and the objective world. Within this context design 'can produce such integrating experiences, raising the awareness of our own aesthetic sensitivity and the spiritual value of life' (*ibid..* p. 188).

Defining ecological landscape design

Ecological design develops out of two areas of inquiry. On the one hand, it is the outcome of ecology's interface with the environmental design professions as discussed in this chapter. Despite the differing perspectives and focus of interest, a number of common concepts have been outlined. On the other hand, ecological landscape design also utilises fundamental ecological concepts as discussed in chapter ten. Input from these two areas of inquiry forms the foundation for ecological landscape design which is here seen as integrating four overlapping attributes (Fig. 11.2). The first is a *holistic approach* to landscape understanding, integrating abiotic, biotic and cultural landscape components. The second is a *dynamic approach* in which landscape is investigated along two continuums: a spatial one, i.e. movement between a larger scale and a local one; and a temporal one representing the evolutionary historical development of the landscape. The third is ecological landscape design's *responsiveness* to the constraints and opportunities of context whether natural, cultural or a combination of both. Responsiveness also dictates an anticipatory approach that considers the impact of the design on existing ecosystems and resources. Finally, ecological landscape design is *intuitive,* encompassing not only the rationality of the outer world but also the neglected 'intangible relationships' (Porteous, 1997) of the inner world. This intuitive approach embraces a new definition of creativity that departs from the formal, i.e. object-centred, appearance-oriented aesthetics to a phenomenological participatory aesthetics where the emphasis is on the totality of human experience of the object (Koh, 1988).

11.8
Conclusions

Ecology's interface with architecture, landscape architecture and urban landscape design has revealed a wide range of concepts, solutions and approaches. The diverse scope of these contributions establishes the potential of ecology to provide alternative approaches in environmental design and to contribute a new awareness and responsiveness to environment and landscape. We have drawn on these alternatives to develop a holistic, dynamic, responsive and intuitive framework for ecological landscape design. Interestingly, the proposed attributes of ecological landscape design are not entirely new but echo the earlier objectives of modern landscape architecture more than fifty years ago.

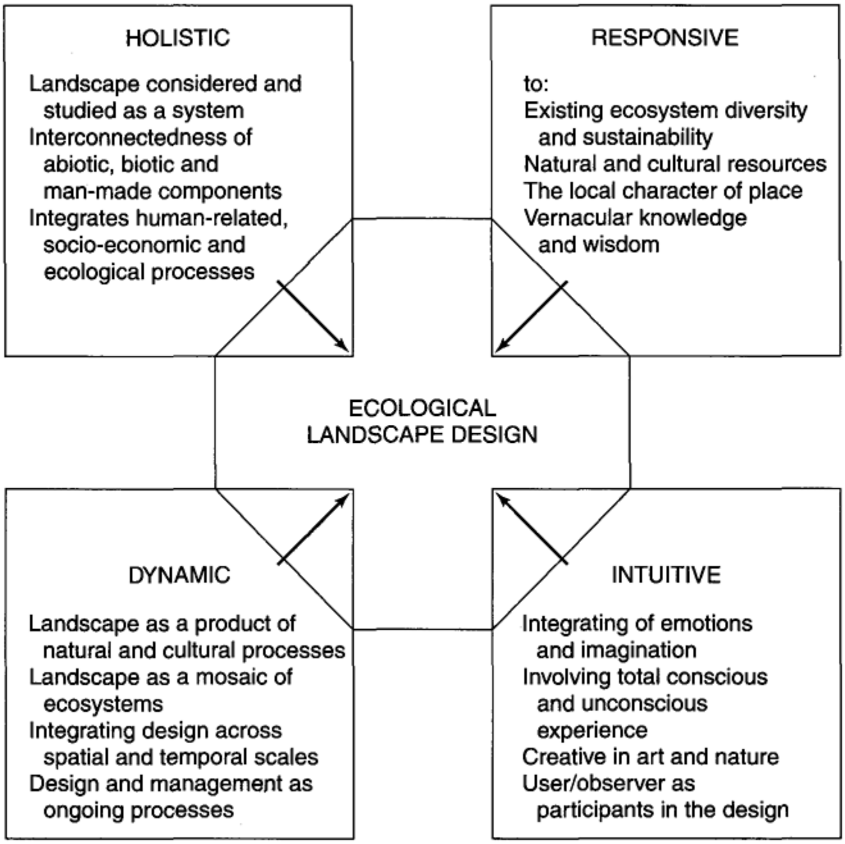


Fig. 11.2 A framework for ecological landscape design, drawing on concepts from ecology (left) and ecological design (right).

Summarised by Krog (1991, p. 101), these were based on 'strategies for dealing with societal changes; respect for new attitudes toward nature and the environment; the application of new technologies; the denigration of identifiable styles of design'. The similarity in objectives and concerns to ecological landscape design is not coincidental but reflects the mark of good design in varying places and ages.

Despite the expansive literature on ecological design, however, a workable ecological landscape design method has failed to materialise. The reasons as mentioned above lie mainly in the restrictive influence of current landscape design methodologies. Without a flexible methodological framework, the integration of ecological concepts into the design process is hindered and the realisation of ecological landscape design becomes a difficult task.

The methodological shortcomings in landscape architecture are amplified in the environmental, economic, administrative and professional context of the Mediterranean.

Added to the latter is the fragility of the semi-arid ecosystem and the scarcity of natural resources, of which water, soil and the land are essential components. In combination these factors place the environmental design professions under increased obligation to base their designs on a comprehensive understanding of the regional landscape and the ecological and cultural processes that have formed it. This is the *raison d'être* of the ecological landscape design paradigm as developed in the following chapter.

Chapter 12
Developing the ecological landscape design paradigm

This chapter develops the ecological landscape design paradigm by drawing on ecology in all its dimensions (chapter ten) and by embracing the concepts that evolved as a result of ecology's interface with the environmental design professions (chapter eleven). Proposing a new paradigm is seen as a necessary undertaking in order to overcome existing methodological preconceptions that have in the past restricted the assimilation of ecological concepts and prevented the development of an ecological landscape design methodology. The holistic and dynamic understanding of landscape provided by ecology forms the foundation of the new paradigm: it inspires alternative values and objectives and contributes to the development of a new design methodology.

12.1
The need for a new paradigm

Before setting out to construct the paradigm, it is first essential to review the development of the term 'paradigm', to investigate its applications in the environmental design professions and to justify its use in the present context. In *The Structure of Scientific Revolutions* historian and philosopher of science Thomas Kuhn (1962) proposed the term *paradigm* to indicate the whole way of working, thinking, communicating and perceiving with the mind. Kuhn argued that the structure of ideas and scientific theories that we take for granted signifies an established paradigm because we must take some such structure for granted. As new systems of concepts and approaches accumulate they give way to a 'scientific revolution' which heralds the replacement of the old paradigm with a new one.

For our purpose, paradigms involve the process of taking ideas and concepts for granted without realising this is in fact going on. This is referred to by Bohm and Peat (1987, p. 26) as the 'tacit infrastructure of ideas' which explains how established methods entail a mode of thinking, which can constrain the development of new ones. It is this aspect of the term that first prompted Hillier and Leaman (1973) to argue the necessity of a new paradigm that could overcome the intrinsic paradoxes of the then dominating 'man-environment paradigm'. The term paradigm has since been used to propose a new conceptual and methodological framework in architecture (Hillier and Hanson, 1984, 1987) and to indicate maturity in the development of the professional community in landscape architecture (Ndubisi, 1997).

In the present context a new paradigm in landscape architecture is seen as necessary for two reasons. First, it is our contention that scientific rationality in design (e.g. the analysis/synthesis design method) has to a larger or lesser extent become part of the 'tacit infrastructure of ideas' in landscape architecture both professionally and academically. The ecological landscape design paradigm therefore attempts simultaneously to challenge and break away from this and other preconceptions by proposing an alternative design approach (Makhzoumi, 1996b). The second reason lies in the potential of 'paradigm' to signify a new design approach, alternative design values and objectives and a fresh methodological framework which are founded on ecological concepts and inspired by an ecological understanding of landscape *(ibid.)*.

The problems posed by the lack of a unifying methodological framework in landscape architecture parallel the dilemma facing architectural design studies in the 1970s—namely whether to recognise environment as a *manifestation* of society or as an *instrument* for its manipulation (Proudfoot, 1986). The dilemma in many ways mirrors the dichotomic man-environment and culture-mature relationships discussed in chapter ten. An alternative approach to resolve the dilemma was developed at the Bartlett School of Architecture by Hillier and Hanson (1984). In their *Social Logic of Space* these authors viewed buildings and towns as the spatial manifestation of social and cultural reality. Similarly our proposed paradigm sees landscape as a manifestation of natural and cultural evolutionary processes and aims to research ways in which such manifestations can be understood, expressed and integrated into a landscape design methodology.

Two main lines of inquiry have been pursued in developing the ecological landscape design paradigm. The first investigates the problems raised by design studies in architecture, mainly the analysis/synthesis design method and its repercussion in landscape architecture. The second is the potential contribution from ecology in establishing a comprehensive understanding of landscape which in turn provides for a holistic, probabilistic, evolutionary and hierarchical outlook in design and which influences landscape design values and objectives. The methodological framework is developed by integrating the input from these two lines of inquiry.

12.2
The analysis/synthesis design method in architecture

Design studies were initiated in the 1960s in response to inquiries into the attitude and method followed by designers and the arbitrariness of changing design trends and fashion. Research into design theory and design methods was a direct outcome of these inquiries (Archer and Baynes, 1977). Design method's common aim was to make the design activity conform to the orthodox canons of science and deductive logic. Managing the complexity of design, it was felt, required coherent processes that dictate a systematic, consistent and explainable sequence of steps. This was achieved by *rationalising* the design problem itself, attempting 'to resolve those design processes which are unclear into clear cut procedures, and in so doing, to establish unambiguous goals and objectives which all parties to the act of building can understand and communicate about and, most importantly, adhere to' (Abel, 1981, p. 209). Design was viewed as a problem-solving activity involving quantifiable and non-quantifiable factors, and research into design seen as a matter of bringing as many factors as possible within the domain of the quantifiable, progressively replacing intuition and rules of thumb with knowledge and methods of measurement (Hillier *et al.,* 1972).

The earliest model of a design method, established in the late 1960s, identified a cycle that began with analysis and proceeded to synthesis, evaluation and communication (Archer, 1984; Broadbent, 1988). This model, later referred to as the analysis/synthesis method, became the basis for most design inquiries that followed (Fig. 12.1).

Systematic design studies failed mainly as a result of attempting to base design theory on inappropriate paradigms of logic and science, ignoring the fundamental differences between the two. Realising the futility of a unified and objective design method, architecture theory turned to the actual process of design as it occurred in 'real' situations (Abel, 1981; Cross et a/., 1981; Darke, 1979) and to the study of the environment as the common factor between designers and the societies of which they are a part (Hillier *et al.,* 1972; Hillier and Leaman, 1973).

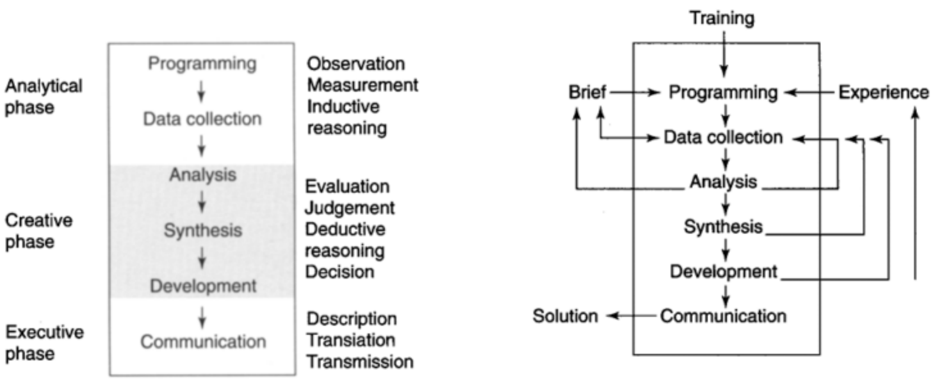


Fig. 12.1 The analysis/synthesis design method: basic design procedures (right) and the main phases of design (Archer, 1984). The implications of a step-by-step process are evident, as are the separation of a 'creative' phase from the 'analytical' one.

12.3
The repercussions in landscape architecture

While the effects of the analysis/synthesis design method have largely been contested in architecture schools in the western hemisphere, they are still very much in evidence in the teaching of architectural design and landscape design in the Mediterranean. They can be seen, as argued by Corner (1991, 1997), as yet another product of the Enlightenment and a preoccupation with scientific rationality, which tends to reduce and even all but eliminate the designer's subjectivity. Creative landscape design, however, must recognise and embrace the 'inner world' of intuition, because it is often these 'irrational' elements in design that provide knowledge and insights that are of greater value than the so-called 'rational' approach (Abel, 1981).

The influence of the analysis/synthesis design method in landscape architecture is seen as contributing to two main shortcomings. The first is a contrived phasing of the design process into sequential stages, assuming a linearity that is not present and which has come to undermine a proper understanding of the landscape. Site analysis, i.e. understanding and describing the landscape, is simply the first of many stages. The designer is eager to complete such analysis and move to synthesis, i.e. concept formulation, as the paradigm falsely indicates that the latter can only follow the former. The nature of the design activity, however, does not allow for a rational progressive ordering that begins with an information phase, i.e. an analytical phase, at the end of which the problem would be well described, the description thus providing the basis for a synthesis phase in which a solution could be worked out (Rittel, 1986). Contrived phasing and linearity in design limit the space and time necessary for establishing a comprehensive understanding of the landscape.

The second set of problems arises from the term 'analysis' (Bohm and Peat, 1987; De Bono, 1994). Analysis is the process of breaking up a whole into independent components to facilitate the understanding of the components themselves and establish an understanding of the whole. This process of 'breaking up' is literally applied in site analysis in architecture and to a large extent in landscape architecture. An understanding of the landscape often proceeds through an assessment of landscape components, i.e. soil, topography, vegetation, etc. Although designers are often aware of the dynamic and ongoing interaction among the landscape components, the static and reductionist outlook dictated by 'analysis' makes it difficult for them to appreciate the dynamic interplay of processes and to integrate the knowledge into creative landscape design. This is further compounded by the inevitable use of two-dimensional maps, overlays of such maps and 'time sequence set' of maps which are static and of limited value in depicting the dynamic nature of the landscape (Simpson, 1989).

Given the implications of the analysis/synthesis design method, it becomes necessary to caution against mechanical and prescriptive methods in design. Although this argument addresses the environmental design profession in the Mediterranean, it may also apply to .scho ols of landscape architecture in Europe and North America. Above all, there still is a need for critical inquiries into method and theory in landscape design. This is especially true in the UK, where ecological landscape design is well established professionally and emphasised in landscape design education but not sufficiently developed in the field of theoretical inquiry into design method, at least in comparison to design theory in architecture.

12.4
Ecological understanding as a foundation for landscape design

Ecology provides a holistic and comprehensive understanding of landscape which inspires the designer and makes possible the development of dynamic and sustainable landscapes. In addition, ecology prepares the designer for the unexpected and advises of possible safety margins that are not derivable from short-term anthropocentric utilitarian calculations. Ecology explains how the natural world is and how it behaves, thus alerting us to worlds beneath the surface, to hidden processes and evolutionary change. It exposes new layers of complexity beyond the strictly visual ones. The intrinsic beauty of the layers revealed and the poetry of their interconnectedness become a source of inspiration for the designer, providing creative insight and contributing to a new ecological aesthetics.

The knowledge gained from ecology and landscape ecology can influence landscape design in three general ways: it can lead to a holistic and dynamic understanding of landscape patterns and processes; it can contribute to the formulation of values, ethics and objectives; and it can alter outlook and method in landscape design. Three complementary overviews (e.g. holistic, probabilistic and hierarchical/evolutionary) are discussed here.

Embracing a holistic perspective

The conceptual and epistemological background of a holistic approach in landscape ecology is closely connected to developments in general systems theory and biocybernetics (Naveh and Lieberman, 1990). A holistic perspective therefore recognises the order of nature as an *open system* with increasing complexity and organisation and prompts designers to view the landscape as a dynamic whole and deal with it as such. A holistic approach integrates physical, biological, ecological, geographical and cultural interacting processes, overcoming as a result the polarity created by the nature/culture and the urban/rural dichotomy. A holistic perspective focuses the designer's attention on landscape processes, counter-balancing professional tendencies to favour visible patterns.

Conceding to a *probabilistic outlook*

The laws of ecology unlike the universality of physics apply to organisms and are 'existential or probabilistic' (Pickett *et al.,* 1994, p. 16). Existential statements deal with variations and tendencies in evolving or historically contingent chunks of the universe where multiple causes can affect the outcome of a particular process and where it is extremely difficult if possible at all to predict the outcome. In landscape ecology 'anticipation' is a more realistic term to use than 'prediction' as the latter carries connotations of certainty of future changes in ecosystem structure and/or function (Naveh, 1995b).

That we can design landscapes with very little absolute certainty is what distinguishes the design of living entities from that of buildings. A probabilistic outlook steers the designer away from generalisations and the search for prescriptive rules. Consequently, investigating the landscape becomes a continuous learning process which extends beyond the production of the landscape design. Learning about ecosystem structure and function, about landscape patterns, past and present, natural and cultural, better equips the designer in deciding which variables can have a greater long-term impact on the design.

The necessity of a hierarchical evolutionary awareness

Ecology's concern with the complexity of pattern and causality in natural systems results in a conceptual framework that simultaneously deals with several levels of spatial organisation and considers the important role of history (Pickett *et al.,* 1994). The concept of hierarchy alerts the designer to the contiguity and/or continuousness of landscape and makes him simultaneously aware of the larger context of landscape as well as the subdivisions that exist within the landscape itself. The hierarchical outlook encourages a mental interplay by moving from one level of the ecological hierarchy to another in search of nature's dynamic scale-linking processes (van der Ryn and Cowan, 1996).

Change in the landscape at all levels of the hierarchy is a result of evolutionary processes both natural and cultural. An evolutionary outlook therefore implies dealing with the past, the history of our interaction with a particular landscape and the deeper history of the general relationship of our species with the rest of nature (Jordan, 1994). A historical evolutionary outlook alerts the designer to the idiosyncratic nature of landscape as a product of continuing natural and cultural interactions and steers him away from generalisations and from accepting or developing prescriptive rules. Rather it prompts him to appreciate the processes, patterns and influences that distinguish a specific landscape, place and/or region.

Scientific understanding in ecology

Having argued that ecological understanding of landscape will constitute the foundation of the ecological landscape design paradigm and having explained how fundamental concepts in ecology can influence our understanding of the landscape, we now need to clarify the meaning of 'ecological understanding'. The first step towards this task is to realise how scientific understanding differs from other modes of understanding, e.g. art, faith, law. Although all modes of understanding entail the construction of a mental picture that represents the world, the process and meaning of scientific understanding is entirely different. In science, understanding is 'an objectively determined empirical match between some set of confirmable observable phenomena in the natural world and a conceptual construct' (Pickett *et al.,* 1994, p. 28). On the basis of this definition, the authors develop a conceptual model of ecological understanding embracing three main components: conceptual constructs, i.e. mental pictures; a specified universe of observable phenomena; and the tools to permit dialogue between them. Above all, scientific understanding is an open system in that it develops as a result of the interrogation of theory and observation by a diverse community of practitioners.

Ecological understanding in landscape architecture

Establishing an ecological understanding of the landscape involves the transfer of knowledge from ecology into the realm of design. As in all transdisciplinary collaboration such a process entails a number of difficulties that arise because the two disciplines differ fundamentally in their outlook, assumptions and method. Moreover, there will be limits to the extent and depth of ecological knowledge acquired and assimilated by the designer. These problems can, however, be minimised by familiarising the landscape architect with the language of ecology and by acquainting him with the process of scientific understanding.

It is our contention that establishing an ecological understanding of landscape is an integral part of the design process. As such it should not be 'supplied' as 'packaged information' by ecologists but rather acquired by the designers themselves for three reasons. First, environmental research has argued that increased and well-packaged knowledge does not necessarily lead to better design. Research undertaken by the designer in preparing for the design is an integral part of developing the solution and is in fact referred to as 'meta-design' (Hillier et *al.,* 1972). Second, a creative and inspired design requires that the designer is immersed in the landscape to allow for a free association of ideas through situational interpretation, i.e. direct experience and metaphor (Corner, 1991). This free association forms the foundation of the ecological landscape design methodology. The third reason is that ecologists 'do not think visually, as do most designers, ecological information is rarely organised in a way that is immediately useful to landscape planners' and designers (Ndubisi, 1997, p. 32). As such the ecological knowledge provided by them can only influence the designer to a limited extent.

Problems arising from the integration of ecological knowledge can be overcome in a spirit of interdisciplinary collaboration and academic tolerance in the course of educating both ecologists and landscape architects. Similarly ecologists should not let their apprehension of a 'trivialisation' or 'popularizing' of ecological knowledge (Pickett *et al.,* 1994) override the many benefits of closer collaboration between ecology, design and planning (Naveh, 1995b). Equipped with a keen perception, constructive thinking abilities and a pro-active outlook, the landscape architect can better complement the role of the landscape ecologist who is versed in the scientific method of critical and analytic thinking.

Exploring the other dimensions of ecology

We have so far explored the potential of ecological sciences in providing the knowledge to understand landscapes and ensure that ecological constraints and potentialities are taken into account. Ecology the science, however, cannot possibly provide *all* the answers. As such, a scientific understanding of landscape should necessarily be complemented by an understanding of the symbolic, artistic and spiritual meanings of the landscape. These and other phenomenological forms of ecological consciousness should not be wrongly belittled by scientistic ecology as having naive or trivial goals with respect to the massive techno-economic scale of the ecological 'crisis' (Corner, 1997).

Ecology's discursive elasticity, as argued in chapter ten, allows it to be used in a number of ways while landscape ecology's holistic overview offers a historical-cultural approach to landscape understanding. Consequently, ecology in the context of landscape design and planning should necessarily transcend the strictly scientific and embrace the emotional, spiritual, spontaneous and imaginative.

12.5
Alternative values and objectives

Landscape values and ethics follow closely the values attributed to nature by a specific culture (Penning-Rowsell and Lowenthal, 1986). Both values and ethics grow from historical and social experience and are institutionalised in systems of thought adopted in a given culture. In landscape architecture, values are often narrowly defined and anthropocentric (Corner, 1997; Koh, 1988), dominated by naive pluralism or neopositivism which hinders any useful progress in issues concerning design (Alexander, 1980). Rational analytical thinking in design method as discussed above has also led to a view of values as purely personal and cultural and separate from, i.e. inferior to, the objective discourse of science *(ibid.)*.

Historically, landscapes have been closely associated with emotions, whether in a religious spiritual context (Eliade, 1991; Tuan, 1990, 1995), in science (Bateson, 1988; Bohm and Peat, 1987) or in the fine arts, poetry and literature (Appleton, 1986; Bourassa, 1991). Modern outlooks and life-styles, however, have strayed far from acknowledging emotional and spiritual involvement with nature and the landscape. Having been long trained to accept only the rational and the objective, we have come to suppress that which we cannot express, i.e. that which resists ready communication, explaining it as idiosyncratic and hence unimportant (Tuan, 1995). The symbolic, sensual and spiritual sense of nature has all but disappeared from design, the result of a 'kind of education which trains the mind and eye to perceive certain accidents while blinding them to the subsurface, leaving the inner faculties and even the other senses practically completely neglected' (Nasr, 1993, p. 122).

It is our contention that landscape design should necessarily engage all the designer's senses, those that are innate, ingrained into us by evolution, and those that have emerged in the course of cultural evolution (Jordan, 1994): in short, our physical, mental, emotional and spiritual capabilities. An attempt to embrace not only the rational but the 'intangible relationships' with the environment is undertaken by Porteous (1997). Porteous integrates the four Jungian 'supports of thought (mind), feeling (heart), intuition (soul) and sensation (the gates of the body)' (*ibid.,* p. 8) into a holistic model that has the potential to reacquaint the designer with subjective values without which creative design cannot be achieved (Fig. 12.2).

Similarly Alexander (1980, p. 296) argues for a theory of design in which 'value and fact are one', where values can be resolved by appealing to one central value that 'forms a single indivisible world picture, within which productive results can be obtained'. A theory that does not appeal to intuition or feeling cannot help us achieve creative and innovative design *(ibid.)*.

Values in general, like ecosystems, are hierarchically ordered, i.e. the planet, society, the community, the family and oneself (De Bono, 1994). A hierarchy of values ensures the acceptance of local values without precluding larger regional and global ones. Appreciating the interconnectedness in the hierarchical order of values allows for their integration into design (Wann, 1996).

Formulating objectives for the ecological landscape design paradigm is a complex and difficult task. On the one hand are the limits set by physical nature which is 'mute' and gives no explicit advice. Nature 'only forbids, sometimes only post festum' (Haila and Levins, 1992, p. 13). On the other is nature the cultural construct which needs to be addressed from sociocultural, economic, historical and political points of view. In the context of ecology, ethical principles can be seen as growing from a realisation that 'nature' is an internal prerequisite of human life and culture, an inseparable part of human existence (Haila and Levins, 1992). Accordingly, the first aim

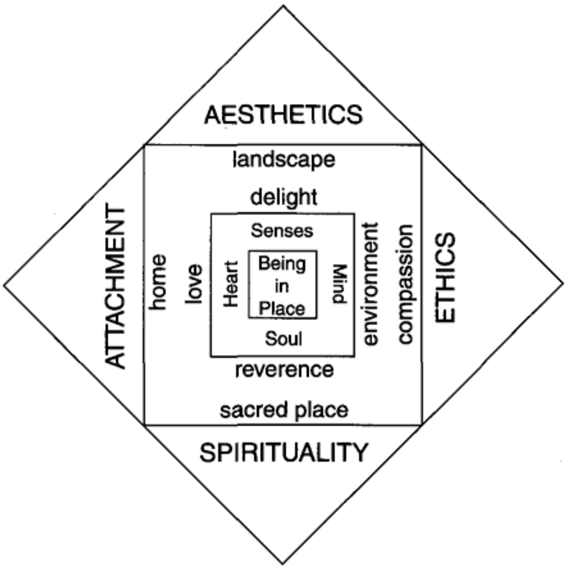


Fig. 12.2 Intangible relationships with environment. (Source: Porteous, 1997.)

of the ecological landscape design paradigm is a respect for the general potential of life in nature, which means that human-induced irretrievable changes of nature that threaten this potentiality are proscribed *(ibid.)*. An ecological ethic provides for a broader view of 'nature' than the prevailing 'instrumental' one while recognising the significance and complementarity of culture.

The general objective of 'respect for the potential of life in nature' within the conceptual and practical framework of the ecological landscape design paradigm entails three fundamental mutually inclusive objectives: the maintenance of landscape integrity; promoting landscape sustainability; and reinforcing the natural and cultural spirit of place.

Maintaining landscape integrity

Ecological integrity was defined in chapter ten as the ability of a living system to sustain an organising, self-correcting capability that allows it to recover when subjected to disturbance (Regier, 1993; Forman, 1997). Regier's view of ecological integrity is flexible and includes end-states other than the naturally whole (e.g. semi-natural, semi-agricultural ecotopes). *Cultural integrity* is defined as 'human capability individually and through institutions to complement the integrity of a modified natural ecosystem in an overall context that is inevitably turbulent, socially and ecologically' (Regier, 1993, p. 3). Landscape integrity then is a broad concept and can be seen as a result of both ecological and cultural integrity. Accordingly, the objective of maintaining landscape integrity implies a landscape design and planning approach that strives to appreciate and complement the ecological integrity of natural, semi-natural and modified ecosystems.

Landscape integrity is 'context specific'; any evaluation of integrity therefore should critically consider the social and cultural context (Kay, 1993). The designer must look for ecological and cultural integrity in the physical, biological and social context of the landscape at hand. Consequently, 'maintaining landscape integrity' becomes both an expression of ecological understanding and an ethic that guides the search for a healthy human environment.

In view of the fragility of the semi-arid Mediterranean ecosystem, maintaining ecological integrity is seen as the single most important objective of landscape design. However, because of the difficulty of measuring ecological integrity, Forman (1997) argues that it is in many cases easier to focus on key components that together capture the general meaning of ecological integrity. Three of the four broad characteristics he proposes are embraced by the present work: biodiversity and soil and water conservation. Their centrality to the objectives of ecological landscape design will be illustrated in the case study applications.

Designing for sustainability

Sustainability can be viewed as the long-term outcome of maintaining landscape integrity. Designing for sustainable landscapes necessitates a holistic and integrative outlook that is based on ecological understanding and awareness of the potentialities and limitations of a given landscape. Such understanding ensures that in accommodating future uses their impact on existing ecosystems and essential ecological processes and biological and landscape diversity is anticipated. This will allow for healthy ecosystems and long-term ecological stability.

