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## Trends in European cultural landscape development: perspectives for a sustainable future

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### Abstract

Europe has a long history of landscape use, ranging from prehistoric to present times. Many old cultural landscapes have high qualities, but the management regime they developed under is no more feasible economically. Modern society increasingly utilizes landscape in a great variety of ways and for many purposes. This poses a complex pressure on cultural landscapes, threatening landscape qualities. Therefore planners and managers are facing the question: *how can a sustainable future for old cultural landscapes, based on sound economics and the commitment of all actors be achieved?* After a comprehensive overview of landscape use in the past, the various ways in which people have regarded their landscape and the ever changing attitude towards landscape use are reviewed. Modern agricultural practices, urbanization and recreation all threaten the existence of valuable cultural landscapes, but simple solutions to conserve many of these landscapes are not at hand. Perspectives for a sustainable future for historic European cultural landscapes are based on the following observations: society's demand for multifunctionality; the inclination of farmers to meet this demand if it is economically profitable; support from national and local authorities (and the public) for ecologically sound management and finally, decentralization of landscape ruling and legislation, which favours regional solutions. Landscape ecology, as a study of relations on the earth's surface can tackle planning and management issues from numerous view points, each with its own focal points. Scientists from all over Europe, convening in the Netherlands, set out new directions for landscape science. Priorities for the next century include: integration between disciplines; matching of scales in time and place with users, researchers and decision makers to enhance interaction and understanding. © 1999 Elsevier Science B.V. All rights reserved.

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### 1. Introduction

Society's demands for new functions in rural landscapes are rapidly changing and diversifying. As a result, highly valued landscapes that developed during centuries till millennia vanish or are completely transformed within a limited number of years. The push factors are those connected with trends in agriculture,

which may be intensification or extensification. They display different technological levels and positions in old and new markets, resulting in a decline of the more traditional roles of agriculture as well as increasing interest in new functions. The pull factors are those connected with urbanisation, improved infrastructure, increasing demands for recreation, nature conservation, etc. Given these multiple dynamics the sustainability of landscape quality may only be guaranteed by commitment of all actors engaged: farmers, nature and water managers, recreation entrepreneurs, spatial

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planners, etc. A sound economic base is a prerequisite for any sustainable future. This leads to the following question for planners and managers: *how can a sustainable future for old cultural landscapes, based on sound economics and the commitment of the relevant actors, be achieved?*

Most of the farmers still focus on agriculture, but many also see prospects in recreation, nature conservation, water management etc. In many traditional rural regions, agriculture is no longer either the main supplier of labour, nor the main source of regional income. Landscape planning and management bodies may be preoccupied with common functions and conditions, and private enterprises may be preoccupied with their own profits, but both are highly interdependent in realising economic, socio-cultural and ecological sustainability in the landscape. How to realise new functions and still guarantee the sustainability of qualities of the past is a major concern in nearly all the old cultural landscapes in Europe — whether these be the *dehesas* and *montados* in Spain and Portugal, the Mediterranean and sub-Mediterranean mixed agriculture landscapes with their terracette complexes, the old bocage, semi-bocage and open field landscapes, or the Dutch polders and peat bog landscapes.

In any case, landscape ecology concepts, methods and knowledge in this field are of interest for broad groups of *landscape scientists (ecologists, historians, hydrologists, etc.)*, *landscape planners and architects*, *policy makers and landscape managers (nature, water, agriculture)*.

Many recent studies in all European countries are engaged with these research themes, as is shown in this volume and as may be seen in the overview of landscape research in Denmark presented in this issue by *Höll and Nilsson*. The articles presented in this issue are a selection out of some 50 lectures from a Workshop of an International Congress of the Dutch Association for Landscape Ecology (WLO) in October 1997. At that occasion landscape ecologists, landscape planners and policy makers from 26 European countries gathered in The Netherlands to mark the 25th anniversary of the WLO. They discussed the role of landscape ecology in solving problems, taking into account the state of the most threatened European landscapes and the new opportunities for landscape ecology.

