

## Ecological networks and greenways in Europe: reasoning and concepts

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**Abstract:** The paper gives an overview of approaches towards ecological networks throughout Europe. It does not intend to present a complete picture, but to highlight common developments within countries and regions and show common principles and differences between countries and regions that have to be taken into account when developing a joint European initiative. Countries or regions that have not been included can be active in the same way, but information was not accessible to the authors for different reasons. This overview shows the comparable trends in decline of landscapes and the diversity in approaches to biodiversity conservation and nature conservation planning. Understanding the differences and common issues are of utmost importance to generalise common principles and to understand the way neighbours and other European partners approach problems.

**Keywords:** ecological networks; greenways; biodiversity; land use change; homogenisation fragmentation

### Introduction

The history of planning of ecological structures such as urban park systems and nature reserve systems started already in the last half of the 19th century and the first period of the 20th century. Nature conservation organisations have been founded in this period as a reaction on industrial revolution and they started to convince governments of the need for nature preservation, both species and areas. National parks and nature reserves are founded.

In large cities the main axes of towns were developed into green boulevards, such as the Champs Elysee in Paris and the footpaths along the Seine in Paris (Searns, 1995). In the USA Frederik Law Olmsted proposed in 1860 a plan for Brooklyn and later for Boston to link the urban parks and quarters by green corridors, the "parkways". These are routes towards the urban parks surrounded by trees and with an aesthetic and recreational function. These parkways were between 65 and 150 metres wide. The Boston plan is the still partly existing and known as the "Emerald Necklace", that also had a drainage function for the town. This drainage function remained an important function of plans for green corridors through the whole century.

Ebenezer Howard developed in England in the same period the greenbelt concept, meant to regulate the urban sprawl of London and other urbanising areas in England. In this concept parks of about 8 km wide surround the inner city. Behind this belt commercial and industrial areas should be developed. London is the clearest example of this approach. The difference between the two approaches is the linking function of the parkways and the dividing function of the green belts.

Also in other countries such as the Netherlands comparable developments took place as in the USA and England. The industrial revolution had a heavy impact on the cities and a need for urban green developed: the Amsterdam Vondelpark was one of first urban parks, established in 1870. The Dutch Housing law of 1901 allowed town authorities to designate areas as open space for public use. The city of Arnhem is around that period the first town that officially designates a park as "public green space" and there the park system is still reaching from outside town into its city centre.

Nature conservation and urban development joined forces in the 1920s. At the International congress on housing and urban development in Amsterdam 1924 the statement has been given, that nature is important for outdoor recreation, for its scenic beauty and its intrinsic value. Urban planners and architects plead for the development of parkways and in this period several have been built (Van Langevelde, 1994).

In the period after the second world war in whole Europe the interest for this balanced development was of low priority because of the need for new houses and reconstruction of the destroyed country. Only in the last decades as a consequence of the new urban planning that emphasises urban quality and as a consequence of the development of the national ecological network a revival of this integrated planning concept occurs.

But the interest returned slowly. In the 1970s studies have been carried out and plans have been

made in Lithuania and Estonia. In the beginning of the 1980s planning started in Czechoslovakia. In the same period the concept of nature corridors has been introduced as part of the Danish regional plans and in 1989 the concept of ecological networks has been worked out as a national plan for the Netherlands.

Recent initiatives are the ecological network initiatives in among others the United Kingdom, Poland, Walloon, Ireland, Switzerland, Portugal, Germany and Flanders. Several countries with regional ecological networks, such as Germany, Spain and Belgium, are federal states, where the actual responsibility for nature conservation is not at the national level but that of the member states or the autonomous regions in the federation. The question is what is behind it, why do people develop these plans.