A workable hypothesis relating ecosystem to landscape and sustainability is proposed by Forman (1990). Forman describes sustainability as underlying the interplay between human aspiration and ecological integrity. As such he suggests that for any landscape 'there exists an optimal spatial configuration of ecosystem and land uses to maximise ecological integrity, achievement of human aspirations, or sustainability of the environment' (*ibid.,* p. 274).

Designs that promote sustainable landscapes should be simultaneously aware of local values and resources as well as regional and national ones, as sustainability is the domain of both. Further, achieving landscape sustainability requires patience, humility and a design approach that attends to scale, community, self-reliance, traditional knowledge and the wisdom of nature's own (van der Ryn and Cowan, 1996).

Realising and enhancing the spirit of place

Whereas maintaining landscape integrity and designing for sustainability can be seen as the practical objectives of ecological landscape design, the design of creative and meaningful places addresses aesthetic concerns. The three objectives are equally essential and are seen as complementary.

An ecological understanding, according to our earlier definition, embraces not only landscape processes and ecosystem interaction but in addition the way in which we perceive, imagine and feel towards a specific place. The concept of *place* is defined by Motloch (1991) as the mental construct of the temporal and spatial experience that occurs as an individual ascribes meaning and value to settings through environmental perception and cognition. Thus the third objective of the ecological landscape design paradigm is to appreciate and enhance the 'sense' and 'spirit' of place (Lynch and Hack, 1986; Norberg-Schulz, 1984) or what in ancient times was recognised as the *genius loci* and the *genius regionis*.

A place is space which has a distinct character; 'whereas space denotes the three-dimensional organisation of the elements which make up a place, *character* denotes the general "atmosphere" which is the most comprehensive property of place' (Norberg-Schulz, 1984, p. 11). Landscape character is also a result of the way cultures have reacted to their landscape setting. Beer (1990, p. 121) argues that 'landscape character can be very important to retain, as it reflects cultural heritage and the way people have used the land within the constraints of the local environment'. As such, landscape character and meaning can be closely associated with identity and a cultural sense of belonging to a particular place. The identity of place, whether at the regional level or the local one, is achieved by emphasising these meanings and by dramatising aspirations, needs and functional rhythms of personal and group life (Tuan, 1995).

The landscape designer should, however, appreciate that places cannot be described by means of 'scientific' analysis. Rather the experience of place is approached through literature, poetry and the visual and plastic arts which in combination enrich and inform the designer in the task of placemaking (Norberg-Schulz, 1984; Tuan, 1995). Insight into the experience of place can also be found in the 'linguistic and imagistic structures' of cultural worlds which 'are as much fictional as they are factual, as much symbolic as they are useful' (Corner, 1997, p. 95). Their potential in enriching a designer's intuitive and imagistic appreciation of place will be explored in the application of the ecological landscape design paradigm.

12.6
The ecological landscape design paradigm

As a profession, landscape architecture has the potential to play a more active role in shaping future environments that are sustainable, ecologically stable and inspired by the natural and cultural heritage of place. The ecological landscape design paradigm was developed to explore this potential. It aims at ecological, cultural and aesthetic appropriateness in landscape design and planning. Appropriateness grows from a designer's awareness of the limitations and potentialities of existing landscapes and available resources whether natural, semi-natural or cultural.

The paradigm integrates input from ecology and design, both of which are seen as providing for parallel and complementary even if methodologically different approaches to landscape research and design. The analytical and descriptive nature of ecology as a science assists in the task of understanding present landscapes, while the intuitive and creative problem-solving capabilities of design can prescribe alternative courses for future landscape development. The integration of ecology and design forms the four main components of the paradigm: an ecological understanding of landscape; alternative values and objectives; ecological landscape design; and a new landscape design methodology (Fig. 12.3).

The paradigm is characteristically open-ended and capable of creative expansion and development. The cybernetic feedback that relates the components of the paradigm ensures such ongoing development; knowledge gained from an ecological understanding of landscape allows for alternative design approaches which in turn make for a better assimilation of ecological knowledge.

Ecological landscape design

Ecological landscape design is based on an ecological understanding of landscape which ensures a holistic, dynamic, responsive and intuitive approach. As discussed in chapter eleven, ecological landscape design engages the designer's rational, intellectual, emotional and creative capabilities.

Four main characteristics distinguish ecological landscape design: first, that it is to a large extent self-sustained, entailing low economic and environmental costs for its establishment and its long-term maintenance and upkeep; second, that it is responsive to existing landscapes whether natural or cultural, seeking to learn and appreciate rather than dictate and impose; third, it adopts a probabilistic outlook which implies that there is no finality that terminates the design activity, i.e. there is no static *final* end product but that design is a continuous process of learning, understanding and appreciation; and fourth, the holistic, hierarchical and evolutionary approach results in a methodological framework that is applicable to different geographical regions and at varying scales of operation (e.g. the local, urban or regional).

The methodology for ecological landscape design therefore aims to restore the balance of priorities whereby emphasis is placed on developing a comprehensive understanding of the landscape. Moreover, ecological understanding is an ongoing process that simultaneously guides and inspires the design. As such any step-by-step linear design process is proscribed. In fact, a clearly defined 'rational' method is altogether avoided. Instead, ecological understanding of the landscape is realised through the concept of *tacit knowing*.

The concept of tacit knowing was introduced by Polanyi (1966) as an alternative to conventional methods of learning. It entails the immersion in a form of knowledge, thereby emphasising the subject's involvement with the objects of his cognition and allowing him to acquire and assimilate complex forms of knowledge. Polahyi outlined two

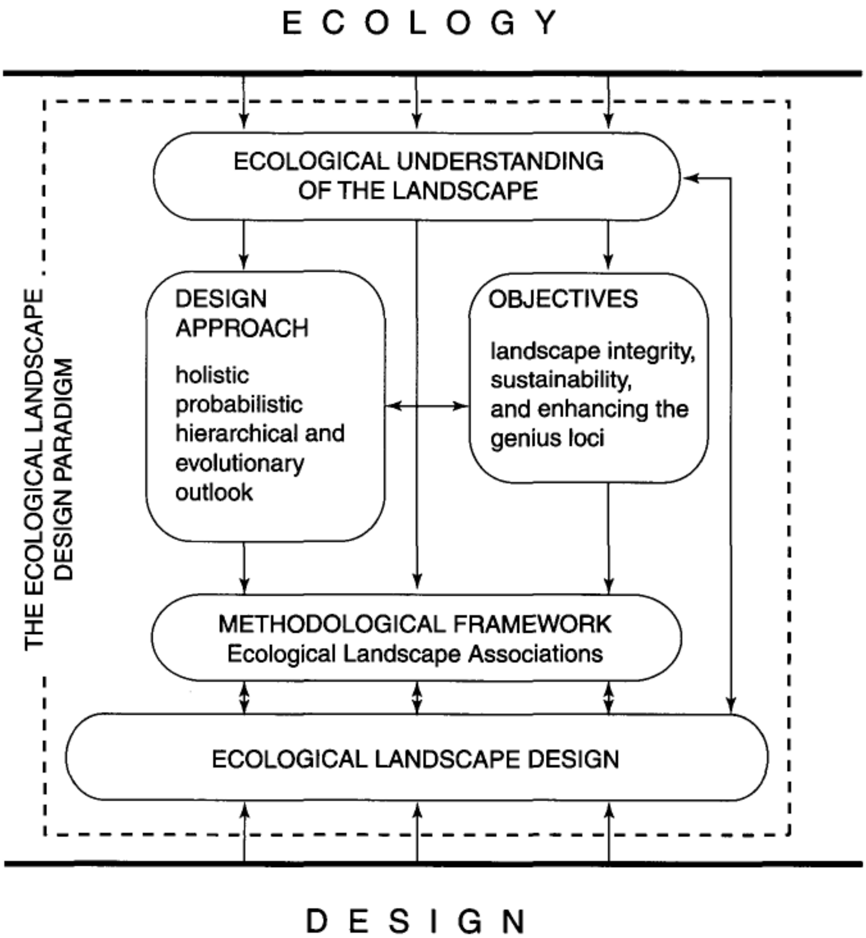


Fig. 12.3 The ecological landscape design paradigm.

constructive mental processes that make possible tacit knowing: indwelling and the use of exemplars. Both were applied in the teaching of architectural design by Abel (1981). The two concepts are seen as forming the foundation for the ecological landscape design methodology. While indwelling ensures that the designer develops an integrated and responsive design approach, the use of landscape exemplars, i.e. those drawn from the evolutionary history of a landscape, or of existing cultural adaptations, offers a dynamic introduction to the regional ecology. This provides the spatial and temporal dimensions that are so difficult to assess through the analysis/synthesis method or by simply observing the landscape.

12.7
Ecological Landscape Associations: a methodology

Design in the context of an ecological understanding of the landscape develops from a holistic appreciation of two key sources: the self-organising characteristics of natural systems; and the symbolic, spiritual and imagistic structures of cultural systems. Unless the design process can recognise and isolate the dynamic interplay between natural, semi-natural and cultural components of the landscape, it will inevitably fail to ensure landscape integrity. Nor will it succeed in contributing to place-making.

The methodology of Ecological Landscape Associations is at once a framework for understanding the landscape and a tool for designing it (Makhzoumi, 1996b). As an open 'interaction framework' it investigates the complexity of landscape processes and patterns, allowing the designer to comprehend the inner workings of the landscape, locate components and consider which components to incorporate into the landscape design. The interaction framework induces a deliberate interplay across the different levels of the spatial hierarchy and along the temporal continuum of the landscape's historical evolution. As a practical method, therefore, it has the potential to integrate ecological and cultural knowledge into the design process.

The term *association* is used to reflect the integrative and interactive relations discerned among two or more landscape components, namely the abiotic, biotic and the cultural, i.e. man-made or man-maintained. The term *ecological* is used to signify that the associations discerned are not strictly visual but the result of an ecological understanding which is gained through a holistic, hierarchical and evolutionary approach (Fig. 12.4).

Developing the conceptual framework

The concept of Ecological Landscape Associations was developed by utilising ecological concepts, a basic understanding of perception and an alternative methodological approach in design. Perception is the process, often unconscious, in which abstractions are made from the total sight before our eyes, i.e. a *schema,* ignoring all else. While normal perception depends on ignoring, a deeper appreciation that can result in creative solutions depends on not ignoring, but on looking, and proverbially the more you look the more you see (Pye, 1983).

If a deterministic, one-way, stimulus-response view of perception is avoided, perception can be likened to the problem-solving process in design whereby possession of a cognitive scheme is known to facilitate pattern recognition. This scheme, however, must be adjusted to accommodate new patterns to ensure cognitive development and learning (Koh, 1988). Similar ways of manipulating our perception towards creative problem-solving are proposed by De Bono (1994) which entail a close relationship between ideas and information. Ideas as organising structures which put values and information together in new ways, however, require creative efforts in perceptions and new methods of investigation and synthesis. In response, De Bono develops what he calls 'attention-directing' devices (*ibid.,* p. 74) which necessitate designing new words in order not to 'remain trapped in the baggage of existing words and unable to use new perceptions' (De Bono, 1994, p. 114). Similarly the concept of Ecological Landscape Associations can be seen as an 'attention-directing framework' which has the potential to

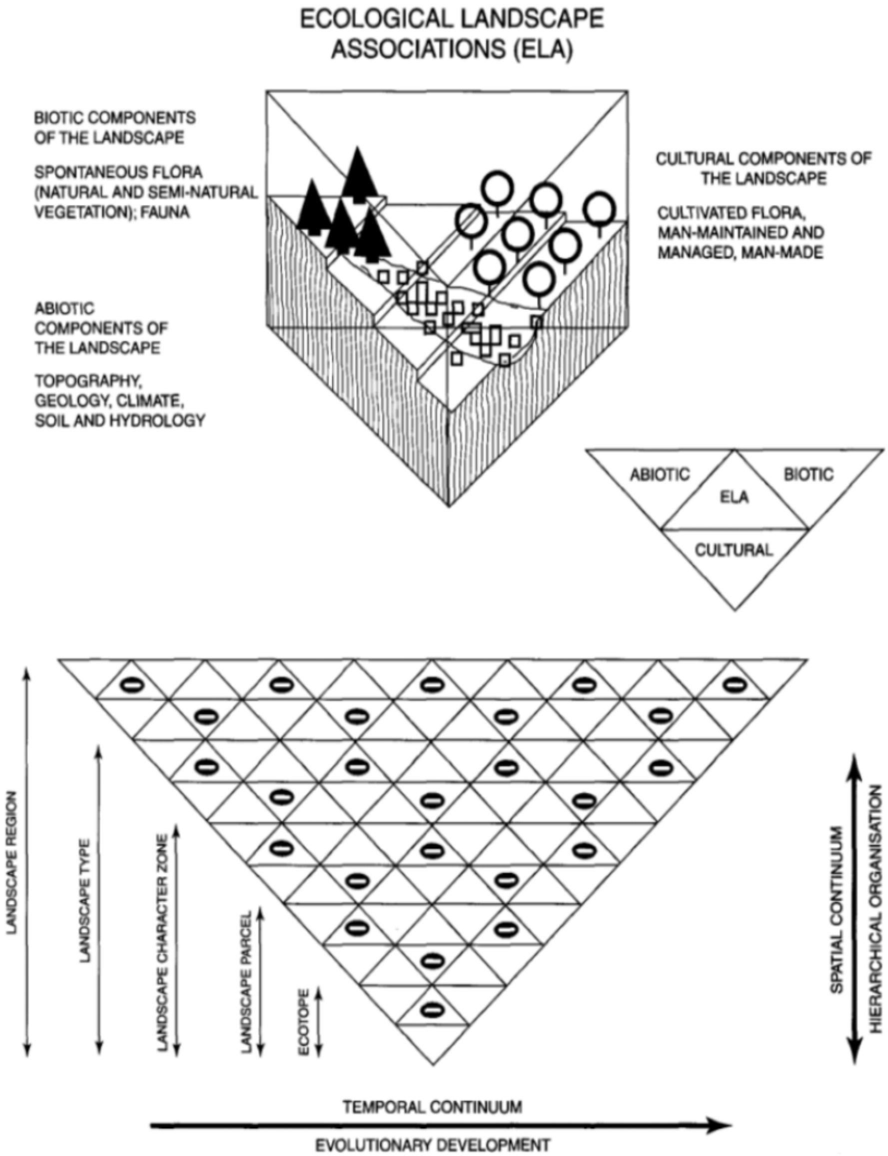


Fig. 12.4 Schematic illustration of the Ecological Landscape Association methodology.

enhance our perception and establish an understanding of landscape. The latter is complemented by the 'active' use of 'movement as a deliberate mental operation that has the potential to suggest things and open up possibilities in an ongoing exploratory process' (De Bono, 1994, p. 123). As such the concept of Ecological Landscape Associations, having been founded on an interplay across temporal and hierarchical scales, offers various frames for 'movement' which go beyond simple associations. In line with de Bono's emphasis on the necessity of designing new words, the Ecological Landscape Associations, once selected, will be abreviated and referred to as 'ELA'.

The methodology of Ecological Landscape Associations

In its dual capacity as an interactive investigative framework and a dynamic attention-directing tool, the methodology of Ecological Landscape Associations contributes to the development of ecological landscape design in four ways. First, it can be seen as a conceptual tool for structuring the landscape. Because it is one thing to realise the complex interrelatedness of landscape components but quite another to integrate them into the landscape design, the framework provides a dynamic and interactive way for the designer to convert ecological understanding into the design process.

Second, the concept is flexible and can be applied on any scale of landscape. ELA can be discerned at the local as well as at regional or subregional levels. The degree of complexity is proportional to the scale, i.e. complexity increases at the regional and national scales. The deliberate interplay induced by the interaction framework allows for landscape scale-linking. In practice the designer engages in a process of investigation which informs of certain associations among the landscape components (e.g. topography/vegetation type, or geology/soil type). He then sets out to test the validity of the ELA by testing them from a historical and evolutionary perspective as well as from a spatial, hierarchical one (Fig. 12.4). Once validated, the ELA form the building blocks of the landscape design.

Third, the concept of Ecological Landscape Associations is founded on the theory of tacit learning through the two concepts of 'indwelling' and 'exemplars'. The process of discerning the associations involves an extended time span which is made possible because design phasing has intentionally been eliminated. Indwelling as the manner in which the designer enters into landscape design will be largely determined by the perception of the landscape as a living and dynamic system. A dynamic interactive framework and knowledge of landscape exemplars will stimulate rather than hinder design creativity. The concept of landscape aesthetic will be afforded a renewed significance not as something that is 'applied' but as an integrating force in its own right and the major vehicle by which the continuity and stability of landscape as a culture form are established.

Fourth, the concept of Ecological Landscape Associations has much in common with some creative problem-solving techniques, namely structuring aids such as morphological analysis, relevance systems and attributelisting (Rickards, 1980). These techniques rely on 'creative analysis' which is defined by Rickards as 'a process whereby a set of procedures or techniques is assimilated by one individual until it becomes part of his intuitive problem solving behaviour' (*ibid.,* p. 264). Morphological analysis systematically attempts to classify a system in terms of its components or form. Thereafter it relies on finding combinations, i.e. associations between the classified components, often by the use of a morphological matrix. The difference between the interaction framework of Ecological Landscape Associations and other forms of creative analysis lies in the subject matter itself: the landscape. While the former is intended to draw the designer's attention to associations that have proved successful in the reality of the landscape at hand, the latter operates in abstraction, pursuing even the seemingly impossible combinations that can yield a creative solution.

12.8 Conclusions

This chapter has argued the necessity for a new design paradigm in landscape architecture if an ecological understanding of landscape is to be emphasised, alternative values and objectives proposed and a holistic, dynamic and creative design methodology developed. A new paradigm is also necessary if existing preconceptions are to be overcome, since these preconceptions continue to influence even if tacitly a fragmentary approach, a contrived rationality and a suppression of the intuitive, which in combination emphasise the analysis of components at the expense of context. This contrasts strongly with the holistic and integrative approach of ecology which attempts to understand underlying processes which shape the components and connect them into a unified whole.

Landscape within the framework of the proposed paradigm is seen as a manifestation of natural and cultural evolutionary processes. As such the paradigm aims to develop an alternative approach, objectives and a method in which such manifestations can be understood, expressed and integrated into landscape design. Above all, the development of a new paradigm has been motivated by a conviction that there is a need to instil a spirit of inquiry into method and values in landscape architecture.

The potential of the methodological framework to result in landscapes that are responsive to regional requirements (both natural and cultural) that maintain landscape sustainability and ensure ecological stability will be illustrated through applications in Cyprus. This will be carried out in two phases. In an initial investigative phase the framework for Ecological Landscape Associations will establish a comprehensive understanding of the regional landscape (chapter thirteen). In the following design phase the Ecological Landscape Associations themselves form the foundation for a regional landscape design (chapter fourteen) and the masterplan for a tourist project (chapter fifteen).

Chapter 13
Ecological Landscape Associations: a case study in Cyprus

In this chapter the methodology of Ecological Landscape Associations is applied to investigate the landscape of the Kyrenia Region in Cyprus. The dynamic, attention-directing methodological framework becomes a means for gaining an ecological understanding of the natural and cultural processes that have shaped the regional landscape, determined its components and formed its character. The methodological framework is also a means for discerning the key ELA in the Kyrenia Region which will serve in the development of the landscape design.

13.1
Methodological procedure for landscape investigation

The methodology for ecological landscape design as developed in the previous chapter relies on a procedural simplicity that integrates ecological knowledge and design. Three suppositions form the foundation of the methodological framework: that landscape is a dynamic evolving system which has the ability to maintain structure; that it has a characteristic complexity which arises from the interrelatedness of its abiotic, biotic and cultural components; and that understanding landscape stability and complexity dictates a temporal (e.g. evolutionary) and spatial (e.g. hierarchical) framework of evaluation.

The overall methodological procedure is simultaneously an investigative framework and a conceptual one. Whereas the former aims to establish ecological understanding, the latter guides and influences the development of design concepts. For the purpose of clarity, however, the two complementary activities will be developed independently. While this chapter investigates the landscape the following two will develop the ecological landscape design solutions.

Establishing an ecological understanding of the landscape is the central aim for the investigative framework. This is accomplished by pursuing five lines of inquiry which are similar to those explained in chapter eight. The first researches available records, archives, published literature, existing surveys and statistics. Historical accounts for Cyprus, whether in the last century or the present one, are limited in number and in the scope of subjects dealt with. Published literature regarding land use and landscape issues are few, aside from the records of British colonial rule concerning forestry. The second line of inquiry reviews available cartographic surveys of physical and biological resources (e.g. geology, topography, soils, hydrology and vegetative cover). A third line of inquiry aims to provide first-hand knowledge of the landscape by conducting field surveys which were carried out in several locations in the Kyrenia Region. A fourth source of information is represented by a series of informal interviews carried out during the course of the field surveys, in addition to interviews with local and national administrators. Finally, floristic surveys were undertaken to determine the biological diversity of selected landscape components.

The objectives of the investigative framework are threefold (Fig. 13.1). The first is to develop a comprehensive ecological understanding of the regional landscape. The second is to locate the Ecological Landscape Associations. The ELA are simultaneously an incentive to investigate the landscape as well as being the outcome of the landscape investigation. The third objective is to determine the location pattern of the associations which is the spatial pattern of the landscape.

13.2
The Kyrenia Region in Cyprus

The island of Cyprus is located in the eastern Mediterranean basin, south of Turkey and to the west of Syria. With an area of 9251 km^2 (3572 square miles) it is the third largest island in the Mediterranean, smaller than Sardinia and Sicily, larger than Corsica and Crete. The centrality of its position in relation to the continents of Asia, Africa and Europe has influenced the island's ecology and its political and cultural history. As elsewhere in the Mediterranean, the long co-evolutionary history of human use and habitation has resulted in a landscape that is a varied mixture of natural, semi-natural and cultural components.

The history of Cyprus is one of successive occupations and settlements. Neolithic culture was established as early as 5000 BC. In the centuries that followed, the island was occupied by the ancient Egyptians, Phoenicians, Greeks, Persians, Romans and later by the Byzantines. Cyprus played a significant role during the Crusades. It was occupied during the Middle Ages by the Lusignan Dynasty and afterwards by the Genoese and Venetians. Three centuries of Ottoman rule left their mark on the island, ending when the British took over the administration of the island in 1878. In 1960 Cyprus gained its independence.

Communal unrest between the Greek majority and the Turkish minority intensified after independence, culminating in armed conflict in 1974 and resulting in the partitioning of the island (Dodd, 1993). The northern part of the island was occupied by Turkey to protect the Turkish Cypriot minority and has come to be known as North Cyprus or The Turkish Republic of North Cyprus (TRNC) while the remaining two-thirds with its Greek Cypriot population continued as the Republic of Cyprus. The partition involved the displacement of both Greek and Turkish Cypriots and has caused Cyprus to undergo profound socio-economic and cultural change (Morvaridi, 1993).

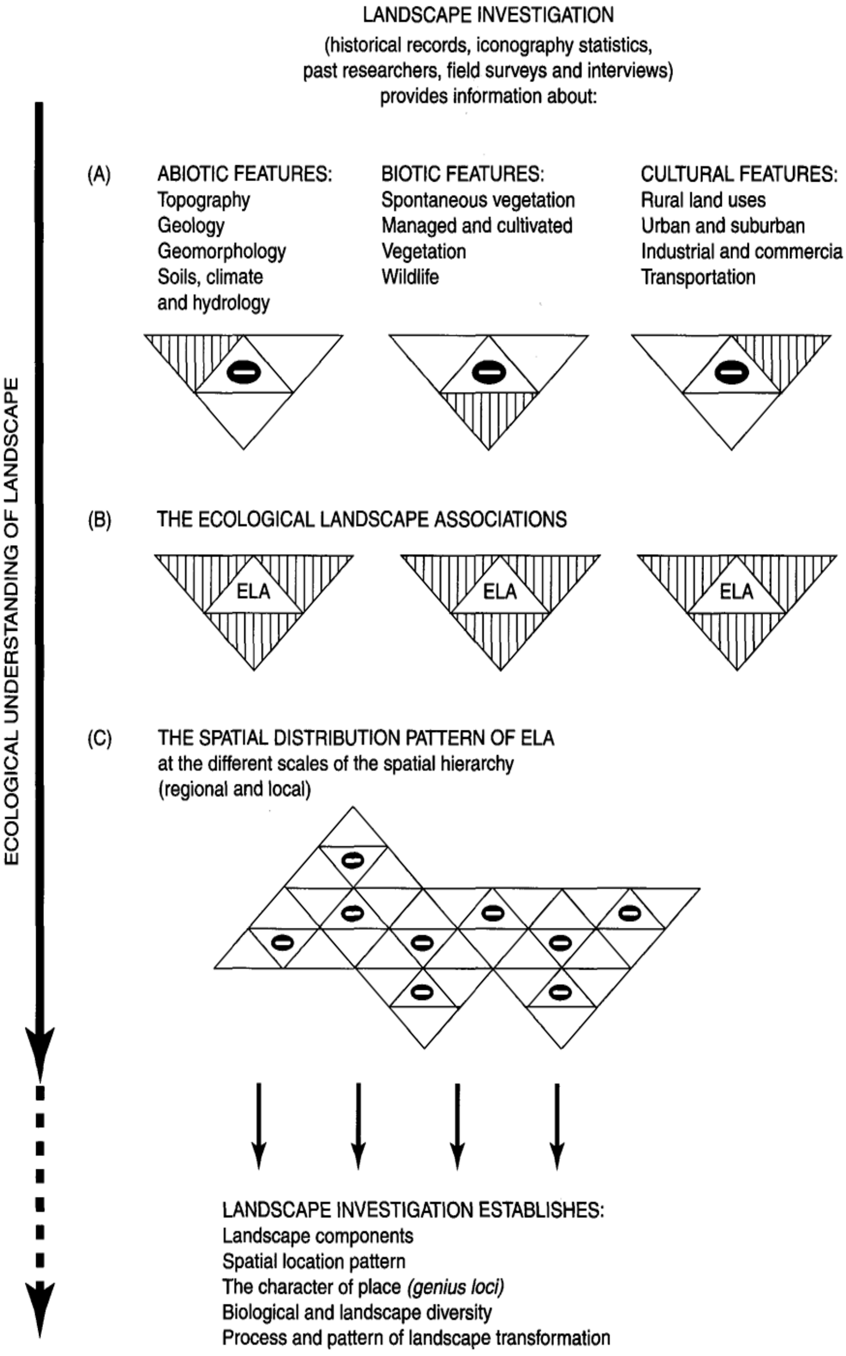


Fig. 13.1 Ecological Landscape Associations: a methodology for investigating the landscape.

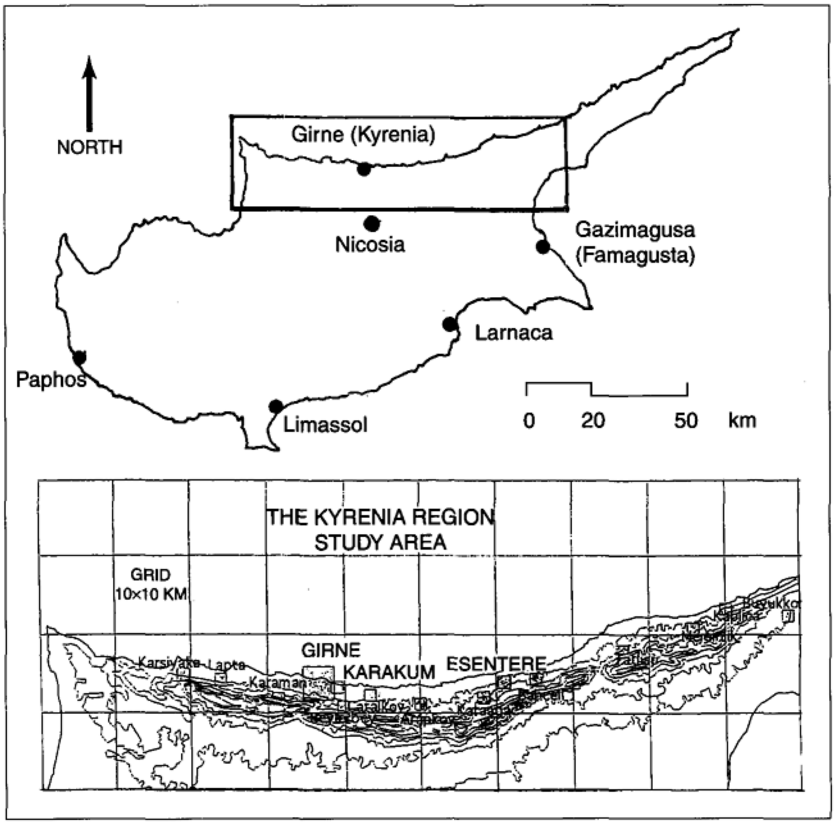


Fig. 13.2 The Kyrenia Region study area in Cyprus.