The workshop on cultural landscapes discussed ways to work out a sustainable future for European cultural landscapes. Participants focused on a mixture of agricultural interests, historically evolved landscape qualities and specific features of ecological value, related to other functions such as recreation and water management. Attention was paid to processes in cultural landscapes such as marginalisation and land abandonment, intensification and mechanisation, that result not only in loss of genetic and biological qualities but also in the impoverishment of our cultural heritage and loss of local identity. Meanwhile, the importance of man as an ecological factor is underestimated, for example in his role as farmer but also the influence of consumers in their demand for ecologically sound products is acknowledged (*De Snoo and Van de Ven*, this issue). Special attention was given to identifying unifying planning and management concepts to safeguard valuable cultural landscapes and to realise new functions.

## 2. Comprehensive landscape history

Most of Europe's cultural landscapes result from a long-lasting land use history: different stages overlaid, refined or replaced each other. Today we may observe complex land use mosaics and multi-layered historical sandwiches in many regions.

The over-all trend ran until recently roughly from a humble dependency of nature, through a nature-adapted multiple use-space towards a man-controlled production-space.

It is just during the past years or decades in many areas that a deviation from this line may be observed.

Generalising we may identify different overlapping stages:

*Natural/prehistoric landscape* (from Palaeolithic till ancient Greek times):

Nature was used by man for many 100 000s of years as a bran-tub for hunting, harvesting and cutting wood. Traces from these societies are locally found as graves, wall-paintings (Lascaux, 15 000 BC; Altamira, 13 500 BC).

From ca. 6000 BC on (Mesolithic), grazing systems with domestic animals and arable cultures developed. There are, however, only local indications of their

impacts, but the Old Testament gives many clear indications.

*Antique landscape* (from ancient Greek times till early Mediaeval times):

Large-scale human impacts started in Europe from Neolithic time on (ca. 3000–1100 BC). Local relicts are dispersed over Europe (e.g. Stonehenge: ca. 2800 BC; Silbury Hill, Avebury Stonecircle: ca. 2600 BC). Around the Aegean Sea the flourishing Minoan culture developed, whose traces may be still found on several places (e.g. Troje and Mycene from before 2000 BC.; Phaistos, Knossos on Crete from ca. 3000 BC on). Ploughs were applied from at least end-Neolithic and cereal cultivation spread widely: e.g. in Britain (Hoskins, 1956), but even locally on the upland plateaux in the Taurus and the Rif, although its imprint remained thinly scattered (McNeill, 1992). Gradually nearly the whole Mediterranean area became more directly cultivated, but always far less so in the mountains than on the plains and hills, as the economies mainly rested on lowland crops (vine, olive, etc.). Although less intensive, also large parts of Central and NW-Europe were cultivated. Already before Plato (429–348 BC) the land near Athens was that much degraded by overgrazing and burning that he worried about the resulting erosion. Elsewhere in Europe the colonisation by the Romans (100 BC–400 AD) had their impacts. In NW-Europe on many places together with remnants of settlements and graves, field patterns from ca. 700 BC on (like the Celtic fields) are found, eventually with earthworks, hollow ways and stone walls (e.g. Hoskins, 1956; Aalen et al., 1997). Especially around the Mediterranean, there often is a direct line from then till today. Ancient history is indicated by remnants of infrastructure and field patterns, walls, terracettes, buildings, etc., as well as by crop cultures and plant species introduced or selected in those days. Vineyards, citrus groves (introduced by Alexander, ca. 338 BC), olive and chestnut groves, terracette complexes, etc. are prominent inherited attributes of many southern landscapes.

*Mediaeval landscape* (from early Mediaeval times till Renaissance):

In this feudalistic period, the layout of the European landscape was gradually completed. The landscape

was more directionally exploited either by farmers (private, as tenant or on common lands), nobility or clergy. Extensive infrastructures and facilities like terracettes, stone walls, hedgerows, dams and canals were made in controlling a nature that was perceived as being hostile.

The latter is symbolized e.g. by the retreat of Francis of Assise (1181–1226) around 1225 in the divine nature of the forest of La Verna where he spoke with the animals. The monastery forests of La Verna still exist. It is also strikingly illustrated by *Dante Alighieri* shortly after 1300 in the first lines of the *Divina Commedia* at the entrance of the Inferno: *Nel mezzo del cammin di nostra vita/mi ritrovai per una selva oscura/chè la diritta via era smarrita*. Here, he seems to describe literally the dark forests that still exist today between Florence, that he was forced to leave, and the Casentino where he lived in exile. This attitude changed significantly with the Renaissance, symbolized with the ascent of the Mont Ventoux by Francesco Petrarca (1304–1374) in 1336. The time before, he called the centuries of ‘*tenebrae*’ (darkness). But, gradually mankind approached nature in a more functional and rational way, with an increasing imprint on landscape. Many of the traditional land use patterns have their base in that period.