## **1 Land use change: polarisation and homogenisation**

Under the influence of changes in food demand, caused by demographic trends, the cultivated area of Northern America and in Europe has shown considerable fluctuations. Agricultural areas are moving from one region to another, forests are removed in one part of the world and forests of exotic species are planted elsewhere. In this period the agricultural productivity in Canada, the United States of America (USA) and the European Union (EU) measured in kg dry matter per unit of acreage continues to rise thanks to ongoing advancements in agronomic knowledge. Through changes in agriculture and forestry practices, landscapes have suffered rapid and often irreversible changes. These changes can be classified as polarisation of land uses, partly through marginalisation, partly through intensification. These results in a homogenising landscape (Fry, 1996): Intensifying agriculture makes land monofunctional and takes away both cultural and natural diversity. Intensification by one farmer-reducing production costs-will improve his position on the market. Also, here we have to realise that the farming market is an international within the European Union and elsewhere. The farmers in the Paramo of the Andes have to compete with the large-scale potato farmers in Canada and the Greek farmers have to compete with the Dutch and the Danish farmers on the cheese market. And as we can see in 2001 also the trade in animal stock is international. If the market is not regulated the farmers in the less favoured regions will marginalise and eventually abandon their land. Probably, if there is no regional restriction diseases will spread more easily. Both intensive and extensive land use are expressed in the landscape: the structure of the land, the size of the parcels and the area of natural and semi-natural vegetation that is present.

The pressure of economic competition in farming, forestry and urbanisation makes the land partly homogenising by disappearance of regional differences in (semi - ) natural features. This is not a new process but its features become more and more recognisable. We develop into a homogenised world. That has consequences.

The multifunctionality of the landscape is disappearing, outdoor recreation and nature conservation do get less opportunities. The results can already be seen for decades in the European landscapes. We see the decline in diversity in structure in the landscape. Coherency is disappearing. Examples can be found everywhere. In the Netherlands forests in the floodplains decreased from 1900—1980 with 90% and hedgerows with 80% (Jongman, 1982). In the period 1950—1990 all the open side channels along the major branch of the Rhine have disappeared (Jongman, 1992). In the period 1976—1986 the treelines in the agricultural landscape of St Oedenrode, The Netherlands decreased with 35%, if taken without the roadside plantings it was even 45%. But it does not only happen in the Netherlands. Also in the Czech Republic the natural plantings in the cultural landscapes disappeared nearly completely during the collectivisation process (Fig. 1).

## **2 New functions in the landscape: fragmentation**

However, this is not the only process that is ongoing. In western Europe in the urban fringe intensive agriculture used to be an important land use. Now her role is strongly diminishing, other functions take over, such as horse keeping, garden centres and recreation facilities (Lucas, 1993). This trend is comparable elsewhere in Europe, from Lisbon to Moscow. In the competition with urban functions rural function mostly cannot survive. The landscape develops into a new diversity of artificial elements causing fragmentation natural features; it can be considered as negative landscape diversity. For small species roads are often inaccessible barriers and that means that they should find new living space within the area they are confined to. Some animals like amphibians in spring take the risk of crossing roads towards breeding ponds. They are only successful in areas with low-density traffic. Larger animals will be hampered in their movements by urban areas, roads and unattractive land.

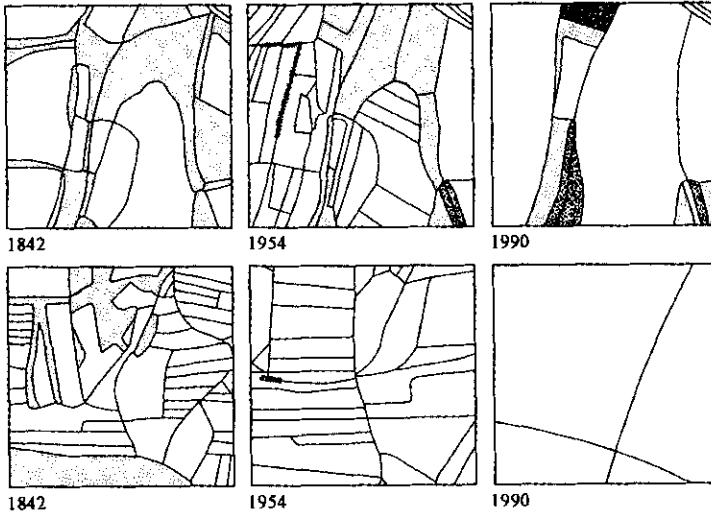


Fig.1 The changes in the Czech rural landscape between 1842 and 1990 in two sample km-squares(Lipsky, 1992)