North *Cyprus and the Kyrenia Region study area*

North Cyprus occupies approximately one-third of the island's area (3298km^2) and has 181363 inhabitants (TRNC/Ministry of Agriculture, 1996). Geographically it is dominated by the Kyrenia Range, which runs parallel to the length of the island's north coast. The study area, the Kyrenia Region, encompasses approximately 50 km of the Kyrenia Range, its northfacing foothills and the adjoining coastal plain (Fig. 13.2).

North Cyprus is a predominantly agro-pastoral society. Half the population live in rural areas while 25.5% of the total working population is engaged in the agricultural sector *(ibid.)*. Of the total land area, 56.7% is agricultural land and 19.5% is occupied by the Kyrenia Range forest. Apart from the expansion of perennial irrigation and afforestation, the rural landscape of Cyprus remains little changed from what it had been in the nineteenth century (Christodoulou, 1959). The interaction of soil, terrain and water continues to play the biggest role in the development of the rural scene, with the major difference that water has become even scarcer than good land.

The landscape of the Kyrenia Region is as beautiful as it is typically Mediterranean. Pine and cypress forests at the Kyrenia peaks gradually give way to dense landscapes of olive and carob dry tree cropping in the foothill terraces. Arable crops and more recently tourism are located in the coastal plain serviced by the main coastal road.

Landscapes of olive and carob dominate the Kyrenia Region which has more than a third of the estimated million olive and carob trees in North Cyprus (TRNC/Ministry of Agriculture, 1993). This typically Mediterranean rural cultural landscape, referred to as multi-use tree planting (Makhzoumi, 1997), is an age-old land use system in which fruit trees are deliberately grown on the same land management units as crops and animals, the different uses being accommodated spatially and temporally. From an evolutionary point of view these landscapes are a surrogate nature or a 'semi-natural forest' (Neef, 1990) which has over many centuries come to replace the degraded Mediterranean forest. Some of the olive trees in the Girne vicinity are over four hundred years old, dating to Venetian times (UNHCR, 1991).

Other rural land uses in the Kyrenia Region include irrigated tree cropping, mainly of citrus trees, and to a smaller extent arable cereal cropping. Commercial citrus production, initially for export purposes, was localised in the coastal plain west of Girne making use of the Lapithos springs. Fruit tree cropping is also commonly found in smaller orchards located in and around settlement fringes.

Pastoralism has been a component of rural life since the earliest times (Christodoulou, 1959). Sheep and goats are kept in mixed herds. Goats, viewed as a threat to forest regeneration, were prohibited from 96% of the main state forest and from prescribed villages in 1940 (Thirgood, 1987). However, they continue to be an integral part of the rural scene.

Settlements in the Kyrenia Region are few in number and small in size. Traditionally settlements are located in the lower foothills at a distance from the coastline. The harbour city of Girne (Greek *Kyrenia*) is the exception (Fig. 13.3). With a population of an estimated 10000 inhabitants, it is the largest city along the island's north coast and its administrative and tourist centre. Tourist facilities, shops, restaurants and detached housing on either side of the main coastal road have in the last two decades led to the merging of several smaller towns and villages to the west of Girne.

Apart from Turkey's recognition and financial support, North Cyprus continues to exist in political and economic isolation since it has not been recognised by the international community. The stagnant economy, although crippling, has curbed the pace of tourist development. In an overcrowded Mediterranean where tourism has all but completely transformed traditional cultural landscapes, the region's landscape heritage is not only an appreciable asset but one that will increase in value as traditional Mediterranean landscapes become increasingly rare.

Fig. 13.3A view from St Hilarion Castle in the Kyrenia Range overlooking the coastal plain and the harbour town of Girne.

13.3
Abiotic components of the regional landscape

The abiotic components of the regional landscape include topography, geology, climate, soil and hydrology. An evolutionary historical approach will be adopted to investigate the interaction between these five components.

Topography, geology and geomorphology

The topography in the Kyrenia Region is dominated by the Kyrenia Range, which runs parallel to the coast in an east-west direction from Cape Andreas in the east to Cape Kormakiti in the west for an approximate length of 225km. Described as a coastal mountain, the range rises to 1000 metres above sea level. The central and western part of the range recedes from the coastline, leaving a relatively flat and wide coastal plain allowing for a wide range of land uses. In contrast, the coastal plain to the east is much narrower, dominated by steep foothills and frequently interrupted by ravines. The land in this portion is characteristically marginal and of little economic value to agriculture or tourism.

The Kyrenia Range is part of the Alpine fold mountain and a continuation of the Taurus Mountains of Turkey. The geological formation of the range is mainly of sedimentary rocks ranging in age from Triassic to Recent (Fig. 13.4). Two categories form the core of the Range (Dreghorn, 1971, 1979): the Trypa formation, the oldest known sedimentary rocks (TriassoJurassic); and the Lapithos formation (Upper Cretaceous-Oligocene) made up of white, massive chalks and limestones. The Kyrenia Range is flanked on either side by the Kythrea formation, the most prominent of the Dhali Group (Miocene), which is made up of marls with thin bands of limestone and gypsum. The Pliocene is represented by beach deposits on what are today raised beaches.

The evolutionary interaction of the regional topography and geology form four distinct geomorphological features that strongly influence the landscape (Makhzoumi, 1996b): the Kyrenia Range itself; the foothill terraces; the ravines; and the coastal plain. The Kyrenia Range foothills comprise a series of natural terraces which have historically influenced agriculture and the location of settlements and roads, and continue to account for the regional landscape character. The geological origin of these terraces is attributed to changes in the sea level about a million years ago when the climate was marked by a much higher rainfall than at present (Christodoulou, 1959; Dreghorn, 1971). With the land rising and the sea retreating several times, the coastal plain extended seaward in the form of stepped terraces which today form the Kyrenia Range foothills.

The evolutionary processes that shaped the foothill terraces simultaneously contributed to shaping the ravines. At first these rivers meandered in shallow valleys but as the terraces were formed and the sea level receded, their erosive power increased, incising deep valleys into the former higher terraces. Today the north side of the wall-like Kyrenia Range is punctuated by these ravines which are rich in sedimentary soils, possess a higher soil moisture and offer considerable climatic sheltering. Thus they are a rich habitat for the indigenous vegetation.

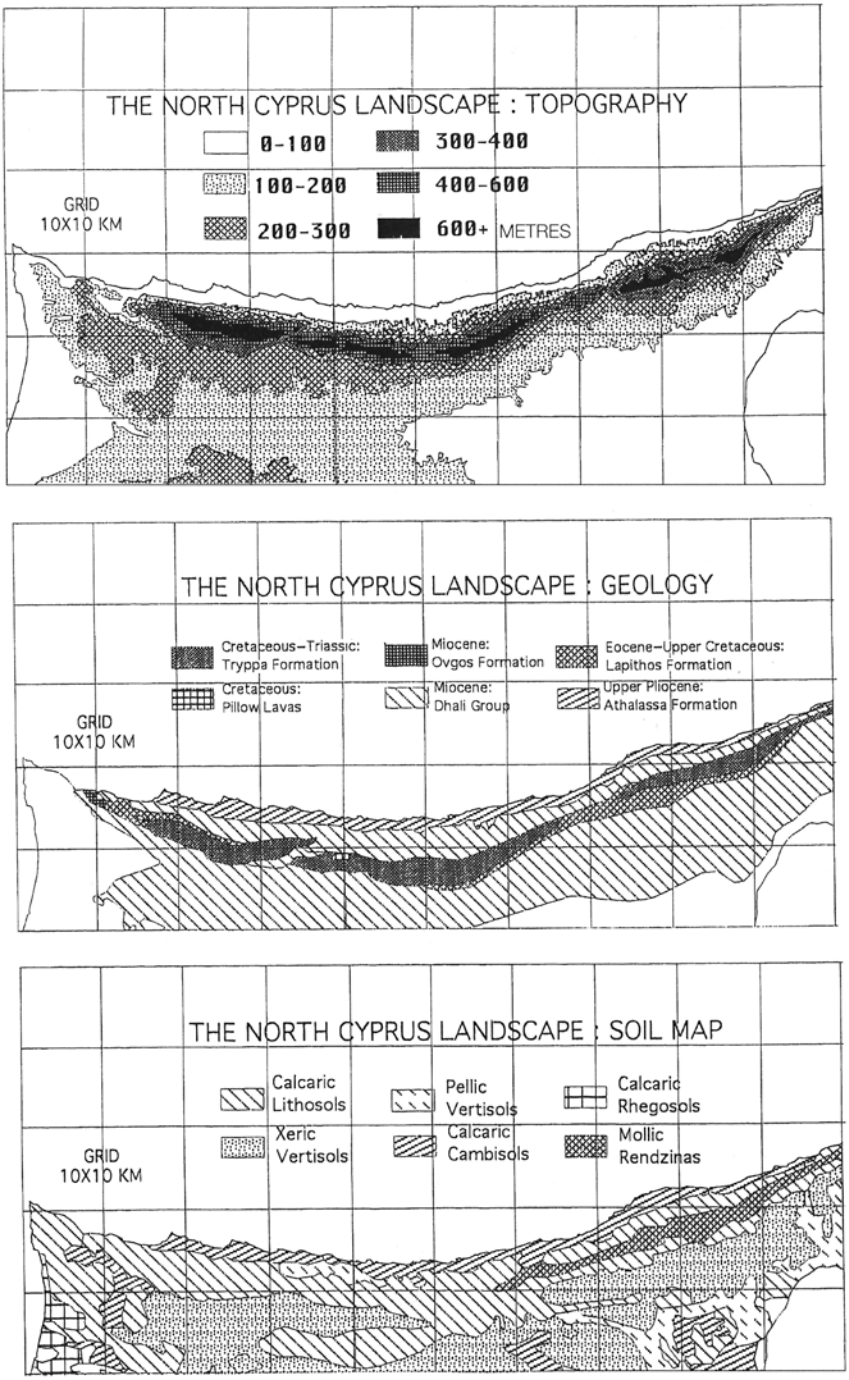


Fig. 13.4 Theabiotic components of the regional landscape: topography, geology and soil.

Climate, soil and hydrology

The evolutionary processes integrating topography and geology can also be seen as affecting the close interaction of climate, soil and hydrology. Cyprus is part of the semi-arid Mediterranean (UNESCO, 1964, 1979). In the bioclimatic map of the Mediterranean zone the climate of Cyprus is described as dry and, with the exception of the Troodos Range, classified as *xerothermo-mediterranean,* the first of four categories describing the descending degrees of Mediterranean aridity (UNESCO/FAO, 1963).

Climate influences not only the life-cycle of vegetation but the very pattern of life. The alternation of a moist, cool season and a long, hot, dry one is a marked characteristic and possibly the most important element in the physical environment of Cyprus (Thirgood, 1987). Variation in annual precipitation is considerable and prolonged droughts are not infrequent. Precipitation concentrates in the months of October to March. Rain-storms are usually torrential, often leading to floods, excessive soil erosion and damage to crops. The annual average rainfall is 350 mm per year but closer to 1000mm in the mountains (Olgun, 1991). The average annual temperature varies from a winter minimum of 9°C in December to a summer maximum of 35°C in August.

Except in the ravines and on the foothill terraces, soils in the Kyrenia Region are thin, overlying porous rock, neutral or slightly alkaline and generally deficient in plant nutrients (Christodoulou, 1959). Soil distribution in the region closely follows the geology and is quite uniform, dominated by calcaric lithosols with calcaric cambisols in the coastal plains.

The loss of soil through erosion is one of island's most persistent environmental problems (Olgun, 1991). The combination of a topography that favours quick run-off and harsh climatic conditions has resulted in a semi-arid type of landscape in which erosion plays an important role. Summer drought greatly reduces soil moisture and parches the soil, exposing it to the subsequent autumn rains. Anthropogenic activities, seasonal cultivation patterns and grazing in particular have exacerbated the problem of soil erosion.

Like most of the island the Kyrenia Region relies on rainfall for its supply of water. Water resources are therefore dependent on input from precipitation received and output through loss by evaporation, run-off to the sea, transpiration and the amount of percolation that makes up its underground water resources. The weathered Hilarion Limestone peaks of the Kyrenia Range are efficient absorbers and retainers of precipitation. Stored water issues in a series of springs at Lapithos to the west with a flow across coastal plain of 5–7.5 million litres a day.

A study of rainfall statistics over the past fifty years indicates that recent precipitation levels in Cyprus are significantly and consistently lower than before (Olgun, 1991). Shortages in available water resources are leading to the drying up of aquifers and the penetration into them of sea water or other undesirable water. Attempts to minimise the shortfall are thwarted by increasing rates of consumption by the local population and by tourist development and inefficient irrigation practices *(ibid.)*.

13.4
Biotic components of the regional landscape

Flora and fauna in the Kyrenia Region have been influenced not only by the climate, topography and soil but in addition by a long history of anthropogenic interference. Despite a long history of successive human occupation the indigenous flora of Cyprus constitutes an outstanding biological local and regional heritage (Meikle, 1977, 1985; Viney, 1994). Trees and shrubs constitute only one-quarter of the total estimate of 1600 plant species, of which 22 species and sub-species are endemic (Viney, 1992).

Little remains of the rich diversity of fauna recorded in the history of the island (Attenborough, 1987). Birds are the most profuse as Cyprus lies on one of the world's great migratory routes and through it pass twice yearly most of the bird species found in Europe, including many rare species that winter on the island (Flint and Stewart, 1992). Of the estimated 350 bird species, 46 breed on the island; the rest are migratory. Sea turtles *Chelonia mydas* and *Caretta caretta* are another prominent feature of the local wildlife as Cyprus is one of the last havens for these endangered species. It is estimated that approximately 2000 adult turtles come to the coast during the mating season, laying their eggs at 46 beaches along the island's north coast (Olgun, 1991).

A history of the forest in Cyprus

Cyprus was known for its heavily forested lands and was a centre of shipbuilding and timber-exporting up until the Middle Ages (Thirgood, 1987; Tomaselli, 1977). Throughout biblical times there was extensive trade in 'cedar' cypresses and pine with Egypt and the Levant. Timber exports continued through Roman times and the Middle Ages into the Venetian period. Unlike the Troodos Range forests to the south which were protected by their inaccessibility, the Kyrenia Range forest was accessible for the entire length from the north coast and therefore suffered the most destruction.

Forest destruction was not always the result of cultivation but of a general state of mismanagement, wood cutting and free-range grazing. To the Cypriot peasant the forest was a God-given natural resource to be used freely. Forest undergrowth provided fodder for flocks of roaming goats and when the tall trees threatened to suppress the undergrowth the forest was burnt away. Towards the end of the nineteenth century when the British arrived on the island, forests and the island's vegetative cover were in a very poor condition. The forest conservation and afforestation programme initiated by the British is one of the oldest and the most successful in the east Mediterranean (Thirgood, 1987). Only in the last few decades, a hundred years later, could the result be appreciated.

The composition and distribution of the forest and maquis

Today the Kyrenia Range forest is a protected nature park almost in its entirety and is managed by the Department of Forestry (Fig. 13.5). The total forest area in 1995 was 60953.5hectares, approximately 19% of the total land area of North Cyprus (TRNC/

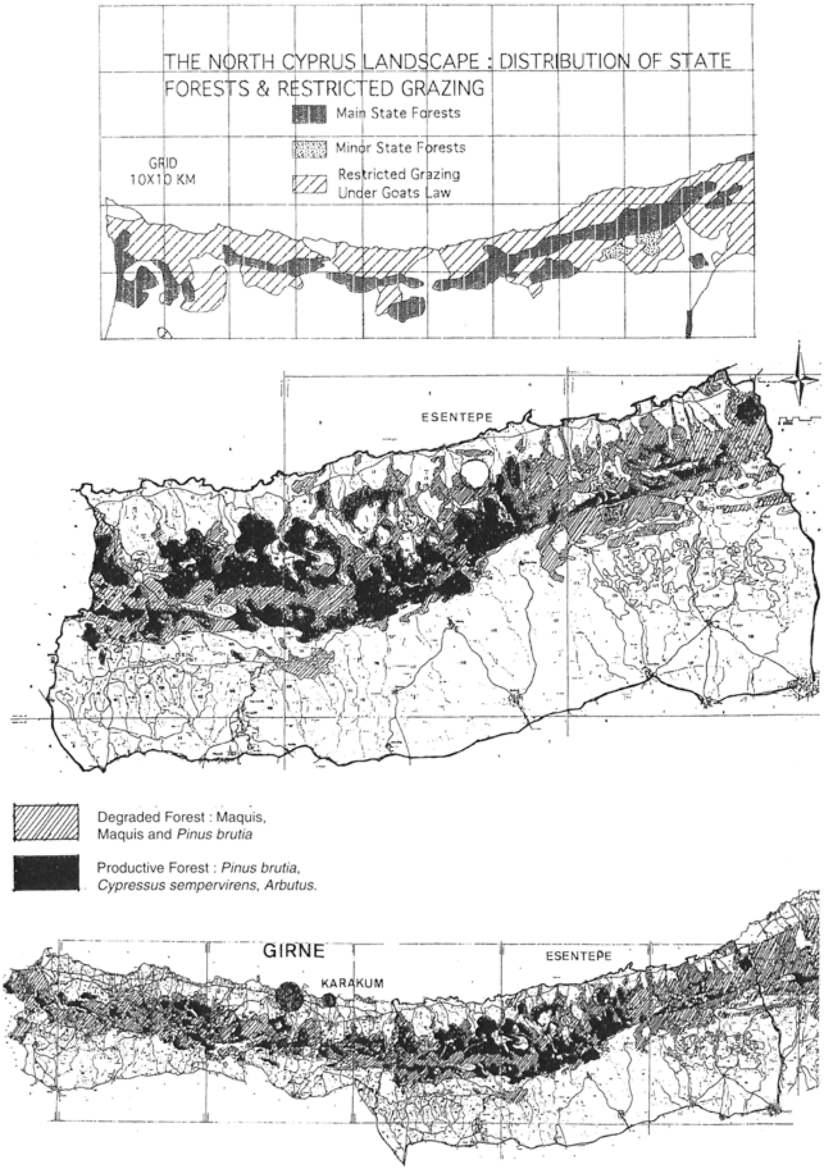


Fig. 13.5 The biotic components of the regional landscape: the distribution of forest and maquis in the Kyrenia Region (centre and bottom) and the municipal limits of the protected forest (Source: TRNC/Department of Forestry, 1992.)

Ministry of Agriculture, 1996). It is dominated by pine trees *(Pinus brutia)* and cypress trees *(Cupressus sempervirens)* which are indigenous to the limestone Kyrenia mountains.

Other tree species in the forest include oak trees *(Quercus calliprinos),* the strawberry tree *(Arbutus andrachne)* and hawthorn *(Crataegus).*

Despite the long and successful struggle to protect and conserve the forest, emphasis continues to be on forest productivity with recent attempts to increase the cultivation of pines (TRNC/Department of Forestry, 1992). This is a clear reflection of north European forestry management policies which are not suitable to the conservation of Mediterranean forests. Further, the dominance of pines increases the forest's susceptibility to fire (Harant and Jarry, 1971). Fire control in the region is particularly difficult on account of the complex terrain and the unavailability of water. The most recent fire in the Kyrenia Region forests in July, 1995 destroyed an estimated one-third of the total forest, the maquis and huge expanses of the olive and carob planting.

Maquis in the Kyrenia Region is well-developed, abundant and dominates the north-facing foothills. Cyprus maquis or scrub woodland has all but completely replaced the degraded Mediterranean forest. Under sustained maltreatment the maquis gives way to garigue, which under persistent and heavy grazing regresses to baatha and this in turn to dwarf woody colonisers, sparse grasses and related species. All three stages can be found at the same time within different locations in the Kyrenia region.

Maquis is dominated by the lentisk shrub *(Pistada lentiscus, P. terebinthus),* juniper *(Juniperus phoenicea),* wild olive *(Olea oleaster),* carob, laurel *(Laurus nobilis)* but also includes myrtle *(Myrtus communis)* and oleander *(Nerium oleander),* buckthorn *(Rhamnus oleoides)* while garigue is composed of rose rock *(Cistus parviflorus, Cistus salviaefolius),* lavender *(Lavandula stoechas),* gromwell *(Lithospermum hispidulum)* and thyme *(Thymus capitatus)*. Maquis species are well adapted to the semi-arid Mediterranean environment as they are evergreen species whose leaves and vascular system are at once frost-resistant and drought-resistant.

Forest and maquis in the Kyrenia Region occupy a broad band that stretches along the peaks and upper foothills of the mountain range (Fig. 13.6). The band is a highly inter-digitated mosaic of forest and maquis patches. A consistent feature in the distribution of the forest and maquis is the narrow corridors of dense, often advanced maquis in the bigger ravines.

Ecological Landscape Associations

Investigation of the Kyrenia Region landscape reveals that the landscape is to a large extent the outcome of evolutionary processes that have integrated abiotic and biotic components. The formation and development of the Kyrenia Range have to a large extent dominated these processes and influenced topography, geology, soil, climate and hydrology. The development of the forest and maquis, although also part of these evolutionary processes, has also been determined by anthropic influences.

The emerging regional landscape pattern is stratified into three tiers which generally correspond to three Ecological Landscape Associations. The first is the *forest/mountain* association which roughly corresponds to the peaks of the Kyrenia Range, i.e. 600 m.a.s.l. contour line and to the municipal limits of the protected forest. Second, the *maquis/foothills* association which is closely intertwined with that of the forest/mountain and is in all aspects a continuation of it. Third, the *maquis/ravines* association formed by mature maquis that concentrates in and along the larger ravines.

Fig. 13.6 Forest and maquis in the Kyrenia Range. Viewed westward towards Cape Kormakiti.

13.5
Rural cultural landscape: the Esentepe field survey

While the regional survey has determined the components and pattern of the regional landscape, field surveys can determine the fine-grain pattern of the rural cultural landscape. In addition, the field survey can verify the three ecological landscape associations discerned in the regional survey.

Survey location and method

Two field surveys were conducted, the first at Esentepe, 26 km east of Girne, and a second in Karakum, a village on the outskirts of Girne (Makhzoumi, 1996b). Esentepe is typical of rural cultural landscapes in marginal lands with little or no modernising influences. In contrast, Karakum was chosen because of its proximity to Girne and the influence of suburbanisation and tourism. Differences in the survey locations were seen as having the potential to indicate the extent and pattern of landscape change in the region.

The size of both surveyed areas is approximately 2km^2. The information was collected using a scale 1/5000 base contour map at Esentepe, and a scale 1/2500 land property map at Karakum. The difference was justified by the complex terrain in the former, the levelness and complicated property holdings in the latter. The information collected was structured into three main categories: first, components of the natural and semi-natural landscape which include landform and watercourses (e.g. ravines), maquis and forest;

second, components of the rural cultural landscape which include a total of 12 components (e.g. arable, multi-use tree plantations, orchards, house orchard/garden, pollarded olive trees, irrigation tanks, animal sheds and buildings); third, components of the contemporary landscape which include commercial and industrial uses and sites under construction.

The base maps and the information gathered from the field surveys were digitised and entered into the MapGrafix Mapping System, a simple version of Geographical Information System (GIS). The system is a powerful means of spatial information management and analysis and offers a wide range of data manipulation.

The findings of the Esentepe field survey

The town of Esentepe (869 inhabitants) and its surrounding landscape is characteristic of the traditional rural landscapes of the eastern Kyrenia Region. It is a marginal landscape with little economic value, i.e. it is difficult to obtain greater agricultural yields per unit area. The survey area includes a variety of landscape components, the coastline and its adjoining coastal plain, the Kyrenia Range foothills, four ravines, and part of Esentepe town fringes. The topographical variation within the two square kilometres is considerable; the change in elevation within one kilometre depth from the coastline is over 800 m.a.s.l.

The findings of the Esentepe field survey reveal an extremely diverse landscape combining natural, semi-natural, agricultural and pastoral land uses (Fig. 13.7). Of a total of 16 landscape components, three dominate. These are the maquis in association with the foothill terraces, maquis in association with the ravines and multi-use olive and carob tree planting. Maquis and a number of forest patches occupy 43.2% of the surveyed area. The lentisk shrub is the last woody survivor from degraded Mediterranean forest and is the dominant species in all locations, contributing considerably to soil protection and stabilisation (Fig. 13.8). Unless it is controlled by grazing or ploughing, maquis dominates the landscape. It is generally welldeveloped in the upper foothills and in the ravines, but degraded along the coast. Nevertheless, it plays a significant role in protecting the steep coastal cliffs.

Landscapes of multi-use tree plantation are the single largest components of the rural cultural landscape, occupying 31% of the surveyed area. Composed entirely of cultivated olive tree (0lea *europaea)* and the carob tree *(Ceratonia siliqua),* these landscapes are a living example of cultural adaptation to the local ecology and a viable concept in ecological landscape design for semi-arid regions (Makhzoumi, 1997). Olive and carob trees shelter orchards, are inter-cropped with cereal and provide for goat and sheep grazing. In addition, their own produce is of much value for local use and for export purposes. Finally, the visual impact of their formations is impressive and implies order, regularity and predictability in a geographically heterogeneous region.

Orchards, mainly of apricot, figs, pomegranate and citrus trees, are located in the ravines. Orchards are also found in close proximity to the town where they form a band along the periphery of Esentepe. Orchards that are cradled in the ravine or crown the

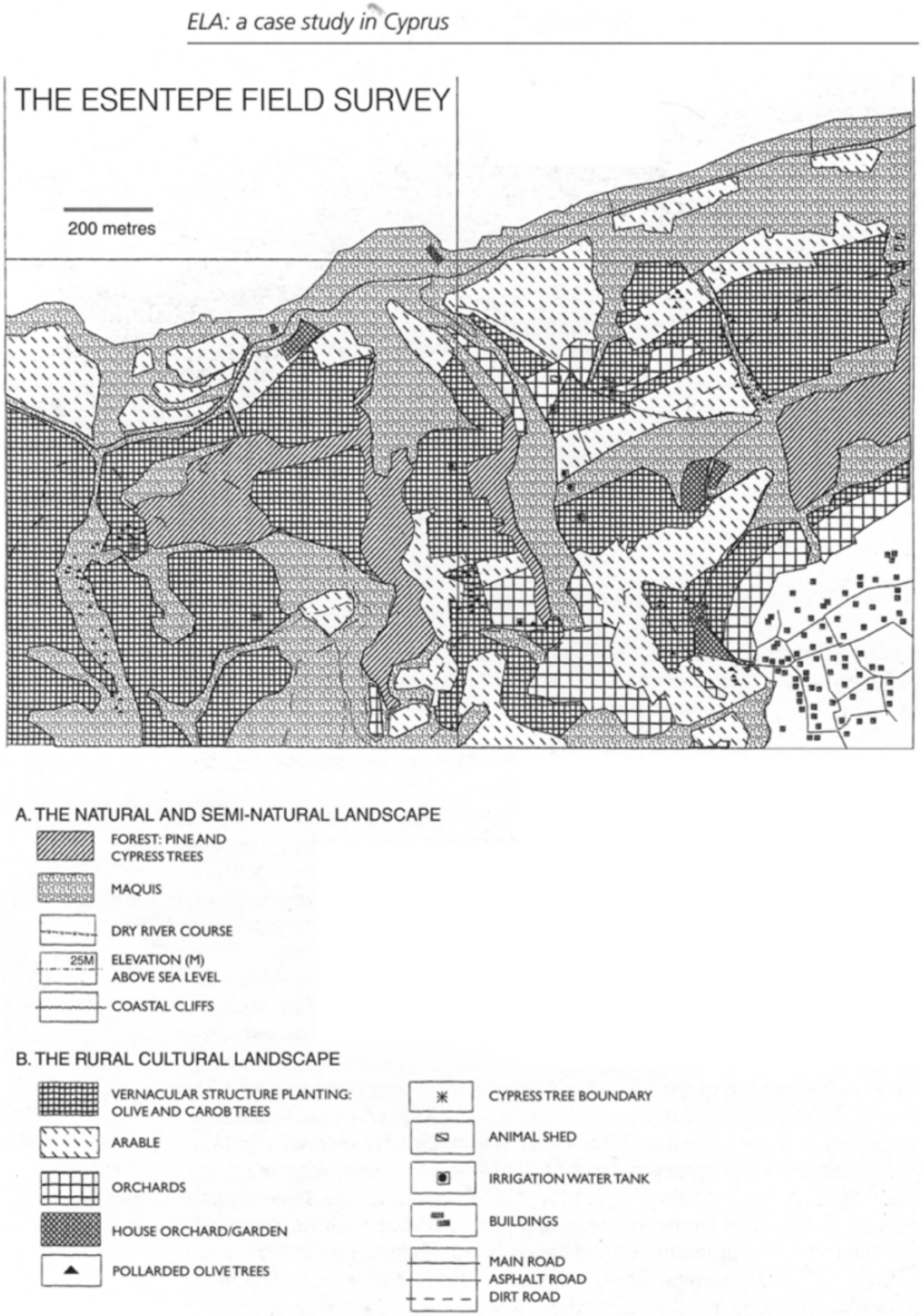


Fig. 13.7 The Esentepe field survey.

