The Green Main Structure for Flanders

The development and implementation of an ecological network

Geert De Blust, Desiré Paelinckx & Eckhart Kuijken

With only 0.75% of its area being effectively protected, Flanders falls far behind as far as nature conservation is concerned. An ambitious project to establish an ecological network should produce a radical change in this situation. However, a lot of problems are still to be overcome.

Introduction

Flanders is one of the most densely populated regions of Europe, with 420 inhabitants per square kilometre. In combination with the high degree of industrialisation, intensive agriculture and the very dense network of highways, railways and canals, this has resulted in severe pressure being put on the biodiversity and natural habitats of this region. Before the reform of the state, nature conservation in Belgium was among the weakest sectors of government policy. The following circumstances, among others, contributed to this:

- the lack of a tradition in a coherent and effective policy for physical planning and countryside conservation and management;
- the minor importance of a comprehensive rural development compared with urban development;
- the limited capacity of the administration responsible for nature conservation and the absence of effective means to implement a successful policy;
- the absence of a general concern for nature conservation in the other domains of government policy.

It is therefore not surprising that nature in Flanders is in a rather bad state. Nevertheless, Flanders still has some very important habitats and ecosystems that, also in an international perspective, should be protected as effectively as possible. As an example, figure 1 depicts the EU bird directive areas as well as the list of designated important wetlands ("Ramsar sites") in Flanders.

Since the beginning of the fifties, nature reserves have been established by both the state and private organisations. From 1970 on, nature conservation attracted a lot of interest from the general public, mainly as a result of the European Conservation Year. Despite this, the total area of strict nature reserves in Flanders is barely 10,000 hectares (0.75% of its total area). This is a great contrast to other countries in Europe, and also to the extent of valuable habitats in Flanders itself.

From a nationwide survey of ecotopes and an evaluation of their importance for nature conservation, it has been estimated that 8% of the total area is of the highest...
value and 17% of a high value for nature conservation (Kuyken, 1994). From Table 1 it can be seen that whereas the number of nature reserves and the total area of properly managed grounds is increasing, the mean area of the reserves is decreasing.

Towards a new nature conservation policy
Nature conservation policy has so far produced only minor results, and even the increased effort to establish nature reserves and to improve environmental management has not been effective enough to stop the decline of nature. Therefore a new and innovative conservation strategy for Flanders needs to be developed. That new strategy should be based on 5 priorities - to increase the area designated for nature conservation, - to ensure the spatial coherence of zones reserved for nature conservation, - to implement suitable environmental standards within and around nature conservation areas, - to increase public concern and support for nature conservation, - to embody nature conservation goals within the other domains of resource planning.

These priorities are detailed in the Environmental Policy Plan and the Nature Development Plan for Flanders (Ministerie van de Vlaamse Gemeenschap, 1990). Especially the objectives of the Nature Development Plan are well outlined. In that policy document was announced an ecological network for Flanders, the ‘Green Main Structure for Flanders’ (GMSF). Immediately, its publication by the ‘Institute of Nature Conservation together with the administration responsible for nature policy’, started the elaboration of that ecological network.

The GMSF was defined as ‘a coherent and organised structure of sites in which a more intensive policy in favour of nature is recommended’. Within this ecological network, four different zones were proposed: core areas, nature development areas, corridor areas, buffer zones. Recognized as such, but not a part of the GMSF, is the category ‘ecological infrastructure’. This refers to the sum of small landscape elements that together have a particular significance for nature conservation.

The four categories of the GMSF are similar to those of the National Ecological Network of the Netherlands (Ministry of Agriculture, Nature Management and Fisheries, 1990), the Tentative European Ecological Network (Bennett, 1991, Buschf. & Jongman, 1993) and (slightly modified in the starting points of the German ‘Biotopverbundsystem’, worked out at the level of Bundeslander (Bohn et al., 1989).

Table 1

<table>
<thead>
<tr>
<th>Year</th>
<th>number</th>
<th>total area (ha)</th>
<th>mean size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>13</td>
<td>982</td>
<td>76</td>
</tr>
<tr>
<td>1970</td>
<td>12</td>
<td>939</td>
<td>79</td>
</tr>
<tr>
<td>1960</td>
<td>25</td>
<td>1353</td>
<td>54</td>
</tr>
<tr>
<td>1955</td>
<td>26</td>
<td>1417</td>
<td>54</td>
</tr>
<tr>
<td>1950</td>
<td>13</td>
<td>2122</td>
<td>74</td>
</tr>
<tr>
<td>1920</td>
<td>111</td>
<td>2583</td>
<td>23</td>
</tr>
<tr>
<td>1910</td>
<td>127</td>
<td>3172</td>
<td>25</td>
</tr>
<tr>
<td>1900</td>
<td>134</td>
<td>3055</td>
<td>23</td>
</tr>
</tbody>
</table>