*Traditional agricultural landscape* (from Renaissance till 19th century, sometimes till today):

The landscapes became multifunctionally managed by farmers, mainly in mixed agriculture systems, integrating forests and tree pastures (e.g. for forest grazing, charcoal burning, fire-wood, timber, manuring, and all kinds of utensils), rough grazing lands (e.g. heathlands, phrygana, garriques), water systems (e.g. for irrigation, fertilization), etc.. (cf Vos and Stortelder, 1992; Austad et al., 1993; Vos, 1993; Vos et al., 1993, etc.). Well-established regionally differentiated land use systems developed that became the engines behind most of Europe’s characteristic cultural landscapes.

These integrated farming–forestry systems were regionally differentiated by their adaptation to climate, physiography and local cultures. Really every site and every tree was used. In practically every case, the base was the trinity of trees-arable cultures-grazing (Le Coz, 1990; Joffre, 1992; Joffre et al., 1991). It occurred at different spatial levels: tree (e.g. in dehasas

and montados), parcels (mixed cultures), farms (mixed farming), landscapes (e.g. altitudinal zones). In many regions this trinity controlled the landscapes for many centuries, sometimes more than a millennium. Really every site and every tree was used, in the beginning for local use, later with a gradually increasing focus on the towns as a market.

Local problems from extreme conditions (water, snow, drought) were solved with local means. Examples are the Dutch like-system in combination with windmills, developed from late Mediaeval times on, without which half of The Netherlands would still be sea. In areas with a long annual snow cover (Scandinavia and parts of the Alps), tree leaves for example extensive Elm woods were used as fodder. And in the Mediterranean zone, the transhumance solved the problem of periodic droughts in lowlands and periodic colds and snow in the mountains nearby. All had their own characteristic biodiversities.

In many landscapes nobility estates were established whose impressive Renaissance and Baroc estate gardens and houses may still be found.

In general, these traditional land use systems reached their optimum at some moment in the second half of the 19th century. At that moment, livestock had become the central component, not only because of their meat, milk, wool and hides, but also for their manure, animal power, transport, etc.

In many cases these systems kept a balance between population numbers and farm production, and they might reach steady states of sites and life communities, being sustainable for a long time. But not always, especially not in early stages, nor with catastrophes, periodic overpopulations and effects of wars and epidemics.

From many of these wide-spread traditional land use systems and their landscapes still the remnants exist, but they tend to vanish rapidly, such as:

The dehesas and montados, the Alpeggio and other high pasture systems, the Dutch peat polders, the terraced Mediterranean ‘coltura promiscua’ landscapes, the grazed fruit chestnut landscapes, the charcoal coppice landscapes, the Nordic mixed farming mountain landscapes, the bocage landscapes, the estuarine landscapes, the coastal wetlands (Maremme, Camarque) and Aegean and Dalmatic islands with fisherman settlements, and all kinds of local land-

scapes, such as the ‘trulli’ landscapes of Puglia, and even old mining landscapes.

*Industrial landscapes* (mostly from mid-18th till mid-20th century, in many places till today):

Especially after the Enlightenment, much of the productive land became monofunctionally oriented, with bulk biomass production, onto distant markets (towns), for the benefit of its owners or investors. Dispersed over the landscapes everywhere the similar production systems were realized. Everything was under control: on vulnerable sites monotonous erosion-control forests were planted; water systems were managed, waste lands reclaimed, new polders created with pumping-engines. These developments were facilitated by ‘modern’ techniques (fertilization, tillage, selected exotic species, steam power and electricity for drainage and irrigation, etc.).

Except for functionality (maximum production, industrial use, safety, erosion control, shelter belts, recreation areas), on estates and in parks also aesthetic fashion (early and late landscape style, cottage style and different neo-styles) and on more natural sites ethic fashion (nature reserves) had their impacts on landscape.

In this industrialization stage, with its specialization and spatial segregation (monocultural fields, production forests, closed nature reserves) much of the land became alienated from the major part of society. The landscape became a landscape at-a-distance, dominated by external markets and governmental planning procedures.

