

Committee of experts for the development of the Pan-European Ecological Network

*Report on the implementation of the Pan-European
Ecological Network, The Netherlands, 2005*

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landbouw, natuur en
voedselkwaliteit

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Foreword

The first Nature Policy Plan of the Netherlands was adopted by Parliament in 1990. One of its main objectives was to create a National Ecological Network. This network should be in place by 2018. Its aim is two-fold: to increase nature areas' carrying capacity (increasing the area and improving habitat quality) and to increase the coherence of nature areas by connectivity.

This is to be realised by increasing the area devoted to nature from the 450,000 ha, which existed in 1990 to almost 730,000 ha in 2018. In addition, ecological linking zones will be constructed and infrastructure barriers removed where possible to reduce fragmentation. The Netherlands has reached the halfway planning stage and more and more projects are being implemented. With nationwide public and political support for the second Nature Policy Plan, Nature for People, People for Nature, the realisation and sustainable management of the National Ecological Network seem to be guaranteed.

The National Ecological Network is part of the Pan-European Ecological Network (PEEN). This report was drawn up at the request of the Council of Europe and describes the current situation in our country.

I am pleased to present you this Pan-European Ecological Network Assessment Report for the Netherlands.

Dr J.A. Hoekstra
Director Department of Knowledge

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1 What Ecological Network(s) are identified or planned in your country at national and sub-national level?

a. National level:

Yes / Network-id: NL001

b. Sub-national level:

Under development, as building blocks for the National Ecological Network. Not elaborated in this report.

c. Name:

Nationale Ecologische HoofdStructuur (Dutch Ecological Networks). In this paper we will use the abbreviation “EHS” when we mean the Dutch Ecological Networks.

d. Location:

The Netherlands

e. Responsible Authorities or Organisation(s):

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f. Main characteristics (summary):

Nature in the Netherlands is characterised by a large variety of natural and semi-natural ecosystems within a short distance from one another. This variety is typical of the Dutch countryside, which has evolved as the result of interaction between man and nature. The Dutch countryside is an inextricable part of a larger whole. The Netherlands is, for example, a junction of many migratory bird routes: our nature areas form an essential and indispensable link in the protection of birds. In a densely populated country like the Netherlands, space is a scarce commodity. More than 16 million people live, work and spend their leisure time in a small area – largely below sea level. The Netherlands also wants to protect and maintain its biodiversity, also for generations to come.

Fragmentation and deterioration of the countryside and environmental quality. The major changes in land use since the early 20th century have badly affected the quality of nature in the Netherlands. The area devoted to nature has halved from around 900,000 ha in 1900 to 450,000 ha in 1990. This was caused by the great pressure on open spaces. Initially from agriculture and forestry but over recent decades from housing, jobs and more infrastructure. As a result, nature areas became fragmented and damaged by acidification, over-fertilisation, water depletion and soil pollution (heavy metals). Spatial coherence between nature areas disappeared. Natural habitats of plants and animals were often dissected by rail tracks, roads and waterways, which caused them to become smaller and increasingly isolated. Small habitats also suffer more from side effects, which further deteriorate their quality. The demand for nature has increased a great deal over the last few decades as a result of changes in the ways in which people spend their leisure time, increased prosperity, urbanisation and an ageing population. People want nature closer to home without barriers or borders. Nature to enjoy, to walk in and cycle through.

The objective of the National Ecological Network is two-fold: to increase nature areas' carrying capacity (increasing the area and improving habitat quality) and

to increase the coherence, or connectivity, of nature areas (increasing network density and permeability).

g. Total area and proportion of country covered by the EHS

	total	%
The Netherlands:	4,100,000 ha	100 %
Existing nature areas:	45,3500 ha	11,06 %
Nature areas still to be developed:	151,500 ha	3,70 %
• <i>nature development areas</i>	51,500 ha	
• <i>nature reserves</i>	100,000 ha	
Robust links	27,000 ha	0,66 %
Areas under management contracts (agri-environment schemes)	90,000 ha	2,20 %
Wet landscapes	6,500 ha	0,16 %
Total area EHS (excl. large waters and rivers)	728,500 ha	17,77 %
North Sea, large waters and rivers	6,300,000 ha	
Total area EHS	7,028,500 ha	

h. Relationship with other Ecological Network(s):

Central government provides much of the funding of the National Ecological Network as it aims to foster the preservation and development of biodiversity. In consultation with the parties involved, provincial authorities, steered by the government, draw up zoning plans indicating the boundaries of the Ecological Network and the type of nature to be developed. These plans do not only take into account the extent of the area involved but also their quality (i.e. the correct ecological principles).

