Work package 1:

Identification of bottlenecks for nature conservation and Natura 2000

0. Table of contents

ABBREVIATIONS

SCI	Site of Community Importance
SAC	Special Area of Conservation
SPA	Special Protection Area
SBZ-H	Speciale Beschermingszone onder de Habitatrichtlijn (= SAC)
SBZ-V	Speciale Beschermingszone onder de Vogelrichtlijn (= SPA)
ANB	Agentschap voor Natuur en Bos (Flemish Agency for Nature and Forest), combination of the former Afdeling Natuur and Afdeling Bos en Groen
VLM	Vlaamse Landmaatschappij
IN	Instituut voor Natuurbehoud (Institute for Nature Conservation), is now part of the INBO
INBO	Instituut voor Natuur- en Bosonderzoek (Institute for Nature and Forest Research), a combination of the former IN and the IBW
IBW	Instituut voor Bos en Wild (Institute for Forest and Wildlife), is now part of the INBO

1. Introduction

The main aim of the SELNAT project, like stated in the project proposal, is to perform **a multifunctional effectiveness analysis of the management of Natura 2000**. **The leading question is how to make NATURA 2000 work properly**? In order to be able to evaluate this effectiveness, we need to define this aim precisely. “Working properly” means the **development of efficient management strategies for nature areas that contribute to sustainable development**.

The central hypothesis is: *An external approach based on the integration of ecological, economical, legal and social aspects is necessary to design management strategies for large nature areas that will create a favorable conservation status and reach N2000 objectives in a robust way*.

The directive aims at knitting a coherent network under the name of Natura 2000, to protect the unique European natural heritage. The general framework and the general goals for the European important habitats and species (Favorable State of Conservation, FSC) were developed at European Level. In 1992 the European Commission has adopted the Habitat Directive. The practical implementation of this legislation is the task of the Regions.

Besides the translation of the European legislation in there own legislation, the regions had to select some areas as Natura 2000 areas. In most of the European countries these steps are taken. Before 2010 the regions have to develop conservation goals for the different habitats and species. This process is running at the moment. An important issue for the future is then the concrete implementation of the developed conservation goals.

In WP 1 the current legal, economic, ecological and social problems with the planning and implementation of the Natura 2000 legislation in general (and in the Walloon and Flemish region in concrete) will be assessed. This integrated analysis gives an overall image of the current situation in a ‘historical’ context (of developing legislation, defining policy development schemes, …). The goal is to deeper the interdisciplinary understanding within the research team of the problems that rise during the implementation of the Natura 2000 policy and this in relation with the historical development of it. In a first step each team has made a disciplinary analysis of the current Natura 2000 policy. The second step contains an integrated analysis.

2. General views

2.1. Sustainable development

2.1.1. Sources

Basically, the sustainable development concept[1] was born from the double report that the ecosystems and the biosphere have a limited capacity of reception[2] and are ecologically interdependent[3]. It is based on the recognition that the survival and the wellbeing of the mankind, all confused generations, depend on the long-term maintenance of the ecosystems within the biosphere and that there are certain ecological limits with the economic growth. These limits are reflected by the objective concept of sustainability[4], which presents similarities with that of integrity of the ecosystems.

In its first meanings, the durable development was thus heard as the process of development whose total objective is of tending towards the durability to the ecological direction of the term. This design is reflected in the first references, formal or implicit, with the concept of development durable, namely in the Declaration of Stockholm (1972)[5], in the world conservation Strategy (WCS, 1980) and in the world Charter of the Nature of 1982[6]. To arrive to this objective, the above mentioned texts recommended an *integrated approach of the stock management and planning of the development*[7].

2.1.2. Definition

The concept of development durable evolved substantially since 1987, following the publication of the famous report "Our common future" of the Brundtland Commission. This one is defined there as "*a development that meets the needs of the present without compromising the ability of future generations to meet their own needs* [8]". The Brundtland report specifies that two concepts are inherent in this definition:

- the concept of needs, and more particularly of the most stripped essential needs for, "*to which it is appropriate to give the greatest priority*"; essential, this concept translates the idea that the development must be limited to what is necessary to meet the needs for the sociaty - that it is appropriate to evaluate with precision considering limited character of

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[1] On this concept and its economic and ethical dimension, see TILMAN, 1998.

[2] World charter of Nature, Preamble; World conservation strategy, section 1, Introduction.

[3] According Rio declaration, « (…)he integral and interdependent nature of the Earth, our home, » (préambule). Principle 25 « *Peace, development and environmental protection are interdependent and indivisible.*». In the same sense, see art. 4 du Draft convention on the environment and the development (1995-2004); Principle 7 Déclaration de principes du droit international en matière de développement durable adoptée par l'ILA à New Delhi en avril 2002 (Résolution 2002/3, 70ème session, 2-6 avril 2002).

[4] On this notion see IUCN, WWF, UNEP, *Caring for the Earth. A Strategy for Sustainable Living*, 1991, p. 43.

[5] See principles 2 to 7, which impose to the member States to safeguard the natural resources of the world, the capacity of the earth to produce vital renewable resources and the heritage of wildlife and its habitat. Principles 8, 11, 13, 14 et 15 contain already references expresses to the two other components (social and economic) of the durable development. This text is the first instrument of world range apprehending, certainly without integrating them by name in only one concept, the various facets of the durable development.

[6] See § 4, 6, 8 à 10.

[7] See principle 13 Stockholm Declaration, § 7 de la Charte mondiale de la nature, and section 9 de la WCS.

[8] COMMISSION MONDIALE SUR L'ENVIRONNEMENT ET LE DEVELOPPEMENT, *Notre avenir à tous*, Montréal, Editions du Fleuve, 1988, pp. 10-11.

the resources and the necessity to satisfy the needs for the future generations - and does not constitute an end in itself;

- "*the idea of the limitations that the state of our techniques and our social organization forces on the capacity of the environment to meet the needs present and to come*".

In other words, to be "sustainable", the development must take care, on the one hand, not to exceed the ecological limits of the capacity of the ecosystems[9] and, on the other hand, to allow the satisfaction of the requirements in natural resources for the future generations. These two fundamental objectives form the substance of the concept of development durable. With the ecological dimension of durability, is added a dimension ethical, namely *equity inter and intra-generational*[10]. Confining with the slogan, this very fuzzy definition was a success fulgurating near the political world[11]. Each one can, altogether, find its account there. It remains, therefore, always of topicality[12].

Reflection of the difficult compromises between the interests of the countries of North and the South, the Declaration of Rio affirms, in its Principle 4, that "*In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it*". The *principle of integration*, in question hereafter, sees kind of granting it a central place in the speech on the sustainable development, of which he becomes the instrument privileged to establish the bonds necessary between his three dimensions economic, social and environmental[13]. The objective of "sustainability" heard as an ecological limit with the development yields little by little the place to an objective vaguer of "balance", "conciliation", or of "reconciliation" between the concerns economic, social and environmental, now omnipresent in the political speeches on the sustainable development.

2.1.3. Principles

Being based on the study of the various nonconstraining texts and the agreements concluded in the wake from the Declaration from Rio and Diary 21, several groups of experts are leaning on the various principles which form the hard core of the sustainable development[14]. Premise of a coding of these principles in the current state of the international law, the Declaration of New Delhi of the ILA (2002) drew up the list of the fundamental principles to respect to reach the sustainable development. They are, according to this Declaration, seven, namely:

1. the duty of States to ensure sustainable use of natural resources
2. the principle of equity (inter-[15] et intra-generational[16]) and eradication of poverty
3. the principle of common but differentiated responsabilities[17]

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[9] The report specifies that this definition means that the control of the various policies must "with the bare minimum... not endanger the natural systems which make us live, the alive atmosphere, water, grounds and beings" (p. 53).

[10] This dimension was already germinates about it in the Declaration of Stockholm (Principles 2 et 5).

[11] SHEATE, 2003, p. 220.

[12] This one is registered at the head of the Strategy of the European Union in favour of the durable development suggested by the Commission in 2001 (COM (2001)264/2) (p. 2).

[13] It is reaffirmed with multiple recoveries in the Plan of implementation of Johannesburg and in a multitude of texts of international law of the environment (*cfr. infra*).