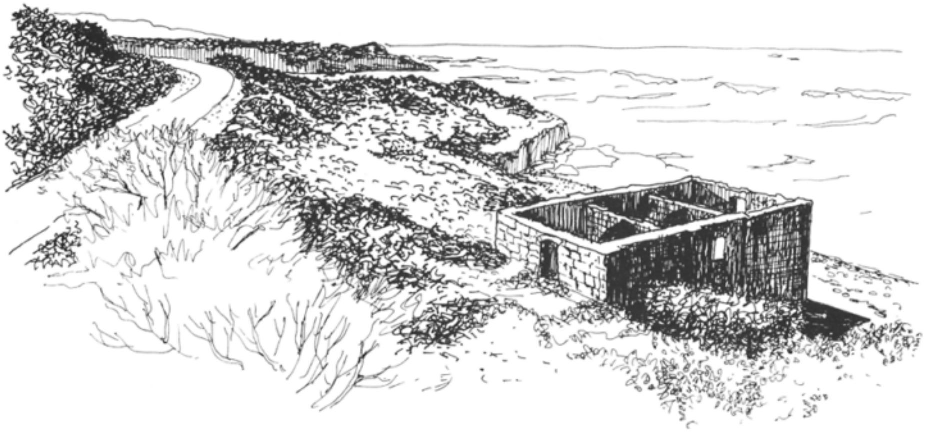


Fig. 13.8 Dense coastal maquis in the Esentepe survey area. The stone structure, dating from the nineteenth century, was used for storing carob seeds intended for export.

settlement are increasingly precious to the rural population and are often viewed as a prized garden that is as much for pleasure as it is for use and profit (Fig. 13.9).

The herding of sheep and goats is an integral part of the rural life at Esentepe even though the town and its surrounding area fall into the restricted grazing zone. Their milk, used for cheese production and meat, is in high demand.

The spatial pattern of the Esentepe landscape is diverse and responsive to the potentialities and constraints of the physical geography. Two outstanding examples of this are the utilisation of the ravines for orchard planting and the relatively flat coastal plain for arable land uses. The ravine emerges as an important morphological feature for the natural, the semi-natural and the rural cultural landscape. Man and nature compete for its fertile soil and sheltered microclimate. Where there is no evidence of human use, the ravine is taken over by maquis. Well-developed maquis in two central ravines has matured into forest patches.

The Esentepe field survey in many ways confirms two of the four ELA established in the regional review: that of maquis/upper foothills and advanced maquis/ravine. The forest/mountain association could not be confirmed as Esentepe lies at a lower elevation. In addition the survey establishes a fourth ELA of maquis in association with the coastal cliffs and a fifth ELA of multi-use tree planting in association with the foothills. Unlike the first four the fifth ELA is a cultural association, i.e. it is man-made and man-maintained.

13.6
Changing regional landscape: the Karakum field survey

Karakum is a small village on the coastal road 2.5km east of Girne. In the past 15 years Karakum has increasingly become a continuation of Girne's suburbs (Fig. 13.10). The main coastal road runs through Karakum parallel to the coast at a distance of approximately 500 metres from it. The road past Karakum leads to several large tourist

Fig. 13.9 View towards Esentepe across the main ravine west of the town. (Buildings and cathedral seen in silhouette at the top of the ridge.)

Fig. 13.10 View of Karakum from the western edge of the survey area looking towards the Zeyko oil factory and the adjoining industrial complex.

complexes and public beaches. This has attracted a number of commercial and residential activities in Karakum which are generally located along the main road. The shape of the surveyed area follows the elongated shape of Karakum. It is bordered to the east and west by two ravines and includes two others. The ravines are generally narrow, broadening as they join the coast. The coastal plain is quite level with an average drop of several metres to the rocky coastline.

The findings of the Karakum field survey

The findings of the Karakum survey indicate that the landscape is predominantly rural with components similar to those recorded at Esentepe (Fig. 13.11). These include multi-use tree planting, arable, orchards and house garden/orchard, which constitute 59% of the total survey area.

The maquis occupies 22.6% of the total surveyed area and is degraded even in the ravines, where it is either dominated by reeds *(Arundo donax)* or utilised by commercial and industrial activities (Fig. 13.12).

Multi-use olive tree plantations are extensive and have long supplanted maquis and forest. This is characteristic of the wide coastal plain on both sides of Girne. In contrast to Esentepe, multi-use tree plantations at Karakum are exclusively of olive trees and planted in an orthogonal layout because they are planted from seedlings and not by grafting of 'wild' olive trees.

Plots of arable land are widely scattered in the survey area, although many show signs of having been abandoned for several years. Rain-fed cereal cropping, it was noted, is gradually being replaced by water-intensive cultivation of garden vegetables and melons, often in plastic houses. The change is a reflection of changing market needs and of the ever-growing urban and tourist population. Orchards of citrus and vines are numerous, 19 in total evenly distributed throughout the survey area. As at Esentepe, cypress tree boundaries in association with orchards are a common feature of the traditional rural landscape.

The house orchard/garden is an important landscape component, especially in villages like Karakum. It is a rural concept of a useful garden that dominates in the eastern Mediterranean. In many ways it is a miniaturised orchard with a variety of fruit trees, a vine pergola, a small water tank, a chicken coop and a goat or sheep pen.

Contemporary land uses constitute 18.3% of the Karakum survey area. However, their impact in transforming the traditional rural landscape is considerable. Two large-scale chicken batteries in the centre of the survey area flank the Zeyko oil factory, all three dating to the 1950s. Of greater impact is the increase in the number of sites under construction, mostly detached houses. Karakum is becoming an increasingly popular location because of its proximity to Girne. It was noted that road construction often precedes house-building.

Above all, the survey at Karakum establishes that the rural cultural landscape in the Kyrenia Region is undergoing a gradual process of transformation. Several overlapping spatial processes lead over time to landscape transformation (Forman, 1997): a process of *perforation* denting the existing landscape fabric; *dissection* and *fragmentation,* a breaking up of a habitat or land into smaller parcels or patches; subsequent *shrinkage,* the decrease in size of the patches; and finally *attrition,* the disappearance of the patches altogether. The first three of these spatial processes have been noted at the Karakum field survey. The many sites of detached housing, whether completed or under construction, exemplify a process that is perforating the continuous cover of olive trees. The construction of roads to service the new buildings is dissecting and fragmenting the existing rural landscape. The process of change at Karakum, however, is in its early stages; olive orchards still constitute 38% of the surveyed area. The process of transformation is more advanced to the west of Girne where the rural landscape has almost completely been replaced on both sides of the main coastal road.

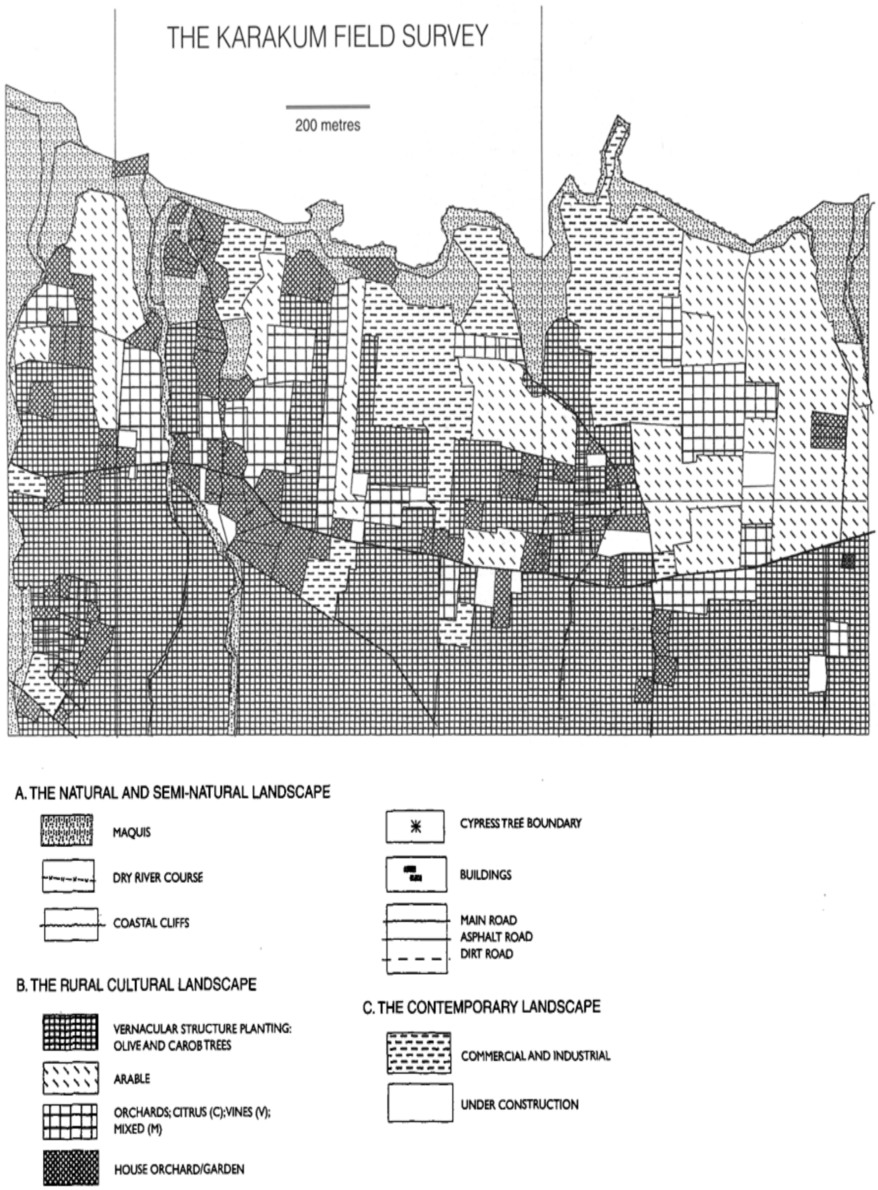


Fig. 13.11 The Karakum field survey.

13.7
Biodiversity in the regional landscape

The floristic composition of the traditional rural landscape in the Kyrenia Region was sampled by means of quadrats, each 100 m2 in area, selected to represent four landscape

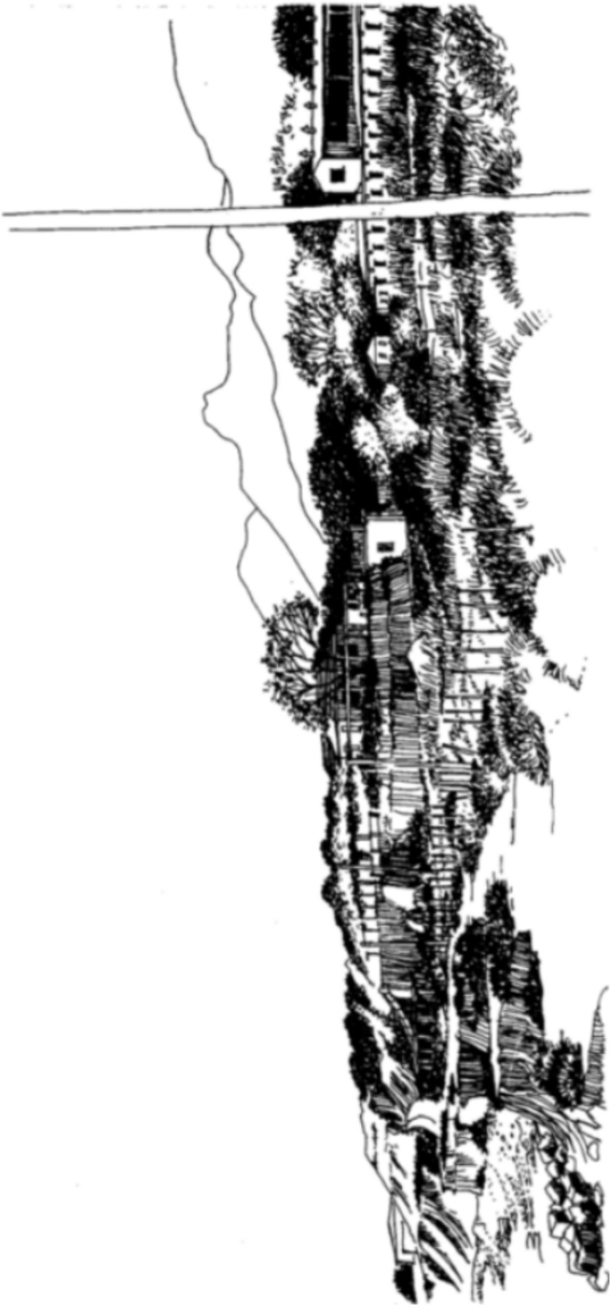


Fig. 13.12 The broad and shallow ravines at Karakum are utilised by industrial (left), commercial (centre) and residential buildings.

components: forest, maquis, maquis/ravine, and olive and carob tree plantations (Makhzoumi, 1996a, 1996b). Placement of the quadrats was intentionally varied (e.g. maquis at higher and lower altitudes in large and small ravines) to achieve a better understanding of the dynamics of species distribution. A species list was then made and the presence of species recorded. Unidentified samples were collected for later identification.

The species density in the four landscape components is summarised in Table 13.1. The highest number of species is to be found in the natural and semi-natural habitats, the maquis/ravine, the forest and maquis/foothills with an average of 19, 15 and 14 species per quadrat respectively. The species diversity in the ravine is mainly because it forms a corridor allowing for the movement of species between the different habitats.

The olive and carob tree plantations have an average of 11.25 species per quadrat, lower than that of the natural and semi-natural components. This, however, is due to the intentional removal of invading species, i.e. maquis, in the process of management. The higher species diversity in quadrats numbers three and four are an exception and can be attributed to their abandonment in c. 1974 and 1950 respectively.

Landscapes of multi-use tree planting, however, have a significantly high number of trees in comparison to the maquis associations. Trees in semi-arid landscapes, whether spontaneous or cultivated, contribute to soil and water conservation, modify the regional climate and add to the aesthetic character of the landscape.

Table 13.1 The species density in 100sq.m quadrats for the main components of the rural landscape in the Kyrenia Region

	Forest	Maquis	Ravine	Multi-use tree planting
Quadrat 1	19	17	22	10
Quadrat 2	14	14	21	4
Quadrat 3	11	8	16	14
Quadrat 4	19	18	17	17
Average species density	15.75	14.25	19	11.25

Variation in the floristic composition of the 16 quadrats reflects the dynamic ongoing processes integrating the main landscape components. The two most prominent examples are the development of maquis in abandoned olive and carob orchards and the progressive evolution of maquis in the ravines towards the forest. Interaction among landscape components is also determined by traditional rural management practices such as coppicing, ploughing and grazing.

13.8
Ecological Landscape Associations in the Kyrenia Region

The methodology of Ecological Landscape Associations has been applied to the Kyrenia Region in its capacity as a dynamic investigative framework. The methodological procedure followed has achieved the aims of this initial investigative stage, mainly providing for an ecological understanding of the regional landscape, allocating the ELA and determining the pattern of their distribution. Five landscape associations have been established by the methodological framework. The following is a description and assessment of the associations, their intrinsic characteristics and the pattern of their location (Fig. 13.13).

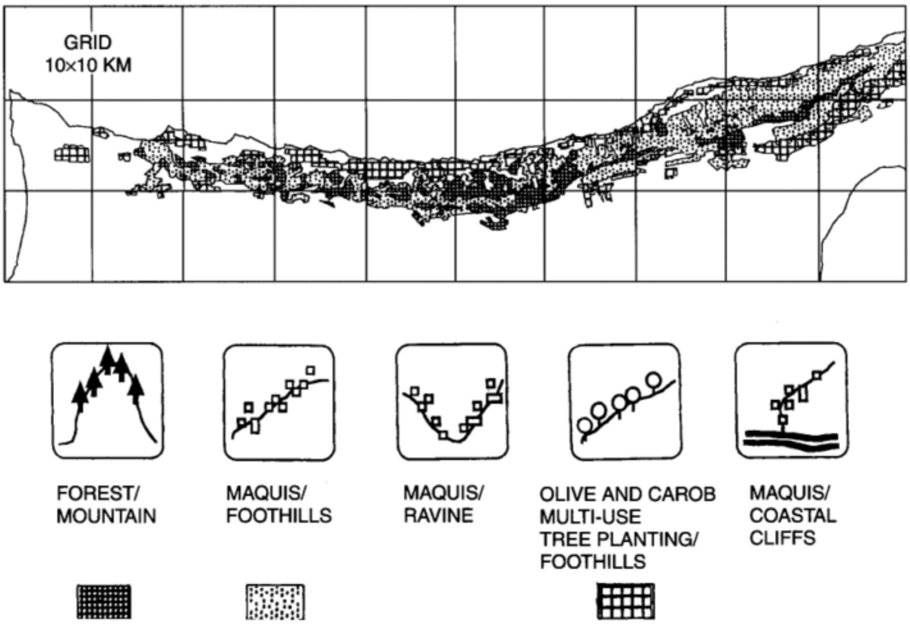


Fig. 13.13 The five main Ecological Landscape Associations in the Kyrenia Region. Because of the scale of the regional map only three of the ELA are indicated.

Components of the natural and semi-natural landscape: forest and the maquis

The forest/mountain ELA is the first of the five associations in the Kyrenia Region. It is ecologically, administratively and aesthetically well defined. The location of this association in the Kyrenia Range peaks has made it easier to protect. The indirect economic benefits of protection are recreational and scenic while direct benefits are mainly ecological and environmental. Forest protection ensures improved water catchment, the augmentation of existing springs, the encouragement of new ones and increased water-holding capacity, all of which are directly related to the water absorption capability in the limestone peaks.

Mediterranean forests differ in their locational pattern, their objectives and their management techniques from those of temperate regions. Unlike the woodlands of temperate Europe which are managed mainly for their marketable productivity, Mediterranean forest production can hardly be used to estimate their economic value nor can it be considered as a source of raw material (Naveh and Lieberman, 1990; Perez, 1990). Rather it is an integral part of local agricultural systems, closely associated with agricultural needs.

The maquis/foothills and maquis/ravine ELA are the second and third associations in the Kyrenia Region. Maquis is ubiquitous in the landscape, the outcome of centuries of anthropogenic interferences that have degraded the original Mediterranean forest ecosystem. Unlike the forest, maquis is not protected by law. And although its location has been indicated in the Forestry Management Plans (TRNC/Department of Forestry, 1992), most of the maquis lies outside the protective limits of the forest.

Recently, maquis has been increasingly considered as a fundamental component of the Mediterranean semi-natural landscape (Naveh and Dan, 1973; Naveh and Lieberman, 1990). Tomaselli's (1977) evaluation of the direct and indirect long-term economic benefits of maquis include: the regulation of watercourses; the protection of the soil against erosion and the increasing of its profile depth; the creation and maintenance of a moderated microclimate; the ability to withstand damage caused by disease and pollution better than other types of vegetation, e.g. pine trees; and finally, the fact that the maquis is a large repository of genetic resources. Above all, and because of its wide distribution in the Kyrenia Region, maquis provides for landscape connectivity and continuity.

The fourth ELA is that of maquis/coastal cliffs which although limited in extent and distribution plays a significant role in protecting the coastal cliffs from erosion and in providing a habitat for the local fauna.

Components of the rural cultural landscape: olive and carob tree plantations

The multi-use olive and carob tree plantations/foothills are the fifth of the ELA. These landscapes are a living example of cultural ecosystems which have the stability, resilience and sustainability of semi-natural ecosystems. Their sustainability derives from the indigenous nature of the tree species and their adaptability to the harsh climate, poor soils and water shortage. The average tree density in these landscapes is regarded as more suitable in the management of semi-arid regions, because of the need to reduce the density of woody vegetation to decrease the danger of fire from the underbrush (Walker, 1979).

The Kyrenia Region is one of the few regions with extensive old landscapes of olive and carob still in productive use. Extensive as these landscapes are, however, the numbers of olive and carob trees are in constant decline. Government figures indicate a loss of 96506 olive and carob trees between 1983 and 1992, an equivalent of 24 trees destroyed each day over the 11year span (TRNC/Department of Town Planning, 1992). The destruction is due to the need of villagers for firewood, the demand for coal, encroaching suburban development and, at a much larger scale, tourist development. The greatest threat to these landscapes, however, is economic and arises from difficulties of marketing the produce of both olives and the carob seed. The local market is not big enough to generate a profitable turnover and the political and economic isolation of North Cyprus has greatly reduced the quantities that can be exported (TRNC/Ministry of Agriculture, 1996). With the loss of profitability these landscapes inevitably come under threat of destruction or replacement. Alternatives that can ensure some extent of protection are urgently required.

The pattern of the rural cultural landscape

The pattern of the Kyrenia Region landscape can be characterised by several dominant features. The first is the unique landscape heterogeneity, the outcome of a rich combination of natural, semi-natural and cultural landscape components. This is enhanced by the biodiversity of the individual components. Inter-digitation among landscape components is another characteristic which relates to the boundaries shared by the components. A diverse and well-integrated landscape spatial pattern such as that of the Kyrenia Region is directly proportionate to the length of landscape boundaries shared between the different landscape associations. Holland *et al.* (1991) have established that ecotones, the landscape boundaries between different patches, are important in satisfying life-cycle needs of organisms and are therefore characterised by high biological diversity. The complex boundaries characteristic of the landscape components in the Kyrenia Region, both at the regional and local scale, take on important control functions within the context of dynamic spatial systems.

Second, the distinct responsiveness of landscape components to features of the regional and local geography reflects a high degree of integration between abiotic, biotic and cultural components. Inter-digitation can be seen as an outcome of site responsiveness which in turn is the outcome of the adaptiveness of the traditional rural landscape to the potentials and limitations of available natural resources.

To achieve the objectives of ecological landscape design and planning it is essential that future landscape development is founded on an appreciation of these characteristics. Landscape heterogeneity, biological diversity and responsiveness account for the sustainability of the traditional rural cultural landscape and long-term ecological stability. As such, the traditional rural landscape of the Kyrenia Region is a rich source of ideas and concepts that can guide towards ecologically, culturally and aesthetically appropriate landscape design and planning.

Chapter 14
Ecological landscape design: regional application

The methodology of Ecological Landscape Associations was used in the previous chapter to establish an ecological understanding of the Kyrenia Region landscape. The investigation revealed that the landscape is a product of complex natural and cultural evolutionary processes and that it is heterogeneous, diverse and sustainable. In this chapter the knowledge gained will guide the development of a regional landscape design, while the five ELA discerned will form the main components of the design. The methodology proceeds by assessing the causes and consequences of landscape transformation, evaluating sustainable alternatives for future landscape development, defining the landscape design objectives and developing the conceptual regional design model.

14.1
Methodological procedure for ecological landscape design

The interactive nature of the Ecological Landscape Association methodology offers several advantages. First, the twin undertakings of, on the one hand, understanding the landscape and, on the other, developing the landscape design are intentionally merged and reciprocally related. Thus the ecological knowledge gained can inspire ideas, concepts and solutions. Second, because a contrived phasing of the design process has intentionally been avoided, the methodological procedures are simplified, allowing for responsiveness and spontaneity in the development of design concepts but also allowing for ecological understanding to dominate the design activity. Third, the interaction framework, motivated by the search for ELA, dictates an 'indwelling' that allows for an appreciation and understanding of the dynamic and complex evolutionary processes that have shaped the landscape and that account for its diversity and sustainability. Because the methodology is based on the concept of indwelling, the designer's perceptual and emotional engagement with the landscape at hand is ensured. This in turn makes possible a creativity in design solutions and allows for a responsiveness to the ecological, cultural and aesthetic characteristics of the existing landscape.

The five ELA discerned in the course of the regional investigation together with their spatial location pattern form the basis for the regional landscape design. The landscape design begins with an assessment of the causes and consequences of landscape transformation and an exploration of alternatives for sustainable landscape development.

It then proceeds to the formulation of the landscape design objectives, the maintenance of landscape integrity, sustainability and enhancing the character of place. The proposed landscape design is developed as a conceptual design model and then applied to part of the Kyrenia Region.

14.2
Landscape transformation in the Kyrenia Region

The findings from the field surveys at Esentepe and at Karakum confirm that the traditional rural landscape in the Kyrenia Region is undergoing a process of transformation. Three influences account for this transformation: landscape fragmentation; a trend for roadside development; and agricultural abandonment.

Landscape transformation is caused by suburbanisation spreading outwards from Girne and engulfing the villages on both sides. This is encouraged further by a trend of roadside development. The combined impact of these two processes results in landscape fragmentation, which in turn affects almost all ecological patterns and processes from the genes to ecosystem functions (Forman, 1997) and leads to the loss of biodiversity and a decrease in habitat heterogeneity and species extinction (Farina, 1998; Turner, 1987; Webb, 1992).

The transformation of the rural cultural landscape observed in the Kyrenia Region has been noted elsewhere in the Mediterranean (Ales *et al.,* 1992; Perez, 1990; Naveh, 1982; Vos and Stortelder, 1988). The change is generally attributed to a process of neotechnological degradation, characterised by homogenisation and fragmentation, leading to the large-scale destruction of the unique landscape-ecological diversity (Naveh, 1993). Unlike other Mediterranean regions, however, population increase is not a contributing factor in the Kyrenia Region, although suburbanisation is. Tourism is another factor contributing to fragmentation by replacing the traditional rural landscape with a commercialised and standardised one.

Landscape transformation is also caused by agricultural abandonment, resulting from the problems of a stagnating rural economy and the prospects of better work opportunities in Girne. The influence of tourism is significant, causing socio-economic and cultural changes in traditional rural communities (Burnett and Rowntree, 1990; Morey, 1994). The impact is not, however, limited to the immediate surroundings of tourist centres but influences peripheral areas at a considerable distance. At Esentepe, it was noted that a large proportion of the young working population travel daily to their work in Girne. This was causing a shortage of manpower in the fields. The neglected state of a large number of olive and carob groves, orchards and arable lands was recorded as one clear manifestation of abandonment.

Agricultural abandonment in the Kyrenia Region is further compounded by the unprofitability of traditional rural practices. This is caused mainly by the stagnant North Cyprus economy and leads to the search for alternative means of development, agricultural or otherwise. At Esentepe, for example, almond trees were increasingly favoured because unlike olives the almonds can be stored for a long period and as such offer more flexible marketing options. Not all alternatives are as appropriate, however.

Ales *et al.* (1992) investigated the change in the traditional landscape pattern in a region in south-west Spain over a period of 34 years. The findings indicate a tendency in landscape development 'to obtain greater yields per unit area, whether of agricultural produce (substitution of the olive grove by irrigated areas and herbaceous crops), animal produce (increase in productivity of livestock), or forestry (substitution of shrub land and open oak forests by plantations of rapidly growing trees), employing new techniques which use a great amount of fossil energy' (*ibid.,* p. 16).

In some cases, abandonment indirectly results from inappropriate legislation. The European Community Common Agricultural Policy, as an example, has intensified the general tendencies underlying the development of a market economy, 'thereby speeding up the dual process of intensification and land abandonment, and generating new specific conditions with important ecological costs' (Perez, 1990, p. 217).

Planning policies aiming to curtail landscape transformation in the Kyrenia needs to simultaneously address the physical aspects (uncontrolled roadside development) and the socio-economic ones (agricultural abandonment).

14.3
Environmental and ecological consequences

The destruction of the rural landscape, whether directly by fragmentation caused by tourist, suburban and roadside development, or indirectly through agricultural abandonment, inevitably leads to the loss of ecological landscape diversity and environmental sustainability in the region. Natural, cultural and biological production, however, depend on soil conservation and the protection of watersheds. Soil and water resources in turn are closely interrelated and dependent on the quality and quantity of the regional vegetative cover, i.e. forest, maquis and multi-use tree planting (Fig. 14.1).

The threat to the soil in North Cyprus is reflected in a general decline in the quality and extent of productive soils. Furthermore, soil loss, argues Olgun (1991, p. 18), 'especially in marginal areas, is resulting in fewer people showing interest in such areas because of low income potential, and this in its turn is leading to further soil degradation because of the absence of any soil conservation activity'. Traditional soil conservation measures which have been practised in Cyprus for centuries include: gully-plugging by means of stone walls with channels leading the way for irrigation of nearby land; stone dividing walls or terraces in steep foothill orchards; strip cultivation with alternating strips of natural vegetation following the contours; and bench terracing for irrigated lands (Thirgood, 1987).