Discussion and recommendation by the Council for Environmental and Nature Policy of Flanders and by the Nature Conservation Council, the Forestry Council, the Social and Economic Council of Flanders

The map was prepared making use of region-wide data such as flora distribution maps and maps derived from them (De Boere et al., 1986; Van Rompaey et al., 1979), region-wide surveys of waterfowl, and the Biological Valuation Map (De Blust et al., 1985, 1994). With these documents we analyzed - the size of individual areas having a nature conservation value, - the distribution and density of these areas, - the degree of human influence due to agriculture, industry and urbanisation. The analysis of these criteria was purely qualitative. Different parts of the maps were interpreted and compared with one another.

As a result, we could broadly distinguish between four types of zones important for nature conservation policy (Figure 2) (De Blust et al., 1992):

1. Zones with prominent nature values
These involve either relatively large (in the context of Flanders) nature areas, or zones with a cluster of smaller but very important nature areas. Species of inter-

- Flemish situation, first a general characterization of the spatial features of nature values in Flanders was carried out. Regions were characterized by the size and degree of fragmentation of their nature areas and by the extent of conflicting land use. The resulting sketch map provided a framework in which the categories of an ecological network could be made concrete. Because the instruments by which the future ecological network would be implemented were barely developed at the time, it was argued that this analysis would also serve as an instrument to explore the main policy directions suitable to achieve the nature conservation goals.
est are present at several sites. Core areas in this zone range from 200 to 1,000 hectares. They are not mapped individually. A distinction is made between the higher regions and the alluvial or peider regions.

2 Zones with smaller and scattered core areas and a high density of small nature areas of minor importance. Target species for nature conservation are present at a restricted number of sites. They are often isolated. Land use in these zones is rather varied. The more or less suitable hydrological conditions, the current forestry practice and the often small-scaled landscape provide good prospects for nature development in these zones. Many lowland brook valleys and alluvial plains and regions with distinct topographical variation belong to this category.

3 Zones with a low density of nature areas, which themselves are of reduced quality, scattered about in intensively used agricultural areas.

4 Zones whose environmental quality suffers a very severe impact from agriculture and urbanisation. Only a few isolated natural elements remain.

The general policy goals that were proposed for these categories deal with the hierarchy of planning objects to be pursued and the role that multifunctional land-use can play.

The purchasing of land for nature management agreements and restoration projects were recognized as necessities if the ecological network were to succeed. For a lot of regions, a restructuring of the landscape and a reallocation of land-use types was proposed, so that mutual negative impacts would be prevented and an independent development in accordance with their specific dynamics would be possible (see e.g. Van Buuren & Kerkstra, 1993).

The Green Main Structure for Flanders

The sketch map for the GMSF sets the main directions and goals for nature conservation policy, differentiated for some general zones. The ideas developed so far have resulted in the policy document 'A memorandum for the Green Main Structure for Flanders' (Ministerie van Vlaamse Gemeenschap, 1991). This document was launched to introduce the concept of an ecological network and the different categories of which it is composed. A first tentative ecological network drawn on a scale of 1:250,000 accompanied the document.

The proper GMSF was elaborated by the administration for nature conservation together with the Institute for Nature Conservation in close cooperation with various private conservationist groups. A scale of 1:100,000 was used, permitting a more precise delineation of the different categories of the network. However, the mapping of the category 'buffer zone' remained impossible, because we lacked the basic information required to identify the location and size of functional buffer zones throughout the whole region. Buffer zones should be site-specific, and deal with the main environmental conditions on which the area of interest depends, or to which they are vulnerable. Extensive knowledge about hydrological interrelations in the landscape, about critical loads and inputs of nutrients, about disturbances caused by recreation or traffic, etc. should therefore be available.

The precise determination and mapping of the categories was based on the one hand on nature values present, expressed as species richness, rarity and diversity. On the other hand, we made an estimation of the potential of an area to support a high biodiversity and to develop ecosystems and communities more valuable for nature conservation. In this respect the presence of more or less undisturbed environmental conditions (e.g. undisturbed river morphology, undrained river valleys with uncontrolled groundwater dynamics and frequent inundations, the presence of a high variation in soil texture, topography and hydrology) in combination with less intensive land use (e.g. extensive agriculture and forestry, nature-based recreation) were judged as favourable starting conditions.