[14] See Experts report XXXXX1995 ; ILA, 2004 ; IUCN, 2004. The doctrines also attempted to define these principles (voy. BOYLE et FREESTONE, 1999, pp. 8-16 ; BIRNIE et BOYLE, 2002, pp. 86-95 ; SANDS, 2003, pp. 256-266).

[15] The right of future generation to enjoy a fair level of the common patrimony (para. 2.1).

[16] The right of all peoples within the current generation of fair access to current generation's entitlement of the Earth's natural resources (para. 2.1).

[17] States and other relevant actors have common but differentiated responsibilities. All States are under a duty to co-operate in the achievement of global sustainable development and the protection of the environment. International organizations, corporations (including in particular transnational corporations), non-governmental organizations and civil society should

4. the principle of the precautionary approach to human health, natural ressources and ecosystems
5. the principle of public participation and access to information and justice
6. the principle of good governance [18], and
7. the principle of integration and interrelationship, in particular in relation to human rigths and social, economical and environmental objectives[19].

The principles thus recognized can be distributed in two categories. On the one hand, the sustainable development implies to respect certain principles of substantial nature - the principles 1 to 3 -, which constitute, to some extent, the normative expression of the objective of "sustainability" as well socio-economic as environmental which any development should persue to be able to be described as sustainable. In addition, the "balanced" and "integrated" implementation of these objectives would require the respect of other principles, of procedural nature - principles 4 to 7 - within the framework of any decision-making process.

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co-operate in and contribute to this global partnership. Corporations have also responsibilities pursuant to the polluter-pays principle.
Differentiation of responsibilities, whilst principally based on the contribution that a State has made to the emergence of environmental problems, must also take into account the economic and developmental situation of the State, in accordance with paragraph 3.3.

[18] The principle of good governance is essential to the progressive development and codification of international law relating to sustainable development. It commits States and international organizations:
(a) to adopt democratic and transparent decision-making procedures and financial accountability;
(b) to take effective measures to combat official or other corruption;
(c) to respect the principle of due process in their procedures and to observe the rule of law and human rights; and
Exact contours this principles are however very difficult to encircle and the drafting of the Declaration on these points is not very precise.

[19] Principles 1 à 7 Declaration of New Delhi. SANDS recognizes five principal elements in the durable development, namely the need for preserving the natural resources with the profit of the future generations (principle of intra-generational equity), the objective to exploit the natural resources in a durable way (principle of sustainable use), the equitable use of the natural resources (principle of equitable use, or intra-generational equity), the need for ensuring that the environmental considerations are integrated in the plans, programs and economic and of development projects, and that the needs for the development are taken into account in the application for the environmental objectives (principle for integration) finally that need for interpreting and for observing the rules of the international law in an integrated and systematic way (SANDS, 2003, p. 266). BOYLE et FREESTONE add the right to the development and the procedural laws (participation, access to information and justice), and include in the durable principle of use that of precaution (BOYLE et FREESTONE, 1999, pp. 9-16).

2.2. Ecological theory

2.2.1. Biodiversity

DEFINITION

Biodiversity is a contraction of 'biological diversity' and is defined as **"the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species** (genetic diversity)**, between species** (species diversity) **and of ecosystems** (ecosystem diversity)**"** (Millennium Ecosystem Assessment: Mace *et al.* 2005).

The term biodiversity is used in different ways, leading to ambiguities and misunderstandings. Mayer (2006) distinguishes three groups of thought styles with different uses of the term biodiversity:

- Natural history perceives biodiversity as biotic elements of nature that can be described and classified.
- Science considers biodiversity as a measurable parameter that is relevant for ecosystem processes and functions.
- In environmentalism, biodiversity is used in the context of concerns about species extinctions and habitat destructions.

Therefore, Mayer (2006) outlines in a coherent concept the way biodiversity should be understood (see appendix 1).

IMPORTANCE (CHAPIN ET AL. 2000, MACE ET AL. 2005)

Biodiversity plays an important role in the way ecosystems function and in the services they provide.

Ecosystem services are the benefits obtained by people from ecosystems (Fig. 1 & 2). The local loss of an essential species can disrupt ecosystem services for a long time.

Biodiversity also (mostly positively) affects regulating services that regulate ecosystem processes, climate, floods, disease, and water quality (Figure 2). For instance,

- The preservation of the number, types, and relative abundance of resident species can enhance resistance of a wide range of natural and semi-natural ecosystems against *invasive species* (see paragraph 1.2.3) or pests (e.g. Knops *et al.* 1999, Hector *et al.* 2001).
- There is a positive relationship between species richness or composition and ecosystem processes like productivity (Hector *et al.* 1999, Fridley 2001, Tilman *et al.* 2001, Rajaniemi 2003), nitrogen cycling (Mulder *et al.* 2002, Scherer-Lorenzen *et al.* 2003, Symstad & Tilman 2001), stability (Valone & Hoffman 2003, Wardle & Grime 2003) or drought resistance (Symstad & Tilman 2001).
- Biodiversity, in particular the diversity of plant forms and the distribution of landscape patches, influences climate at local, regional, and global scales. Thus changes in land use and land cover that affect biodiversity can in turn affect climate. Some components of biodiversity affect carbon sequestration and thus are important in fighting *climate change* (see paragraph 1.2.2).

For a detailed synthesis on the current knowledge of the relationship between biodiversity and ecosystem functioning: see Hooper *et al.* (2005).

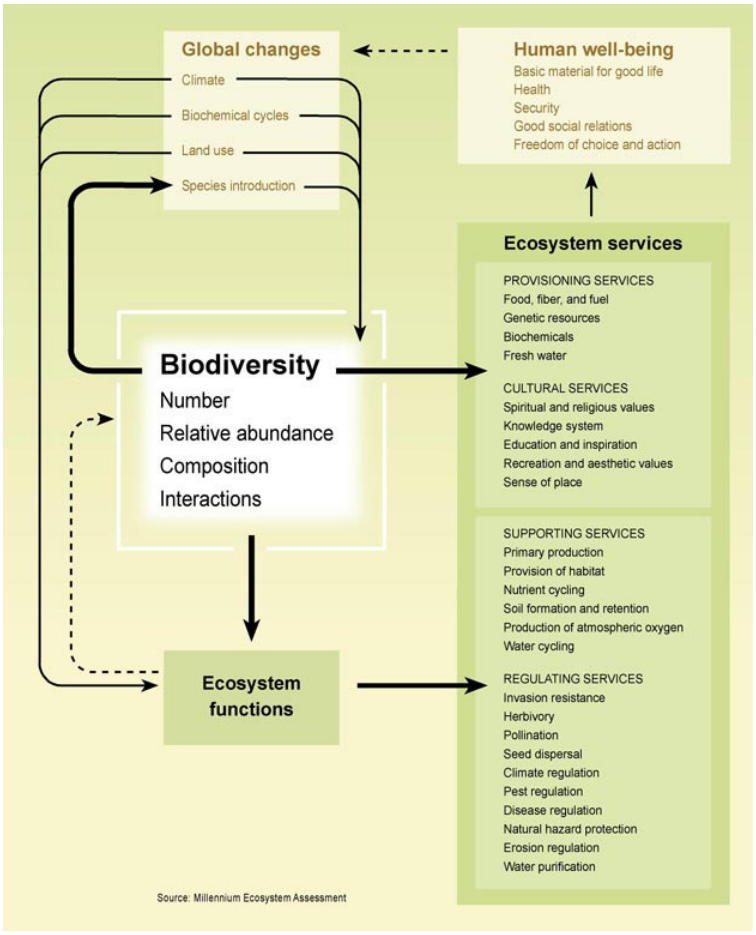

Figure 1. Biodiversity is both a response variable affected by global change drivers and a factor modifying ecosystem processes and services and human well-being. On land, biodiversity affects key ecosystem processes such as the production of living matter, nutrient and water cycling, and soil formation and retention. All of these govern and ensure supporting services that are necessary for the production of all other ecosystem services. Differences between regions in terms of ecosystem processes are driven mostly by differences in climate, in resource availability, and in other external factors, and not by differences in species richness. Though losses of biodiversity may have only small impacts on an ecosystem in the short term, they may reduce its capacity to adjust to changing environments in the future. From: Mace *et al.* (2005).