Fragmentation of the landscape has many causes. Transport infrastructure in Europe (roads, waterways and railways) intersects habitats of species and thereby decreases the possibilities of species to disperse between different habitats that are divided by traffic lines. Urbanisation, agriculture and industry have put increasing pressure on the total area of landscape and nature. The remaining natural area is fragmented due into a dense network of motorways, railways and waterways that covers the land especially in north-west Europe. This process of fragmentation has resulted in loss of habitats, fauna casualties, barrier effect, disturbance (noise and light) and local pollution (IENE, 1997).

Fragmentation of natural areas is a spatial problem that can be defined as the dissection of the habitat of a species in a series of spatially separated fragments(Fig. 2) . Fragmentation leads to diminishing habitat area and an increase in barriers or spatial discontinuity. Barriers such as roads, urban areas inaccessible agricultural land, do not only cause fragmentation but also by a decrease of landscape elements (small forests, hedgerows riparian zones) .

Effects are species-specific and depend on the needed functional area, species mobility and isolating effects of the landscape(roads, urban areas, and canals) . Both decrease of functional area of a habitat site and isolation increases the chance of local extinction of populations and diminishes the chance of spontaneous return of species. The spatial effects are (Mabelis, 1990); Decrease in suitable area of the original ecotope; increase in landscape heterogeneity and land use; landscape fragments with subpopulations; Source-sink-relationships in natural populations (larger natural areas become increasingly important) .

We can be sure that this process is surely influencing landscapes negatively. Biological diversity is declining due to fragmentation. If we want to maintain our cultural landscapes in Europe we have to mitigate the population dynamics of species in that landscape. Otherwise it will become an empty carcass as the ruins of buildings in an abandoned town.

### 3 Landscape ecology concepts in landscape planning

The German and Eastern tradition in geography has concentrated on the horizontal and regional aspects and has found applications in physical planning. Planning in central European and the Baltic States have been influenced by this

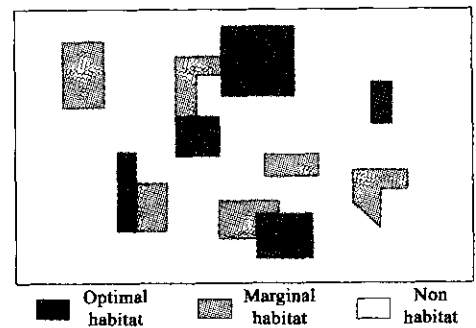


Fig. 2 Fragmentation of the landscape seen by an imaginary species (Opdam, 1991)

geography tradition (Roosaare, 1994). On the other hand, spatial planning in the Soviet era has not existed by itself but was subordinate to the rules of the planned economy. This kind of planning initiated large-scale technocratic projects and a monofunctional simplification of the collectivised agricultural landscape (Fig. 1). Destruction of traditional landscape systems and ecological destabilisation of landscapes with enormous erosion, salinisation of agricultural soils, water and soil pollution were visible results of this process.

### 3.1 Ecostabilisation

In opposition to this economical planning, concepts such as "territorial systems supporting landscape ecological stability" have been developed in the early 1980s. Theoretically the approach was based on the idea of a polarised landscape, that was suggested in 1974 by the Russian geographer, Rodoman (Mander, 1995). This concept accepts intensive land use, but proposes a functional zoning of the landscape, including areas and elements for natural zones that antagonises the poles of intensive land use. The planning principles derived from this concept were on the one hand a strictly delimitation of natural zones, zones for nature restoration, and zones for recreation united into one coherent zone. On the other hand these zones polarised the zones selected for agriculture, industry and urban development. Until the end of the 1980s nature did not make part of the spatial planning maps of countries such as the GDR and zoning was directed by economic principles.