750,000 ha in the Netherlands has been designated under the Habitats Directive and over 1,000,000 ha under the Wild Birds Directive. The designated areas sometimes overlap and include IJsselmeer, Wadden Sea and the North Sea coastal zone. They make up 1,113,400 ha of Natura 2000 area, almost all of which come under the National Ecological Network.

i. Link to PEEN (and its guidelines):

For a number of years now the Netherlands has been working on the National Ecological Network. A network of ecologically connected nature areas, including not only large continuous nature areas, but also the hot spots that support species unique to the Netherlands. 'Robust links' are created to link all these areas up and allow species to range from one area to another, which increases their chance of survival. The National Ecological Network should be in place by 2020. To realise this, clear quantitative and qualitative goals have been formulated, which pay considerable attention to the necessary environmental conditions required. With this network, the Netherlands aims to achieve the conservation of biodiversity on its own soil.

The Netherlands also works towards establishing a Pan-European Ecological Network (PEEN) by 2020. This will connect all European hot spots and afford them adequate protection. The areas that are part of the National Ecological Network in the Netherlands will link up with the Pan European Ecological Network. EU members and the candidate countries can make significant contributions to this network by designating Natura 2000 areas on their territory. Natura 2000 areas are legally protected nature areas designated under the EU Habitats Directive and Wild Birds Directive. Protection can also be ensured through management agreements and land purchases.

Non-EU countries that have signed and ratified the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention)

can grant areas a protected status under this Convention. In 1996 an Emerald Network was set up as part of its implementation. Areas can also acquire a protected status under the Pan-European Biological and Landscape Diversity Strategy (PEBLDS). The PEBLDS has been accepted as a policy instrument by all European countries and the UN.

The strengths of the PEEN are the cross-border corridors, the buffer zones and the identification of European core areas. The goal is to incorporate the network into a legal framework, similar to that which characterises Natura 2000 and the Emerald Network. In this way, a cohesive and functional Pan-European Ecological Network, including oceans and coastal areas, will be realised.

j. Mapping procedure and availability:

Description of the mapping procedures (methodology, scientific background layers etc.), including reference to available GIS-layer(s) and an identification of the mapping scale, projection and projection parameters should be entered in this paragraph.

GIS layer(s):	EHSNETTO_03_2005
Mapping scale:	1:10,000
Type:	ArcGIS shape file (ESRI)

Projection and projection parameters:

Coordinate System:	Horizontal control network (<i>Rijksdriehoeksmeting, RD</i>)
Projection:	Double Stereographic
False Easting:	155000.000000
False Northing:	463000.000000
Central_Meridian:	5.387639
Scale_Factor:	0.999908
Latitude_Of_Origin:	52.156161

Relevant areas have been selected by specialists. These are entered in a GIS-layer with the aid of another GIS-layer with the Top 10-Vector data set, a 1:10,000 core database made by the Ordnance Survey (TDN).

Related GIS-layer:	RV_06_2004: Robust Corridors, linking up network areas
Related GIS-layer:	Natura 2000: all Wild Birds and Habitats Directive areas in the Netherlands

k. Reference to Web-site

http://www9.minlnv.nl/servlet/page?_pageid=573&_dad=portal30&_schema=PORTAL30

As the website is still under development it only gives an introductory text and is therefore not very helpful yet to get a full understanding of the EHS.

l. Publications

- Nature for People, People for Nature, Policy document for nature, forest and landscape
- National Spatial Strategy
(<http://www2.vrom.nl/notaruimte/engelsesamenvattingnr.pdf>)
- 'De Ecologische Hoofdstructuur, vitaal en verbindend' (booklet, only in Dutch)
- Interactive game on the National Ecological Network (on CD-Rom, only in Dutch)
- DVD about the National Ecological Network (film in Dutch and English)
- Working paper on Ecological Networks, Experiences in the Netherlands, 2004
- International Biodiversity Programme of the Netherlands 2002 – 2006 (BBI)

2 What are the general goals of and motivation (scientific as well as strategic) for the Ecological Network and the degree of success in achieving these goals?

2.1 General goals

2.1.1 Scientific

The Dutch concept of the National Ecological Network is based on a variety of scientific theories. We describe three of these below.

Island theory and metapopulation model

The first is the 'island theory', originally developed by McArthur and Wilson and later expanded with the metapopulation model by Alterra. The crux of both theories is that a sustainable preservation of species (and thus ecosystems) is only possible if local species extinction is compensated by recruitment from elsewhere. The extinction of local populations (in a forest parcel or a pond, for example) is a natural occurrence. Extinction can be accelerated by poor conditions (e.g. caused by pollution or natural calamities such as fire). It does make a difference whether or not a species can get away on time, or can survive as seed, so that it can recolonise the area at a later stage. For non-flying species, actual corridors can facilitate this migration to other areas and their return to the original habitat. In other words, linking zones are vital, as are large nature areas containing different ecosystems (e.g. woodland and heath). For many species, it is easier to recolonise a heath, which had been unsuitable for a while from a neighbouring heath in the same nature area, than to have to cross roads and/or farmland to return to the original heath. In short, the island theory proposes that local extinction is simply a fact of life caused by process of coincidence and that these processes have more influence in small, isolated areas ('islands'). The metapopulation theory adds that species often survive in a network population and it is therefore important to maintain the links between the different components of the network in order to maintain its effectiveness (i.e. a combination of core areas and linking zones).