### 3. Postmodern landscapes

As in former times, also in our time there is no single direction in landscape development. Characteristic is, however, the rapid change in production and information technology as well as demands from society, which changes the economic base of the landscape households completely. Land use profits in one region are expanding spectacularly, but diminish equally spectacularly in other regions. Everything seems possible: people are shopping in the landscape. The ‘unity of the world’ is definitively over: man is at a distance from landscape. This development of our shopping society with its multiple

demands results in our postmodern landscapes in a complex mozaic of *different landscape types*. These display different intensities and styles of man's control (high → low) whose products are all desired by society:

- |  |                                  |
|--|----------------------------------|
| (1) industrial production landscapes:        | landscape as an industry         |
| (2) overstressed multifunctional landscapes: | landscape as a supermarket       |
| (3) archaic traditional landscapes:          | landscape as a historical museum |
| (4) marginalized vanishing landscapes:       | landscape as a ruin              |
| (5) natural relict landscapes:               | landscape as a wilderness        |

### 3.1. Industrial production landscapes

The intensification and the increasing scales of farming on the most suitable sites are the most common expressions of its external market orientation. All production factors are controlled in favor of bulk production: the landscape is used as a functional production space. Any form of 'nature' or scenery is an unintended by-product of agriculture. Several authors in this issue are dealing with the problems arising from this demand as they exist in various countries in Europe: Czech republic (*Cudlinova et al.*), Portugal (*Firmino*) and Denmark (*Kristensen*).

### 3.2. Overstressed multifunctional landscapes

In areas with an increasing urban population, the market most recently demands 'à la carte' from our landscapes a broad spectrum of functions: food production; industrial use; recreation; housing; water extraction; nature conservation; global environmental control, etc.

The urban society is 'shopping': they have the time and the money for second houses, new estates, ski resorts, long-distance walking paths, mountain biking tracks, caravan parks, nature reserves, camping at farms, endless boulevards with hotels, diving, yachting, which are all recent developments.

Still, as everything has to be realized within the same limited space, a positive by-effect for some

landscapes is that the shift from production-space towards multiple-use-space gives them a new economic base and integrates them again in society. This is especially true for urbanized areas with a scarcity of land and an extensive multiple interest, as well as for attractive old cultural landscapes (e.g. by agro-tourism and recreation, second houses).

Research and projects to solve these problems are under way in many European countries. Some examples are presented in this issue: Germany (*Herrmann and Osinski*), Finland (*Hietala-Koivu*) and in the Netherlands (*Smeding and Joenje*).

### 3.3. Archaic traditional landscapes

In some distant rural areas that are mostly less suitable for biomass-production, the most characteristic traditional agricultural landscapes may survive as archaic remnants from previous centuries. This is caused by various reasons, like any form of isolation due to specific socio-economical, cultural or political conditions, land property conditions, a museum or conservation function, specific recreational profits. They may be either small-scale or large-scale, and labour-intensive or labour-extensive, but they are always in any way multifunctionally managed.

Research here falls into two categories:

- fundamental research, dealing with factors and mechanisms that influence diversity in the landscape. Here the effects of various agricultural practices play an important role. Which practices contribute to the (species) diversity of the countryside. Examples of such research topics in this issue are the contributions by *Alard and Poudevigne*, *Canter and Tamis*, *De Snoo and Mander et al.*
- procedural research, dealing with the criteria that may be used to evaluate landscapes and their elements as well as implementation issues for landscape planning. Examples of the first type may be found in this issue in contributions by *Andreoli et al.*, *Bühler-Natour and Herzog* and *Pinto-Correia and Mascarenhas*, whereas the planning and implementation in various countries is tackled by *De Haas et al.* (The Netherlands), *Primdahl* (Denmark) and *Sepp et al.* (Estonia).

### 3.4. Marginalized vanishing landscapes

In other distant rural areas the urban demands are the main force behind a bifurcation in the countryside: intensification and increasing of scale of farming on the most suitable sites and extensification or abandonment on less favourable sites. In the marginalized parts of the European countryside, the old cultural landscapes are vanishing. Where they are abandoned, spontaneous nature development takes over and within a couple of decades dominates landscapes that were used intensively for centuries.

Contributions in this field included in this issue are from *Cudlinova et al* (Czech republic), *Pinto-Correia and Mascarenhas* (Portugal) and *Kristensen* (Denmark).