According to Kavaliauskas (Kavaliauskas, 1995) the concept of the polarised landscape "represents a territorial elaboration of the idea of sustainable development". Rodoman's concept was dialectical and holistic, developed within a deductive scientific tradition. His formal and geometrical principles were developed into principles for practical ecological planning in the Eastern and Central European states in the late 1970s and the beginning of the 1980s. It was based on co-operation between geographers, ecologists and territorial planners (Kavaliauskas, 1995; Buček, 1996; Miklós, 1996). It resulted in concepts such as "nature frame", "natural backbone", "ecological compensative areas" and "ecostabilising functions". Essential in these concepts is: (1) the designation of territories to function as an ecological compensation to the territories that are heavily exploited; and (2) to connect these compensative territories by zones with coherent land management.

Since Rodoman's approach only has been published in Russian language the theory of a polarised landscape is only known in the West through its applications in other countries. In the west European countries a polarisation of the landscape and land use has become reality as well and comparable planning concepts such as the framework concept in the Netherlands have been developed (Vrijlandt, 1994). This was done to mitigate the ongoing segregation of land use functions. The strong competition for land in the more densely populated areas in Western Europe has had a decisive influence on the development of segregation of functions. The development of segregation of functions has caused a debate in the Western European planning on the question if long-term ecological goals could at all be achieved with such a separation of land use functions and if a multi-purpose development should be better.

### 3.2 Population dynamics

In general nature conservation has developed from NGO-movement towards politically accepted issue and it has been expressed in claims for land; national parks, nature reserves, sites of special scientific interest and so on.

In the last decades landscape ecological principles have become part of nature conservation. Site based nature conservation can only be successful if the conservation sites are huge as it is in Russia. Even then larger carnivores are threatened. Species have difficulties to survive in fragmented landscapes and that hampers the core objective of nature conservation. Nature conservation changed from site protection towards conservation of the ecological networks including the wider landscape based on principles from population dynamics (Macarthur, 1967; Opdam, 1991). Nowadays nature reserves and national parks are considered as units within which the biodiversity of species only can be maintained on the long run if they are connected with other larger units (Jongman, 1995).

### 3.3 Spiralling concept

Running waters constitute a vector for the transfer of material from elevated reaches to the bottom of a drainage basin. The strong interaction between the stream and its riparian ecosystems in its ecotone provide a huge exchange of energy, matter and nutrients that attracts all kind of natural species. The transport of matter and nutrients is restrained by all kind of natural and man-made retention devices and in this way the

river is an important mechanism to reconstruct landscapes and to link species reproduction sites and populations. This role of rivers is related to the concept of nutrient spiralling the recurrent use of matter in ecosystems along the river (Pinay, 1990). Originally this concept has been developed for nutrients, but it also is a valuable concept for considering species and matter. They are in principle dynamic systems and in relation to other parts important pathways at the landscape and drainage basin level. Downstream they have higher diversity and are less dynamic than upstream. This also means that interactions with other ecosystems are more complex in the downstream stretch than upstream. Human use of rivers as a transport route or recreation pathway will also be different, because of differences in accessibility, the diversity of the landscape and the potential use of the system. It varies from water provider to the most intensively inhabited areas in the world, where conflicts for space are common. That is why rivers should be considered important landscape structures for planning ecological networks.

#### **4 Ecological networks**

These three concepts provided the insight that nature is at the landscape level a relatively dynamic system reacting on a complex of environmental and land use conditions. Land use is considered to influence the functioning of ecosystems as a whole, its self-purification capacity and the carrying capacity of the landscape (Mander, 1995; Kavaliauskas, 1995). It also affects habitat quality for wild species and the potential for dispersal and migration that are vital for survival of populations especially in fragmented landscapes.

Natural carrying capacity of water and land for human functions can be considered on the scale of the landscape. In the concepts of Rodoman (Mander, 1995) the carrying capacity of the landscape and the division of land between anthropocentric core areas, buffer zones and ecotones on the one hand and large natural ecosystems on the other hand are key elements. It has been the basis for the Estonian, the Lithuanian and Russian networks. In these plans the relation between human land use and the ecologically stabilising landscape functions received the main emphasis.