Space for natural processes

Second, it is vital to provide sufficient space to allow natural processes to run their course. The 1990 Nature Policy Plan (and its Nature Development background document) first recognised the importance of natural, landscape-shaping processes for the sustainable preservation of ecosystems. Examples of such processes are inundation, soil or sand dispersion and grazing. It was found that many areas could be managed less intensively and with less attention to detail without losing natural values. On the contrary, new natural values developed or became established (such as in the Oostvaardersplassen reserve). Space is an important precondition for this: these processes will only function well in large areas, which are not fragmented. One of the main reasons to support the creation of large core areas is the importance of providing space for these natural processes.

Keeping out external negative effects

Third, it is important that external negative effects are kept out as much as possible. In the 1980s people began to realise that adequate management in the areas was not enough to preserve nature areas for the long term. It was also important to combat acidification, eutrophication and drying out. There are two approaches to counter these negative effects: generic and area-specific. A generic approach, for example, aims to reduce the 'background deposition' of nitrogen. The effect of this measure should be the same in a large or small area. Area-specific policy focuses on the zones where agriculture and nature meet. Clearly, small nature areas, or reserves with a 'jagged' boundary have a relatively larger perimeter. This means that they are more exposed to external influences. The aim of both nature conservationists and polluters should be to minimise the contact zone. This is easiest in large areas, which can be seen clearly on the 1990 map of the National Ecological Network.

2.1.2 Strategic

Introduction

According to the Nature Policy Plan, the National Ecological Network is a coherent network of nationally and internationally significant ecosystems to be preserved in a sustainable manner. This definition also underscores the goal of the National Ecological Network: to maintain and preserve for future generations ecosystems of national and international significance. The coherent network is the means by which this objective will be achieved.

The goal of the National Ecological Network agrees with the general goal of nature policy: the sustainable maintenance, restoration and development of natural and landscape values.

A closer analysis of the definition follows below:

- *The National Ecological Network was designed for ecosystems, not for individual species.* In other words, the National Ecological Network is aimed at more or less complete ecosystems made up of interdependent species and their physical habitat (soil and water). The network is not intended for the conservation of specific species outside a well-developed ecosystem. The latter aim is pursued by the species policy laid down in the Nature Policy Plan. Species policy complements the National Ecological Network policy and aims to preserve species whose sustainable survival is not guaranteed by the network (these mostly tend to be species that traditionally occur in farmed and/or urban areas). The Nature Policy Plan gives a general indication of which ecosystems are important in the ecological network. This was worked out systematically in the *Handboek Natuurdoeltypen in Nederland* (1995, revised 2001). This practical guide described the whole range of nature types addressed by nature policy. Area targets for these nature types were laid down in memorandums.
- *The definition refers to the preservation of ecosystems.* In practice, this also comprises the restoration and development of ecosystems. In practice, this aim is pursued through funding of routine management, effect-driven measures, transformation and nature development.
- *The definition states that preservation should be sustainable.* Sustainable in this context refers to creating good conditions to safeguard natural values for future generations. In other words: the policy is aimed directly at long-term effects (and would benefit from long-term stability). It not only pertains to the preservation of ecosystems or biological communities, but also aims to create the right conditions (soil, water, spatial planning, management) to make preservation possible. The memorandum *Nature for People, People for Nature* stressed the importance of the condition of public support.
- *Of national and international significance.* The National Ecological Network areas should be distinct from areas that are only locally or regionally significant. The level of significance is determined by means of the international importance of the various species. This is accumulated to ecosystem level. Species occurring on the National Red List are important quality criteria for preserving ecosystems.
- *The National Ecological Network is a coherent network.* This means that the network is made up of different components that are linked up and thus function as a coherent network.

Two other aspects, which are not mentioned in the definition, are also important. These aspects are mentioned in the network policy. They are:

- The National Ecological Network aims to cluster low-dynamics functions. This appeals strongly to spatial planners and landscape architects, who believe that the landscape should be structured according to the shell concept: functions with a high dynamic (living, working, modern agriculture) contained within a network of low-dynamic functions (nature, forestry, extensive agriculture). This also agreed with the Ministry's own wish to link up nature conservation and extensive agriculture (initiated by and laid down in the 1975 *Relatienota*). In practice, however, the two approaches (the definition and the shell concept) do not always lead to the same result.