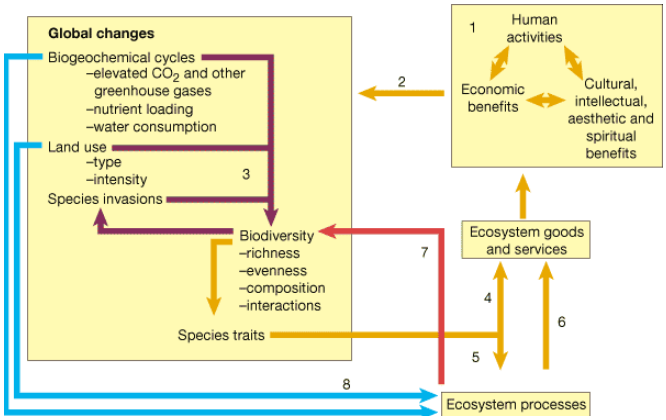

Figure 2. Human activities that are motivated by economic, cultural, intellectual, aesthetic and spiritual goals (1) are now causing environmental and ecological changes of global significance (2). By a variety of mechanisms, these global changes contribute to changing biodiversity, and changing biodiversity feeds back on susceptibility to species invasions (3, purple arrows). Changes in biodiversity, through changes in species traits, can have direct consequences for ecosystem services and, as a result, human economic and social activities (4). In addition, changes in biodiversity can influence ecosystem processes (5). Altered ecosystem processes can thereby influence ecosystem services that benefit humanity (6) and feedback to further alter biodiversity (7, red arrow). Global changes may also directly affect ecosystem processes (8, blue arrows). Depending on the circumstances, the direct effects of global change may be either stronger or weaker than effects mediated by changes in diversity. We argue that the costs of loss of biotic diversity, although traditionally considered to be 'outside the box' of human welfare, must be recognized in our accounting of the costs and benefits of human activities. From: Chapin *et al.* (2000).

MEASURING BIODIVERSITY: INDICATORS (BEGON ET AL. 1996, MACE ET AL. 2005)

The definition of biodiversity emphasizes the many dimensions of it. Every biota can thus be characterized by not only its taxonomic (e.g. species number) diversity, but also by its ecological (e.g. nitrogen-fixing plants) and genetic diversity and even their distribution, function and interactions among species affecting their dynamics and function (like predation or parasitism). Furthermore, the way these dimensions of diversity vary over space and time is a key feature of biodiversity. Thus only a multidimensional assessment of biodiversity can provide insights into the relationship between changes in biodiversity and changes in ecosystem functioning and ecosystem services.

However, it is in most cases not possible to measure biodiversity in this multidimensional way because the data are lacking (Orr 2003). Even for the taxonomic component of biodiversity, where information is the best, considerable uncertainty remains about the true extent and changes in taxonomic diversity (e.g. 'Estimating the size of the world's threatened flora': Pitman & Jørgensen 2002, 'The taxonomic bottleneck': Kim & Byrne 2006). Moreover, several taxonomic groups are only poorly investigated (Figure 3).

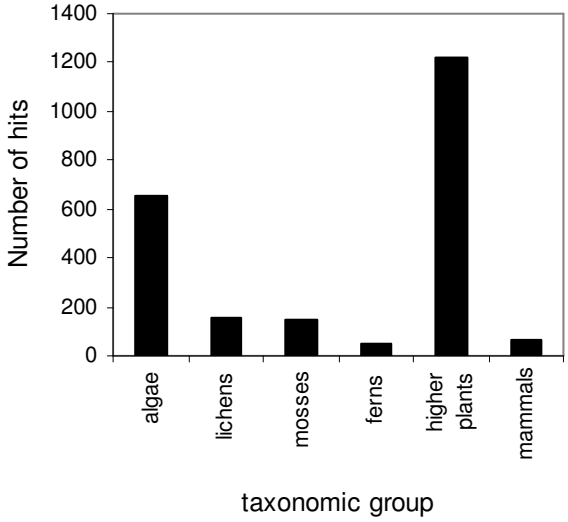

Figure 3. Comparison of the number of hits in the Web of Science - Science Citation Index Expanded – 1972 to present (ISI Web of Knowledge: URL: http://portal.isiknowledge.com/) for the following search strings: mosses: "taxonomy AND (moss OR bryophyte)"; lichens: "taxonomy AND lichen"; higher plants: "taxonomy AND plant"; ferns: "taxonomy AND fern"; algae: "taxonomy AND (alga OR algae)"; mammals: "taxonomy AND mammal".

As a result, a variety of surrogate or *proxy measures* are often used. Ecological indicators are thus scientific constructs that use quantitative data to measure aspects of biodiversity, ecosystem condition, services, or drivers of change, but no single ecological indicator captures all the dimensions of biodiversity. However, there is a need for more integrated indicators (see appendix 2).

Species richness (Mace et al. 2005)

The most common ecological indicator is *total species richness* (TSR). However, TSR only partially captures ecosystem services for several reasons, e.g., what constitutes a species is sometimes not well defined and the value of TSR depends on the definition of the area over which it was measured and may scale neither to smaller nor to larger areas (for a full discussion: see appendix 3).

Local species diversity indices (Begon et al. 1996)

Biologists trying to understand community structure often use a diversity index, instead of TSR. Diversity indices are mathematical measures of species diversity in a community, taking into account the relative abundances of different species.

Consider two communities of 100 individuals each and composed of 10 different species. One community has 10 individuals of each species; the other has one individual of each of nine

species, and 91 individuals of the tenth species. Which community is more diverse? Clearly the first one is, but both communities have the same species richness. By taking relative abundances into account, a diversity index depends not only on species richness but also on the evenness, or equitability, with which individuals are distributed among the different species.

In order to measures of species diversity and equitability, dozens of indices have been introduced (see Hubalek 2000 for a critical review). The two most common used ones are the Simpson's and Shannon Wiener diversity index (for a discussion: see the appendix 4).

Measuring biodiversity over spatial scales: α, β and γ diversity (Whittaker 1972, In: Loreau 2000, Gering & Crist 2002)

To investigate trends of biodiversity in space, three diversity indices have been developed: the diversity of species found *within* homogeneous sampling units (habitats) or **α-diversity,** the component of the total diversity which can be attributed to differences in species compositions between ecosystems or **β-diversity** and the regional diversity or **γ-diversity** (for a full discussion: see appendix 5).

Genetic diversity

Like biodiversity at other levels, genetic diversity within a species can be measured in many different ways, for a discussion of which we refer to p. 95 of Mace *et al.* (2004).

2.2.2. Threats to biodiversity

Biodiversity is currently degrading at a catastrophically high rate (Pimm & Raven 2000, Novacek & Cleland 2001). Direct destruction of habitats evidently is the most drastic threat to biodiversity (Hermy *et al. in press*). In Europe for instance, land use intensified drastically with the industrial revolution (1850) and again after the Second World War (1950). The introduction of machines, fertilizers and wire fencing, the conversion of natural areas into agricultural land and the increased scale of agricultural holdings have led to a huge degradation of nature values. Here, as in other places in the world, the remaining habitats suffer from increased fragmentation, overexploitation and pollution. Furthermore, the arrival of exotic, invasive species, as a result of increased anthropogenic mobility, puts an extra stress on vulnerable ecosystems.

In addition, one is now increasingly becoming aware of the global impact of nitrogen deposition and climate change on biodiversity (Novacek & Cleland 2001). While human-induced habitat fragmentation and invasive species are particular threats to biodiversity in the short-to-medium term, the effects of climate change are likely to become increasingly prominent relative to other factors (Thuiller 2007).

In this chapter, we critically asses the literature concerning these main threats to biodiversity, while the following chapters will discuss the paradigms dealing with the conservation of our degrading biodiversity like the small population paradigm, the equilibrium theory of island biogeography or ETIB, the metapopulation theory and ecological networks. Figure 4 gives an indication of the research effort paid since 1972 to these topics or paradigms.