The general scarcity of water resources is characteristic of semi-arid regions. In North Cyprus several factors contribute to exacerbating the water shortage (Olgun, 1991): the increase in demand for domestic water due to rapid urbanisation, affluence and the development of the tourist industry; an increase in demand for irrigation water; the contamination of aquifers due to sea water penetration along the coast; and the loss of water from seasonal rivers. Increasing demand for irrigation water as a result 'of the rising demand for agricultural products through the rapid growth of the cash crop sector' *(ibid.,* p. 10) was recorded at Karakum, where rain-fed arable lands and olive orchards had given

Fig. 14.1 The extensive landscape of olive and carob multi-use tree planting in the Kyrenia Range foothills protects the watershed and stabilises the soil. *Viewed against the distinct silhouette of the Besparmak peak.*

way to plastic house production of melon and vegetables. The process of landscape change places increased demand on the water resources.

Future management of natural resources should therefore try to benefit from the ecological wisdom of earlier generations and re-evaluate their potential contribution to current environmental and ecological problems. The traditional measures of soil and water conservation, efficient and economical as they are, should be encouraged, especially in marginal landscapes such as at Esentepe.

14.4
Environmental and planning legislation

The problems of landscape transformation in the Kyrenia Region are directly affected by the existing legislative and administrative mechanisms. The responsibility for planning and managing the landscape in North Cyprus is shared by three government agencies: the Department of Town Planning in the Ministry of Housing; the Ministry of Health and Environment; and the Department of Forestry in the Ministry of Agricultu re. Not only is the responsibility divided but in addition the concerns and priorities of these three agencies are not necessarily complementary.

The Department of Town Planning is the central body in charge of physical planning, issuing building permits and regulating all building activities. With an extremely limited technical staff, almost no computer support and extremely limited implementational authority, the department has managed to prepare town plans for all the settlements in North Cyprus. However, a regional development strategy and planning proposals for the Kyrenia Region have not to date been undertaken by the Department. The Ministry of Health and Environment deals with problems of air and water pollution and solid waste disposal but not with natural resource management. This is mainly because 'environment' is increasingly perceived by administrators and the public as a problem to be solved. The Department of Forestry is responsible for managing the protected forest and deals with the everpresent danger of fire hazards and curbing goat grazing in prohibited areas. Even though the role of the forest in recreation has gained in popularity in the last decade, forest productivity is still a main concern.

To summarise, the Kyrenia Region is not included in planning policies or in future physical planning proposals. Nor is there a single government agency responsible for landscape, rural or countryside planning. Furthermore, there is a general absence of landscape surveys, classification and documentation of traditional landscapes. There is, for example, no survey to date of the physical extent of multi-use olive and carob tree plantations despite their significance locally and within the wider Mediterranean context (Makhzoumi, 1997). These problems are characteristic in a large number of Mediterranean regions and form a major obstacle to landscape development. The problem is further compounded by the short supply of landscape architects and the general absence of landscape design education (e.g. all the universities in North Cyprus have schools of architecture but none offers landscape architecture courses). There is therefore an urgent need to establish schools of landscape architecture but also to educate architects and town planners, as they are in fact presently responsible for landscape design and environmental planning.

14.5
Environmental awareness and local initiatives

The history of Cyprus, like that of the eastern and southern Mediterranean generally, is one of foreign domination and political unrest. The lack of stability and continuity directly affects public attitudes towards long-term concepts such as sustainability. Like most traditional societies in the Mediterranean, Cypriots remain proud of their village and retain their village connections and their share in the family holding even after moving to the city. This interest, however, stands in marked contrast to attitudes to public land and property, another characteristic of lands that have a history of foreign domination. As an example, forest and maquis in the late nineteenth century were viewed by the public and the Ottoman administration alike as a free resource that was available for all to exploit. Forest fires up to the early decades of the twentieth century were an expression of political and communal unrest as well as a reaction against restrictions imposed on the free exploitation of the forest (Thirgood, 1987). Although attitudes towards the forest have changed appreciably, the deep-rootedness of the traditional view of public land continues and is reflected in local attitudes towards the landscape and natural resources. There is therefore an urgent need for new initiatives that can gradually inform the public and establish new cultural attitudes to environment and landscape.

In the last ten years, a considerable number of local initiatives have materialised, reflecting concern for environmental deterioration and a general threat to wildlife (Cant, 1998): the Society for the Protection of Turtles (SPOT) is one example. Close collaboration with Glasgow University has contributed a scientific dimension to local efforts to protect turtle beaches during the breeding season. The North Cyprus Society for the Protection of Birds (KUSKOR) is another local initiative spurred by concern for uncontrolled hunting. It has succeeded in limiting the hunting season to four Sundays in November and continues its campaign to protect the local and migrating bird population.

Of special significance is the establishment of the North Cyprus Chapter of the Society for International Development (NC/SID) which was born out of frustration with 'environmentalism' as an import from the 'rich North' (Cant, 1998). As such, NC/SID aims to move the local debate to sustainable development on the grounds that it has the potential to lead to sound management of environmental resources *(ibid.)*. In addition, its efforts have focused on raising public consciousness of sustainable development, especially among professionals, administrators and politicians, and on introducing the idea of NGOs (Non-Governmental Organisations) as a valid means of mobilising support and organising action towards environmental protection.

Individual initiatives have also contributed to raising public awareness of the environment. The designation of 30 of the oldest trees in North Cyprus as part of the natural heritage of the region (UNHCR, 1991) is one example (Fig. 14.2).

Attempts to build environmental awareness need to overcome a number of obstacles which cannot be overcome through design alone, but necessitate efforts in three complementary areas. First, increased public awareness of the environment and the value of natural resources in order to modify short-term landscape solutions in favour of long-term investment in nature. Second, introducing local and national governments to the link between sustainable development and sustainable landscapes, whether through newly created landscapes or the management of existing ones. And third, promoting an appreciation of the cultural landscape by recognising it as an important part of the cultural and historical heritage.

14.6
Sustainable alternatives for landscape development

The process of landscape transformation in the Kyrenia Region is still in its early stages. By taking advantage of the present political impasse to evaluate alternative courses for landscape development we can limit the wasteful and exploitative approach that has destroyed the traditional rural landscapes elsewhere in the island and in the Mediterranean.

Future landscape design and planning policies should appreciate the potential and limitations of the existing rural landscapes, which are increasingly open to influences from rural mechanisation, changes in agricultural methods, changes in life-style and the aspirations of the rural economy, as well as changes caused by integration into market economies. In practice, ecologically informed alternatives for landscape development can and should match the reality and diversity of rural cultural landscapes. While some alternatives combine conservation and protection with recreation (Broder and Odonic, 1990; Burnettand Rowntree, 1990; Carlson *et al.,* 1989), others seek to integrate nature conservation with agricultural production (e.g. Saunders, 1994). Development alternatives for regions with characteristically fragile ecologies and/or developing

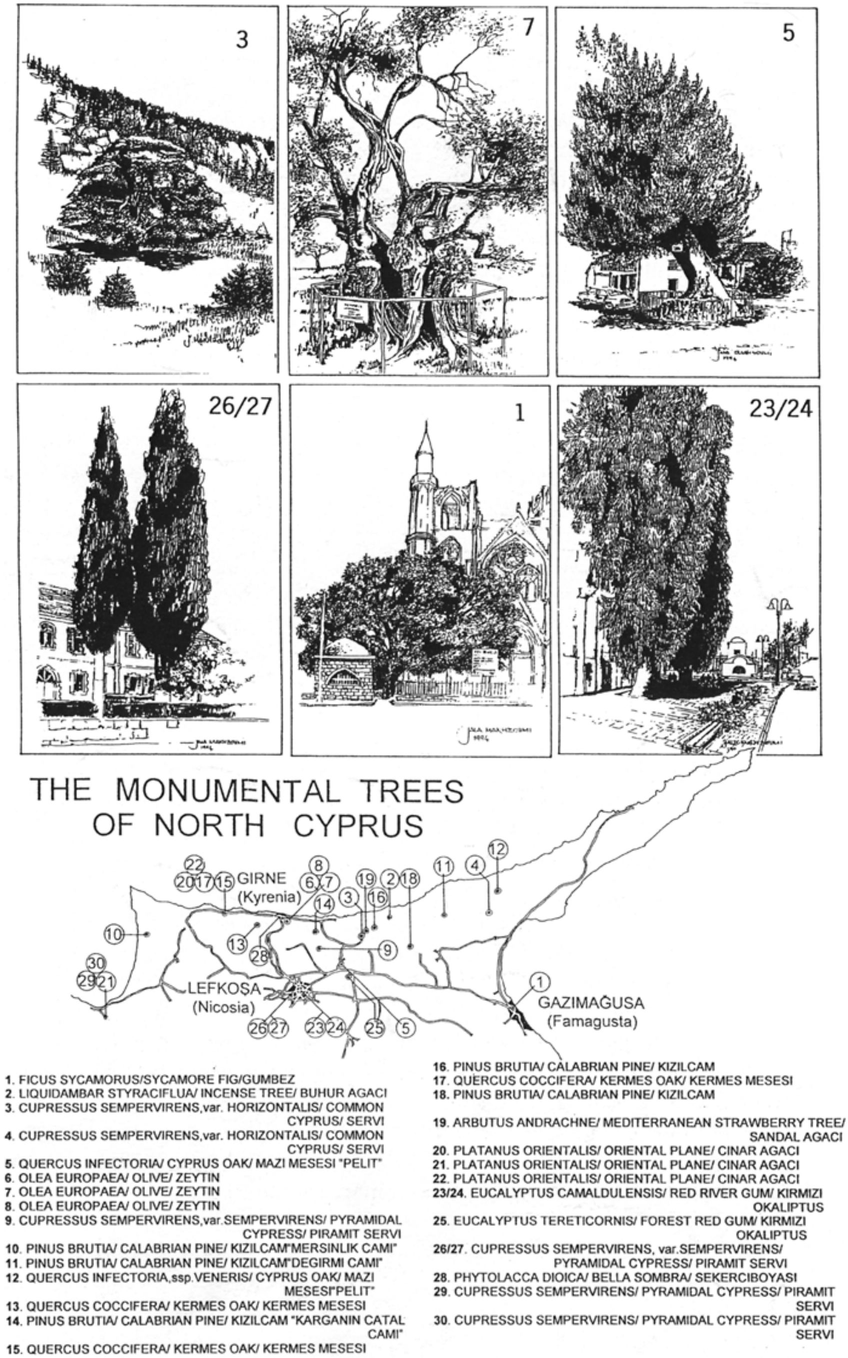


Fig. 14.2 The monumental trees of North Cyprus.

economies should have as their priority environmental protection, i.e. against soil erosion and subsequent desertification, as well as food production (Chan, 1985; Jameson, 1984; Ovalle et al., 1990). Placing emphasis on the promotion of existing qualities in regions with a strong identity, both in terms of special products and in environmental characteristics, is one alternative proposed by Meeus et al. (1990). Another is the need for protection and preservation of natural and cultural values in the landscape, placing restrictions on production and the large-scale subvention of farmers *(ibid.)*.

Above all, there is a need to integrate the rural cultural landscapes into future development. This is the only possible and feasible alternative in the Kyrenia Region, mainly because the physical extent of the landscape involved renders protection costly and difficult to implement (Lucas, 1992). An important alternative lies in the very activity that threatens traditional rural landscapes: tourism. The initiation of sustainable tourism can contain the adverse consequences of development and limit the indiscriminate use of natural resources. This will be discussed in the following chapter.

14.7
The concept of 'landscape recycling'

The concept of recycling, another of nature's lessons, is essential in the elimination of waste and also ensures sustainability in natural ecosystems (Chiras, 1992). In design, the concept of *landscape recycling* can be defined as the reuse of existing ecosystems whether natural, semi-natural or cultural by integrating them into future landscape design and planning (Gilbert, 1991, 1992). It is, however, essential that the process observes the ecological and cultural integrity of the ecosystem that is to be integrated. This implies a flexibility in approach that is adaptive to the surprises inherent in the dynamics of any ecosystem garden (Regier, 1993).

The concept of landscape recycling can be applied regionally as well as locally and can be adopted within the framework of the ecological landscape design. Viewed in the global context, nature conservation is a large-scale application of this concept. National Parks and Protected Landscapes are examples of landscapes, natural and cultural, that have been selected and rewoven into the contemporary regional landscape.

Although in theory the concept of landscape recycling is not a complicated one, the practical constraints of implementation pose several problems. The lack of environmental and ecological awareness, whether on the part of the client and public at the local scale or of the authorities at the regional scale, can cause resistance to the application of this concept. Another problem concerns the development of the concept into a workable design. Decision concerning the choice of the landscape component that is to be integrated is another significant consideration. ELA lend themselves readily to landscape recycling because the choice of landscape/ecosystem to be integrated, i.e. the ELA, is based on ecological understanding.

Despite these problems, the concept of landscape recycling can be an invaluable tool for conserving biodiversity and maintaining landscape sustainability. This will be illustrated in developing the conceptual regional model and also in the local application.

14.8 The landscape design objectives

The general objectives of ecological landscape design as discussed in chapter twelve lie in maintaining landscape integrity and sustainability and in enhancing the character of place. The first two objectives are generally realised by conserving living resources and the maintenance of essential ecological processes and by preserving genetic, biological and landscape diversity. These objectives are discussed below as they apply to the Kyrenia Region.

Maintenance of essential ecological processes

Essential ecological processes are those that are governed, supported or strongly moderated by ecosystems. These processes are essential for food production, health and other aspects of human survival and sustainable development (IUCN, 1980). Soil conservation and watershed protection in the Kyrenia Region contribute to the continued functioning of essential ecological processes. The adverse environmental and ecological consequences resulting from the transformation of the traditional regional landscape were outlined earlier in the chapter. Measures for soil conservation and watershed protection should therefore constitute a major consideration in future landscape design and planning.

Preservation of biological diversity and landscape heterogeneity

The preservation of biological diversity is a broader term used to indicate the preservation of genetic diversity and ecosystem diversity. Recent trends in landscape ecology have come to view biodiversity as an integral part of the broader concept of landscape heterogeneity (Kim and Weaver, 1994; Turner, 1987). The World Conservation Strategy (IUCN, 1980) recommends the preservation of as many varieties as possible of crop plants, forage plants, timber trees, livestock and other domesticated organisms and their wild relatives.

Ecological landscape design and planning in the Kyrenia Region should consider the potential of the ELA in contributing to biological diversity. The ELA, whether the natural ecosystem of the forest or the semi-natural ones of the maquis, were shown to have a high degree of biological diversity.

The sustainable utilisation of landscape

Sustainable development ensures that society can benefit from its natural resources virtually indefinitely. Traditional agricultural systems in the Mediterranean have evolved to adapt to restrictive environmental conditions and limited natural resources, namely soil and water. Sustainable utilisation of ecosystems and landscapes is related to the degree to which the local society is dependent on the resources in question. Ironically, it is in subsistence societies, where these resources are most needed, that resource utilisation is least sustainable (Dasman, 1985). Although these problems are common to all developing economies, they are more pronounced in arid or semi-arid regions, e.g. North Africa, the

Mediterranean and the Near East, where indiscriminate utilisation of natural resources and mismanagement of agricultural and grazing lands have become major contributors to desertification *(ibid.).* In North Cyprus, severe and continued droughts and intensive and inappropriate use of marginal landscapes 'have resulted in desertification in many areas—especially on the southern slopes and foothills of the Kyrenia' (Olgun, 1991, p. 19).

Landscape design and planning should appreciate that the ecological and cultural variability of the regional landscape mean that the objectives and priorities for sustainable development should not be generalised. An idiosyncratic approach to landscape design as well as landscape development is required. Perez (1990, p. 219) strongly recommends that 'all policies designed to conserve valued agrarian landscape be specifically adapted to each particular area, taking into account the character of the development issues as well as that of the local environment'. The methodology of Ecological Landscape Associations, because it is founded on ecological understanding of the landscape at hand, i.e. the Kyrenia Region, has the potential to determine the pattern and pace of future landscape development.

14.9
A conceptual design model for the Kyrenia Region

The preceding discussion has been aimed at establishing the causes and consequences for landscape change and the environmental, ecological and administrative context for developing a landscape design for the Kyrenia Region. The latter is herein referred to as the *conceptual regional model.* Model in the present context implies a conceptual construct that represents and simplifies reality. Of the four types of models used in ecology, i.e. static, system, analytical and simulation, the *static model,* a 'map of a landscape' (Pickett *et al.,* 1994, p. 72), most closely approximates 'model' as it is used here.

A conceptual model cannot and does not intend to replace conventional landscape planning. It is the very qualities that differentiate it from conventional planning procedures, i.e. its simplicity and spontaneity, that allow the conceptual model to liberate the intuitive and creative problem-solving potential of the landscape designer. The model should therefore be viewed as a tool that integrates concepts and insight gained from ecological understanding of landscape and has the potential to serve as a pilot for complex planning processes and procedures. The model can also serve as a basis for gaining input from professionals, administrators and the public in general.

Developing the regional model

The aim of the conceptual regional model is to accommodate contemporary development while maintaining landscape integrity and sustainability and, in addition, enhancing the regional character of place. These aims in turn can be achieved through maintaining essential ecological processes and lifesupport systems and by conserving biodiversity and landscape heterogeneity.

Developing the regional model proceeds from two fundamental assumptions. First, that the ELA discerned in the regional investigation will constitute the building blocks of the proposed model. Second, that the existing interrelations that bind the ELA, i.e. their spatial location pattern, can be taken as a prototype for future landscape design and planning. It is the continued functioning of the essential ecological processes within each of the ELA as well as among the different ones that accounts for long-term landscape sustainability.

The concept of Landscape Recycling is adopted to integrate the ELA into the future landscape plan. Accordingly, five ELA form the foundation of the regional model and a sixth component is proposed to accommodate future development (Table 14.1). Developing the regional conceptual model will, it is hoped, illustrate the workability of the ecological landscape design paradigm and the proposed methodology.

Components of the regional model

The conceptual regional model for the Kyrenia Region (Fig. 14.3) consists of six main components. The following is a brief description of the individual components. It is, however, essential that the components be viewed within a holistic and interactive framework because the relationship between components is as significant as the role of each component independently.

Forest / mountain

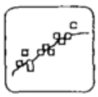
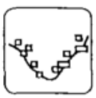
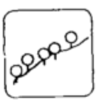
The first component of the regional model is represented by the forest/ mountain association. The forest in the Kyrenia Region is well-defined spatially and protected by law. It is not only a repository of genetic and species diversity but in addition conserves the soil and protects critical watersheds in the upper limits of the range. Crowning the peaks, the forest dominates the regional landscape and is the one component that is increasingly appreciated by the local population.

Maquis / foothills

The second component of the regional model is represented by the semi-natural maquis/ foothills association. Maquis is just as important as the forest in that it is also a repository for genetic and species diversity but in addition harbours a profusion of annuals which cannot survive within the thick forest canopy. Unlike the forest, however, it is not protected by law and is little appreciated by the public, whether for aesthetic or environmental reasons. The economic and ecological significance of the maquis is considerable (Naveh and Lieberman, 1990; Pignatti, 1978; Tomaselli, 1977). The extent of its distribution along the Kyrenia foothills makes the protection of maquis a difficult and costly undertaking.

The main role of this second component of the regional model, however, lies in its adjacency to the forest, which provides for mutual protection. As such it can be simultaneously viewed as a ‘connective landscape tissue’ providing for landscape continuity and as a buffer for the forest. In landscape ecology *buffer* is defined as ‘a

Table 14.1 The Kyrenia Region ELA, their present function and as components of the conceptual regional design model

Ecological Landscape Associations in the Kyrenia Region		Components of the regional model Function and proposed management
	Forest/mountain	1 Repository of genetic diversity Protection of watershed State protected nature reserve
	Maquis/foothills	2 Landscape connectivity Ecological buffer to forest Protection of watershed and soil The need for some protective legislation
	Maquis/ravine	3 Linear connectivity Essential to ecological networks Genetic diversity Protection of selected ravines
	Maquis/coastal cliffs	4 Genetic and biological diversity Stabilise and protect coastal cliffs Protection of selected areas
	Olive and carob multi-use tree planting	5 Landscape continuity Protection of watershed and soil Integrates settlements, agricultural and pastoral uses Protection of selected olive groves
		6 Zone proposed for contemporary uses (e.g. commerce and tourism)

transition area acting as a filter or a mitigator of disturbance processes' (Farina, 1998, p. 219). This component therefore increases the chances of forest conservation.

Maquis/ravines

The third component of the regional model is represented by the seminatural maquis/ravine association. While the maquis in association with the upper foothills functions as a 'connective landscape tissue', the maquis/ ravines association provides for linear connectivity. This association has by far the richest diversity of species of all the ELA in the Kyrenia Region. It acts as a natural corridor providing for the dispersal and movement of birds and small mammals resident within the corridor or in adjacent patches (Bennett, 1990; Dmowski and Kozakiewicz, 1990; Henein and Merriam, 1990; Hudson, 1991; Flink and Searns, 1993).

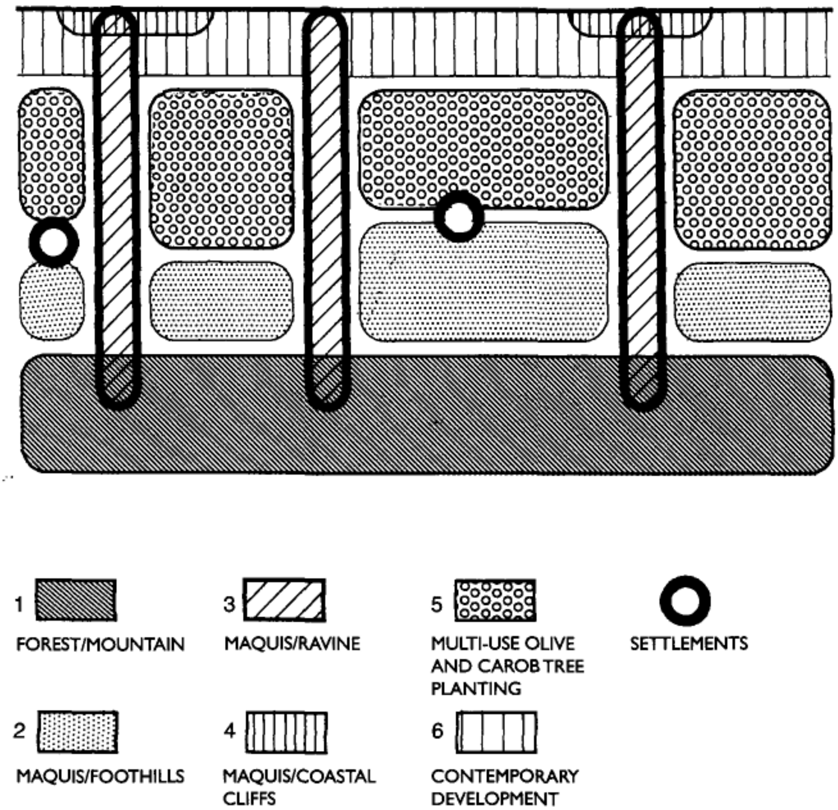


Fig. 14.3 A conceptual design model for the Kyrenia Region.

Maquis/coastal cliffs

The fourth component of the regional model is represented by yet a third semi-natural ELA, namely that of the maquis/coastal cliffs. Its environmental role in protecting the steep coastal cliffs which are often geologically unstable is extremely significant. In addition, coastal maquis and garigue is a habitat for the local fauna and flora (e.g. nesting grounds for the turtle).

Multi-use tree planting/foothill

The landscapes created by multi-use olive and carob tree planting/foothills constitute the fourth component of the model and represent a mature element of Mediterranean rural cultural ecosystems. These landscapes can spatially and temporally integrate a number of rural and agricultural uses and in addition harbour interesting bird and plant communities. Environmentally, this fourth component together with the second one of maquis/upper foothills contributes to soil conservation and to watershed protection on account of their location.

Contemporary development

The final component of the regional model has been proposed to accommodate contemporary development. Mainly this means tourism because of its demand for coastal accessibility. The coastal plain is also the site of contemporary development for the practical reason that it follows the present trend of roadside development in the Girne vicinity. Roadside development, despite the many problems it creates, has somewhat limited landscape transformation to the land on both sides of the main road. However, to prevent continuous development along the coast, selected ravines with the support of planning legislation will act as barriers, thus providing relief from the monotony of roadside development.

Evaluating the regional model

The regional model aims to integrate contemporary development into the existing landscape of the Kyrenia Region while maintaining long-term sustainability, conserving biological and landscape diversity and enhancing the regional landscape character. The extent to which the model meets these objectives depends on the characteristics of the model's individual components as well as on their location within the model and in relation to each other. The components of the model, i.e. ELA, because they consist of a mosaic of ecosystems, are in themselves sustainable and possess ecological and cultural integrity. The first component (forest/mountain) represents a natural ecosystem, the second, third and fourth (maquis/foothills, maquis/ ravine, maquis/coastal cliffs) are semi-natural ones and the fifth (multiuse olive and carob tree planting) a cultural ecosystem. Using the ELA as the building blocks of the regional model allows for the maintenance of landscape integrity and sustainability, the conservation of biological and landscape diversity and the protection of essential ecological processes in the Kyrenia Region.

Realising the objective of ecological design also depends on the overall location pattern of the components within the model. The conservation of biological diversity, for example, is better ensured by the adjacency of two or more components, namely, the forest/mountain, maquis/foothills and multi-use tree planting/foothills. This adjacency not only allows for landscape continuity which is central to the conservation of biological diversity (De Klemm, 1985; Frankel and Soule, 1981), but in addition curtails the destruction of genetic resources outside the protected forest. Therefore strategies should be formulated to afford some measure of protection to the second and fifth components, the maquis/foothills and the multi-use planting/ foothills respectively. Such strategies would then extend land use control to agricultural, silvicultural and pastoral activities by means of various incentives or disincentives (De Klemm, 1985).

The model's third component (maquis/ravine) complements the role played by the above-mentioned three components. The physical characteristics of the ravine, namely its linearity and transverse position, allow it to link the remaining components and contribute towards the development of ecological networks (Nowicki *et al.,* 1996). Within the framework of the regional model, the ravine is also seen as a physical barrier preventing continuous contemporary development. Further, such an easily distinguishable physical feature facilitates implementation, management and protection.

A central feature of the regional model is that its components have no fixed boundaries. On the one hand, keeping the boundaries flexible reflects the existing complex inter-digitation that characterises landscape components as recorded at Esentepe. The relationship of maquis/foothills and the forest/mountain, for example, represents the ongoing interaction that transcends strict boundaries. Another example is the interaction between maquis/foothills and multi-use tree planting. On the other hand, flexible component boundaries reflect the responsiveness of the design to economic and management determinants. With the increasing difficulty of managing the olive and carob orchards, it is inevitable that some of these landscapes will be overtaken by the maquis. This was in fact recorded in several of the abandoned olive and carob orchards in the Esentepe vicinity. Accordingly, abandoned olive and carob orchards can either be reclaimed by clearing the maquis through ploughing, or alternatively the advancement of maquis is unchecked, thereby allowing for these cultural landscapes to revert to their semi-natural and natural state.

The model, however, is not a conservation plan but rather a dynamic interaction framework. It can in fact be viewed as an alternative to conservation and protection since developing economies have neither the resources nor the commitment to undertake such large-scale initiatives (Hernandez et a/., 1993; Lucas, 1992). Further, the intensity of land use in the regional model increases with progression from the forest to the coast. The forest, being a nature reserve, excludes any land use, while the maquis/upper foothills and maquis/ravine allow for limited land uses, namely grazing. Landscapes of olive and carob trees are more flexible and incorporate, as they presently do, a variety of agricultural uses, towns and villages. Contemporary development, with the exclusion of the garigue/coastal cliffs model component, is contained in the coastal plain.

The regional model can also be evaluated as to whether it enhances the regional landscape character. This in fact it does because the methodology provides the designer with not only knowledge about the functional aspects of landscape but also insight into the aesthetic character. The proposed landscape design attempts to replicate and enhance the existing regional landscape character: the forest continues to dominate the regional skyline, followed by the maquis and multi-use olive and carob tree planting, punctuated by the distinct character of the ravines (Fig. 14.4).

Finally, the landscape design is based on the conviction that a good designer should appreciate that when the vernacular landscape is in a healthy state, as it is in the Kyrenia Region, it will require a minimum of intervention. Rather, landscape design efforts should focus on enhancing the existing landscape character because its tradition is a living one in which there is a happy consensus between past and present, mind and hand, nature and culture (Curtis, 1986).