- With the National Ecological Network, nature policymakers aimed to achieve more than the preservation of biodiversity alone. This policy is also aimed at: enhancing the aesthetic value of nature, providing nature in and around cities, providing recreational opportunities and guaranteeing a minimum level of self-sufficiency as regards timber.

The network concept of the National Ecological Network: core areas and linking zones

The National Ecological Network as charted in 1990 consists of core areas, nature development areas and linking zones. The map only gave a general indication of where the network was to be (a 'gross' map); further specification was necessary. By 2018 at the latest, it will have to be clear where exactly in the shaded areas nature is to be a main function or a secondary function. In addition, the exact situation and size of the linking zones must be laid down.

The difference between the gross and 'net' (final) area can be explained by the fact that nature is not (yet) a function on agricultural land and that built-up areas and infrastructure also diminish the area for nature.

In nature development areas, there is very little nature at the outset. These areas are made up of farmland with very little natural value. Thirty per cent of these areas, a total of 50,000 hectares, will be developed into core areas for nature. By 2018, these areas will all have become core areas.

The National Ecological Network, as mapped in the Nature Policy Plan and the Structure Plan for the Rural Areas, is made up of a limited number of large areas with a robust delineation. This is no guarantee, however, that the actual network will have the same clean lines and robustness.

In realising the National Ecological Network, every effort should be made to realise core areas with a minimum size of 250 ha. This is a general guide that applied to the 'gross' map for areas that consist entirely of existing nature. Areas where new nature is to be developed should not be smaller than 500 ha. This approach was a continuation of older policy ideas dating from the 1970s and 1980s for national parks, large nature areas, large landscape areas and so on. A scientific theory was now introduced to back up this approach.

Linking zones

A loose collection of core areas does not make a network. The areas need to be linked up. These linking zones are also shown on the map. Initially, the linking zones were only intended as wildlife corridors for otter, badger, deer and three species of migratory fish (sea trout, river trout and salmon). These are all species whose survival depends on a nation-wide network of nature areas for their survival.

In the realisation of the linking zones, it was often decided that these should serve multiple aims. This was because most linking zones are ecologically meaningful in a much broader sense, and also the image of everything being connected raised a lot of enthusiasm that was defined more specifically in the memorandum Nature for people, people for nature (2000). This policy memorandum introduced two new supplements for the ecological linking zones established by the provincial authorities: an interlacing network of green and blue and robust nature links. The interlacing network of green and blue was to be made up of fine links of land or waterways to be used by a few relatively mobile species, aimed at enhancing the natural quality of the rural areas. Robust nature links were wider-than-normal ecological linking zones that could in theory be used by all the species on both sides of the link. Robust nature links were not just wildlife corridors, they were more like a new form of nature development.

The importance of natural quality

Sustainable preservation, restoration and development of nature requires more than a straightforward expansion of nature area. The problem of declining biodiversity is related to some degree to *decreasing nature area*, but it is not the sole reason. Another important cause has been the simultaneous *decline in the quality* of remaining areas (farmland, nature areas and water), caused by pollution, fragmentation and poor management.

The main conclusions are:

- The focus of the National Ecological Network is on complete ecological communities in which all the potential species for that ecosystem actually occur.
- There should be no barriers to these species to establish or maintain a population in the network.
- Many barriers are created by man, but can also be removed by us. At the moment, we are still creating more barriers than removing them.
- The result is that nature in our country consists primarily of ‘non-saturated communities’: communities made up of small groups of species that are relatively immune to the various stressors in their habitat (species, in other words that are fairly robust and not fussy about their habitat). This process has occurred in varying degrees and differs from one area to another.
- The aim to create more complete biological communities is a priority of nature policy. Nature type targets are aimed at specific species (species which the government has prioritised in its nature policy because they are threatened and/or because the population in our country is important for the survival of the species internationally).
- Optimum nature management should seek a balance between the different needs of the different species. It is not right to give a handful of species excessively preferential treatment at the expense of other species in the ecosystem.

In order to make nature more complete, restoration measures (effect-driven measures) are necessary next to enlarging and connecting areas. Also, management must be aimed at maintaining nature and populations. In recent years, these type of management measures have produced some spectacular successes as well as some failures. Both types of outcomes provide lessons to be learnt.

The aim of effect-driven measures is to restore as best as possible ecosystems that have been damaged by acidification, eutrophication and/or drying out, at least until such a time as these environmental problems are erased. Effect-driven measures include dredging fens and mowing the heath more frequently. It can be hard to differentiate effect-driven management from routine nature management aimed at maintenance; in general, it can be said that effect-driven measures tend to be more intensive or frequent than routine management tasks.

Implementation strategy

The provincial authorities play an important role in working out the details of the National Ecological Network. The network can only be assured a place in spatial planning via regional plans and municipal zoning plans. The provincial authorities also decide which areas will be earmarked for inclusion in the network and which privately owned nature areas qualify for a subsidy under a private land management scheme.