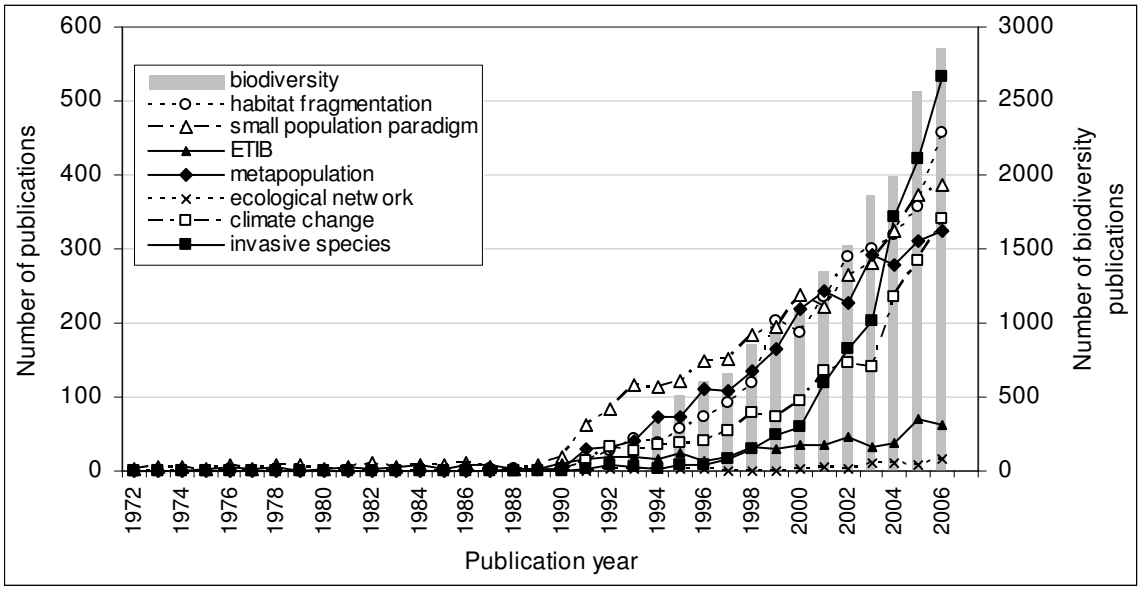

Figure 4. Comparison of the number of hits (for biodiversity on the right-hand axis) in the Web of Science - Science Citation Index Expanded – 1972 to present (ISI Web of Knowledge) for the following search strings: for biodiversity: *biodiversity*; for habitat fragmentation: *"habitat fragmentation" OR "fragmented habitat" OR "fragmented landscape" OR "habitat fragments"*; for small population paradigm: *extinction vortex OR "small population paradigm" OR "population viability" OR "minimum viable population" OR "demographic stochasticity" OR "inbreeding depression"*; for ETIB: *"island biogeography" OR "MacArthur & Wilson" OR "island biogeography theory" OR "island assembly theory" OR "MacArthur-Wilson theory" OR "island theory"*; for the metapopulation theory: *metapopulation*; for ecological networks: "ecological network"; for climate change: *("climate change" AND diversity) OR ("climate change" AND biodiversity) OR ("global warming" AND biodiversity) OR ("global warming" AND diversity) OR ("global warming" AND extinction) OR ("climate change" AND extinction)* and for invasive species: *invasive species*.

2.2.2.1. Habitat fragmentation

Habitat fragmentation, or habitat sub-division, is the subdivision of continuous habitat into multiple patches (Fahrig, 2003).

Landscape fragmentation results from patch conversion and development of sites, e.g., into urban settlements or intensively used areas, and from linkage of these sites via linear infrastructure such as motorways, railways or others (Harris, 1984; Saunders *et al.* 1991; Forman 1995; Jaeger, 2000; Clergeau & Désiré, 1999). Landscape fragmentation also comprises natural barriers to animal dispersal such as rivers. This is defined here as *geogenic fragmentation* (Jaeger, 2000).

RESEARCH HISTORY

Habitat fragmentation has become a major research theme in conservation biology (Haila, 2002; Fazey *et al.* 2005). It is considered as a severe threat to global biodiversity (Sala *et al.* 2000; Foley *et al.* 2005), and is believed to negatively affect virtually all taxonomic groups including birds and mammals (Andrén, 1994; Recher, 1999), reptiles (Gibbons *et al.* 2000), amphibians (Stuart *et al.* 2004), invertebrates (Didham *et al.* 1996) and plants (Hobbs & Yates, 2003). Although 'fragmentation' has become a major research theme, progress in the field has been hampered by overly restrictive, conceptual paradigms (Haila, 2002) and the imprecise or inconsistent use of important terminology (Bunnell, 1999; Fahrig, 2003).

The focus of previous studies was often on the fragmentation of forests, an important subtopic of landscape fragmentation. Studying the relationships between structural and functional consequences of landscape fragmentation offers insight into the more general question of how landscape patterns and processes are correlated (Forman & Godron 1986; Turner 1989; Turner & Gardner 1991). In particular, the comparison of anthropogenic and geogenic fragmentation effects and of their spatial and temporal scales provides fruitful research opportunities (Jaeger, 2000).

In literature, many threshold values for habitat connectivity can be found, for example, for fragmented forests and forest plant species (e.g. Butaye *et al.* 2001; Honnay *et al.* 2002).

PROCESS

Habitat fragmentation does not only characterize the structural *state* of a landscape, but it is also understood to be a *process* (Forman, 1995) that results in the disruption of existing ecological connections between spatially separated elements of landscapes (Haber, 1993 *in* Jaeger, 2000).

Habitat fragmentation essentially encompasses three major components:

- pure loss of habitat,
- reduction of individual patch size and
- increase of spatial isolation of the remnant patches (Andren, 1994)

STAGES OF FRAGMENTATION

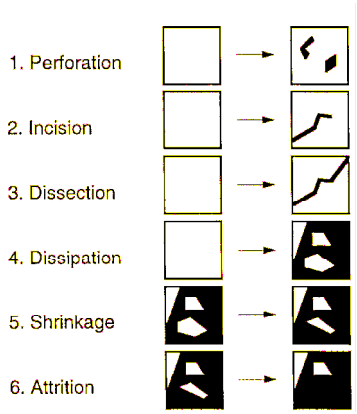

Figure 5. Stages of the fragmentation process, distinguished according to geometric characteristics (Forman, 1986).

Habitat fragmentation shall be used as a comprehensive notion integrating all six stages (Figure 5). The dissipation phase (4) can be represented as a combination of dissection (3) and shrinkage (5). Nevertheless it is considered as an extra phase because of its different genesis compared to phases (3) and (5) in real landscapes, i.e., when dissection and shrinkage take place at once and cannot be regarded as separate processes. Further, an *incision* phase is distinguished from the dissection phase A critical remark we can make is that these depictions distinguish only between two types of areas. Their application to a landscape includes a decision about which landscape elements are supposed to be involved by the fragmentation process, and depends on the system property of interest (Li & Reynolds, 1995; Gustafson, 1998). Examples are the distinction between habitat and uninhabitable area (depending on the organism of interest) or between forested and non-forested area (Jaeger, 2000).

DIRECT EFFECTS ON THE LANDSCAPE

Habitat fragmentation produces a series of more or less isolated segments of habitat, ecosystem, or land use type, which are surrounded by a matrix of more intensive land use and lines which modify the ecological interrelations between the segments, e.g., acting as barriers against the dispersal of animals (Jaeger, 2000).

According to Fischer and Lindenmayer (2007), binary classification of land into habitat (native vegetation) and non-habitat (other land cover) ignores habitat suitability gradients and differences between species with respect to what constitutes suitable habitat for them. So, habitat fragmentation should be used only in a single-species context.

EFFECTS AT THE SPECIES LEVEL

A. Smaller habitat patches

Since smaller patches generally support smaller populations, a decrease in patch area may lead to increased extinction risk due to decreasing resistance against stochastic extinction events, typically affecting small populations (Shaffer, 1981; Lande, 1988) (See further: Small populations paradigm, paragraph 1.3). It is theoretically expected that a small population size increases the risk of erosion of genetic variation and of inter-population genetic divergence due to increased random genetic drift, elevated inbreeding, accumulation of deleterious mutations, and reduced gene flow (Young *et al*., 1996).