In the western European countries in general ecological aspects have been playing a much more dominant role, although ecological networks and especially ecological corridors, being multifunctional, also fulfil a function in developing co-operation between administrative sectors as agriculture, road planning and nature conservation.

In ecological sense isolation is an important feature in agricultural landscapes of north-western Europe. Even in production forests, management can cause isolation of the remnants of natural old growth forests within it (Harris, 1984). Most natural and semi-natural habitat sites are remnants of a former natural area. Present landscapes are dominated by man-made dynamic habitats and the less dynamic habitats are small and isolated, as are the populations in it. Habitat isolation and habitat loss prevent natural species to develop viable populations or let populations survive on different equilibrium levels (Hanski, 1985). Natural relations have declined by the disappearance of forested corridors and natural river corridors and the development of human infrastructure. The strategy to overcome this is the redevelopment of ecological coherence through networks.

Ecological networks can be defined as systems of nature reserves and their interconnections that make a fragmented natural system coherent to support more biological diversity than in non-connected form. An ecological network is composed of core areas, (usually protected by) buffer zones and (connected through) ecological corridors (Bischoff, 1993). Core areas have mostly been identified by traditional nature conservation policies. The insight gained from recent geographical and ecological concepts link this traditional conservation strategy with other land use and integrate nature conservation in general land use policy and spatial planning. In this way ecological corridors and buffer zones are becoming key elements in nature conservation strategy.

Reviewing recent developments in ecological networks, Arts *et al.* (Arts, 1995) concluded: "During the last decade, the nature conservation policies in many European countries have been based on landscape-ecological research, especially concerning the role of land use and landscape structure in the survival of species and in the protection of nature reserves. Plan proposals were made to establish ecological networks on local, regional and national scales." There of course is a great link with landscape networks for extensive use by humans.

#### **5 Ecological corridors**

Within ecological networks ecological corridors are various landscape structures, other than core

areas, in size and shape varying from wide to narrow and from meandering to straight structures, which represent links that permeate the landscape, maintaining or re-establishing natural connectivity (Jongman, 1995; Bennet, 1999). Within an ecological network they are mostly multifunctional landscape structures. In Europe ecological corridors are often the result of human intervention in nature: hedgerows, stonewalls, landscapes with small forests, canals and regulated rivers. Others such as coastlines and watercourses are predominantly natural. The nature of ecological corridors and their efficiency in interconnecting remnants and in permeating the landscape depend on the habitat site they originate from and the land use mosaic within which they are embedded in and of which they consist. Their density and spatial arrangement change according to the type of land use. Their connectivity varies from high to low depending on their spatial arrangement, internal structure and management. They are multifunctional by definition; they have functions for: (1) Aesthetics: it makes an area characteristic; (2) Social-psychological well being: attractive living environment; (3) Education: they help to understand and experience nature; (4) Recreation: nature close to housing; (5) Ecology: temporal and permanent habitat and pathways for species.

Ecological corridors are multifunctional in both ecological and societal sense, because they function in the wider landscape. They are also found in most of the American "Greenways". In their classification they can be as wide as a watershed or as narrow as a trail (Florida Greenways Commission, 1994). They can encompass natural landscape features as well as a variety of human landscape features and are from more natural to more cultural classified as: landscape linkages, large linear protected areas between large ecosystems including undisturbed rivers; conservation corridors, less protected and in many cases with recreational functions, often along rivers; greenbelts, protected natural lands surrounding cities to balance urban and suburban growth; recreational corridors, linear open spaces with intensive recreational use; scenic corridors, primarily protected for its scenic quality; utilitarian corridors, canals, powerlines that have an utilitarian function but serve natural and recreational functions as well; trails, designated routes for hikers and outdoor recreation having a function as natural corridor as well.

This classification shows clearly the potential multifunctionality and morphological diversity of greenways and ecological corridors.

The more complex a corridor is, the better it can function for different species groups and the more it is multifunctional in an ecological sense. A high immigration rate can help to maintain species number, increase metapopulation size, prevent inbreeding, and encourage the retention of genetic variation which can be judged as the main advantage of corridors (Simberloff, 1987). They increase the foraging area for wide-ranging species and provide possibilities to escape predators and disturbances.