According to the National Spatial Strategy, the National Ecological Network is made up of existing nature and woodland, estates, new nature areas (nature development areas, reserves, management areas), robust nature links, large bodies of water and the North Sea. The delineation of the robust nature links has not yet been completed, and functions have yet to be designated to some nature areas.

The current situation is as follows:

- New nature areas and so-called ‘Network hectares’ have largely been included in the ‘gross’ National Ecological Network.

- The provincial authorities have given considerable attention to the linking up of nature areas. There has been less attention for increasing the size of the core areas, so that the National Ecological Network has a finer structure and is less robust than originally intended. Some of the linking zones were not designed or do not work for the target species defined in national nature policy. According to the National Nature Balance (2000) (an annual evaluation of nature policy in the light of ecological and social developments), linking zones should be no more than 3 km long in order to be effective and should hook up with spatially coherent core areas. Many of the linking zones mapped by the provincial authorities do not meet this criterion (yet). Their effect on the overall functioning of the National Ecological Network thus varies (for that reason, some of the linking zones were redefined as robust links in the new policy).
- The side-effect of all this is that nature has a much larger contact zone with the surrounding farmland and infrastructure than originally foreseen. It therefore takes considerable effort to adequately protect the nature in the nature areas from negative external environmental influences.
- As regards the substance of the National Ecological Network, the Ministry of Agriculture, Nature and Food Quality and the provincial authorities have concluded that the right nature targets have been chosen, in consideration of the network's spatial structure. Two things must be kept in mind, however: large-scale, self-regulatory nature areas are less evolving as planned (mostly because of the many infrastructure barriers), and water and environmental policy will be essential for the realisation of the nature quality targets.

2.2 Degree of success

- High x

2.3 Comments as regards the degree of success (with reference to the term 'adequately conserved')

The National Ecological Network is part of the National Spatial Strategy. The Dutch Government is therefore committed to its realisation. Half of the network is now in place and is a success mainly in terms of quality. It is only a matter of time before the network has been realised to its full potential quality.

3 What is the main scientific basis for the development of the ecological Network: species, habitats, ecological functions or natural physical processes, etc?

3.1 Main scientific basis:

- species x
- habitats x
- ecological function x
- natural physical processes x
- other: (e.g. recreational) x

3.2 Species, habitats, ecological function and natural physical processes

The theory behind linking up and enlarging nature areas.

Even if habitat conditions are good in general, species are known to become extinct. This is often the result of poor conditions of a temporary nature such as droughts, flooding, fires, mowing etc. Various studies have revealed more about species' requirements and have shown such short-lived unfavourable conditions can be overcome and populations can survive provided a species' habitat is large enough. But it is not just size that makes a habitat suitable. It should also be linked up to other areas: if part of a population becomes extinct in one place, it is important that recruitment can take place from elsewhere to keep up population numbers. The table below shows the maximum allowable distances between habitats necessary for the various species to survive.

Table 1 Criteria for habitats and species

Species	Max. allowable distance between habitats	Barriers
Large birds	1000 m	-
Medium-sized birds	500 m	-
Small birds	200 m	-
Large mammals	1000 m	Motorways
Small mammals	0-200 m	Motorways, smaller roads
Flying insects	0-100 m	Motorways, smaller roads
Walking insects	0-100 m	All metalled roads

(Source: background report *Natuurverkenning '97* no 8)

This theory was used to determine the habitat size and links required for different species.

In drawing up policy, target species were used as reference point for the ecosystems that nature policy aimed to realise. This also enables calculation of the minimum area required to establish long-term habitats for species that are dependent on a given ecosystem. These calculations were made for the whole range of nature types described in the *Handboek Natuurdoeltypen*.

Examples:

Nature targets have been defined at landscape element level: a brackish tidal creek (along the Westerschelde), chalky grasslands (Zuid-Limburg) and a woodland area on poor sandy soil (Veluwe). Most target species in brackish tidal waters seem able to survive in very small areas. This means that, given the right environmental conditions, saturated communities can exist in very small areas. Target species in woodland, however, have very different requirements and as a result saturated communities can only be found in very large woodland areas. Chalky grasslands are in between. In the Netherlands chalky grasslands generally cover no more than a few hectares: given this size, their fauna can only be incomplete even with the best possible management.

Other nature targets were defined at landscape level. A salty tidal landscape like the Wadden Sea may support a reasonable number of species even in a small area but complete communities would have to include seals and raptors, and require larger areas. A dynamic river landscape (like *Gelderse Poort*) supports species adapted to a dynamic environment: they possess expansion potential, which is why they do not need a very extensive area. Species of heath and woodland areas on sandy soils however (in the south-eastern part of the Veluwe) can only cope with slowly changing conditions. These species therefore need quite extensive areas to overcome bad periods. Thus a representative heath and woodland landscape must always be quite extensive.