As with all criteria used in the preparation of the GMSF, the basic data were derived from an analysis of existing maps and statistics. The topographic map and the soil map provided standardized and detailed information about the natural environment. Information on the inundation frequency of river valleys and polders was obtained from local naturalist groups and wardens. The appreciation of the landscape pattern with special attention paid to the scale and the presence of landscape elements typical of a region (e.g. networks of hedgerows, old dykes, sunken roads) combined with information on management practices, gave us an insight into the
Spatial categories of the Green Main Structure for Flanders

The meaning of the different spatial categories represented on the GMSF (Figure 3) as described can be as follows

Core areas

Core areas have at present a high nature value for the whole area. Biotopes are well developed. Nature conservation should be the primary function. Examples are large, old woodlands, heathlands, unmanaged and frequently inundated river valleys and water meadows. If ecologically compatible, other forms of land use could be maintained.

A strict minimal size for core areas has not been defined, although ecological requirements for a sustainable preservation and development sets limits to its minimal area. As such, our notion of core area differs from that of e.g. the Netherlands, where sites are not included unless they cover at least 500 hectares (Ministry of Agriculture, Nature Management, and Fisheries, 1990).

Nature development areas

It is difficult to define nature development areas unambiguously. Three types can be distinguished:

- Areas with important biotopes which are comparable with those of core areas. These biotopes are however limited in size, and are highly fragmented. Nature restoration projects on the parcels in between and proper management should lead to larger, highly valuable areas in the long term. There is a trend towards core areas.

- Areas without extended nature values but with environmental characteristics that allow the development of important biotopes within a short period of time and with restricted efforts (e.g. pollinated, but morphologically intact rivers). A re-structuring of the area combined with specific management and ecological engineering may lead to the sustainable development of valuable biotopes.

- Areas with rare animal species that can only exist when land use takes some specific restrictions into account. Examples are wintering grounds for geese and breeding areas for meadow birds. In these cases, the original land use must be continued, but with some management restrictions. The same holds for large woodlands where biodiversity has become impoverished due to a strictly production-oriented management. A minor change in forestry practice can produce many nature values. As for core areas, a required minimal size has not been defined.

Ecological corridors

The ecological corridor areas drawn on the GMSF map have two different meanings. On the one hand, zones were selected which are thought to facilitate the movement of species between core areas or nature development areas, thus reducing the ecological isolation of these valuable sites. Contrary to the Dutch Ecological Main Structure, the design of these corridors was not based on the requirements of selected species. Instead, we looked at the landscape structure and land use, and for suitable environmental conditions (comparable with those of the sites that had to be connected) to delineate the corridors. Their ecological functionality for a large area was the main reason they were included in the GMSF. This is in accordance with international opinion (Buschhof & Jongman, 1993).

On the other hand, individual areas with a dense network of small biotopes (mainly hedgerows, sunken roads, ditches) forming small-scale landscapes were also designated as corridor zones. The idea was that these areas possess a high degree of internal connectivity that completely accounts for the nature values of the sites. This interpretation of "corridor zone" differs from that used elsewhere (see e.g. Buschhof & Jongman, 1993).

In corridor zones, the greater part of the area has no proper nature conservation use, although the landscape design and the management of the small biotopes must allow the ecological corridor to function as such.

Results and discussion

After decades of a defensive and reactive policy, the GMSF now provides nature conservation with a distinct and well-founded instrument to pursue a more aggressive policy, one which is attempting to influence and steer other sectors operating in rural areas.

Table 2 gives the area of the categories depicted on the GMSF map compared with the total area designated for the different types of nature functions on the zoning plans of Flanders (Kuyken, 1994). These zoning plans date from 1976-1980 and regulate land use as laid down in the Physical Planning Act of 1962. The GMSF covers an area of 531,709 ha of the total area of the region. However, with some 13% (152,267 ha) of the area on the zoning plans currently designated for nature and only 0.75% (10,000 ha) of realized nature reserves, it is quite clear that the current project is very ambitious.

The plan nevertheless seems to be realistic from the point of view of nature conservation. Its similarity with the results of other analyses reflects this. It is striking, for example, that 34% of Flanders belongs to the Tentative Ecological Main Structure (Buschhof & Jongman, 1993). This ecological network for Europe is based on an elaboration of the CORINE database. Whereas the total area is comparable, it is not surprising that the individual categories differ. In the European context, only 2% of Flanders comprises core areas, and 22% belongs to "habitat connection areas", whereas these categories in the Flemish GMSF cover 11% and 13%, respectively.