The functions of corridors can be various: (1) Dispersal, range extension or redistribution of a population; (2) migration, escape adverse environmental conditions; (3) foraging, movements between nest and feeding grounds; (4) reproduction, movement between winter sites and reproduction sites.

A typology of ecological corridors may be proposed relating to attributes such as shape, position and structure. As an example, in Slovakia the following types have been described (Miklós, 1996): (1) According to their relative spatial position to core areas (biocentres): conjunctive corridor, connecting two core areas; "blind" corridor, no core area in one end (peninsular wedging). (2) According to their structure: continuous corridors, without gaps; interrupted corridors, "stepping stones", "diffusion by jumps". (3) According to their topographic position: on ridge positions, divides of watersheds; in valleys; on slopes (transversal). (4) According to their shapes: line-like (typical example: ecotones); belt-like; belt-like for water flows (as specific type of belt corridors); diffuse (created by a mosaic of different landscape elements without marked direction).

However, corridors also can have negative influence such as the breaking of isolation that is needed for some species, exposing populations to more competitive species, the possibility of spreading of diseases, exotic species, and weeds, disrupting local adaptations, facilitating spread of fire and abiotic disturbances and disruption of local adaptations (Noss, 1987). Nowadays practice shows however, that transports by man are much more important for dispersal of unwanted species.

## 6 Barriers

Since the last century the balance between nature and other land uses has been disturbed. Planning of ecological corridors is a method for compensation of the fragmentation process in cultural landscapes. A network can meet all kind of barriers. Increasing traffic and intensifying agriculture made the European

cultural landscape more open on the one hand and more difficult access on the other. Hedgerows disappeared in intensively used agricultural land, forests became uniform production forests, streams have been straightened and the road-network became asphalted, denser and more intensively used. Last but not least many large and important wetlands have been drained. Canalisation of waterways and the building of motorways however did disturb both the habitat of species as well as their possibility to disperse.

Fish ladders have to be built to make it possible for fish to cross weirs and locks. Road crossings can be made as tunnels or pass-overs. Tunnels are used by small species. Habitat elements must be replaced at the right side of the road and they have to be constructed in such a way that wild species are guided towards the tunnel. Pass-overs or ecoducts are meant for larger species.

## **7 Beyond the twentieth century**

Developments go fast. We cannot look far into the new century. Still we can detect some important trends and issues.

### **7.1 Implementation**

Ecological networks and greenways show a fast development from a few in the end of the 1980s to over forty now. Implementation is starting in a number of countries. The Slovak, the Czech and the Dutch approaches are similar in the sense that they are elaborated in four different hierarchical levels, the national, provincial, municipal, and across the borders. The planning approach is a centralised top-down agreed upon by national governments. Emphasis is now given to regional development of ecological networks. Nearly all plans that have been developed now (Jongman, 1998) have regional aspects and do have instruments at the regional level. Most show linkages with the local level where implementation has to take place. In this context, regional and local has to be considered as a policy level, not as a spatial scale level. Regional is linked with regional authorities between national and local. Local is the level of municipalities.

### **7.2 Intensification and extensification**

In Western Europe possibilities to create ecological networks provided by the temporary marginalisation process have not been utilised due to resistance from agricultural lobbies. In Denmark e.g. there is a consensus between the agricultural and environmental ministries that agriculture in the temporary marginalisation process should not give up land for purposes of conservation but be ready to extend production in case of more prosperous times for agriculture to come in the future. In Denmark only lately ecological networks are based on a more offensive strategy as to double the areas of forests. More offensive ideas for channelling marginalisation of agricultural land into networks of corridors along e.g. boundaries and watercourses have not been implemented yet (Agger, 1987).

### **7.3 Public involvement and support**

To our knowledge there are different historical preconditions for public involvement. One essential difference to mention is that in some countries nature conservation has partly the objective of creating public access to nature, while elsewhere the conservation of nature is the most important objective. In Russia the objective has been to exclude the public from the "Zapovedniks". This is now changing with the establishments of national parks and the yearly public arrangements of "March for Parks". In the UK the definition of national Parks mentions explicitly recreational use, while in the IUCN definition and in the German definition strict protection has been used as the most important feature of national parks.