Non-saturated communities

An ecosystem consists of a biotic component (a living community) and an abiotic component (soil, water, air). A community embraces all interacting organisms living together in a specific habitat. Their interdependence can be expressed in terms of feeding relationships (food web) or in descriptive terms: plant community, fish community.

Communities thrive in ideal conditions. If a community supports all potential species we speak of a saturated community. Saturated communities can only come about in the absence of obstacles to species' establishment and survival, such as detrimental abiotic conditions or inadequate vegetation structure, habitat size and accessibility. Obstacles are often man-made (damaging effects of land use: housing, infrastructure, or of agriculture, forestry, fisheries) but the right nature or planning policies may help to remove them.

The balance has not yet been redressed and many nature areas in the Netherlands are non-saturated communities: communities consisting of small groups of species that can cope relatively well with stress factors (hence do not make great demands on the habitat that supports them).

The importance of distinguishing between non-saturated and saturated communities should not be underestimated. Nature is all too easily discussed in abstract terms, without much attention being paid to quality. Or quality is too much evaluated from associated factors such as environmental quality, while nature quality is a result of several influences. In other words: nature policy should not be satisfied with heath land that is simply 'purple' or 'clean'.

To realise more complete communities, priorities have been drawn up to formulate the desired quality for the different types of nature objective. A wide range of aspects is described, but the priorities concentrate on the occurrence of target species.

It is not necessarily the case that all species in a community suffer from a specific stress factor like intensive agriculture. Some species can indeed profit from this, for instance grazing geese and meadow birds on agricultural grassland. But we do have to realise that a high density of these species alone does not reflect successful nature policy, because other species may disappear under these conditions. An optimal nature policy attempts to find a balance between the conditions required by *different* species, without excessively favouring a limited number of species to the detriment of the majority of other species in the community.

This does not mean that a small area with a large set of target species is not interchangeable with a large area of agricultural land with a limited set of target species, even if the area were to be multiplied with a proportionate number of accompanying species and the end result is the same. In other words: to maintain biodiversity, one hectare of scrubland with many target species is not, for instance, equivalent to 100 hectares of rye grass meadow with oyster catchers and geese.

4 Recreational objectives

The National Ecological Network is also very important for extensive forms of recreation (walking, hiking, cycling, horse riding etc.). One of the national goals is a free access to about 90% of its territory.

5 What is the legal basis for the creation and implementation of the Ecological Network?

The Spatial Planning Act (*Wet op de Ruimtelijke Ordening*) and the Nature Conservation Act (*Natuurbeschermingswet*) provide for the protection of existing nature areas and ecological development areas.

6 What is the timing in the planning of the creation and evaluation of its implementation?

- **Timing** in the planning of the creation of the Ecological Network:
 - 1990 – 2020 (2018 technically realised).
- **Evaluation of the implementation**
 - Planning by the provincial government: on time (except the planning of the so-called robust ecological connections).
 - Spatial implementation by provincial government: on time; by local government: delayed.
 - Expanding area by acquisition: on time.
 - Expanding area under private contracts: delayed but in progress.
 - Expanding area under agri-environmental contracts: on time.
 - Realisation abiotic conditions (environment, water): delayed but in progress.
- **Some notes about the evaluation of the implementation**

The present government has made some changes in the way the land for the EHS is to be acquired and managed. Private landowners and farmers have a bigger role here and there will be more room for privately managed wildlife and landscape. So far, however, private management has had very limited success and land acquisition under on-farm conservation schemes is tailing off.

Lowland forest and fenland ecosystems will remain highly fragmented even after the EHS has been established. The spatial coherence of forest and woodland ecosystems on the higher grounds has further improved. The policy document 'Nature for People, People for Nature' proposed the construction of robust corridors to link the large nature conservation areas together, but so far progress has been slow. Initially provincial councils were uncertain about the level of government grants available for the corridors, but the Ministry of Agriculture, Nature and Food Quality and the provinces have since come to an agreement, allowing implementation to proceed.

In recent years water quality has improved but environmental quality in many areas still needs further improvement to bring the quality of nature reserves and conservation areas up to the levels intended by policy. In recent environmental policy documents, though, the target date for the realisation of quality objectives in parts of the EHS has been moved forward. 'Nature for People, People for Nature' (2000) sets 2018–2020 as the target date for when environmental quality should have reached a level at which it forms no obstacle to establishing the ecological objectives within the EHS. In the recently published *Agenda vitaal platteland* (Agenda for a Living Countryside) the target date for areas under the Habitats and Birds Directives is set at 2015. Areas under the Water Framework Directive should reach their target by 2027.