B. Increased edge effects

Edge effects are changes in physical and biological conditions at an ecosystem boundary or within adjacent ecosystems. Abiotic edge effects refer to changes in physical variables such as radiation, moisture, temperature, humidity, wind speed and soil nutrients (Chen *et al.* 1990; Matlack, 1993; Weathers *et al.* 2001). Biotic edge effects are changes in biological variables such as species composition of plants and animals, or patterns of competition, predation and parasitism (Malcolm, 1994; Robinson *et al.* 1995; Lahti, 2001; Valladares *et al.* 2006).

C. Spatial isolation

Besides patch size, spatial isolation or the degree of connectivity between patches is another important feature of fragmented habitats (Butaye *et al*, 2005). In small patches that are also spatially isolated, extinction probabilities are expected to further increase through a reduction of colonization events, hampering the 'rescue' of the population by the inflow of new individuals (Brown & Kodric-Brown, 1977) or genetic material. Indeed, the hypothesis that plant pollinator interactions may be disrupted by habitat fragmentation became a major topic in conservation biology, with the growing consciousness that habitat fragmentation seriously affects plant fitness and reproductive success (Wilcock & Neiland, 2002; Goverde *et al.* 2002). Pollination in particular can limit seed production

in habitats that became more isolated than the foraging distance of the pollinator;
in habitat patches that are too small to support a viable pollinator population or
when pollinators avoid small relic populations (Kearns *et al.* 1998; Kwak *et al.* 1998)

Also, in spatially isolated patches, recolonization after species extinction is less probable (Hanski, 1999).

Habitat isolation can negatively affect day-to-day movements of a given species (e.g., for birds, between nesting and foraging resources; Saunders, 1980; Luck & Daily, 2003). Habitat isolation may also negatively affect the dispersal of juveniles (Cooper & Walters, 2002). Metapopulations, i.e. (set[s] of local populations which interact via individuals moving between local populations) sometimes develop as a result of habitat isolation (Hanski & Gilpin, 1991 – see further for more information) Habitat isolation may negatively affect large-scale movements of species such as seasonal migration or range shifts in response to climate change (Soulé *et al.* 2004 *in* Fischer & Lindenmayer, 2007). Steffan-Dewenter and Tscharntke (1999) showed for *Sinapis arvensis* and *Raphanus sativus*, two annual crucifers, that increasing isolation of experimentally established small calcareous grassland fragments resulted in decreasing numbers of pollinators and lower seed set of the two crucifers.

INDIRECT EFFECTS AT THE COMMUNITY LEVEL

The ultimate consequence of reduced population viability is local extinction, leading to disappearance of the species from the fragment and consequently to decreased species richness and altered community composition.

Butaye *et al.* (2005) showed that there is no obvious relation between the size of calcareous grassland fragments and overall species richness, species richness at different spatial scales and abundance of some typical invader species or species characteristic of semi-natural grasslands.

Often species-area relations are used to describe species richness of fragmented habitats (Butaye *et al.* 2005). A positive species-area relationship may result from one of the two following ecological hypotheses. First, there is the habitat heterogeneity hypothesis which predicts higher species numbers because of higher habitat heterogeneity in larger fragments. The second hypothesis, the so called equilibrium hypothesis, considers increasing species numbers with

increasing patch area independent of habitat heterogeneity (Rosenzweig, 1995). In the latter case, small habitats contain fewer species than larger habitats because population size in small habitats is restricted and because small populations are more extinction prone (Butaye *et al.* 2005). Both hypotheses have been tested by Krauss & *al.* (2004) for calcareous grassland fragments in Germany. These authors found evidence for the habitat heterogeneity hypothesis, but not for the equilibrium hypothesis. Many calcareous grassland species are long-lived perennials that form remnant populations by prolonged clonal growth (Sammul *et al.* 2003). The result of this persistence is that current patch occupancy patterns of most clonally propagating species may be not in equilibrium with the present degree of habitat fragmentation (Eriksson & Ehrlén, 2001). We are so dealing with a so called *extinction debt* (Tilman *et al.* 1994). Moreover, since species of different trophic levels are differently affected by habitat fragmentation it is likely that also other biotic interactions are altered (Steffan-Dewenter & Tscharntke, 2002). Generally the trophic-level hypothesis of island biogeography states that species of higher trophic levels are more prone to the effects of fragmentation than species of lower levels (Holt *et al.* 1999). Empirical evidence for this hypothesis was found by Kéry *et al.* (2001), who showed that reduced reproduction of *Gentiana cruciata* in small and isolated calcareous grassland fragments was offset by decreased herbivory by its specialised herbivore, *Maculinea rebeli*. Colling and Matthies (2004) came to similar conclusions and argued that habitat fragmentation may release plants from parasites and pathogens, which may mask the direct negative effects of habitat fragmentation on plant fitness (Butaye *et al.* 2005).

Groppe *et al.* (2001), finally, investigated the relation between *Bromus erectus* and the pathogen, *Epichloë bromicola*, with respect to small scale habitat fragmentation. These authors related increased disease frequency at the level of the host plant and/or the fungus to a higher degree of habitat fragmentation.

2.2.2.2. Climate change

Currently, evidence is accumulating that biodiversity is affected by a global phenomenon called *climate change*. This refers to statistical significant variation in the Earth's global climate or in regional climates that persist for an extended period, typically decades or longer (IPCC 2001).

The Earth's energy balance and climate have always been subject to changes resulting from processes internal to the Earth or external forces like variations in sunlight intensity (Calow 1998). However, since the industrial growth (1750), the Earth's climate has changed as a result of human activities, e.g. by the emission of greenhouse gases (CO_2, CH_4, N_2O, O_3). There is currently strong evidence that these human activities have resulted in *global warming*: by 2100, global temperatures are predicted to rise by up to 4°C, with associated alterations in precipitation patterns (Thuiller 2007).

The scientific world now also agrees that anthropogenic global warming in the 20th century has affected Earth's biological systems. The ranges of species are generally shifting towards the poles and upward in the mountains (Parmesan 2004). Each 1°C of temperature change moves ecological zones on Earth by about 160 km (Thuiller 2007). On the one hand, warm-adapted communities are expanding (IPCC 2001, Parmesan 2006). On the other hand, species of which the entire habitat disappears, or the ones which cannot follow the 'movement' of their habitat quickly enough, are the most extinction-prone (such as range-restricted species like those inhabiting tropical coral reefs). Thomas *et al.* (2004) predict that 15 to 37 % of the taxa in their sample regions (covering 20% of the Earth's terrestrial surface) will be 'committed to extinction' until 2050. Further, an advance in the timing of flowering may cause disruptions in the interaction with pollinators (and may thus affect fruit harvesting, Parmesan 2004). Climate change may also lead to community restructuring, for instance in Polar regions (e.g. Aanes *et al.* 2002) and arid ecosystems (Brown *et al.* 1997).

Furthermore, there is little evidence that the predicted species extinctions will be prevented by genetic adaptation of these species to the changing environment (Parmesan 2006). Anthropogenic climate change and the associated global warming is thus the major threat to biodiversity at the moment.

2.2.2.3. Invasive species

While anthropogenic global change has negatively impacted some species, others have thrived and proliferated, sometimes with dramatic impacts on biodiversity. Such species are referred to as "invasive". The spread of alien species into native ecosystems and habitats is believed to be the second largest cause of current biodiversity loss worldwide, after habitat destruction (Vitousek et al., 1997).

Most definitions of "invasive" consider a combination of criteria: (1) being an exotic (species, subspecies or lower taxon, introduced outside its natural past or present distribution); (2) reproduce and increase its range in its new environment; (3) have an important impact on this new environment (Vanderhoeven & al., 2006).

Exotic species are characterized by different degrees of potential for naturalization and invasiveness. Only a small fraction of exotics become invasive, and even a small part of those are considered, based on rather subjective criteria, as troublesome or nuisance. For most species the process of invasion is rather poorly documented (Vanderhoeven & al., 2007).