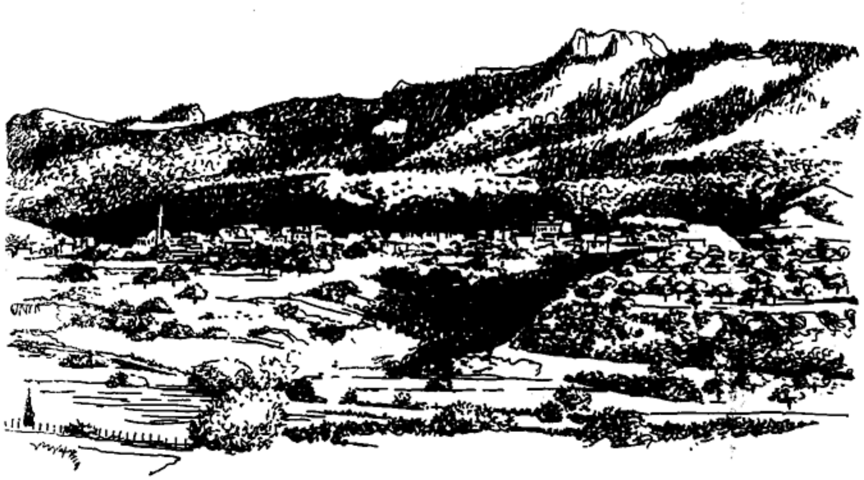


Fig. 14.4 The town of Kaplica and the distinct character of the rural landscape in the Kyrenia Region: forests along the higher mountain reaches, maquis in the higher foothills, stone terracing with permanent tree cropping in the lower foothills and arable uses in the coastal plains.

Applying the regional model to the Esentepe area

The proposed model is a conceptual construct and offers an extremely schematic representation of the actual landscape. To appreciate its applicability more clearly it has been applied to a part of the Kyrenia Region. The location embraces a portion of the Kyrenia Range, its foothills and the adjoining coastal plain in the Esentepe vicinity. Familiarity with this portion of the Kyrenia Region through the field surveys, the floristic surveys and through involvement with the Dik Burun masterplan design (chapter fifteen) made such an attempt possible.

Of the nine ravines in the selected area, two were designated for protection because of the density of their maquis cover. The resulting landscape plan (Fig. 14.5), although still schematic in representation, illustrates more clearly the applicability of the conceptual regional model. Further, the model provides a holistic, integrated and dynamic framework that incorporates existing settlements and land uses as well as future landscape development, while maintaining landscape integrity and sustainability.

The regional model offers insight into landscape planning and can be used to guide environmental policies and legislation because it offers a spatial dimension for testing out these proposals. Alternatively, the model can represent a prototype in the preparation of a more comprehensive landscape planning proposal by applying the landscape planning procedure proposed in chapter eight—local professional and administrative capabilities permitting. The conceptual regional model meanwhile can serve as an interim solution while landscape planning policies are being developed.

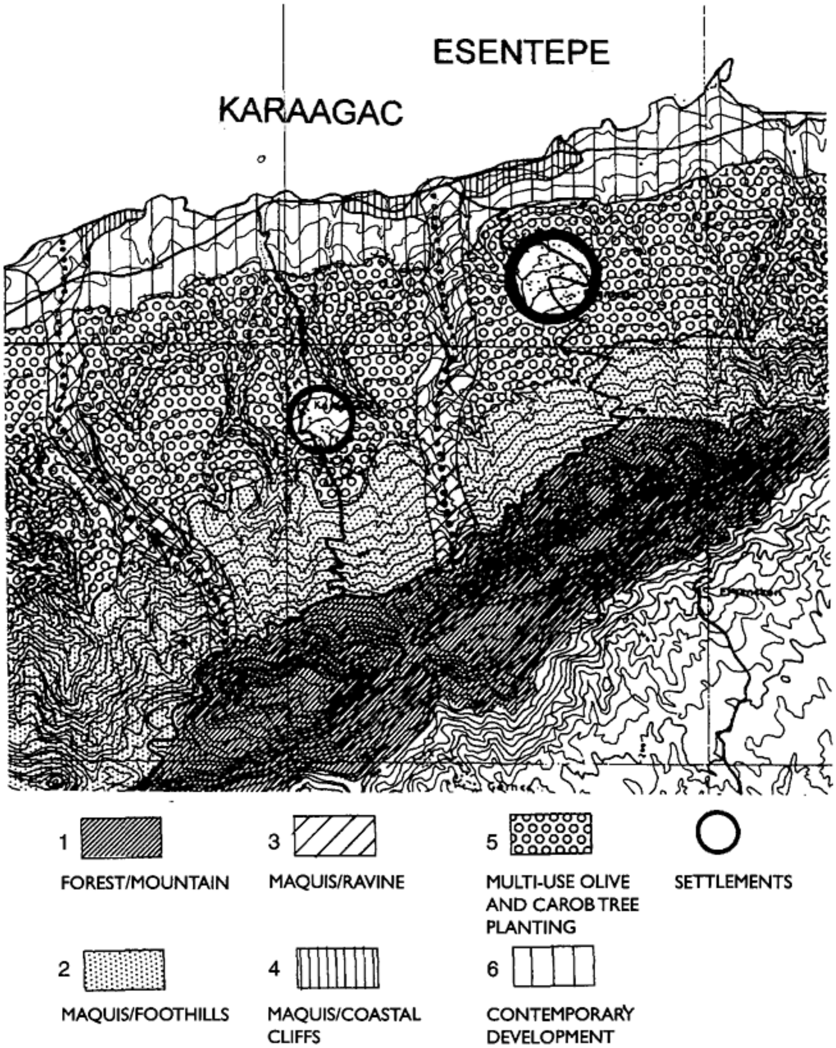


Fig. 14.5 Applying the conceptual design model to the western part of the Kyrenia Region.

14.10
Ecological Landscape Associations: a framework for regional design

The methodology of Ecological Landscape Associations has been developed to ensure that design solutions evolve from a deeper and more intimate understanding of context. Context in the Mediterranean, as argued in the previous chapters, is determined by two dominating factors: the characteristics of the semi-arid ecosystems and the evolutionary role of human agency. A comprehensive understanding of landscape should proceed from an appreciation of these two factors and their role, past and present, in shaping the Mediterranean landscape. Understanding and accepting the regional ecology in fact implies a responsibility to design landscape and environment efficiently and sustainably.

The Ecological Landscape Associations methodology affords the designer a comprehensive understanding in three ways. First, the dynamic and interactive framework proposed familiarises the designer with the processes that shape landscape rather than the visual landscape itself. This allows the designer to understand the interaction of abiotic, biotic and cultural components at all levels of the spatial hierarchy, to appreciate the interrelatedness of landscape components and the diversity of the existing landscape. The ecological knowledge gained is integrated into the designer's thinking process, thereby resulting in a landscape design that is responsive to context.

Second, the methodology attempts to avoid a dichotomic view of nature and culture; rather it adopts a holistic and integrative perspective by placing equal emphasis on natural and cultural processes. The methodology's evolutionary and hierarchical approach provides the designer with historical and spatial exemplars which reflect the ongoing interaction of natural and cultural processes and their combined role in shaping the Mediterranean landscape.

Third, the methodology allows for landscape design flexibility. This flexibility is partly due to the fact that the design develops from an ecological understanding of landscape. It is also prompted by a realisation that landscape components are living and changing entities that cannot for practical reasons be contained within fixed boundaries and a rigid design. Design flexibility in the regional landscape design is reflected in two characteristics: the structure of the overall design and the flexible boundaries of its components which allow for change and development as well as flexibility in their management.

Overall landscape design flexibility, more recently defined as 'framework planning' (Vroom, 1997), also means that the landscape design is appreciated as a continuous process and that it extends beyond the completion of a plan. Consequently, ecological landscape design becomes as much a learning process as a design activity. Both design flexibility and continuity are founded on ecological concepts. They have been developed in response to the complexity and unpredictability of ecosystems and the necessity for a holistic and dynamic view of the landscape.

The Mediterranean rural landscape and the concept of regionalism

Our concern throughout this book has been mainly with the design and planning of the rural landscape. In this last section we will broaden the perspective to investigate briefly some of the concepts closely associated with the rural landscape. The various meanings of the word 'landscape' as discussed in chapter one reflect the different ways in which landscape has come to have human significance: landscape as an expression of culture, as a repository of the regional history, as an embodiment of the local heritage and as a basis for

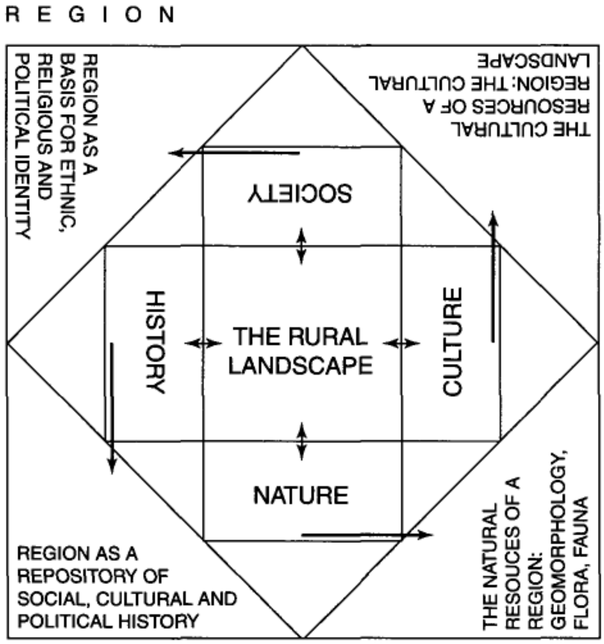


Fig. 14.6 Schematic illustration relating the rural landscape to nature, society, culture and history within the context of region.

a contemporary regional identity. In this connection, 'region' takes on an added significance by providing an overall context for these various meanings of landscape (Fig. 14.6). Let us look briefly at the relationship of some of these concepts to landscape, concluding with the concept of regionalism.

The landscape as an expression of culture has been amply discussed in the previous chapters. The rural cultural landscape, as defined by Sauer, refers to landscapes that had been fashioned out of a natural landscape through processes of change by a specific culture in place and time (English and Mayfield, 1972). This sense of time and social continuity is now an important aspect of identifying the heritage values of particular cultural landscapes. In the last two decades, heritage has become extremely popular not only in the West but in the Third World as well. Heritage is represented by two domains (Lowenthal, 1993): one is the realm of ideas and expressions; while the other is the environment in which artefacts arise and are used. The concept of historic landscapes, which has only recently entered the mainstream of heritage, falls into the latter. However, designating the rural cultural landscape as part of the regional historical and cultural heritage necessitates efforts to increase local awareness of their value among administrators, politicians, policy makers and the public in general (Hernandez *et al.,* 1993; Viedma *et al.,* 1976). Local awareness in turn is established by communicating the value of these landscapes, an undertaking which begins by preparing an inventory of the natural, archaeological and historical resources of the region and an exploration of the regional history, and proceeds to the reconstruction of myths as well as the search for local traditions and folklores (Fladmark, 1993). Once undertaken, heritage interpretation will be equally relevant as part of school and university curricula, in museums, in parks and for tourist enterprises *(ibid.)*. Furthermore, awareness of the significance of the traditional rural landscape as cultural heritage provides policy makers and administrators with the insight necessary to embrace a more sensitive approach to planned change in the rural landscape (Scott, 1979).

Rural landscapes contain some immutable essences that have been used in support of myths of national identity (Curtis, 1986). Like most rural landscapes, traditional Mediterranean landscapes contribute to people's sense of belonging to a particular place and can be seen as an embodiment of their cultural, historical and regional identity. Landscape design and planning has the potential not only to protect the cultural heritage but also to contribute positively to the local and regional landscape identity: this is the aim of place-making, the third objective of the ecological landscape design paradigm. The search for a regional identity in the Mediterranean will be further discussed in chapter sixteen.

All those concepts forge strong links between landscape and region. Like region, landscape embodies distinctive associations of physical and cultural forms generated by the interplay of man and nature. In fact, landscape has often been used synonymously with region (Forman, 1997). Furthermore, many landscape ecology concepts have been applied directly to understanding regions because both link 'the physical environment of microclimate, major soil groups, and biomes, with the human dimensions of politics, social structure, culture, and consciousness, expressed in the idea of regionalism' (*ibid.,* p. 13).

In the simplest terms and in the present context, *regionalism* means finding the common grounds between landscape, architecture and region. In architecture, regionalism has developed to embrace different approaches: in reconciling tradition and modernity (Frampton, 1996), in the search for identity (Khan, 1986) and in establishing environmental responsiveness (Turan, 1990). It is our conviction that awareness of these concepts (regionalism, heritage, identity) is essential not only to expand landscape architecture's professional scope of interest but also to allow for greater interaction between landscape architecture, planning and society at large.

Chapter 15
Ecological landscape design: local application

Sustainable tourism is an alternative that needs to be encouraged in semi-arid regions. It is in fact the only long-term alternative for economic development in the Mediterranean islands. Ecological landscape design can be an instrument for realising sustainable tourist development and a means for developing future landscapes that are appropriate ecologically, culturally and aesthetically. In this chapter the Ecological Landscape Associations methodology will assist in the development of a landscape masterplan for the Dik Burun tourist project in the Kyrenia Region. The masterplan design will serve to illustrate the potential of ecological landscape design in realising the objectives of sustainable tourist development while maintaining landscape integrity, maintaining sustainability and reinforcing the regional spirit of place.

15.1
Tourist development in the Kyrenia Region

Tourism in Cyprus has increased considerably since its early beginnings in the 1950s. The availability of abundant beaches along a considerable coastline, a year-round moderate climate and a geographic location that makes it readily accessible to Europe, Africa and the Middle East combine to make Cyprus increasingly attractive to Mediterranean tourism. In the last four decades tourism has increased in physical extent as well as in its contribution to the island's economy, even if at different rates in the north and south parts of the island. Although statistical comparisons are difficult, general estimates in 1990 indicated that North Cyprus received less than one-quarter of the tourist arrivals in the South and employed less than onesixteenth of the total number employed in the hotel industry in the South (Martin, 1993). A considerable recompense for the slower rate of tourist development is that 'North Cyprus has so far been spared the excesses that have now afflicted, in some respects irreversibly, some tourist areas of the Mediterranean basin, including south Cyprus, and has been left, as a prize, a largely unspoilt environment of enormous potential value to tourism in the future' (*ibid.,* p. 369).

Tourist development in the Kyrenia Region

After independence from the British Mandate in 1960, coastal tourism in the Kyrenia and Famagusta regions developed rapidly. In the years that followed, tourist development favoured an intensive development, extensive in the amount of land used and exploitative of the natural and the cultural resources. Although development trends have not changed, they have slowed down since 1974. In 1992 the total number of tourist arrivals in North Cyprus was 267618 of which Kyrenia attracted 59.3% (TRNC/ Tourism Planning Office, 1995).

Growing concern over haphazard development in the coastal areas prompted the development of an action-oriented Priority Plan for the Famagusta and Kyrenia coastal regions. This rudimentary plan proposes five basic zones of use, two of which are designated for tourist development. Uses that are excluded from these five zones include industry, wholesale storage and poultry farms. The zoning, however, does not provide for the protection of natural or cultural resources.

The environmental impact of tourist development

The environmental impact of tourism is best reflected in the increased consumption of fresh water which is a valuable and a diminishing resource in Cyprus. The island's present consumption of ground water as discussed in the previous chapters is extensive. In the South, the authorities have been forced to ration domestic water consumption by withholding distribution for three days a week, which might if present consumption rates continue be increased to four or five days a week. That the tourist industry is responsible for much of the water shortage is reflected in the strong opposition of local residents to plans for establishing a golf course. It was argued that the proposed 36-hole golf course will take up good agricultural land and consume at least one million cubic metres of fresh water annually, enough to sustain a town of ten thousand inhabitants. Encouraging tourism outside the dry high summer can alleviate the problem of water shortage to some extent. However, only regional policies for the sustainable utilisation of water resources and efficient local management can be of long-term impact.

Another impact of tourism is its adverse influence on agriculture and the rural landscape. Tourist accommodation and facilities fragment, transform and eventually replace the traditional rural landscape and as such undermine landscape sustainability and destroy the regional character of place. At present tourist development along the North Cyprus coastline is limited to isolated clusters. Continuous development, however, would destroy biological and scenic diversity and threaten coastal ecosystems, especially on 'turtle beaches' (Martin, 1993). The conceptual regional model (chapter fourteen) tackles this problem by containing tourist development while protecting selected coastal enclaves.

Tourist development can have a profoundly negative impact on the manmade environment. Large, unintegrated tourist resorts are constructed with little consideration of the regional context, while the buildings are generally functional and standardised. Moreover, the 'western style' architecture and landscape of these complexes are aesthetically and culturally inappropriate. In fact, tourism often introduces new life-styles and wasteful consumption patterns which influence local values, tastes and preferences, an especially damaging trend in the absence of awareness and appreciation of the local landscape heritage. In short, unrestricted and inadequately planned development that disregards the environmental constraints will inevitably destroy the very assets that attract tourism to the Kyrenia Region.

15.2
Alternatives for sustainable tourism

The increasing scarcity of new avenues for tourism, i.e. of natural and cultural landscapes, has increased international awareness of the environmental consequences of indiscriminate mass tourism. On a global scale the impact of past trends in tourism has often been associated with a general homogenising of place and an overcrowding and degradation of rural and urban landscapes alike, ultimately destroying the environment of the host and 'holiday-maker' (Krippendorf, 1987). The international popularity and subsequent intensity of Mediterranean tourism necessitate a change in present trends and a search for alternatives. Alternatives should also avoid the 'neocolonial' features that past tourist trends have displayed in some parts of the Mediterranean (Tangi, 1977). This is especially significant with the shift in Mediterranean tourism from the industrialised North and West to the southern and eastern developing littorals.

In the last two decades, several approaches have emerged that reflect increased environmental awareness. These alternative approaches have developed from a realisation that environmental and ecological priorities must be taken into consideration if the scale of associated environmental disturbances and disruptions is to be reduced (Edington and Edington, 1990). Sustainable tourism is one alternative and is defined as meeting the needs of the present tourist and host region while protecting and enhancing future opportunities (Godfrey, 1993). Ecotourism is another alternative seen as a nature-based tourism and defined as responsible travel to natural areas which conserves the environment and improves the welfare of local people (Boo, 1993; Lindberg and Hawkins, 1993). Ecotourism's emphasis on local resources and employment makes it attractive to developing countries which are generally rich in wildlife but disadvantaged by rural poverty and a lack of export earnings. Ecotourism, that is, not only plans an active co-existence with the local population, but utilises the local landscape character to promote a specific tourism marketing image.

Alternatives such as sustainable tourism and ecotourism have recently been encouraged by support from local and national political organisations. The Tourism for Tomorrow Award (British Airways, 1997) is one example. The award, jointly organised by British Airways, the British Tourist Authority and the Federation of Tour Operators, reflects concern for the natural world and awareness of the need to encourage environmentally responsible and sustainable alternatives.

The objectives of ecological landscape design have much in common with these alternatives. The methodology of ecological landscape design can be used to realise the concepts of sustainable tourism. This would make it possible for the Kyrenia Region to profit from the economic benefits of tourist development without suffering the adverse environmental and ecological consequences.

15.3
The Dik Burun tourist project

The Dik Burun project was conceived in the early 1990s when investigating possible locations for a tourist development in North Cyprus. *Dik Burun* was the site chosen. Located in the Kyrenia Region approximately 27 km east of Girne, the site lies 2 km east of Esentepe (Fig. 15.1). In the Turkish ordnance maps *Dik Burun* is the name given to the prominent land protrusion, a mini-peninsula that distinguishes the site and is noticeable even in the large-scale maps. The site stretches along the coastal road and forms a rough triangle in outline with an area of 37ha. The geomorphology, hydrology and vegetation cover are very much a continuation of the regional landscape.

Administratively the site lies within the municipality of Esentepe and is included in the planning zone designated strictly as tourist development. The only planning regulation governing the site relates to the minimum building distance from the coastline, which is set at 30 metres. Water for the project is to be provided by pipeline from Esentepe with alternative water to be supplied by freshwater wells on the site itself.

From its inception, the developers aimed for the project to set the trend for ecologically conscious and sustainable tourism. Three levels of commitment to a sustainable and ecological alternative were outlined. The first level

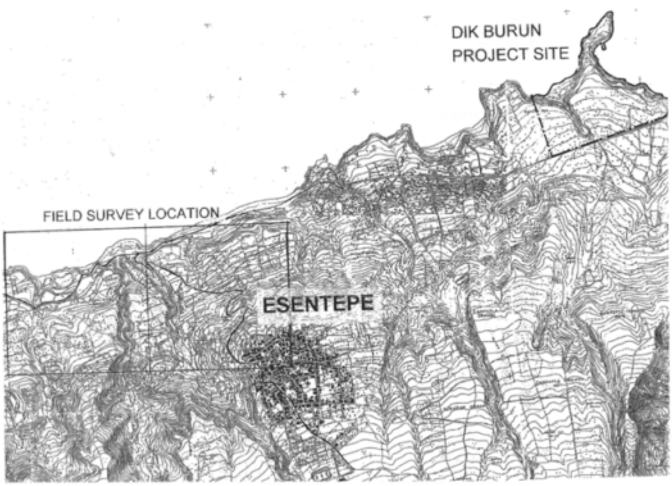


Fig. 15.1 The Dik Burun tourist project site.

involves a *passive ecological option* which entails an awareness of the principles of passive solar design and the application of ecological landscape design principles in organising the site layout; this alternative provides considerable saving in long-term running costs.

Beyond this level there is an *active ecological option* which targets the design of the development's operational systems, rendering them partially or totally autonomous. The aim is to lower, to a greater or lesser extent, the overuse of the existing natural resources. Some possible options include: extensive reliance on solar energy generation instead of the conventional power resources; the use of refuse incineration with low air emission filters, since the twice weekly municipal collection from Esentepe will only dispose of it elsewhere in the region; an on-site desalination plant, possibly powered by electricity generated from refuse incineration or solar energy; the recycling for irrigation purposes of low-level waste water as there are currently no drainage facilities and by-laws will require the construction by the developer of sewage treatment plants anyway; and finally, the use of sea water for toilet flushing. The adoption of all these alternatives is ideal. However, the high initial cost entailed is the determining factor.

While the first two options separately or in combination deal with the physical design, the third option addresses the *social and cultural aspects* of tourism. The project's harmonious existence depends not only on achievements in design but also on a social and cultural integration with the local community. This option, although more difficult to realise, is essential for a tourism with an ecological outlook. The benefits of tourism should not only be limited to the provision of employment opportunities, welcome as these may be. The conventional 'detached' attitude of tourism towards the local cultures should be replaced with one that advocates 'experiences' and an understanding of the host people, their culture and traditional way of existence. This third option would also include the tourist industry's active financial support towards landscape protection and efforts in heritage interpretation as discussed in the previous chapter.

In the absence of regional or national environmental restrictions, guidelines or incentives, the choice was largely dependent on the financial and ethical commitment of the developer. In the Dik Burun project the developer's decision was to combine the first two levels of commitment, combining ecological landscape design, passive solar architecture and a selection of autonomous service systems. The prevailing legislative situation, however, should be rectified and policies developed that integrate the three levels of commitment to ecological and sustainable tourism within regional and national tourism planning policies.

15.4
Investigating the Dik Burun landscape

The Dik Burun project site is outstanding in the variety of its topography and coastline, the richness of its vegetation and the spectacular view it commands. The site comprises the coastal portion of the Kyrenia Range foothills which slope gently from the site's highest point along the main road (55m.a.s.l.) to the wall-like coastal cliffs to the west. The peninsula creates a natural marina to the east, presently utilised by fishermen from Esentepe, and a natural sandy bay, the estuary of the Katarkti River to the west (Fig. 15.2).

The investigative framework of Ecological Landscape Associations was applied to gain a comprehensive understanding of the Dik Burun landscape and to delineate possible ELA. Since the site is a continuation of the Esentepe landscape (chapter thirteen), a detailed description of the abiotic, biotic and man-made components will not be undertaken here. Instead, the site investigation will proceed by describing the three ELA that dominate the Dik Burun landscape.

Fig. 15.2 A view of the Dik Burun site looking towards the steep, maquis-covered coastal cliffs and the plateau with the Kyrenia Range in the background.

Multi-use olive and carob tree planting/plateau

This landscape component corresponds to the multi-use tree planting/ foothill ELA discussed in the regional survey. However, because the foothill terrace is fairly level, having a general incline of 8.75%, it is here referred to as the *plateau.* The plateau is the largest site component. Its northern edges, especially in the eastern portion of the site, end abruptly with steep coastal cliffs.

Olive and carob trees dominate the plateau. Evidence from an aerial view of the site indicates that the trees have been planted in rows that continue into the surrounding sites. A total of 289 trees were recorded in the digitised topographic survey of the site, generally concentrated along the higher reaches of the plateau close to the main road. As at the Esentepe field survey, many olive and carob trees have been cleared from the northern parts to allow for uninterrupted arable farming. In the spring, cape sorrel *(Oxalis pes-caprae)* and crown daisy *(Chrysanthemum coronarium)* cover most of the plateau.

Maquis/ravine

As established at the Esentepe field survey, ravines with seasonal water flow are characteristic of this part of the coast. The Katarkti Ravine is another distinguishing feature of the site. It is exceptionally broad and deep: a total length of 300 metres and an average width between 35 and 50 metres. Previous erosion processes have caused the ravine walls to collapse, giving it the extraordinary appearance of a sunken amphitheatre.

The Western Bay is the estuary of the Katarkti Ravine. The beach is sandy and its adjoining coastal cliffs gentler in slope than the ones east of the peninsula.

The maquis in the ravine is extremely dense, almost impenetrable with a large number of mature pine trees *(Pinus brutia)*. The density of the vegetation and the physical isolation of the ravine make it a suitable sanctuary for the indigenous fauna. The sandy estuary is the breeding ground for turtles (Caretta caretta) in June.

The species diversity in the ravine and along its edges is considerable. The lentisk shrub *(Pistada lentiscus)* dominates not only the ravine but the whole site. The species in the ravine include the thorny broom *(Calicotome spinosa),* cistus *(Cistus salviaefolius),* broom *(Genista equisetiformis),* juniper *(Juniperus phoenicea),* laurel *(Laurus nobilis),* myrtle *(Myrtus communis),* oleander *(Nerium oleander)* and wild olive trees (Olea *oleaster).* The garigue in the estuary is dominated by gromwell *(Lithodora hispidula),* spiny burnet *(Sarcopoterium spinosum)* and thyme *(Thymus capitatus)*.

Maquis/coastal cliffs

The coastal cliffs extend along the site's northern boundary for a length of more than 600 metres. The sheer drop of the cliffs is in some places in excess of 25 metres. The limestone cliffs are bare and noticeably disintegrating in many places. The coastal cliffs together with the peninsula form a natural marina which is used by the local fishermen.

Mature clumps of the lentisk shrub, often several metres in diameter and a metre in height, dominate the face of the steep coastal cliffs. Their role in these locations is of extreme significance as they protect the exposed limestone cliffs and prevent further erosion. In the shelter of these shrubs a large variety of smaller flowering plants thrive. Among the species identified are pheasant's eye *(Adonis annua),* pimpernel *(Anagallis arvensis),* crown anemone *(Anemone coronaria),* field marigold *(Calendula arvensis),* yellow Cyprus sun rose *(Helianthemum obtusifolium),* grape hyacinth *(Muscari parviflorum)* and germander *(Teucrium polium)*.

The peninsula can be seen as a continuation of the coastal cliffs. Its prominence derives from the length of its protrusion, approximately 500 metres. The peninsula slopes gently from a level of 14.35 metres at its narrowest point to 6.54 metres at its tip, where it is reduced to a narrow strip with bare, rocky sides. The vegetation in the peninsula is sparse, consisting of widely scattered dwarf scrub.

These three ELA dominate the Dik Burun site and closely agree with the associations discerned regionally. This is not a coincidence but rather a manifestation that self-replicating natural processes operate at the different levels of the spatial hierarchy. The three ELA will constitute the foundation of the project masterplan by applying the method and approach used in developing the conceptual regional model from the previous chapter.

15.5
The concept of Ecological Vegetation Zoning

The concept of Ecological Vegetation Zoning is based on the principles of efficiency and economy that are intrinsic to all natural and semi-natural ecosystems. It is, moreover, inspired by the reality of these principles in arid and semi-arid regions. The spatial distribution pattern of the indigenous vegetation in these regions is very different from that of temperate ones. In the latter, the moderate climate and the frequency and quantity of rainfall result in a uniform distribution pattern. In arid and semi-arid regions, however, the vegetation concentrates in locations that offer advantageous climatic sheltering and favoured ecological conditions. Accordingly, vegetation in arid and semi-arid regions forms a distinct pattern in and along ravines and land depressions or along both sides of large streams and rivers. Their vegetation density decreases with increasing distance from these geographical features. Consequently, the distinct pattern of the vegetation can be seen as the footprints of nature in these regions and can be adopted as a valid landscape design concept A similar outlook has been developed in the arid and semiarid regions in North America by Miller (1978) and Woodward (1997).