### 3.5. Natural landscapes: relict and new nature

Some sites have no profitable production potential, which implies most often that they are somewhat backward and/or the natural dynamics are too high for human control. Examples are all sites or landscapes that are too cold, too wet, too dry, too steep, too salt or too distant for any human use. Here, natural relicts could survive despite sometimes intensive land use at a short distance. And here, conditions are also favourable for a fast development of new nature.

The contributions by *Bühler-Natour and Herzog* and *Cudlinova et al.* partly deal with these issues.

Ongoing influences from unsustainable land use in our cultural landscapes are having major effects on biodiversity at the level of species, ecosystem and landscape.

Meanwhile, the socio-cultural identity of landscapes as a source of inspiration for aesthetic, educational and scientific information and a healthy environment for living is degenerating rapidly. Concurrently, long term economic potential is negatively affected by short term decisions. The loss of potential use is directly connected to the unsustainable exploitation of natural resources.

## 4. From involution towards replacement

In many areas landscape history reflects a *shift in man-landscape relations* from involution towards

replacement, that strongly determines an over-all tendency towards decreasing characteristics, biodiversity, scenic values, sustainability. The differences between involution and replacement are fundamental for many forms of landscape change.

### 4.1. Involution

With limited technical means but abundant labour power, many traditional landscapes developed through involution: the gradual endogenous transformation of preexisting structures and processes by adaptation and refinement.

Under these conditions, with land and labour as principal production factors, the main objective was to maximize land productivity by intensifying and organizing labour inputs. Surplus labour was invested in by-products, e.g. by landscape management that, although being imponderable, had a high value for the local society by sustainability of production factors, amenity, regional identity, etc..

Some attributes of many European involution landscapes are:

- *Multifunctionality* at different levels (field, enterprise, landscape) predominates. The trinity of 'trees-arable cultures-grazing' frequently was its backbone.
- *Characteristic patterns* of agro-ecosystems were established and maintained over centuries. They were merely small-scaled and similar over large areas, as most farmers in a particular region had similar means of production, technologies and traditional backgrounds.
- *Spatial land use interactions* were maintained between 'improved' smaller sites with intensive use and 'impoverished' larger areas with extensive use (e.g. in Drenthian essen-landscapes (The Netherlands) and dehesas/montados (Portugal) with enrichment by animal manure, in regions with lands regularly enriched by directed inundation, etc.).
- *Sustainability* of natural resources was achieved by keeping a balance with the production capacity and the internal renewability of the systems, as was learned from trial and error during generations. Still it could go wrong from time to time.

- *Biodiversity* was an unintended by-product of an agriculture that was not capable of controlling the system completely; sometimes it was consciously used, like the aromatic plants and numerous herbs in the Mediterranean zone and a variety of game species.

#### 4.2. Replacement

More advanced technical means enable a stronger control of the physical conditions, and therefore promote the transformation or replacement of previous situations. Where this exogenous trend prevailed, i.e. with land and money as principal production factors, the main objective was to maximize labour productivity. The profits were invested in more of the same, for the benefit of the private owner or investor, with as accidental effects environmental problems and a loss of local identity.

of the land use systems. Monofunctional specialization, low labour inputs and high investments are their implicit attributes.

- *Less characteristic landscape patterns* prevail, as the new technologies, products, markets, planning approaches and funding instruments (e.g. from EU) are similar everywhere. Large, specialized monofunctional land units are considered to be more cost-effective, at least on the short term. Still, locally they are very characteristic (e.g. Dutch polders).
- *Sustainability* of natural resources in these landscapes may only be achieved by on-going and in many cases increasing external inputs of matter and energy.
- *Biodiversity* is most often completely subordinate to the production-objectives, but may nevertheless be specific and valuable (wetland bird species, geese on arable lands, etc.).

		Involution	Replacement
<i>aim:</i>		maximal land productivity	maximal labour productivity
<i>technology:</i>	technical means:	limited	high
	labour input:	high	low
	animal input:	high	low
	fertilizers:	low	high
	pesticides:	low	high
<i>management:</i>	natural resources:	sustainable	expenditure
	cultures:	mixed	mono
	farming system:	mixed	specialization
<i>homeostasis:</i>	nutrients:	conservation	transfer
<i>space:</i>	scale:	small	large
	locations:	specific	indifferent
	spatial relations:	internal	external
<i>produce:</i>	products:	many	few
	amount:	few	bulk
	biodiversity:	high	low
	amenity:	high	low
<i>market:</i>	scale:	internal-local	external-international

For these approaches roughly the reverse holds of the involution approaches:

- *Segregation of functions*: ‘pure nature’ is consciously excluded in favour of the successfulness

#### 5. From engagement towards alienation

Undoubtedly, concomitant with a shift from involution towards replacement, in many parts of Europe a transition occurs from living with and

within the landscape towards a weakening of man's functional and mental ties.