Richardson *et al.* (2000) describe the process as an introduction-naturalisation-invasion sequence. The invasive process requires a taxon to overcome various abiotic and biotic barriers: geographic, environmental, reproductive and/or dispersal barriers. The status of taxa evolves after each barrier coped with. Invasion requires for introduced plants also to overcome barriers to dispersal within the new region and to cope with the abiotic environment and biota in the general area: in a first stage disturbed habitats and later more natural habitats.

The impacts of invasions are direct or indirect and may be classified in three categories (Vanderhoeven & al., 2007):

- environmental impacts (genetic impacts, impacts on populations, communities and/or ecosystems)
- economic impacts with direct (yielding decreasing, management cost) or indirect costs (species richness decrease…)
- impacts on public health (Vanderhoeven & al., 2007).

So, in addition to the threats for biodiversity, the direct costs of Invasive Alien Species are huge. It is difficult to estimate precisely the economic losses resulting from biological invasions. They include the impact of weeds on crop production, the increased costs of control, the decreased water supply, the management costs of reducing the alterations of protected areas, the impact of introduced pathogens affecting wildlife and public health, the impact of marine organisms transported by ships (mainly ballast water and hull-fouling)... Based on data obtained in the US, the UK, Australia, India, South Africa and Brazil, the economic costs generated by the biological invasions would represent approximately 5 % of the world economy (Pimentel *et al.*, 2000).

2.2.3. Problems of small populations

Because many species can no longer survive in our man-dominated landscapes, increasing effort is being paid by conservationists to protect reserves of relatively undisturbed habitat. Therefore, a predictive understanding of the relationship between population size and its chances of extinction, is indispensable (Shaffer 1981).

The small population paradigm (*sensu lato*, see Hedrick *et al.* 1996) or the conservation genetics paradigm (Ouborg *et al.* 2006) deals largely with the population genetics and population dynamics problems faced by a population at risk of extinction because its numbers are small, comparable to a population on a small island, or its analogue in a zoo. As discussed above, the main causes for this are loss of habitat, habitat fragmentation, introduction of species, overexploitation, environmental pollution and climate change.

At least part of the processes which are induced when a population decreases in size are depicted in Figure 6, the so-called *extinction vortex*.

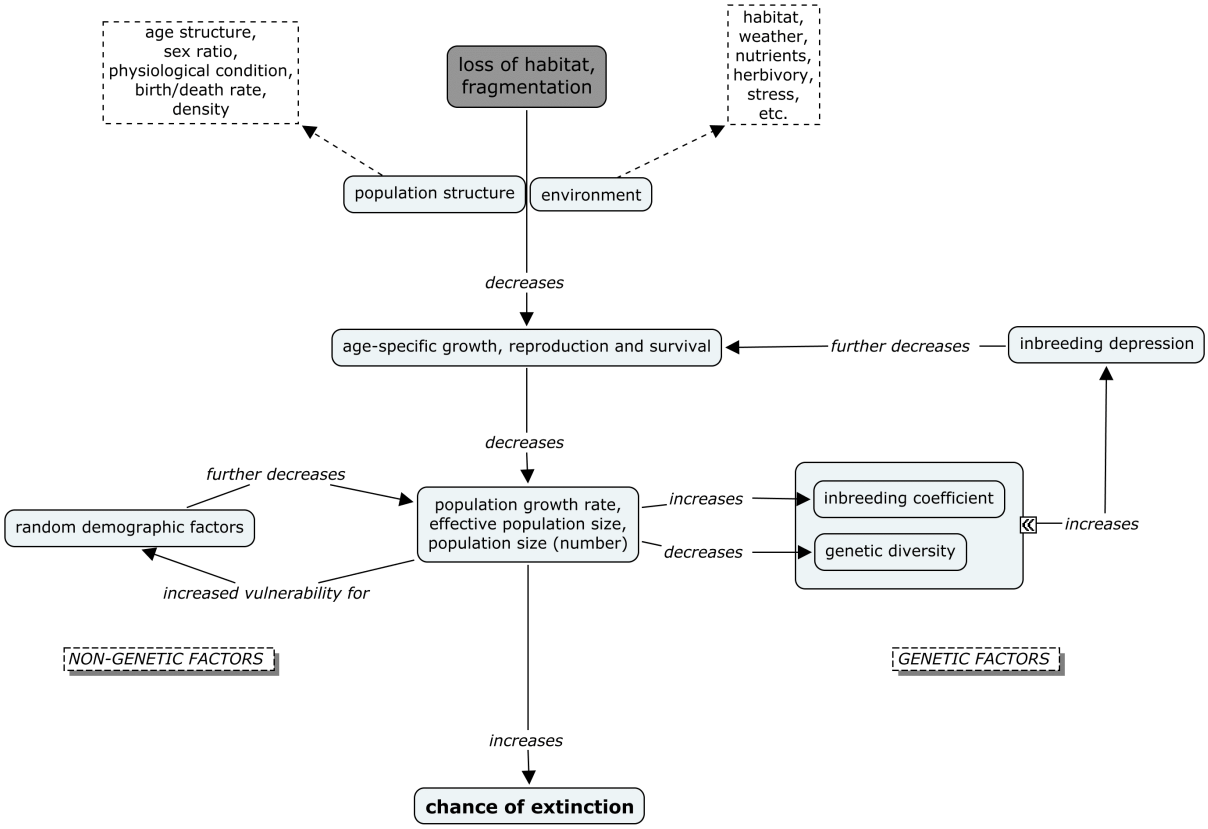

Figure 6. The extinction vortex (adapted from Buiteveld & Koelewijn 2006).

Small-sized populations become more susceptible to stochastic (or chance) events like demographic, environmental and genetic stochasticity as well as Allee and edge effects (Lande 1998), in turn leading to smaller population sizes.

Demographic stochasticity is the variation in population dynamics owing to chance events *affecting individuals* and it increases extinction risks in small populations only (Menges 2000, Ouborg *et al.* 2006). In a very small population of mammals, for instance, if a female produces male offspring for three consecutive years and then dies herself, the population may die out (Caughley 1994). Simulation studies have shown that demographic stochasticity is only relevant in very small plant populations (N < 50; Oostermeijer *et al.* 2003).

Environmental stochasticity is the variation in demographic parameters caused by environmental variation (competitors, disease, weather, herbivory, pollinator availability, etc.) *affecting whole populations*. Increasing environmental stochasticity increases extinction risk (Menges 2000, Ouborg *et al.* 2006). For instance, edge effects, which increase in importance as habitat becomes more fragmented, will magnify environmental stochasticity (Caughley 1994, Oostermeijer *et al.* 2003). Environmental stochasticity is believed to be more important than demographic stochasticity and populations need to be larger to be buffered against environmental stochasticity. In particular, catastrophes, i.e., environmental stochasticity with high impact and low frequency, may easily cause local extinction. Catastrophes involve extreme natural events such as floods, but we may also place high-impact anthropogenic accidents with local reserve management or road works in this category.

In the 'extinction vortex' (Figure 7), two positive 'feedback loops' may be discerned. These non-genetic and genetic feedback-loops may also enhance each other.

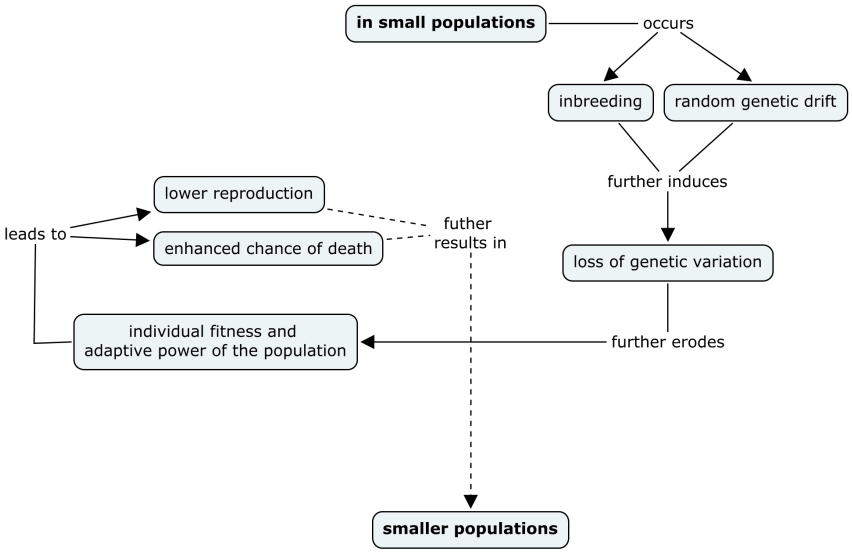

Figure 7. The genetic, positive feedback loop in detail (adapted from Buiteveld & Koelewijn 2006).