The concept of Ecological Vegetation Zoning therefore replicates the natural pattern by organising vegetation in zones that correspond to their specific requirements for shelter and irrigation. Applying the concept entails apportioning the site into three or more broad planting zones. Each zone has its selected list of recommended plants and a management plan appropriate to their requirements. Accordingly, three broad zones were proposed for the Dik Burun project. The first zone includes the site ‘boundary planting’ with hardy trees and shrubs requiring irrigation only upon establishment (e.g. cypress trees which are also used to delimit orchard boundaries in the traditional rural landscape). This green belt will function as a soft visual site boundary that screens off the project facilities from the main road.

The second zone includes the landscape that lies between the boundary planting of the first zone and that of the third zone. The planting type and distribution in this landscape emulate that of the olive and carob multi-use tree planting, requiring minimum maintenance and no irrigation.

The third zone is the landscape/building interface and consists of a ‘Gardenesque’, a more conventional landscape of lawns and flowering plants. Ecological Vegetation Zoning therefore limits the extent of this attractive but ecologically inappropriate landscape to the immediate surroundings of the buildings where their impact is maximised.

Since it is an abstract concept and does not necessarily follow specific site lines, the Ecological Vegetation Zoning was introduced before developing the landscape design. The three proposed zones were integrated into the landscape design and, together with the Ecological Landscape Associations, form the foundation for the masterplan design.

15.6
The landscape design objectives

The masterplan design had two main objectives (Makhzoumi *et al.,* 1992). The first was to develop landscape design concepts within the potential and limitations of the local ecosystems, i.e. Ecological Landscape Associations. This then ensures landscape sustainability and allows for the conservation of biological diversity. The second objective was to provide for a general site and project character that is indigenous to the region and that contributes positively to enhancing the *genius loci.*

The landscape architect for the Dik Burun project, the senior author, had the advantage of being part of the developer/investor's team from the inception of the project. As a consequence it was possible to advance the concept of ecological landscape design and planning through the use of a masterplan and to argue the necessity of a sustainable development approach. It is interesting to note that the most convincing argument for adopting such an alternative, from the developer's viewpoint, was the financial justification. Ecological landscape design, it was argued, entails lower initial cost for establishing the landscape and lower running costs.

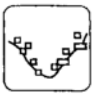
The landscape master plan was developed through a close collaboration of planners, architects and the landscape architect. The former two were sensitive designers and receptive to an ecological approach. Consequently, the development of the masterplan design proceeded by integrating input from all three (planner, architects and landscape architect). This presents a marked contrast to the common practice where input from the landscape architect follows the development of the architectural design concept. However, once the buildings have been located, the contribution of the landscape designer becomes increasingly limited and restricted to a 'beautification' of the spaces surrounding the buildings.

15.7
The landscape masterplan for the Dik Burun project

The masterplan for the Dik Burun project proceeded after a schedule of accommodations had been developed. This included the following facilities: a hotel with 100 studio-type rooms; sport and leisure facilities, shops and restaurants that form a centre for the 'tourist village'; 200 one-bedroom bungalows, 40 two-bedroom bungalows and 10 de luxe bungalows; and the real estate component with a total of 200 villas of varying sizes.

In fulfilling the two objectives of the masterplan, the landscape design embraced the two concepts discussed earlier, Landscape Recycling and Ecological Vegetation Zoning. The three ELA established for the Dik Burun site were incorporated into the masterplan. Mainly because of their size, the first two ELA were classified as *landscape character zones* (Table 8.3) and accordingly referred to in the landscape masterplan. Moreover, landscape components developed through the concept of Ecological Vegetation Zoning will be referred to as *ecological vegetation zones.* The two components that do not follow these two classifications are the *gardenesque landscape* in the vicinity of the buildings and the *technological landscape* that has been proposed for the peninsula (Table 15.1).

Table 15.1 The Dik Burun ELA and their integration into the masterplan design

Ecological Landscape Associations in the Dik Burun site		Ecological Vegetation Zoning	Components of the Landscape Masterplan
		Zone I	site boundary planting
	Olive and carob multi-use tree planting/plateau	Zone II	landscape character zone: the plateau
	Maquis/ravine	Zone II	landscape character zone: the ravine
	Maquis/coastal cliffs*	Zone II	
		Zone III	the gardenesque landscape

Components of the landscape masterplan

The preliminary masterplan reflects the conceptual landscape design (Fig. 15.3), integrating the five main landscape components which are discussed in the following.

Ecological Vegetation Zone I: site boundary planting

This component aims to create a visual and climatic barrier that simultaneously screens off the project from the main road and tempers the site microclimate. Large hardy trees and shrubs are used, most of which are commonly used along motorway verges (e.g. casuarina, cypresses and acacias), requiring irrigation only upon establishment.

Landscape Character Zone: the plateau

The plateau dominates the site by its sheer size and distinct landscape character. It occupies the centre of the landscape masterplan. The size and flatness of the plateau was initially seen as suitable for locating bungalows and the hotel building complex. However, the landscape concept of retaining the plateau prevailed almost in its entirety. Rather than fragment this prominent site feature, buildings have intentionally been positioned around it, thus further emphasising the landscape (Fig. 15.4).

The existing mature carob and olive trees are retained and in some parts complemented by olive trees planted in an orthogonal grid 10 × 10 metres. Traditional management practice for olive and carob orchards will be followed. The development of maquis will be

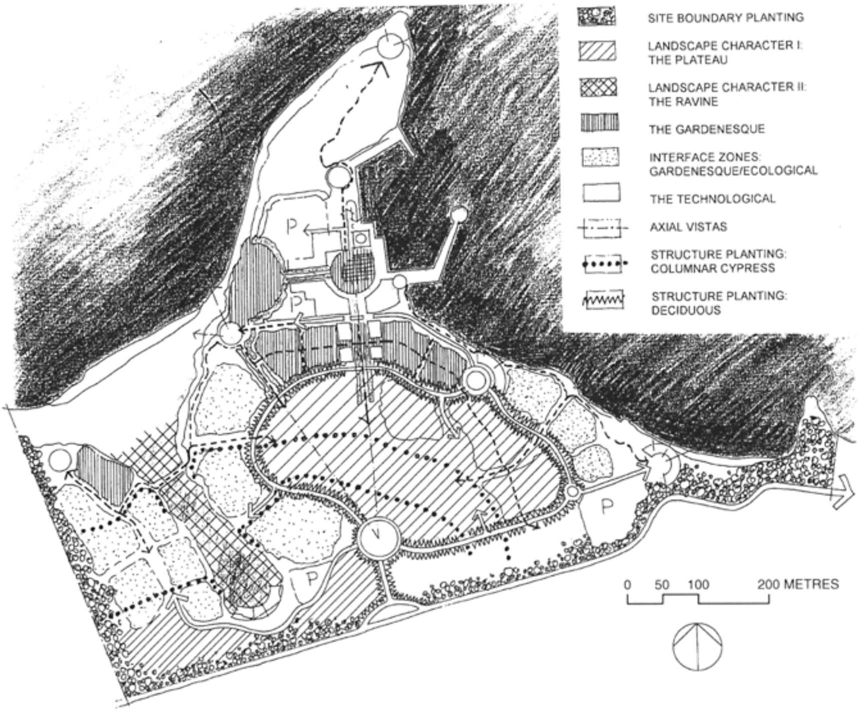


Fig. 15.3 Schematic landscape masterplan for the Dik Burun tourist project indicating the main landscape components.

checked either by ploughing once a year or by giving access to herders in the vicinity to graze their sheep and goats. The trees will also be pruned once a year and their fruit gathered. The introduction of traditional landscape management practices can inform the resident tourists as to the historical and socio-cultural dimension of these landscapes and in addition contribute to increasing local awareness and pride in the rural cultural heritage.

Landscape Character Zone: the ravine

The ravine, like the plateau, corresponds to Ecological Vegetation Zone II and as such requires almost no management. The maquis, however, is fragile in comparison to hardy olive and carob trees and can be trampled and affected by overuse. As such, access to this landscape should not be allowed to the resident tourist; rather the assemblage of shrubs and pine trees should be appreciated at a distance.

The presence of numerous mature pine trees *(Pinus brutia)* will be echoed by further pine tree planting, however of a different species to accentuate the difference between the indigenous vegetation and the introduced one. Stone pines *(Pinus pinea)* will be planted around the upper edges of the ravine as their attractive forms are closely associated with a Mediterranean image (Fig. 15.5). In addition, these trees will serve as a visual clue to the

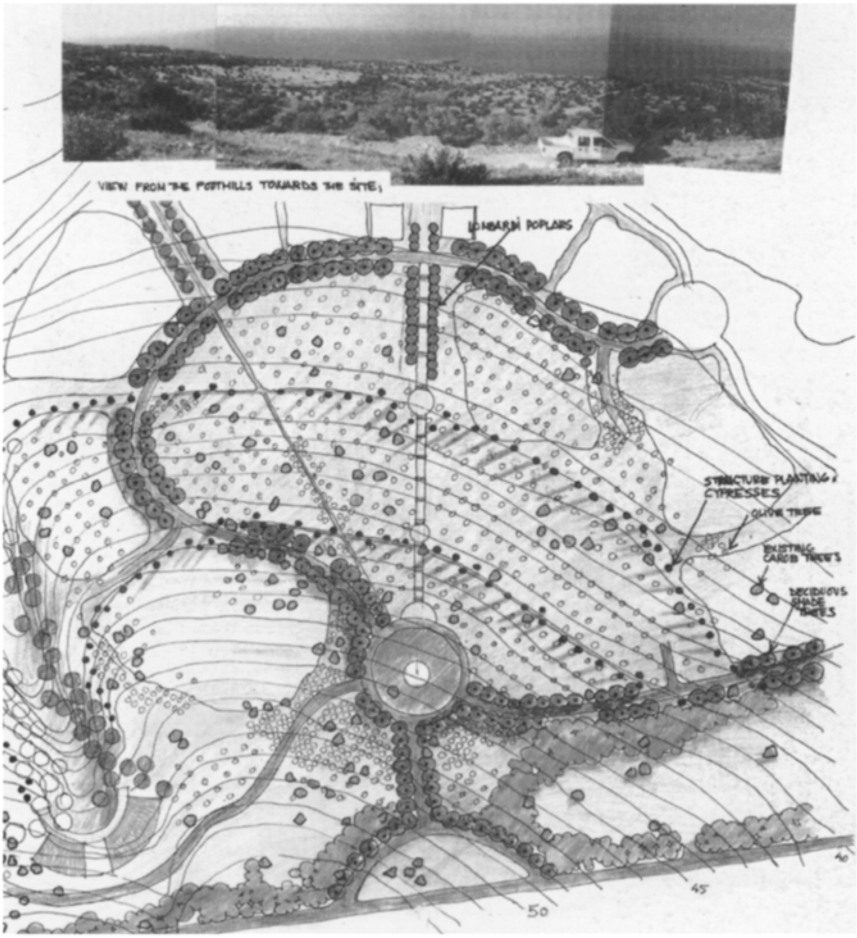


Fig. 15.4 Preliminary study of the Plateau Landscape Character Zone.

ravine because they can be seen at a distance and as this is the only location on site where pine trees are planted.

Ecological Vegetation Zone III: the gardenesque

The gardenesque includes all the open spaces immediately surrounding the hotel building complex and bungalows as well as the gardens of the real estate villas. It is typically a landscape of green lawns, ornamental flowering shrubs and flowering climbers. The demands for irrigation and upkeep will be considerable; indeed, the initial cost for establishing and managing will be higher than any other landscape within the masterplan.

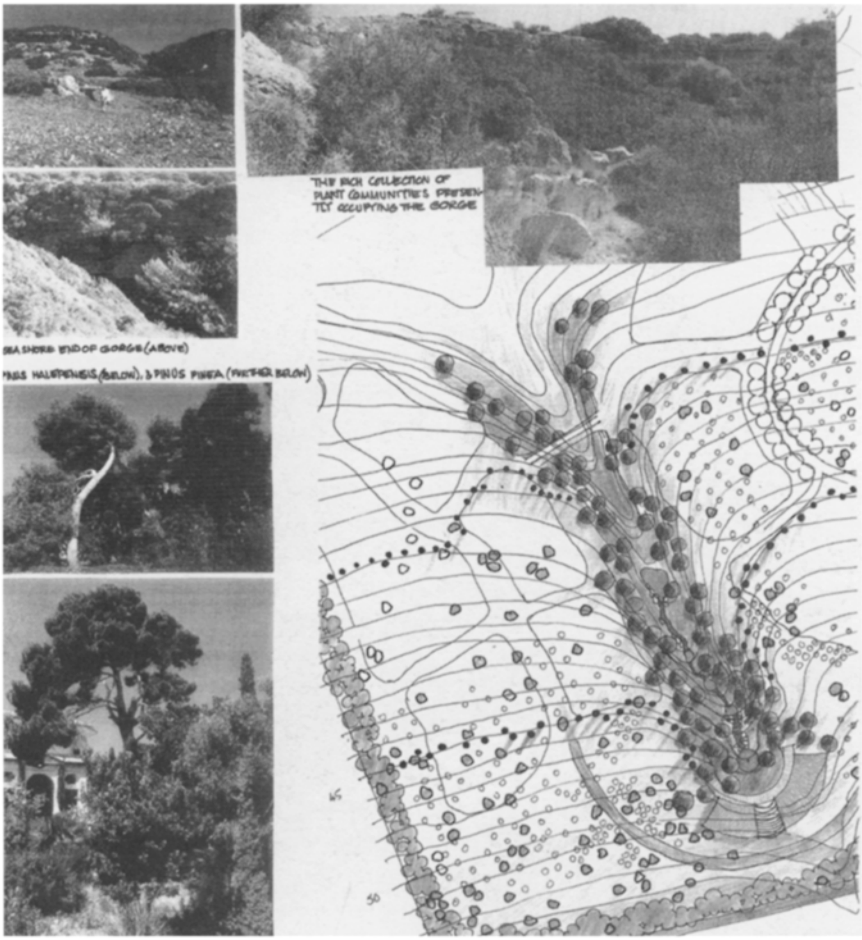


Fig. 15.5 Preliminary study for the Ravine Landscape Character Zone.

This, however, is somewhat justified in view of their limited extent and their strategic placement in locations where their attractiveness is maximised.

Technological Landscape Character: the peninsula

The technological landscape emulates the existing landscape of the peninsula which is rocky and bare in comparison to the rest of the site. The proposed landscape character is very similar to the concrete landscape typical of urban areas from which the term is borrowed (Gilbert, 1992). Conventional landscape design approaches cannot succeed here because of exposure to salt spray and high winds. As such the landscape consists mainly of hard surfaces, i.e. rock, stone and concrete, and hardy and salt-tolerant plants such as the salt bush *(Atriplex halimus)* which has been used successfully in establishing problem sites (Makhzoumi and Charchafchi, 1990). The salt bush will be complemented with a selection of flowering succulent species and pergolas with potted climbing plants. This landscape, though neither traditional nor ecological, will nevertheless be appropriate and sustainable.

Evaluating the Dik Burun masterplan

The landscape design for the Dik Burun project attempts to accommodate the requirements of the programme of facilities, while taking into consideration the environmental, ecological, aesthetic, economical and socio-cultural context of the Dik Burun site. Environmental and ecological considerations are the first consideration. They are realised at Dik Burun mainly through the provision for landscape sustainability. The masterplan is to a large extent sustainable because it integrates large portions of the site's existing semi-natural and rural cultural landscape, the two Ecological Landscape Associations of maquis/ ravine and of multi-use tree planting/ plateau. The combined area of the latter two together with the site boundary planting make up more than 60% of the total site area, which is sustainable.

The concept of Landscape Recycling contributes not only towards landscape sustainability but also to the protection of the indigenous landscape and the conservation of biodiversity. This is especially the case with the ravine, which is viewed by the regional model as forming part of an ecological network of the Kyrenia Region. All three ELA are in fact continuations of the regional landscape and well-established natural and cultural ecosystems. Their protection and their integration into contemporary development, albeit only partial, ensures that spatial and temporal continuity is preserved (Fig. 15.6).

Aesthetic consideration is another aspect addressed by the landscape masterplan. Two concepts dominate the landscape design. The first is based on the tension created by the juxtaposition of two contrasting landscape characters: the spontaneous landscape of the ravine and the cultural landscape of the plateau. The landscape of the ravine is at once serene, contemplative and chaotic, while the landscape of the plateau is ordered, controlled and managed. Moreover, the placement of the latter at the very heart of the masterplan is an attempt to give to the Mediterranean rural landscape the prominence and centrality that reflects its role as part of the historical and cultural heritage of the Region.

The second design concept revolves around the oasis metaphor. The oasis symbolises the serenity of the garden and the cool, shaded courtyard. Regionally, the oasis image is re-created by the visual contrast between the rich, dense orchards that encircle Esentepe and the sparse and dry surrounding olive groves. Similarly, the lush green and flowering gardenesque landscape that encases the hotel and bungalows lies in marked contrast to the olive and carob landscape of the plateau. The contrast in both concepts is not only visual but also perceptual, experiential and symbolic.

At another level, the masterplan can be seen as resolving the conflict between the economic necessity for tourism as the only alternative for development in North Cyprus and its environmental and ecological adverse consequences. The masterplan design illustrates the potential of ecological landscape design and planning to bring about a more sustainable tourism. More significantly, the masterplan design allows for an appraisal of the traditional rural cultural Mediterranean landscape in the context of tourism. By incorporating existing landscapes of olive and carob trees into contemporary tourist development, tourism provides the traditional landscape with a newly acquired role. This role re-establishes the value of these traditional landscapes to the local farmer/owner as well as to the authorities, who are then able to take the initiative in managing and protecting them. Promoting the historical and cultural dimensions of these landscapes is equally beneficial to the tourist industry (e.g. marketing a distinct regional landscape image) and to the local community (e.g. enhancing the landscape character of place and defining regional identity). Combining sustainable tourism with appropriate environmental legislation and management strategies is an alternative that would realistically ensure the continued existence of these valuable landscapes.

At a professional level, the Dik Burun masterplan is a clear example of the potential of landscape architecture to develop a site efficiently, sustainably and creatively. The landscape design exemplifies the necessity for input from landscape architecture to arrive at the very early stages of the design if its full benefits are to be realised.

15.8
Ecological Landscape Associations: a framework for landscape design

In chapter one landscape was seen as a product of the interaction between abiotic, biotic and human factors varying over time and space. This view formed the basis for defining ecological landscape design and for developing the Ecological Landscape Associations methodology. With the aim of integrating the fundamentals of time and space into a holistic and dynamic understanding of landscape, the methodological framework was used to investigate the landscape of the Kyrenia Region and to develop regional and local landscape design solutions. Both solutions in fact result from integrating ecological knowledge and understanding with the intuitive and creative potential of design—the central postulate of the ecological landscape design paradigm as proposed in this part of the book. The applications also illustrate the potential of the methodology to realise the objectives of the paradigm: namely to maintain landscape integrity and sustainability and to enhance the *genius loci*. This last part of the chapter will evaluate the methodology's contribution to landscapes that are ecologically, culturally and aesthetically appropriate.

Ecological appropriateness

The holistic approach of the methodology, its interactive evolutionary framework and its emphasis on hierarchical scale linking provide for an understanding of the natural and cultural processes that shape landscape. Such understanding equips the designer with the knowledge and insight necessary to develop designs which are ecologically appropriate and which maintain landscape integrity and sustainability. The ELA have demonstrated a flexibility in application. Like ecosystems, they can be discerned at different levels of the spatial hierarchy (e.g. landscape region, landscape types, landscape character zone and landscape parcel). In the regional model the ELA can be classified as 'landscape types', while in the local application at Dik Burun, ELA, being smaller in scale, can be classified as

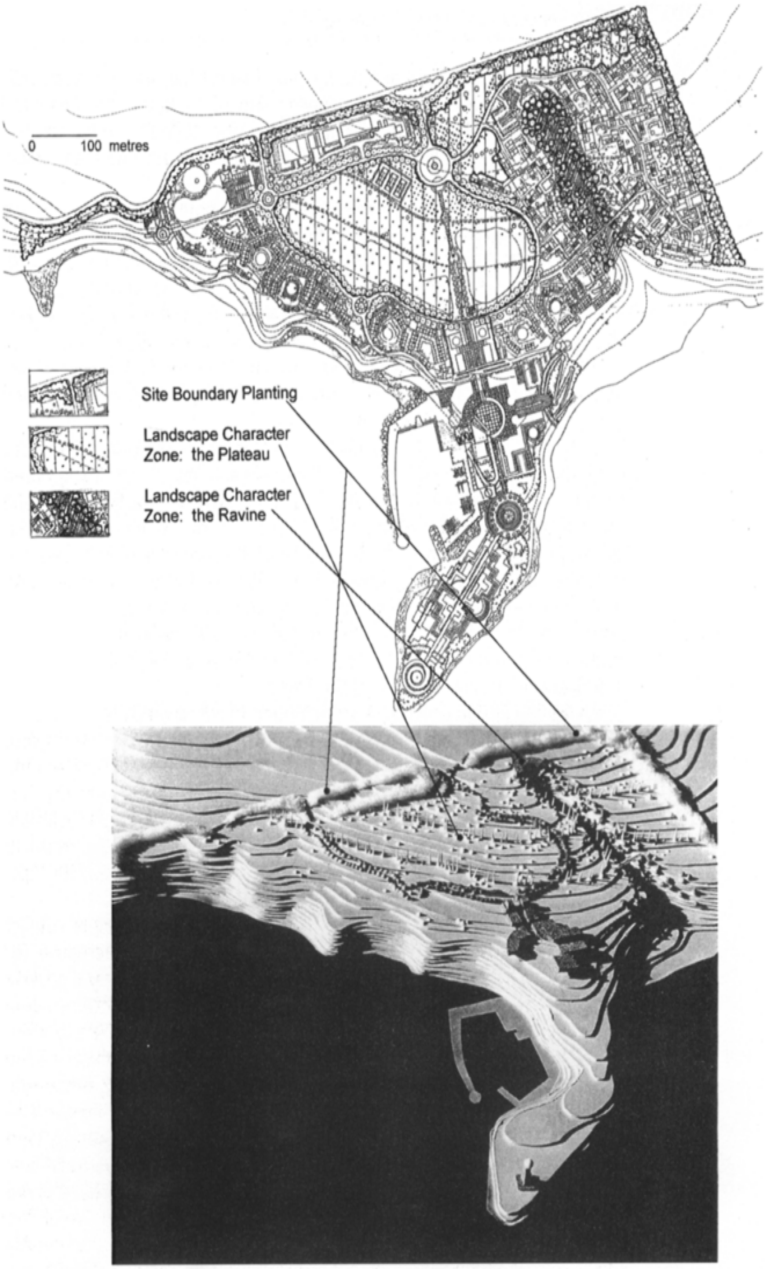


Fig. 15.6 Dik Burun project masterplan design. The landscape of the Plateau (centre) and Ravine dominate the design and form the core around which the project facilities are organised.

'landscape character zone' and even 'landscape parcel' (e.g. maquis/coastal cliffs).

ELA represent natural, semi-natural and cultural ecosystems. In this way they possess integrity and are sustainable. The process of locating the ELA provides the landscape designer with an understanding of natural and cultural landscape processes and how they have shaped the landscape. This understanding then becomes part of the design process and guides the designer in ensuring future landscape sustainability.

The specific objectives of landscape sustainability are dictated by the physical and socio-cultural context as well as by the scale of the landscape design. At the regional level, i.e. the conceptual regional model, sustainability depended on conserving biological diversity, maintaining landscape heterogeneity and protecting essential ecological processes. At the local level, i.e. the Dik Burun masterplan, however, landscape sustainability was determined mainly by the consumption of water. Both the regional model and the Dik Burun masterplan have actively pursued the objectives of conserving biological diversity, protecting ecological processes and designing landscapes that are to a large extent sustainable.

Cultural appropriateness

The investigative framework of Ecological Landscape Associations is based on the concept of tacit learning which attempts to gain an ecological understanding of the landscape through the concept of 'indwelling' and the use of 'exemplars'. While indwelling allows the designer to develop an appreciation and comprehensive understanding of the landscape, exemplars draw on evolutionary history, cultural adaptations and vernacular wisdom. In combination these concepts afford the designer insight into cultural perceptions of nature and everyday experience of the landscape, which enable him to create landscapes that relate to the physical and cultural spirit of place. The task of the landscape design is to create places that have a clear perceptual identity (e.g. recognisable, memorable, vivid, engaging our attention) to enable the user/observer to relate the identifiable features to each other, making an understandable pattern of them in time and space (Lynch and Hack, 1986). The Dik Burun landscape masterplan aimed to develop a perceptually coherent design that re-creates the spirit of the region by invoking cultural images and using historical metaphors and symbols. In turn this enhances the spirit of place, contributing not only to the overall landscape character of the Kyrenia Region, but also to the regional identity and as such to the preservation of the cultural heritage.

Aesthetic appropriateness: fractal geometry as a foundation for an ecological aesthetics

The evolutionary and hierarchical approach of the methodology, it has so far been argued, allows for design solutions that are responsive to the ecological, cultural and historical determinants of landscape. The methodology, however, also allows for a more profound appreciation of the aesthetic qualities of landscape. This can eventually lead to the development of an ecological aesthetics as discussed in chapter eleven which is not superficial or imposed, but inspired by natural and cultural forms, patterns and processes.

It is our conviction that the quest for ecological aesthetics can be illuminated and guided by the science of fractal geometry as developed by Mandelbrot (1977). Realising that patterns in nature are irregular and fragmented in comparison with standard Euclidean geometry, Mandelbrot has developed a mathematical language that describes the patterns of natural forms from shells, trees, clouds to galaxies. The new geometry is based on the realisation that nature presents herself in a cascade of selfsimilar shapes that are replicated at different scales, e.g. the structure of a leaf for example is similar to that of the branches, while both replicate the structure of the whole tree.

Fractal geometry is increasingly being used for understanding and planning the physical form of cities (Batty, 1994) and in architecture and design (Bovill, 1996). Bovill (1996) outlines two ways in which fractal concepts can be used in design. First, the fractal dimension of a design can be measured and used as a critical tool (e.g. as in using the golden section or other harmonic proportions). Second, fractal distributions can be used to generate complex rhythms for use in design (e.g. the fractal dimension of a mountain ridge or the folds of a coastline). In the latter, fractal geometry provides a means to tap the process and complex rhythms of a landscape or a settlement pattern, with the difference that the 'designer is not copying the particular indigenous layout but rather using the underlying rhythmic structure that makes the settlement pleasant, the same rhythmic structure that makes nature pleasant' (*ibid.,* p. 173).

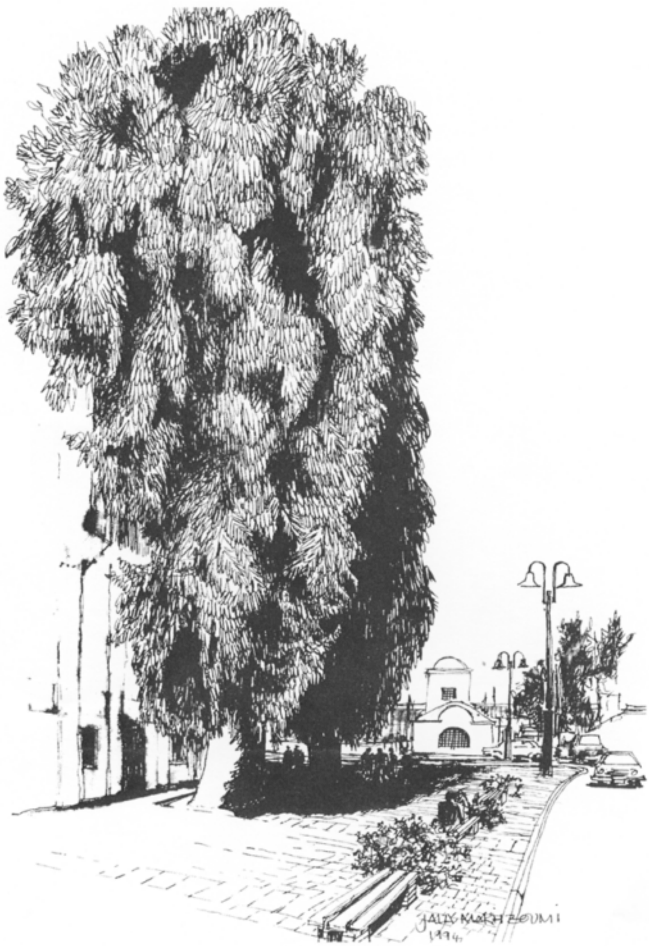
Fractal rhythms necessitate a perceptual framework that is as open to the underlying geometry of nature as it is conscious of the futility of searching for a formal order in nature's patterns and processes. If we look back to the Kyrenia Region landscape with such an awareness, the presence of self-similar patterns becomes abundantly evident in the landscape patterns that are replicated at the regional, subregional and local levels. They are reflected in the rhythm of evolutionary processes, manifested in the rich forms of the topography and coastline and can be seen in the patterns of the landscape (e.g. vegetation distribution and the inter-digitation of landscape components). Thus awareness of fractals and the self-similar processes and patterns can be a rich source of landscape design concepts.