7 What are the research efforts for the establishment of an Ecological Network?

Research efforts (a selection):

- Bal *et al*, 2003, Handboek Natuurdoeltypen.
- Bauchau *et al*, 1998, Survival of Spoonbills on Waddensea Islands, *Journal of Avian Biology*: 29: 177-182,
- Bennett, G. *et al*, 2001: The development and application of ecological networks: a review of proposals, plans and programmes, IUCN and AIDEnvironment, Amsterdam,
- Bennett, G., 2004, Integrating Biodiversity Conservation and Sustainable Use (IUCN).
- Beijer *et al*, 1998, Do habitat corridors provide connectivity? *Conservation Biology* 12: 1241-1252,
- Bouwma *et al*, Z.J. 2003, Ecological Networks: linking protected areas with sustainable development, Wageningen,
- Broekmeyer, M. (ed.) 2001: Handboek robuuste verbindingen, Wageningen/ Den Haag,
- Brink, F. *et al*, 2003, De Levende Natuur: Themanummer Ecologische Netwerken,
- Foppen, R.P.B. *et al*, 2000, Corridors of the Pan-European Ecological Network: concepts and examples for terrestrial and freshwater vertebrates, Alterra and ECNC, ECNC Technical Report, ECNC, Tilburg,
- Foppen, R. 2001, Bridging gaps in fragmented marshland, (Dissertation)
- Hootsmans, M. and H.Kampf, 2004, Ecological networks: experiences in the Netherlands, Ede/ Den Haag.
- Jongman *et al*, 2001, National and regional approaches for ecological networks in Europe, CoE, Strasbourg.
- Jongman, R. (ed), 2004, Ecological networks and greenways – Concept, design, implementation, Cambridge studies in Landscape Ecology Vol,1, Cambridge, UK,
- Klijn, J.A. *et al*, 2003, The indicative map of Pan-European ecological network, ECNC, Tilburg, The Netherlands/Budapest, Hungary.
- Ministry of Agriculture, Nature and Food Quality, 2003, Strategic Round Table on the Role of Protected Areas and Ecological Networks in Biodiversity Policies, Den Haag,
- Opdam, P. 2002, Assessing the conservation potential of habitat networks, Pp, 381-404 in: Gutzwiller (ed,) Concepts and application of landscape ecology in biological conservation, Springer Verlag, New York.
- Pelk, M. (ed), 2000, Schetsboek kwaliteit door verbinden, Alterra en IKC - Natuurbeheer, Wageningen.
- Rientjes *et al*, 2003, Support for ecological networks in European Nature conservation, Tilburg, ECNC.
- Van der Sluis *et al*, 2004 (in prep): European priority species and European corridors, Wageningen.
- Van Opstal, A.J.F.M., 2000, The architecture of the Pan-European Ecological Network: suggestions for concept and criteria, Wageningen.
- Vogelbescherming Nederland, 1999: Lang leve de Lepelaar, Zeist,
- Vos, C., 1999, A frog's-eye view of the landscape: quantifying connectivity for fragmented amphibian populations, (Dissertation).

8 Planning of the Ecological Network (management, regulations, etc. ...) and evaluation of its implementation

- **Planning.**
National policy lays down a qualitative framework, provincial authorities determine the borders of the National Ecological Network in regional plans, and

local councils determine the exact location of the National Ecological Network by setting this down at plot level in zoning plans. The implementation phase has been reached.

- **Evaluation of its implementation**
High : In 2018 technically realised, now about halfway.
- **Comments to the evaluation**
Surface area on target.
Quality levels increase as implementation proceeds.
The realisation is becoming more expensive with rise of land prices.
Pressure on the environment is still too high

9 Is there any monitoring activity foreseen or planned directly related to the Ecological Network?

The policy document 'Agenda for a living country side' provides for a monitoring and evaluation programme spearheaded by three criteria:

- spatial cohesion of nature areas;
- natural values;
- environmental and water conditions,

Working plans have been developed for all three criteria and by the end of this year (2005) the precise criteria will have been decided and implemented.

Progress reports are published annually in what is known as National Nature Balances, which evaluate the natural quality of areas under nature policy regimes.

10 Are there any partnerships to be identified within the Ecological Network?

Partnerships:

- Government: co-operation between the different ministries (e.g.: Ministry of Transport, Public Works and Water Management, Ministry of Housing, Spatial Planning and the Environment, Ministry of Foreign Affairs)
- 12 provinces and the local communities
- Nature management organisations (GOs and NGOs)
- Farmers' organisations
- Estate owners
- Environmental NGOs, educational NGOs etc.