### 5.1. Engagement

Apart from an 'external market', all people with any kind of means of production also have an 'internal market' that may guide their decisions.

This is evident for food production in traditional subsistence households. But besides, some imponderable functions are for owner and tenant: respect, private/family identification with the land/estate, long-term investments. However, the land(scape)s of the farmers and foresters also have imponderable functions for broader groups in society. They may identify themselves with the natural and cultural heritage of 'their' territory, even if it is owned by somebody else. On these grounds they select their political parties, they fund nature conservation movements, they work as volunteers in nature and landscape management. And for the natural and cultural heritage of 'their' society, they will even start a war. Landscapes reflect who they are and what they are, and therefore they invest in it.

And therefore, the involvement in the decision making on future landscapes of all people engaged in their use and management is an important condition for the sustainability of future landscapes.

### 5.2. Alienation

In less labour-intensive production regions man may be expected to alienate from landscape. There, farmers are only responsible for their own production units, which are not that specific and culture-tied, and their support of the common functions frequently does not overstep the limits of the private property, unless they are paid for it. Tourists and nature conservationists are either visitors or in the same way only responsible for their property.

Therefore, the segregation of functions, with its orientation on external markets and a tendency to neglect local environmental quality as a significant function, is basically not in favour of sustainable management of the traditional cultural landscapes.

*The ongoing alienation of man from its landscapes seems to be an inevitable threat for sustainable landscape management.* However, periodic reactions

occurred during both the industrial and the information revolution in various 'back-to-nature' movements, including its exaggerations and falsifications: living in garden cities, the reform movement, organic agriculture, recreation in nature, nature conservation movements, but also less elevated such as in retro-movements in fashion, in small-scale gardening, congresses on cultural landscape, etc.. It is remarkable that this occurs again in our times of kilophobia, waiting for the next millennium (a 'fin de millénaire'), somewhat similarly to the fin de siècle one century ago.

## 6. Perspectives for the future

Apart from the fashionable back-to-nature movements, good perspectives for the future of the old cultural landscapes of Europe are based on the following observations:

1. *A rich and stable society demands a broad spectrum of functions from our landscapes, including nature and landscape.* These 'multiple demands' may offer landscapes a sound economic base: primary production and nature, recreation, housing, environmental control through recycling, health-care, water control as well as clean drinking water.
2. *Many farmers move towards multifunctionality, including landscape management, when they gain profits from it.* In this development they display quite different farming styles and attitudes: the spectrum of farming and management styles, includes those that call themselves 'ecological', 'biological', 'integrated', 'biological dynamical' or 'organic' has never been broader all over Europe. Basic in its effects on landscape is a dichotomy of enterprises that are primarily either more 'production-oriented' or 'integration-oriented', symbolized by 'huge farmers' and 'economic farmers', respectively. The parallel with 'replacement and alienation' and 'involution and involvement', respectively, is evident (Van der Ploeg and Long, 1994).
3. There is a growing political and public engagement with a 'healthy' countryside as part of regional cultural heritages, especially at international level. It is also acknowledged that the scale at which changes manifest themselves seems to be

increasing and that these changes have to be addressed at an adequate level. Many solutions to problems, however, have their origins at a very local level, and high level targets can only be achieved with the support of local or regional actors ('think globally, act locally').

4. These developments coincide with a shift towards decentralization and denationalization, which favours a *Europe of the regions* with their own cultures, products and landscapes.

These perspectives are in line with the purpose of several supranational policy statements and initiatives such as the Council of Europe — Convention for the protection of Europe's Rural Landscapes; the Pan European Landscape and Biological Diversity Strategy; the Resolution 1940 on the conservation of threatened landscapes, adopted by the General Assembly 1994; the World Heritage Convention; the IUCN-actions on priority schemes for safeguarding cultural landscapes and the COST-concerted action G2 on Ancient Landscapes and Rural Structures. (see e.g. Commission of the European Communities, 1993; Council of Europe, 1996; The Cork Declaration, 1996; IUCN, 1978, 1991; Phillips, 1997; European Spatial Development Perspective, 1997).