Genetic variation is indispensable for populations to adapt to changing conditions and a loss of it is mostly translated into altered birth and death rates and thus the long-term survival. The two processes underlying loss of genetic variation in small populations are (Figure 7 and see Ouborg *et al.* 2006):

- **Genetic stochasticity** or **genetic drift** involves the random loss of genetic variants (alleles) from small populations due to the fact that not all of them are represented in the new generations. In the absence of mutation, in a smaller population, the chance that beneficial genetic variants, e.g. resistant genes, disappear by accidence is several times higher than in large populations. This even increased in isolated populations where migration is much less probable than in non-isolated populations. For plants, loss of genetic variation by drift is then not compensated for by immigration of seeds or pollen from other populations. This leads to increased genetic differentiation among populations. It has recently been established that gene flow has significant effects on population fitness (Newman & Tallmon 2001, Tallmon *et al.* 2004). In years with for instance extreme drought, loss of genetic variation may occur and the population may genetically be completely different from the previous year. In large populations, this risk is much smaller. The probability that genetic drift will fix a given allele is dependent upon its initial frequency (the chance of being lost is, of course, greater for rare alleles) and the size of the population.
- **Inbreeding** (mating between close relatives) is obviously much more likely in small populations than in large ones. This does not lead to a loss of alleles, but rather redistributes alleles from heterozygous to homozygous combinations. This may then result in the expression of vulnerable, recessive alleles in the offspring, which are masked in previous, heterozygous state. Inbreeding may result in lower fitness (decreased vitality and fertility) of the offspring and in decreased total population viability and fitness, called inbreeding depression (Crnokrak & Roff 1999). For instance for plants, inbreeding may result in significantly reduced seed quality, which is expressed in lowered germinability, small seedling size and higher mortality (Oostermeijer 2003). Inbreeding effects are more predictable and directional than the effects of genetic drift and genetic drift may be generally more significant.

The importance of anthropogenic, ecological and genetic factors affecting population dynamics can simultaneously be evaluated through the use of **population viability analyses (PVA)**. PVA extrapolates from field-collected demographic data in order to understand the health and functioning of populations and to model extinction scenarios (Boyce 1992). By correlating

habitat characteristics and management regimes with population survival estimates based on PVA, one can then identify site management strategies that enhance the likelihood of long-term population survival (Menges & Dolan 1998, Menges 2000). However, studies that integrate all of these variables in a single PVA are still very scarce, so identifying the exact causes of species decline and proposing management guidelines to alleviate these threats, remains often challenging (for plants: Oostermeijer 2003, Oostermeijer *et al.* 2003, Hermy *et al.* 2007). Furthermore, some authors argue that the estimates of extinction risk are usually too imprecise to be worthwhile (Ellner *et al.* 2002), while others underline its value as the best tool available in many circumstances (Brook *et al.* 2002).

A closely related concept is **minimum viable population (MVP) analysis**, an estimate of the minimum number of organisms of a particular species that constitutes a viable population (Boyce 1992), i.e., a population that has a good chance of surviving for some relatively long period of time, for instance, a 95% chance of surviving for at least 100 yr.

2.2.4. The spatial structure of populations

Traditionally, conservation efforts promoted a '*species approach*', by implementing measures mainly aiming at protecting areas with populations of particularly vulnerable or threatened species (Primack 1998). This approach resulted in the design of nature reserves, devoted to the protection of biodiversity with little attention paid to other parts or aspects of the territory or landscape matrix (e.g., Myers *et al.* 2000). In that period the linkage between protected sites did not seem to be crucial.

This method is now recognized as being largely insufficient to preserve biodiversity in a sustainable way, as reserves represent only a negligible part of the earth's surface (and hence a low portion of global biodiversity) and because of the additional effects of habitat fragmentation (Burkey 1989). The emergence of new scientific paradigms has allowed the identification of the shortcomings of a strategy solely based on preservation of nature reserves. Natural scientists have approached the problem of habitat fragmentation for the past 25 years largely within the framework of two key theoretical developments in community and population ecology: the theory of island biogeography and metapopulation dynamics. From these theoretical paradigms, a new territorial planning strategy emerged in the beginning of the eighties (Figure 4): the ecological network, which will be discussed in paragraph 1.5.

2.2.4.1. The equilibrium theory of island biogeography (Hermy 1986; Begon et al. 1996)

The equilibrium theory of island biogeography (ETIB, often referred to as 'island theory') was elaborated by MacArthur and Wilson (1963, 1967) to explain the observed lower species diversity of animal communities on oceanic islands than in apparently comparable pieces of mainland.

They proposed that **the number of species on any island** (i.e. the equilibrium number; Figure 8) **reflects a balance between immigration** (the rate at which new species colonize it) **and extinction** (the rate at which populations of established species become extinct).

Four assumptions were made:

- **The immigration rate decreases with isolation of the island** (Figure 8) since colonizers have a greater chance of reaching an island the closer it is to the source pool. The curve will always reach zero at the same point (when all members of the pool are resident); but, it will generally have higher values on islands close to the source of immigration than on more remote islands.
- **Extinction rates are higher on small than on large islands** (Figure 8) since population sizes will typically be smaller on small islands.
- **The rate at which new, unrepresented species could become established, is initially very high, but inevitably declines as the number of resident species rises.** The immigration rate reaches zero when all species from the 'source pool' (i.e. from the mainland or from other, nearby islands) are present on the island in question.
- **The rate at which species might become extinct on the island increases with the number of resident species.** When an island is nearly empty, the extinction rate is necessarily low because few species are available to become extinct. However, as the

number of resident species rises, the extinction rate is assumed by the theory to increase, probably at a more than proportionate rate since the resources of an island are limited (due to competitive exclusion).

Furthermore, **this balance is dynamic**, with species continually becoming extinct and being replaced (through immigration) by the same or by different species. The rate at which additional species will establish populations will be high when the island is relatively empty, and the rate at which resident populations go extinct will be high when the island is relatively full. Thus, there must be a point between 0 and the number on the mainland, where the two rates are equal - where input from immigration balances output from extinction. That equilibrium number of species would be expected to remain constant as long as the factors determining the two rates did not change. But the exact species present should change continuously as some species go extinct and others invade (including some that have previously gone extinct), so that there is a steady turnover in the composition of the fauna and flora (Ehrlich *et al.* 1988).

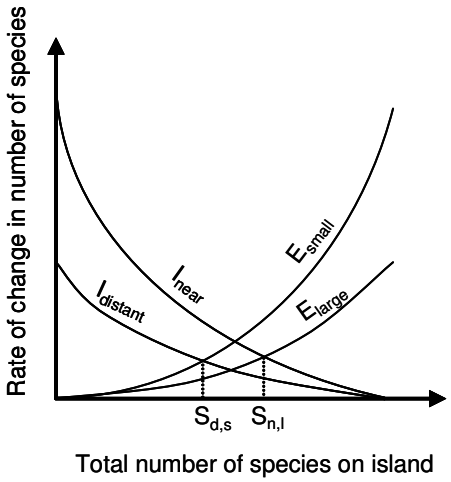

Figure 8. The equilibrium theory of island biogeography (ETIB) of MacArthur and Wilson (1967): I = immigration rate, E = extinction rate. Islands close to a mainland would likely have higher immigration rates than more distant islands, while large islands would likely have lower extinction rates than small islands (Simberloff 1976). Thus, large islands close to continents are predicted to have a higher number of species ($S_{n,I}$) than small islands more distant from continents ($S_{d,s}$).

The authors suggested that while this theory focused on species diversity on oceanic islands, the predictions may be consistent for plant and animal communities inhabiting terrestrial 'islands' (MacArthur & Wilson 1967).