In the Netherlands the approach dominated by nature conservation authorities in the implementation phase has turned the debates in on itself instead of broadening out the debates towards network planning and co-operation with other actors in the field (Lammers, 1996). The Danish counties have so far also had difficulties in co-operation with actors involved on the local level. In Flanders the failure to broaden out the values has led to strong political opposition in the phase of implementation (De Blust, 1995). It should be an important lesson for the next century, that development of greenways and ecological corridors can not happen without public involvement. The more successful you are the more results you will gain.

### **7.4 NGO's and grassroot groups**

Local NGO's and grassroot groups are important everywhere as actors who care for nature and as guardians when nature protective legislation is violated. They are also important actors who can promote knowledge and mediate between expert discourses and lay discourses, and between the national level and local communities. In Eastern Europe the role of the NGO's as a legitimate and effective partner, on local, regional and national levels. Especially on the local and regional levels they fill out gaps of lacking

nature conservation as well as democratic institutions. In some regions NGO's together with some scientific institutions fill out functions that in Western Europe is taken in hand by long established institutions, which e.g. is seen in Moscow, Poland, Czech Republic and Slovakia. They develop slowly into well established institutions.

### 7.5 Decentralisation

The whole territory of Europe is diverse in natural conditions, regional development, administration, regulation, and protection of nature. In some countries a national centralistic top-down approach concerning nature conservation and planning seems a well working system, although serious obstacles for implementation on the lower levels are reported as well. In other countries a unified national approach will be hard to achieve and maybe it would not have any practical sense. Especially in Russia the area in question includes such a huge and partly unknown diversity concerning both natural and cultural features that a national approach would be unachievable within a limited time period. This is due to the fact that planning or nature conservation management has to be based on a decentralised framework. Spain, Italy, Denmark, and Germany are as well examples of mainly decentralised approaches. In a number of other countries (UK, the Netherlands) a decentralisation process is ongoing. The consequence of the decentralised position of nature conservation in Europe includes that international co-operation in the future is not only a matter of countries, but also of autonomous regions, Länder, provinces, districts, cantons and amte, or whatever the level and the name is of the responsible region. This makes co-operation more complex.

### 7.6 Functions, scale and monitoring

To clarify which sites and parts of the area should be included in the ecological network we need in location to ask the questions, what, where, and how. This has to be done on different levels from the estate, the local, community, national etc. What is the need and what will we potentially save—and what will not be saved? Where are we locating the network, and how will it function and dysfunction? However, no single theory, no single scientific concept or planning concept can be taken as representative. In general our available knowledge is not sufficient to predict in detail, what are the advantages and disadvantages. Further research will be needed all the time, which again will develop, and specify scientific criteria, Red Lists, and location of ecological networks and especially the combined function of ecological corridors and greenways. They can have potential advantages in the objective of saving biodiversity and involving the public. However, it is important to consider the potential disadvantages too.

The design of ecological networks is based on concepts, within certain scientific and planning traditions, mediating specific values, traditions, and relations of power. Specific concepts are selective and will usually only be valid under the specific circumstances they were created. The elaborated ideas of a national ecological network give little sense on a national scale in Russia and would not within the time limits of next generation be given the large amounts of funding that is needed. The more comprehensive ecological networks of the relative sparsely populated Estonia and Lithuania will certainly be more easy to implement there, than it would in Denmark, The Netherlands or Poland.

## 8 Conclusion

For the future development of greenways and ecological networks as a strategy for developing and maintaining multifunctionality we can draw some conclusions:

Implementation of ecological networks and greenways is possible through the integration of nature conservation objectives into the economic sectors of agriculture, forestry and tourism.

Instruments for implementation should especially be developed at the local and regional levels.

We can learn much from European experiences and exchanges; it is important to exchange and share experiences and disseminate results.

Trans-disciplinary research programmes are important concerning understanding of the value and function of landscape diversity, its perception and the conservation of nature within Europe.

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