## 7. Things to do

Landscape ecology is the study of various relations taking place at the earth's surface and focuses on landscapes from the point of view of hydrology, soil science, vegetation science, geomorphology, geography, zoology, etc. It is a blend of basic theory, research and application, with areas of special attention such as ecohydrology, fragmentation ecology, relationships between ecology and agriculture and historical ecology. Landscape ecology research also includes the historical, present and future role of humans. Subject and approaches make it an interdisciplinary science par excellence, as is shown by numerous applied and fundamental studies.

Landscape ecology as an applied science has in some countries been accepted fully by the makers of policy on nature conservation and restoration. To date, this traditional landscape ecology has been involved with abiotic and biotic aspects at landscape scale and

has aimed to be very applied. There is now a general understanding that this biased approach is not appropriate to support our coping with today's problems. Landscape ecologists are now ready to seize the opportunity to draw on social and economic disciplines to complete landscape ecology, and to explore new avenues towards *landscape science with emphasis on the following three themes* (see WLO, 1998).

### 7.1. Matching of scales in time and space with relevant processes in society, administration and management

Given the developments in world economies and the formation of an international administration within Europe in agricultural, environmental and nature conservation issues, it appears that the ongoing process of upscaling must inevitably be accompanied by appropriate scientific approaches. But so far these have lagged behind. Most scientific results originate from lower levels of scale (plots, small regions) but need to be upscaled to larger scale domains (e.g. international levels). That is why landscape ecology research has to pay special attention to:

- the various temporal and spatial landscape ecological processes;
- the need to choose the relevant scales and to translate insights from one scale to another in a reliable manner;
- the tuning of scale domains in the landscape, in social problems and in decision making.

### 7.2. Integration between disciplines

(1) landscape ecology, (2) economics and psychology/sociology, (3) disciplines involved with design, planning and management and (4) decision making:

- The integration of knowledge to solve current complex problems requires economics, sociology and disciplines involved with public administration to be included together with ecology at landscape level.
- The integration of traditional landscape ecology and disciplines involved in design, planning and management, to improve the use of insights and data in spatial planning and implementation, and,

vice versa, a more articulated role of landscape ecology in assessing the effects of alternatives in planning and management strategies.

### 7.3. Interaction between decision makers, researchers and users of the landscape

Interactions between these actors should be stimulated to signal the problems arising in the landscape ('early warning') and to avoid concentrating on side issues or an 'end-of-pipe' approach.

This specifically calls for intensive communication: scientists should be alert to ways to present their knowledge more rapidly, more appealingly and more efficiently to the public and to policy makers. The communication should be two-way. Both a change in attitude and an investment in communication and communication techniques are explicitly required.

The 'traditional' land use systems of the past have, largely through serendipity, produced landscapes that we now consider highly desirable. Rather than repeating the haphazard and often unsuccessful ways of the past that also occurred, time has now come to consciously use *scientific principles in understanding the processes and spatial ecological structure to maintain, restore and create these or similar landscapes*. Things to be done by landscape science in this respect, may be (WLO, 1998):

- Compose a *priority list (or red book)* for the sustainable safeguarding of valuable cultural landscapes in Europe, selected on the basis of biodiversity, scenery and integration of designated production and nature conservation functions.
- Develop a *handbook of the landscape management activities* that enhance and safeguard the valuable cultural landscapes of Europe as an integral part of sustainable land use.
- Develop a *multifunctional approach in landscape ecology*, including socio-economics and disciplines that deal with culture, in order to contribute to new concepts for integrated land use, including optimization of the ecological functioning of monofunctional land use.
- Explore *strategies to improve the economic benefits of multiple land use systems* by integrating primary production with recreation, health care and other secondary functions.

– Inventory the *options available for improving the cultural identity* of specific cultural landscapes, stressing the interrelationships between local cultural phenomena (e.g. architecture, art, local traditions) and regional nature-friendly products, based on initiatives from within.

– Develop *zonal strategies/plans* with different zones for (a) strict museum-like conservation, (b) complete replacements by new functions, (c) multifunctionality within old structures, offering the latter a new economic base, and (d) abandonment and nature development ('let nature do its work'), while keeping in mind that not all extensive romantic and archaic old cultural landscapes may be preserved as reserves.