The methodology of ELA has the potential to establish fractal awareness in several ways. First, its evolutionary approach allows for an understanding of the way nature changes through time which is also expressed in fractals. Second, its hierarchical approach establishes an ecological understanding of landscape through a deliberate movement from one level of the hierarchy to the other. This makes it possible to distinguish self-similar pattern at the different scales of the hierarchy. Third, just as emphasis is placed by the methodology on landscape processes, fractal geometry provides a means of abstracting process. Fourth, the holistic approach of ecological landscape design is based on the interconnectedness of landscape components; fractal geometry is the language that can accurately express this.

The existence of patterns in nature challenges us to study what has otherwise been seen as 'formless' or chaotic and to investigate the 'invisible' processes that connect landscape components and result in an aesthetically pleasing whole. Ecological landscape design and fractal geometry are both inspired by a common search for patterns and processes that have eluded logic and a fragmentary view of nature. In Bateson's (1988, p. 18) words, these are the very patterns that provide 'for an ultimate unifying beauty'.

Part Four:

Conclusions



***Red River Gum (Eucalyptus camaldulensis)*.**

Chapter 16
Towards ecological landscape design and planning in the Mediterranean

This chapter suggests future steps towards ecologically and culturally oriented landscape design and planning in the Mediterranean. After a review of the current situation, proposals are advanced for the future of the cultural landscape in the region through the link between ecology and culture, the search for regional identity and the progress of landscape research. Alternatives for ecological landscape design and planning are then suggested and their implications for education and the professions are drawn out. Recommendations for future policies on landscape development, sustainable landscape design, planning and management follow. Finally, suggestions are made towards ecological literacy and securing community awareness and participation.

16.1
Revisiting the Mediterranean landscape

In ancient traditional regions like the Mediterranean, traces of human agency endure almost everywhere. Only the wilderness areas, generally on top of the highest mountains, retain the original landscape of the Mediterranean. 'Nowhere has mankind had a greater effect on his environment or left more continuous, detailed and abundant evidence of his activities' (Attenborough, 1987, pp. 7–8). Therefore these cultural landscapes should be viewed in the context of the past. There is surely a need to look at historical processes, to rediscover what we have already kept or lost of that landscape in the spirit of a fresh respect for nature. Having looked at the past and seen what human agency has done to the original landscape, we can then assess how far this has been an abuse of the environment. An enlightened society would then do what it can to remedy any abuse and place restrictions on man's further interference with nature.

Biological diversity, aesthetic characteristics and cultural background are elements to explore in the evolutionary process of any landscape. The next step is to investigate whether these are typical of that region and whether the landscape is being threatened or preserved. In the Mediterranean the cultural landscape is under enormous pressure and traditional methods of management are disappearing. Therefore the full facts on the cultural landscape should be researched and established without delay and on this foundation new guidelines for its protection and development should be laid down. One option is to follow 'forms of cultural exploitation' (Austad, 1993) which have a positive influence on the environment with minimum transformation and without destruction.

These forms can provide a basis for conservation and restoration of ecosystems and habitats and allow the expansion of biological species while maintaining the productivity of the region.

The transformation of landscape, however, extends beyond the physical environment to include social and cultural values. Although this is a universal phenomenon of the twentieth century, what makes the case different in the Mediterranean is the general lack of public consciousness on environmental issues. The point is that all but a few of the regions here have a predominantly developing economy. Accordingly, their priority lies with economic development, regardless of its long-term consequences for the environment. There is a need to make governments and the public aware of the value of the traditional rural Mediterranean landscape in order to facilitate the adoption of strategies and policies for its protection and conservation.

16.2
Linking ecology and culture

From all this, it emerges that the complexity of human interference in the Mediterranean requires a co-evolutionary view of the nature/culture relationship. Such an integrated concept explains the human impact in the conversion of the natural landscape into semi-natural and agricultural. The man-maintained balance between natural forest, semi-natural maquis and cultivated components has contributed during past centuries to ecological stability and biological diversity, as well as to the attractiveness of the Mediterranean landscape. In semi-arid regions there is, moreover, a characteristic scarcity in natural resources and ecosystems are very fragile, i.e. easily disturbed and slow to recover from disturbances.

The intensity and the scale of present development, however, is placing an increased pressure on the Mediterranean ecosystem as a whole; the repercussions on the environment and the landscape are far-reaching and often irreversible. This has implications for the traditional rural landscape which is gradually being transformed and replaced by a contemporary neotechnological one. The consequences can be recognised at two levels. At a practical level, this traditional landscape retains a delicate ecological balance between availability and use of natural resources. At a theoretical level, it is part of the Mediterranean cultural heritage and therefore should be protected and conserved. The rural cultural landscape, furthermore, can serve today as a living example of sustainable landscape development, as a reflection of a mutually beneficial relationship between man and nature that existed at different times and in different places throughout history.

16.3
The ecological landscape design and planning alternative

Another aspect of the Mediterranean setting is that professions like architecture, landscape architecture and landscape planning, whether they influence the environment directly through design and planning or indirectly by contributing to policy formulation, are frequently unaware of the sociocultural and ecological context. In addition, they often fail to realise the necessity of maintaining the historical co-evolutionary relationship between culture and landscape. The situation is further complicated by the increasing influence from North Europe and North America not just in architecture, landscape architecture and planning but also in policy-making and above all in nature conservation. Hence the outcome is often design solutions and planning approaches that are inappropriate ecologically, culturally and aesthetically.

It is the consideration of these various influences that has prompted our search for alternatives. Our proposals for ecological landscape design and planning methodologies draw on the integrative and dynamic concept of ecology and the holistic outlook of landscape ecology to provide a scientific foundation for understanding the landscape as discussed in Parts Two and Three.

More precisely, our search for ecological and cultural appropriateness is effective at two levels. First, it is rooted in the reality of the Mediterranean, its evolutionary history and its natural and cultural landscape. The case studies in Sardinia and Cyprus are a fair representation of the applicability of the proposed methodologies. Second, it can be extended elsewhere, since at a conceptual level the methodological frameworks are in themselves models that can be used in other regions of rural cultural landscape. This is because ecological landscape design and planning develop from the physical, historical, cultural, socio-economic and spiritual reality of the place. Therefore, any imported approach should be first evaluated and thereafter adapted to the specific context.

The rural cultural landscape, it has to be added, is seen as constituting the foundation for developing a contemporary landscape architectural identity in the region. Therefore new directions for future research and education in landscape design and planning are here proposed. Then recommendations towards sustainable landscape policy, planning and management are presented, aiming at a balance between economic development and nature resource conservation. Ecological landscape design and planning, furthermore, rely on redefining landscape values in the context of the conservation of biological and landscape diversity and of sustainable utilisation of natural and cultural resources. If in one sense cultural values can contribute to the development of a Mediterranean identity, in another ecological values are a path towards conservation policies for valued cultural landscapes that are vanishing. Along these lines finally, approaches to prompting ecological awareness are suggested.

16.4
The search for regional identity

As global trends continue to undermine with ever-increasing force all forms of local traditional culture, many developing nations in the Mediterranean seek refuge in an idealised view of their past heritage in an attempt to find their contemporary identity. The emergence of regionalism is one reflection of this search, embodying the aspiration of these nations to attain ‘some form of cultural, economic and political independence’ (Frampton, 1996, p. 314). The search for identity often tries to establish links with place, as these links offer a bond with history and instil a feeling of belonging. Landscape too possesses a strong sense of place, is a repository of the regional history and embodies the cultural heritage. As such it can form the foundation for forging a regional Mediterranean identity.

Twenty years ago, architecture in the eastern and southern Mediterranean was facing a similar situation (Kahn, 1986). Architecture's rejection of borrowed styles was closely associated with a need to define cultural identity after colonial occupation but also seen 'as part of a wider reaction against simplistic models of modernism' (Curtis, 1986, p. 24). At that time attention turned to the regional vernacular, whose forms and patterns exemplified a responsiveness to local environmental conditions and sociocultural needs and values. Moreover, vernacular buildings and settlements, having developed over centuries, were seen as representing the regional historical and cultural heritage.

It is our contention that the regional landscape can similarly contribute to the development of a contemporary landscape architecture and planning identity in the semi-arid Mediterranean. This is partly based on the case study applications in this book but also on previous research and applications (Makhzoumi, 1988a, 1988b; Pungetti, 1990, 1991). The rural cultural landscape therefore has the potential to enhance the regional identity, contribute towards sustainable future environments and assist in the search for ecological and cultural appropriateness. These objectives can be realised, as landscape designers and planners understand and embrace three characteristics that are central to Mediterranean rural landscapes.

First, there is the character and identity of the traditional rural landscape which is well defined although little recognised and poorly researched and documented. Regrettably, past attempts to search for landscape identity, having focused on the urban scene and architecture, failed to realise the limitations of the urban landscape design vocabulary. By contrast, the rural cultural landscape is extensive in distribution, possesses a characteristic diversity and offers many lessons in ecological and environmental appropriateness. Further, it is a clue to culture because it embodies the interrelationships between places, events, people and settings over time (Taylor, 1989).

Second, the traditional rural landscape, being guided by vernacular wisdom, is intrinsically ecological, holistic in scope and responsive to the constraints and potentials of place. As such it can be of benefit to contemporary landscape design and planning. Vernacular wisdom is as valid today as it was then and moreover allows the leap of faith beyond information into imagination and intuition (Wann, 1996). As Orr (1992, p. 182) points out, 'the difference between a humane and sustainable world and a technological nightmare will ultimately be decided by people capable of acting with wisdom, foresight and love, which is to say virtue'.

Third, there is the spiritual dimension of the traditional rural landscape (Eliade, 1991; Tuan, 1966, 1990, 1995) which is largely missing from modern times and much sought after in the context of environmental awareness (e.g. Bateson, 1988; Devall and Sessions, 1985; Naess and Rothenberg, 1991). Spirituality in the traditional rural landscape derives from a continued contact with nature, a contact that is increasingly denied to modern man. It also derives from the need to develop a particular sense of place and time and an awareness of the vital importance of honouring the primeval forces. To borrow a quotation from Pearson (1994, p. 12), the vernacular everywhere 'strove to express a harmony between people, land, and cosmos—to make forms that linked earth to spirit'. This is a lesson that has to be learnt if we are planning for a sustainable existence.

16.5
Advancing ecological landscape research

The contemporary Mediterranean landscape is the outcome of design and planning approaches that have failed to appreciate the regional ecology and culture and the interrelatedness of these. The objectives of maintaining sustainability, ecological-cultural integrity and local-regional sense of place address many of the current problems. However, landscape architecture and landscape planning are pioneering professions in many countries in the region and not sufficiently recognised or professionally established to be able to respond to the problems of the contemporary landscape. Therefore there is an urgent need to invest in ecological landscape research and education.

Theoretical inquiry in landscape architecture is generally limited but even more so in the Mediterranean. Three complementary and parallel areas of research should be covered in the present context. The first is research that is practically oriented and can accumulate information regarding design vocabulary and guidelines. The second is research concerning survey and documentation of the rural cultural landscape. The third is an inquiry into aesthetic preferences and cultural attitudes. Research in these areas together with education is a prerequisite to professional and academic advancement in landscape architecture and planning in the region.

Practical research is necessary to build up the inventory of plants and building materials that are appropriate to landscape design in arid and semiarid regions. The use of plants that are environmentally and ecologically well-adapted is a central concern of this type of research. The historical adaptation and management of the Mediterranean forest and the maquis and the use of olive and carob tree planting are good examples of such appropriate practice. These plants, whether indigenous or introduced, are hardy, drought tolerant and resistant, require almost no care or long-term management and above all possess better chances of long-term adaptability.

Attempts to investigate the available plant inventory are limited (Cochrane and Brown, 1978) and need to be added to and complemented with research into the aesthetic qualities as well as the ecological adaptability of the plant stock. It has to be noted that research into ecologically appropriate plant species is often available for uses other than amenity (e.g. rehabilitating range land, sand dune fixation, wind shelter belts) as it is the outcome of research into alternative agriculture, forestry and animal husbandry. Interdisciplinary collaboration in this subject expands the scope of landscape research and allows for the exploration of a wider range of advanced solutions (Makhzoumi, 1989; Makhzoumi and Charchafchi, 1990).

Survey and documentation of the rural cultural landscape is another important area of research that necessitates immediate action because this landscape is increasingly being fragmented, transformed and replaced by commercial landscape. In our work, the value of this landscape has been argued elaborately and the need to research it has been underlined not only because the traditional landscape represents a significant part of the regional historical and cultural heritage but also because it typifies ecologically stable and environmentally sustainable design and planning. It is therefore necessary to mobilise resources and expertise to survey and document this valuable landscape.

Documentation, however, is not in itself sufficient; it should be followed by steps that beget pride in the regional landscape heritage and ensure public recognition and stewardship into the future. This can be achieved by communicating the historic, cultural and symbolic values of the traditional landscape as handed down to the present Mediterranean culture by previous generations. In a word, this implies a third area of research, namely the cultural one. Research at this stage is essential to encourage a dialogue over the meaning and value of the Mediterranean cultural landscape. This can be further supported by critical research into landscape history, philosophy and psychology. Landscape history can assist in articulating a cultural framework which responds to present needs and values while drawing on past experiences. Landscape philosophy and psychology help us to understand the social and perceptual views of landscape which are closely linked to aesthetics, meaning and value. It is essential, furthermore, to investigate the local experience of nature in the context of the different Mediterranean regions. This will provide insight and knowledge about attitudes, cultural constructs and feelings regarding the landscape and the environment as a whole.

16.6
Advancing ecological design and planning education

In the Mediterranean ecological education is central in cultivating awareness of semi-arid ecosystem fragility and of nature and landscape appreciation. This is especially significant in view of the rapid urbanisation and the loss of contact with the natural and rural landscape. The necessity of ecosystem education as opposed to environmental education has already been emphasised (e.g. Bakshi and Naveh, 1980; Naveh and Lieberman, 1990; Orr, 1992). Ecosystem education is seen as encouraging holistic thinking and stressing the interrelatedness of components (e.g. soil, hydrology, geology, climate, topography, flora and fauna). Change in one component inevitably influences the whole. Ecosystem education, especially in the framework of landscape ecology, can counterbalance trends that offer a 'one-sided reductionist biological education, presenting man as detached from nature and as the almighty manipulator of life' (Naveh and Lieberman, 1990, p. 97). Ecosystem education in addition to its holistic view of environment and landscape cautions against seeing environment as a set of problems which can be solved by strictly technological means.

The development of ecological landscape design and planning education in the Mediterranean, according to the above discussion, should adopt three parallel strategies. The first aims to *establish* schools of landscape architecture and planning in regions where there are none. The second *advocates* an ecological approach in landscape architecture and planning schools that have already been established. The third *introduces* ecological landscape design and planning to both architecture students and professional architects.

Departments of architecture are well instituted in these regions and it is often the architects who deal with urban and landscape design and the physical environment in general. However, there is a need to shift the focus of design from the traditional ordering of ‘form’ to the ordering of ‘process’. This will change the architect’s outlook from a predominantly visual and static approach to a holistic and dynamic one with increased awareness of the design’s impact on the earth’s ecosystems and natural resources.

Therefore, students of architecture should be familiarised with the concepts and methods of ecological landscape design, since these can assist in shifting emphasis from building to context. This, it is hoped, will allow a bridging of the contrived professional divide between architecture and landscape architecture and will make for a new design paradigm which can lead to ‘major redefinitions of the ecological and cultural roles of the environmental design professions’ (Motloch, 1991, p. 262).

16.7
Towards sustainable landscape policy

The Mediterranean landscape, it has here been argued, is a product of the continuous intervention of man who has modified land use patterns. Accordingly, most of the Mediterranean countries have already established instruments to regulate land use but some, especially in the south of the basin, have only just started to do so. Yet in the Mediterranean man’s intervention needs regulation and since this regulation varies from several degrees of establishment, there is an urgency to formulate in each country a general strategy on both land use and landscape. Such a strategy should have clearly stated objectives and accordingly national legislation should be passed with a view to attaining these.

National landscape legislation should be geared towards three main directions. First, it should outline landscape policies for executive bodies (e.g. public authorities) to be developed in detail at lower levels (e.g. regional, intermediate, local). Second, it should give the necessary legal authority to the executive bodies in order to implement the landscape policies. Third, it should impose controls on the executive bodies and offer incentives to them to facilitate landscape policy implementation.

To achieve the objectives stated in the landscape strategy mentioned before, public authorities should ensure that policy statements are effectively communicated to the interested organisations and people. To execute the landscape policies, in addition, planning procedures should be formulated at different governmental levels. These procedures must be put into effect through vertical co-operation, i.e. at the different levels between public authorities, and horizontal co-operation, i.e. at the local level between the executive authority and the public.

Public authorities, furthermore, should advocate educational programmes and should encourage local consensus and community support. As stated in the Lake District Declaration (Countryside Commission, 1987b), the protection of landscape depends upon the preservation of good conditions for both economy and society, as well as on the consensus of local population on conservation. Thus a sound policy should verify the economic and social situation of the area and work with people at all levels (Lucas, 1992). In doing so, it might be possible to obtain voluntary support from some landowners and residents willing to co-operate in the achievement of strategy goals. Community support can indeed be more effective than penalty provisions in the implementation of landscape measures in the rural Mediterranean.

The problem is that the present Mediterranean cultural landscape is already threatened by urbanisation and construction and is destabilised by the intrusion of the urban life-style, consumer society, transport and tourism (Grenon and Batisse, 1989). Moreover, in this region it has been said that the media do not much concern themselves with environment and landscape. Ecology education as emphasised through this chapter is a prerequisite for success in landscape policy.

To protect these landscapes from degradation, however, policies more vigorous than the current ones must be thought out and implemented. Problems of land use management and urban, suburban and tourist development need to be solved and a balance between economic development and natural resource conservation needs to be found. This can be a considerable investment for the future, for the progress of both nature and society.

16.8
Towards sustainable landscape design and planning

After landscape policy, the further step to take is landscape planning. The landscape planning process can be linked to several factors like economic and social issues or nature and environmental conservation. It encourages developers and politicians therefore to take into account both physicalnatural and socio-cultural environments (Beer, 1990). Yet more information about the socioeconomic causes and consequences of landscape transformation is needed.

The present landscape should be understood in terms of how and why it was formed in the past (Fairclough, 1994) and above all how it now functions in ecological and cultural terms. Such a knowledge is a prerequisite for guiding future landscape changes in the Mediterranean. These changes, however, do not always have a positive impact. The observation of Sinclair (1983) that changes in rural landscape are sometimes seen as an ‘intrusion’ is not completely out of place; changes in fact can become intrusions when they threaten the landscape. To curtail the negative impact of landscape changes, improvement of the Mediterranean lands can be carried out by ecologically sound countryside planning.

Changing landscape might also mean to break that past tradition which allowed the desirable equilibrium between man and nature. The solution can be found in a balance between environmental and economic interests through a policy in sympathy with nature. At this stage it is necessary to know about landscape planning and management decisions since they produce different environmental results. Therefore solutions to countryside conservation cannot be seen only as ‘one person deep’ (Potter, 1994) but in the context of the local society. Sharing goals on nature conservation is fundamental for the planning process (Steiner, 1991). A local group of people must be able to influence the formation of the conservation plan and to ensure their future viability. Clearly, awareness of the whole set of the above interrelated factors is necessary in the Mediterranean in order to provide an answer to the large variety of problems that this area presents. It has already been observed (Fabos, 1985) that one role of planners can be to synthesise these factors, in order to reach decisions for the future.

As noted before, the planning carried out in Mediterranean countries in relation to rural landscapes has been oriented more towards physical structural development than nature conservation. To safeguard Mediterranean rural areas, an ecologically and culturally sound planning should be implemented. The link between man and landscape, however, is a basic fact not just in sustainable landscape planning but also in achieving sustainable landscape design. This link should be viewed within the holistic, dynamic, hierarchical and historical framework as afforded by the ecological sciences. Therefore establishing an ecological understanding should form the foundation for both landscape design and planning.

Landscape ecology is a step forward: it is planning for landscape development in the perspective of both nature and society. Taking this interrelationship as fundamental, landscape ecology pursues sustainable landscape planning. In order to achieve this, landscape ecology embraces the holistic view of understanding the entirety which is the complex of all relationships already existing before the planning process (Kerkstra *et al.,* 1973).

Thus, planning with a holistic view means to make an effort to see the area to be planned as a totality. This implies the integration of all the data collected in the field and relating to different aspects of the site into a unitary framework in order to achieve a global perspective of that landscape. The frequent mistake, however, is the custom of dealing independently with each aspect of landscape. This 'island approach' is a complete failure in the planning operation. On the contrary, one can only achieve environmental sustainability by working with the natural and cultural processes in combination. This procedure allows the planning of the Mediterranean cultural landscape in an ecologically and anthropologically sound way.

16.9
Towards sustainable landscape management

It has been argued that 'landscape must be seen as a partnership between natural history… and human management' (Meeus *et al.,* 1988, p. 13). Clearly, man has transformed natural conditions in the Mediterranean through the centuries. Past land management practices continue to influence the present. Therefore thinking on long-term lines helps to avoid conflicts between landscape use and management. It is also necessary to think locally, since history teaches us that the problems and challenges are different in each region. Consequently, in landscape management it is required to operate on a local level of understanding, proposing and acting.

At local level, for instance, awareness of the interaction between landscape and agriculture is a common issue, while at a higher level this is often lacking. Thus measures able to retain agricultural use and at the same time preserve ecological landscape quality are necessary especially in the Mediterranean. Some of the answers to the problem can be found in compensation for farmers in marginal zones which are affected by restrictions imposed by natural conservation in policies to maintain ecological corridors in areas where traditional agriculture is mixed with modern practices.

In landscape management, the shift in emphasis from passive protection of biological species to dynamic conservation of ecosystems and landscapes is the next step to take (Naveh and Lieberman, 1994). This is definitely a way to ensure the continuity of all ecological processes, namely abiotic, biotic and human. Such an approach is coming to be adopted in Mediterranean countries too. Many recent ecological studies, carried out with a comprehensive methodology, have emphasised the importance of fire, grazing and human disturbances in the evolution of the Mediterranean landscape. A study of rural habitat in which further evolution and diversification can proceed is, however, urged.

In working within the framework required for landscape development, after the collection and analysis of data regarding landscape transformation and threats and the production of the landscape plan, future management of natural resources should be outlined. This can provide up-to-date material for the public authorities of Mediterranean countries and assist them in the decision-making process. Computer models in landscape planning furthermore can help to evaluate the human impact on biodiversity in order to develop management strategies. Hence the maintenance of biological diversity and productivity should be on the list of landscape management goals.

Afterwards, an integrative approach to the land use of Mediterranean rural areas should be urgently envisaged, considering their ecosystems as fundamental elements. In this respect, one of the main goals in managing ecosystems of man-made environments is a balance between conserving biological diversity and meeting the socio-economic needs of local people. On the other hand, one of the main goals in conserving ecosystems of semi-natural environments is the achievement of their maximal long-term utilisation, merging ecological and economic objectives. Among the aims of landscape management, therefore, there should be reconciliation of conservation of biodiversity with productivity of its ecosystems.

16.10
Landscape awareness in the contemporary Mediterranean

Although having reached the last phase of the planning framework, represented by its implementation with landscape management, the cycle is not yet concluded. Awareness through education and participation is an essential step to take in order to advance successful ecological landscape design and planning. In fact, ecological landscape design and planning, creative and intuitive as their frameworks may be, cannot on their own achieve future environmental sustainability and long-term ecological stability. This requires efforts outside the professional confines and necessitates addressing cultural values in the contemporary Mediterranean society. However, social and demographic change together with economic striving for better living conditions and political instability complicates such an undertaking. The cultural re-awakening in Mediterranean countries and the inquiry into traditional values is in fact one reflection of change and political instability. Perhaps the point of departure, as Frampton (1996, p. 315) suggests, should be to 'regard regional culture not as something given and relatively immutable but rather as something which has, at least today, to be self-consciously cultivated'.

Fundamental to the search for values in design and planning is an investigation of the contemporary view of the man-nature relationship in the Mediterranean within the dynamic context of cultural change. This requires the establishment of a continuing dialogue on the cultural meaning of nature in order to discover people's social and cultural perceptions and cultivate in them environmental awareness. Ecological and environmental education can build public awareness while the creative contributions of art, poetry and literature can enhance cultural perceptions. These two avenues of exploration, the top-down environmental education and the grass-roots community activism, should be pursued in parallel.

Aiming for ecological literacy

The ecological crisis is seen by Orr (1992) as being rooted in modern society's focus on self in isolation from obligation, tradition and community and perpetuated by an education that was designed to further the conquest of nature. Education, however, can act as a leverage to broaden understanding of how people and societies relate to each other and to natural systems and how they might do so sustainably. This life-centred education is what Orr defines as 'ecological literacy'.

Compared to 'literacy', which is driven by the search for knowledge, ecological literacy is seen as being driven by the sense of wonder and delight in the beauty, mystery and bounty of the natural world. It presumes both an awareness of the interrelatedness of life and knowledge, and a broad familiarity with the development of ecological consciousness *(ibid.)*.

A holistic ecological education, i.e. ecological literacy, should be introduced with appropriate adaptations to different age groups in primary and secondary education and at university, specifically in the architecture, landscape architecture, civil engineering and agricultural faculties. Individuals who deal with the environment should also be targeted, whether they are professionals, bureaucrats or local and regional administrators. Interdisciplinary workshops too, together with intensive training programmes, should be worked out at this stage. In this way environmental education can be more effective in promoting appreciation of the Mediterranean landscape and in furthering collective action towards its protection.

Environmental art, public participation and landscape

Landscape appreciation has always been linked with literature, poetry and the visual arts (chapter four). The latter have often been more successful than landscape architecture in expressing the experience of landscape and the *genius loci*. The arts should therefore be encouraged to contribute towards cultivating a better awareness of landscape.

In this context the innovative work of environmental artists, also known as 'earth artists', is worth mentioning as it has given new meaning and significance to public appreciation of the landscape in Europe and North America. Using landscape as the medium, environmental art has a liberating influence which enriches landscape perception, fascinates and provokes in a way that neither traditional art forms, e.g. painting and sculpture, nor contemporary landscape architecture has succeeded in doing (Krog, 1983). The ingenuity and scale of Christo's landscape art (e.g. The Umbrellas, Surrounded Islands, Running Fence), of Long's work in the desert, of Gladsworthy's willow sculptures and of Chillida's art (e.g. the Comb Of The Wind) challenge our perception in very different landscape settings (Baal-Teshuva, 1995; Beardsley, 1984; Malpas, 1995, 1996). Therefore environmental art should be pursued because it is an effective way of focusing local attention and raising appreciation of landscape in the Mediterranean.

Community initiatives too can be effective in raising awareness of landscape and the environment. The varied interests and achievements of local environmental groups (chapter fourteen) are an example of the potential of such initiatives. Worthy of special mention is the work of NonGovernmental Organisations and of grass-roots groups that aim to promote local awareness of the distinctiveness and character of place (Clifford and King, 1993; Common Grounds, 1987). This is done through a variety of activities, such as making parish and county maps, which involves the participation of school children and local community groups in gathering the information, discussing what to include in the map and illustrating it.

These initiatives encourage community solidarity and awareness of the physical, historical, cultural and aesthetic dimensions of landscape. They establish, moreover, a sense of communal pride in the local landscape. Encouraging community initiatives, together with ecological education, is indeed an effective way of focusing social and cultural perceptions on landscape issues and increasing public awareness of natural resources, their management and conservation.

16.11
Epilogue

'So the Mediterranean still has some remnants of its former glories' (Attenborough, 1987, p. 206). It is a wonder that despite all the events which have occurred here so many species have endured. Nonetheless, natural landscapes should have a chance to survive not by accident but rather through the wisdom of contemporary developers. At this point we have to protect these landscapes actively, with great determination to save and maintain them. After all, the Mediterranean is one of the oldest humanised landscapes in the world. This is the place where we became so powerful that we were able to transform landscapes wholesale, where we started to keep exotic animals and plants brought from all over the world, where we turned half a continent into a market garden. Might this also be the place where we really learn from our mistakes?' *(ibid.).* Perhaps this lesson is the last gift that we, people of the Mediterranean, have to offer. Or perhaps, hopefully, we can go beyond, learning from this lesson and embarking upon a new approach to the problem. This means to pursue sustainable landscape design, based on a framework that integrates ecological knowledge and has the potential of maintaining landscape integrity while ensuring landscape sustainability. It also means to advance in the direction of a common policy for sustainable landscape planning, based on an ecologically and culturally sound methodology. This will allow us to understand and finally preserve our vanishing cultural landscape.

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