The Biological Valuation Map offers another argument. From this map it is estimated that 25% of Flanders has a high or very high nature value. This is comparable with the total area of the proposed core and nature development areas. We must remark however that the evaluations on the Biological Valuation Map concern distinct ecotopes, whereas the areas on the map of the ecological network include sites of minor importance (e.g. intensive agricultural land). We therefore cannot expect the sites of interest on both maps to match precisely.

The idea of an ecological network in order to enlarge nature areas and incorporate them in a coherent structure by means of nature development and corridors, has as a consequence that not all parts of the area are equally valuable. This is clear when we relate broad classes of land use (derived from the Biological Valuation Map) to the categories of the GMSF. Paemel and others (1995) carried out such an analysis for circa half the area of Flanders. From table 3 we can see that the total area of agricultural land or woodland (broad-leaved woodland, coniferous woodland and poplar stands) within the three categories is very high. On the other hand, the area of "natural habitats" (i.e. heathland, dunes, marshes) is almost always relatively small.
modest. It must be noted also that there is no clear difference in the number of natural habitats in the categories of the network. Finally we point to the fact that the GMSF still comprises a fair amount of urbanized area. It is therefore clear that for the final implementation of the plan and the designation in the field, there is still a lot to be detailed and corrected. From these figures on land use, one can also foresee that the realisation of the GMSF will depend largely on the willingness of the agricultural and forestry sectors to cooperate with nature conservation.

As explained above, the ecological network was in fact designed on the basis of professional judgement, making use of existing data on biota and environment. Because we did not have the time or means to elaborate a sound and completely scientifically justified method, we are aware of the errors and gaps in the final map. We think they mainly occur in the analysis of the abiotic environment, and in the description of functional and coherent areas that was derived from it. Also the functionality for the species of the landscape pattern as it was used for the identification of corridor areas remains highly speculative. But here we do not differ very much from most of the exercises made in this field of applied landscape ecology.

The response of the Councils to the Green Main Structure for Flanders

The government services responsible for the development and management of the rural area were consulted at an early stage of the elaboration of the plan. They provided information on the nature- and economic values of particular sites, on the management practices and on the compatibility of their particular projects with the new conservation goals. That contribution led to the further adjustment and completion of the programme.

The consultation with the official councils started in May 1991. The recommendations of the Nature Conservation Council were positive, as expected. The only remarks concerned the scientific justification of parts of the proposed ecological network. The Forestry Council made a lot of objections. They remarked that, while forests are a very important part of the GMSF, professional foresters and private-forest owners were not involved in the elaboration of the plan. They therefore fear that, especially in the core areas with nature conservation as the first function, an economic exploitation of their forests would no longer be possible.

Similar reactions came from the agricultural sector. First of all, this sector does not agree with the total area claimed by the GMSF. Secondly, they oppose the restrictions they think they will be faced with when the plan is put into practice. As a result of these concerns, the Social and Economic Council of Flanders (in which the agricultural sector was represented) formulated a reservation.

The position of the agricultural sector forced the coordinating Council for Environmental and Nature Policy of Flanders to examine the GMSF very carefully. For the further implementation of the nature conservation plan, it was of the utmost importance that a shared agreement could be reached within this council. Finally, after eighteen months, discussions led to a consensus and a positive recommendation to the minister. The parties involved agreed upon the measures to be taken and the necessary budget. It was recommended that the realisation of the ecological network should be phased in gradually for the first term (till 2006), the realisation of 50% of core area was set as a task for the area actually categorised as nature development zone, during the first term 25% should be reclassified as a core area and realised as such, while 33% should be implemented as a nature development zone.

The public enquiry

The public enquiry began as soon as the official recommendations had been collected. A director containing a questionnaire was distributed, and 20 public hearings were organised. The response to both initiatives was large but, unfortunately, not always very calm. When during the hearings the feelings of farmers became so intense that the safety of the officials could no longer be guaranteed, the minister in charge decided to cancel these information rounds.

The administration responsible for nature conservation received 16,833 completed questionnaires (Ministerie van de Vlaamse Gemeenschap, 1994) as well as statements concerning the acceptance of the GMSF, some of them also contained valuable suggestions for its improvement. Of the latter, 2,458 were retained for further consideration.