– Develop instruments for practice and policy making, such as scenario studies, monitoring systems, expert systems for management implementation, decision support systems like a landscape-SWOT analysis.

### 7.4. Research on water systems: water as a carrier

This theme includes topics based on a growing awareness of the importance of water systems (such as rivers, estuaries, marshlands, polders and ground-water systems), their boundaries and related constraints relevant for planning and management. The following recommendations have high priority:

- ecological and hydrological research on water systems: processes, reference values/areas, environmental conditions, ecological corridors, effects of climate change on relevant ecosystems, etc.;
- research on the use of the water system approach as a base for sustainable spatial planning and management of functions and for sustainable wetland management, agricultural landscapes and urban areas.

### 7.5. Research on regulation functions

Regulation functions have to do with the capacity of natural and semi-natural ecosystems to regulate essential ecological processes and life support systems which, in turn, contribute to the maintenance of a healthy environment by providing clean air, water and soil. Examples of regulation processes

are purification and stabilization. There is a need for ecological knowledge and numerical data about how to use these processes in planning and management. Research on the following topics is recommended:

- life support functions in agricultural landscapes (especially aspects of spatial planning and management);
- CO<sub>2</sub> storage by forests, farming and marshes;
- role of water systems for water retention and water purification (for example rivers: flood control, denitrification, sediment traps);
- design and management of buffer areas adjacent to natural areas: the roles of organic and conventional ways of farming.

#### 7.6. Multiple landscape values ('landscape research')

Landscapes are not determined solely by natural processes; each landscape is also assigned a particular 'identity' by human perception. The concept of landscape identity has historical, geomorphological, cultural and other aspects that are complementary to ecological aspects. To ensure the effective planning and management of future landscapes it is therefore necessary to understand how people perceive their environment (and changes in it) and to have public support. Research is highly recommended on the following topics:

- landscape identity and values: ecological aspects (historical ecology), land use and their relation with cultural history and geology/geomorphology;
- tools for describing and monitoring characteristic features (e.g. cultural history): typology of European landscapes;
- public perception and support of inhabitants and users of landscapes;
- relationship between human well-being and changes in the landscape/landscape identity;
- translation of landscape identity into physical planning and management.

#### 7.7. Science of public administration related to landscape research

The natural boundaries of landscape ecology patterns and processes rarely coincide with adminis-

trative boundaries. The borders between urban and rural areas are not very clearly indicated. There is a need for public administrative concepts and tools based on sustainable planning principles and incorporating ecological knowledge. Research is recommended on the following topics:

- transboundary natural areas (problems, opportunities): realization of a European Ecological Network and a representative European Cultural Landscape Network for spatial planning and nature conservation/rehabilitation;
- administrative boundaries versus water systems (for example floodplain issues); making a new administrative map based on ecology;
- new statutory tools for dealing with urban–rural relations; creation of new institutions capable of dealing with the problems of tomorrow, for example new water control bodies, new management bodies for complete watersheds (each scale problem should have its own competent authority: matching knowledge with administrative units);
- issues concerning top-down versus bottom-up: realization of national and international biodiversity targets when nature management is partly bottom-up (e.g. nature management in agricultural areas).

#### 7.8. Socio-economic research related to landscape

One of the main reasons for the continuing degradation and loss of natural ecosystems and landscapes is that the importance of nature is still not adequately reflected in economic planning and decision making. There is a need for socio-economic research related to landscape. Priority topics are: the value of nature in economic terms; how to finance the conservation and development of natural and semi-natural systems (economic carriers such as agriculture, agroforestry, recreation/tourism, cities and industry); and social processes. Research is recommended in the following directions:

##### (a) economic carriers

The congress stressed the need to find mechanisms to have new economic carriers that comply with landscape identity and are sustainable.

These may include: a role for conventional agriculture or new ways for agriculture, urbaniza-

tion and industry as economic carriers ('red pays for green'), recreation and tourism as economic carriers and possibilities for Public Private Partnership constructions to enhance the role of landscape users in landscape conservation and development.

*(b) value of nature and landscape in economic terms*

The issue to be tackled here is the controversy between local or regional economy versus landscape identity. Major problems will be how to express the ecological and other functions of greenspace (especially recreation and tourism) in economic terms and how to use this information in decision making, planning and management to steer processes in a more sustainable direction).

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