Various local authorities help develop and execute the National Ecological Network, whilst central government takes on a guiding role. Central government provides much of the funding of the National Ecological Network as it aims to foster the preservation and development of biodiversity. In consultation with the parties involved, provincial authorities, steered by the government, draw up zoning plans indicating the boundaries of the Ecological Network and the type of nature to be developed. These plans do not only take into account the extent of the area involved but also their quality. The lands are managed by farmers (agri-environment schemes), private landowners or nature organisations such as the National Forest Service, the Dutch Society for the Preservation of Nature and the Union of Provincial Landscape Organisations.

11 Financial aspects of the implementation of the Ecological Network (investor, yearly budget, compensation measures, investments in ecological infrastructure, etc.)

Specification for 2005 (in euros x 1000)

Acquisition	robust corridors	14,518	
Acquisition	new nature	59,486	
Acquisition	wet nature	11,563	
	Subtotal		85,567
Construction	robust corridors	1,360	
Construction	new nature	30,857	
Construction	wet nature	13,281	
	Subtotal		45,498
Management	In 2005: 528,387 ha	153,968	153,968
	Total		285,033

Long term budget (example for a few selected years in euros x 1000)

	2004	2005	2006	2009	2018	>2018
Acquisition and construction	101,300	129,829	196,396	214,019	guaranteed	finished
Management	149,981	155,204	161,401	170,743	guaranteed	guaranteed
Governmental budget	251,281	285,033	357,797	384,762	guaranteed	guaranteed

These figures are without the investments, grants etc by provinces, management organisations and others.

12 Education and information efforts: public awareness campaigns including public reactions to the creation of the Ecological Network

Education and information efforts:

- National policy plan: Nature for people, people for nature
- International Policy Programme: Biodiversity of the Netherlands 2002-2006
- National Spatial Strategy (with summary in English)
(<http://www2.vrom.nl/notaruimte/engelsesamenvattingnr.pdf>)
- 'De Ecologische Hoofdstructuur, vitaal en verbindend' (booklet in Dutch)
- Interactieve spel cd-rom EHS (Cd-rom in Dutch)
- DVD about the EHS (film in Dutch and English)
- Working paper on ecological networks: Experiences in the Netherlands
- Press releases, etc.

13 Evaluation of intrinsic conceptual/ecological threats through the creation of the Ecological Network; (importance of isolation for some species, relation to threats from invasive species, etc.)

Evaluation of threats:

The main objective of the National Ecological Network (EHS) is to preserve biodiversity in the long term. To realise this, 27 habitat types have been distinguished which should provide suitable conditions for ca 1000 nature target species of national and international (Natura 2000) importance. A recent evaluation shows that spatial conditions may not be sufficient for 20% of the target species. Part of the problem can be solved by habitat rearrangement. Such measures will be most effective in or in the neighbourhood of core areas. Another measure is expansion by creating robust supraregional corridors. For some species however the problem can only be resolved by linking up EHS areas to the Pan European Ecological Network (PEEN).

Linking up habitats in an ecological network might however be a threat to species living in naturally isolated areas, which could be driven out by more competitive species with similar habitat requirements. This is not a problem in the Netherlands however. Threats from invasive species mostly concern the introduction of exotic species. This problem cannot be resolved by not linking up habitats; one should either accept the phenomenon or take specific measures to reduce these populations of exotic species. Species introduced naturally should be accepted as an ecological phenomenon.

Another threat might be the spread of animal diseases as a result of increasing migration. In some places fences can be erected to keep other species out. But the spread of diseases cannot be eliminated altogether: there will always be migratory birds, for instance.

14 Main conflicts between biodiversity conservation and impacts from other sectors (human activities) within the ecological network as a whole

The main conflicts include:

- Urban development and the construction of industrial estates;
- Infrastructure developments;
- Intensive agriculture;
- Groundwater extraction;
- Benthic fisheries.

Possible solutions (economy – ecology):

- Involving farmers in landscape management;
- Improving water quality;
- Integrating ecological objectives in planning activities: constructing ecobridges, badger tunnels etc.;
- Integrating nature objectives in water management: creating flood plains, more space for rivers; improving sustainable forestry;
- Relocating water extraction areas to the fringes of nature areas;
- Integrating protection regimes in zoning plans;
- Finding partners in NGOs, banks, building co-operations etc.

Other solutions:

- Compensation;
- Mitigation;
- De-fragmentation;
- Creating robust links to enlarge habitats;
- Developing generic nature policy;
- Developing specific nature policy (relocating farms);
- Continuing specific policies.

15 Coordination with Ecological Networks of neighbouring countries and/or regions (trans boundary issues)

- International chapter in the Dutch memorandum Nature for People, People for Nature (BBI-MATRA-grants);
- Benelux partnership ;
- Informal ecological network platform Cleve Meeting (Germany, Belgium, Netherlands);
- Regional cross boundary projects (Interreg, etc.);
- Wadden Sea co-operation;
- Rhine Co-operation;
- Etc.