The degree of acceptance that emerged from the questionnaire confirmed the general feelings that characterized the hearings. For 83% of the respondents, the GMSF was unacceptable, 14% found it a good plan, needing minor modifications, and 3% thought it too restricted. These results are based on the unequal response from different sectors. Respondents related to the agriculture sector accounted for 55% of the replies, whereas those related to nature conservation accounted for only 4%, which was less than forestry (6%) and the socio-cultural sector (8%). As was expected, the strongest resistance to the proposed ecological network came from the agricultural- (92%) and forestry (94%) sectors. However, also the industrial-, recreation- and socio-cultural sectors were firmly opposed to it. The number of hunters supporting the plan was the same as the number opposed to it. Finally, nature conservation interests and freshwater fisheries were favourable to the project.

Because of the raising of public sentiment in the weeks previous to the enquiry, the results of the questionnaire should not be considered representative of the general public's feelings. After all, the opposition to the GMSF as seen from the survey was counterbalanced by a petition for the plan signed by some 40,000 people.

The strong sentiments and the actions against the project seem to result from a coincidence of circumstances. The GATT Agreement and the Flemish regulation on fertilizing and manuring were implemented or discussed in that same period. Both led to a high degree of uncertainty amongst farmers. A lot of unrest was caused by especially the fact that in the fertilizing and manuring regulation a formal reference was made to categories of the GMSF at a moment when this plan was the subject of public hearings and had no legal status at all.

The future of the Green Main Structure for Flanders

Three years after the proposal for the GMSF was launched, causing a lot of hope and hate, peace has been restored. The concept of the ecological network and the map of the GMSF were handed over to physical planners, where they are considered as the input from the nature conservation sector for the elaboration of the new structure plan for Flanders. In this comprehensive plan, the ecological network will be more balanced with the other functions of the rural area. In such a form, it is hoped that the chances of realizing at least the part of the project that was agreed upon with the different parties in the Council for Environment and Nature Policy of Flanders will increase.
The do’s and don’ts concerning the GMSF have been laid down in a new Nature Conservation Decree. In the meantime, for real situations in the field, a pragmatic cooperation with other types of land use is aimed at. As long as strong instruments and sufficient financial support are lacking, the completion of the ecological network depends largely on the willingness of others to adopt and realize the objectives of nature conservation.

Summary

The Green Main Structure for Flanders

The development and implementation of an ecological network (G. De Blust, G. Pinxten & E. Kuijken) Landbouw 129

In 1990 the Flemish government launched its Environmental Policy and Nature Development Plan. In that document was announced the elaboration of an ecological network, the ‘Green Main Structure for Flanders’.

There were only a few months available to develop the plan, and it had to be based on existing data on nature and environmental qualities. The determination and mapping of core areas, nature development areas, and corridors was based on nature values present, as well as on an estimation of the potential of an area to support a high biodiversity and to develop ecosystems and communities more valuable for nature conservation.

The result is a network covering 531,709 ha (39% of Flanders), with 28% as core area, 38% as development area, and 34% as corridor zone.

Before adopting the policy plan, a large-scale public enquiry was held. The response was overwhelming, though not always very calm.

The lack of clear instruments for implementation and the uncertainty about the legal status caused a lot of concerns among farmers and private landowners. The concept of the ecological network has now been adopted by physical planners. There is it being considered as the input from the nature conservation sector for the elaboration of the new comprehensive plan.

References


Introduction

Over the last decades, our cultural landscape has fundamentally changed as a result of various and increasingly intensive types of land use. In today's landscape, unaffected or extensively used habitats exist only in the form of remnant areas (Packer, 1991). This development has had not only a redrawing of area but also an increasing isolation of natural and semi-natural habitats. Not only have the distances between them become larger, but the intermediate zones have become more inhabitable for many species. Finally, the coherence of the landscape has been disturbed. For instance, the dynamic and genetic processes of populations have been adversely affected (Heydemann, 1983, Simberloff, 1988, Reh & Seitz, 1990, Seitz, 1991). An attempt is now being made to counter the fragmentation of natural and semi-natural habitats in our landscape by the formation of ‘habitat networks’. In this, the effects of isolation will be reduced by the establishment of cross-linking elements (stepping stones and corridors) (Gledick, 1994). In practice, ‘network elements’ usually mean linear elements (e.g. hedgerows, headlands and roadsides). Although the impression has been given that it was conceived to interconnect small areas of a ‘residual nature’ by means of linear structures, natural interconnections are in fact more diverse, as appears from a comparison between the landscape of former decades and that of today.

Three aspects should be emphasized. Firstly, the quantitative extent of losses of valuable habitats the area of certain natural and semi-natural habitats has been reduced by more than 90% (Ringler, 1987, 1993). According to the theory underlying the biogeographic model for islands, this reduction alone is sufficient to reduce the number of species to less than half compared to the original situation (Diamond, 1975). The loss of large-scale habitats for