The Equilibrium Theory represented a great conceptual advance over the theories that dominated island biogeography in the mid-20th century. At the time of publication of this new theory, insular community structure was considered static, resulting from unique immigration and extinction. It thus represented a novel, even revolutionary, unifying theory that stimulated many hundreds of studies on patterns in species richness of a great variety of ecosystems and biotas (Lomolino 2000a). Hence, MacArthur and Wilson's ETIB quickly became the paradigm of the field in the 1960s and has strongly influenced this and other disciplines of ecology and conservation biology for the past decades (Hanski & Simberloff 1997, Hanski 1999, 2004).

CRITICISM REGARDING THE ETIB

Recently, however, a growing number of ecologists have begun to question whether the theory remains a useful paradigm for modern ecology. In short, the theory has not kept pace with advances in ecological theory and our growing appreciation for the complexity of nature, especially with empirical findings that species diversity on many islands is:

- not in equilibrium;
- influenced by differences in speciation, colonization, and extinction among taxa; and
- influenced by differences among islands in characteristics other than area and isolation.

Hermy (1986, based on Pielou 1979) summarized these critics into eight categories, which are discussed in appendix 6.

Because of these critics, it is now argued that the theory needs re-evaluation (Lomolino 2000a, 2000b; Brown & Lomolino 2000; Fox & Fox 2000; Heaney 2000; Ward & Thornton 2000; Whittaker 1998, 2000; Drake *et al.* 2002).

ETIB AND NATURE CONSERVATION: THE SLOSS DEBATE (WHITTAKER 1998)

Within a few years after the publishing of the ETIB, its application to the field of conservation biology had been realized and was being vigorously debated in ecological circles. This led to the debate known as Single Large or Several Small (SLOSS), described by writer David Quammen as 'ecology's own genteel version of trench warfare'. The SLOSS debate was a debate in ecology and conservation biology during the 1970s and 1980s as to **whether the choice of a single large or several small (SLOSS) reserve(s) with the same total area was a superior means of conserving biodiversity in a fragmented habitat**.

If a reserve is created by clearance of surrounding habitat, then it follows that on initial isolation the immigration curve should be depressed. The contiguous area of habitat is also reduced and thus extinction rate should increase. At the point of creation, therefore, the habitat island contains too many species, it may even gain fugitive, displaced populations, and the result is that it becomes *supersaturated*. The ETIB then predicts that it should in time undergo *'relaxation'* to a lower species number (thus lose species), a new equilibrium point.

Given a finite total area which can be set aside for conservation as a natural landscape is being converted to other uses, what configuration of reserves should conservationists advocate? Following the island analogy, Diamond (1975) and later the IUCN (1980) favored larger rather than smaller refuges, short rather than long inter-reserve distances, circular rather than elongated reserves (minimizing edge effects), and the use of corridors connecting larger reserves where possible (Figure 9).

Indeed, large reserves have several advantages:

- larger chance of conserving whole ecosystems
- lower impact of predation and competition
- decreased edge effects
- lower risk of local extinctions
- higher local genetic diversity

The view that large reserves should be the norm in reserve design (which is particularly true when conserving larger species), was popularized by many other ecologists, and has been incorporated into most standard textbooks in conservation biology, and was used in real-world conservation planning.

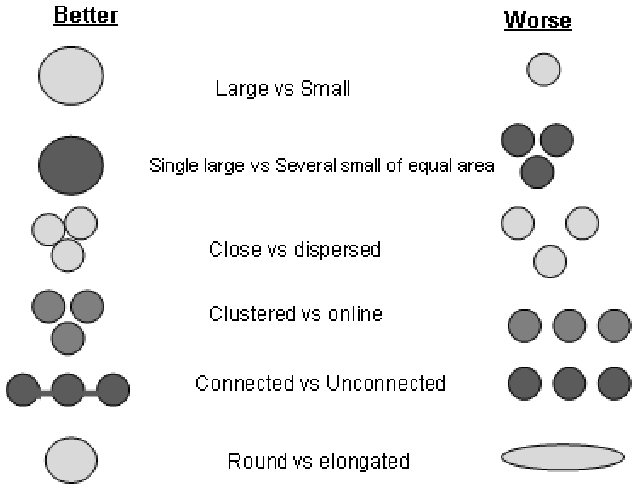

Figure 9. The suggested geometric principles for the design of nature reserves which were supposedly derived from island biogeographic studies, and which were at the centre of the so-called SLOSS debate (redrawn after Diamond 1975). These 'principles' have been challenged on both theoretical and practical criteria.

The suggestions of Diamond were, however, challenged by among others, Wilson's former student Daniel Simberloff, who considered this to be an unproven over-simplification that would damage conservation efforts. Much of the debate hangs on the validity and interpretation of the ETIB, on which these recommendations are based (see appendix 7). One of the issues under

discussion is that oceanic islands fundamentally differ from habitat islands ('islands in a sea of habitats modified by man'), see, for instance, Boecklen (1997). There is increasing recognition that the matrix in fragmented landscapes can potentially influence species abundance or composition in the embedded patches (for animals: e.g. Ricketts 2001 and a recent review by Watling & Donnelly 2006 and for plants: e.g. Cook *et al.* 2002 and a recent review by Murphy & Lovett-Doust 2004).

Advantages of several small reserves over single large ones may be:

- they may serve as 'stepping stones' between larger entities
- a large set of smaller reserves may be more buffered against extinction, predation and catastrophes
- regional species diversity and regional genetic diversity may be increased by conserving several small refugia instead of only one large refugium.

Most commentators regard these theoretical debates as **having contributed little of direct practical value to conservation**. It is now recognized that the answer to the question whether a large or several small reserves is the best option, depends on several criteria, such as the ecology of the species (It might, for instance, be possible to keep the highest diversity of butterfly species by means of a number of small reserves, each targeted to provide particular key habitats) or the trophical level and body size (top carnivores, such as big cats, need large territories incorporating both good and poor habitat), competition, which may lead to the exclusion of species of similar niches within the same reserves, epidemiological risk (having 'all your eggs in one basket'), overriding practical considerations, the physical consequences upon fragmentation or edge effects.

CONCLUSION: THE APPLICATION OF THE ETIB AS A CONSERVATION TOOL?

The ETIB has lead to a more integrated vision of nature conservation where space has become more heterogeneous and where natural patches are separated by intensive agricultural zones, urban zones or barriers like communication and transport infrastructures. The reduction of extinction rates and the maintenance of immigration possibilities became thus objectives of nature conservation. Models based on this theory have allowed the delineation and the spatial distribution of nature reserves (Shafer 1990).

To conclude, the application of ETIB is not recommended in nature conservation (and other fields like town and country planning). The risks to give wrong (or in the best case, incomplete) advice for the choice and construction of nature reserves are higher than the chances for good recommendations (Hermy 1986).

Although the ETIB remains controversial, it has stimulated several concepts that need to be considered for a sound conservation practice. Thus from the point of view of maximization of species number and ensuring persistence several ecological factors should be considered, including distribution of the fragments across environmental gradients, intrinsic patchy nature of habitats, area requirements, dispersal ability and sensitivity of constituent species to fragmentation.

2.2.4.2. The metapopulation theory

The waning of the ETIB as a dominant conservation paradigm in the late 1980s coincided with the burgeoning interest among biologists in the metapopulation concept (Hanski & Simberloff 1997). The ETIB was originally developed to explain patterns at large spatial scales and dealt with species richness of communities, whereas the metapopulation concept applies to populations in fragments (patches) of our landscapes.

A *metapopulation* (MP) can be defined as a set of local populations (subpopulations) of the same species within a larger area, where migration of one subpopulation to at least one or several other suitable patches (already or not occupied by local populations) is possible. A *patch* may then be defined as a continuous area with all necessary resources for the subpopulation, separated from other patches by an unsuitable habitat. The *metapopulation structure* is then the network of different patches, occupied by a MP. This is featured by (i) a specific spatial occupancy of the patches and (ii) specific interpatch migration rates.

In MP biology, the population concept (a population is a group of interacting individuals of a species in a certain place and at a certain time) at *local scale* is thus abstracted to a higher level, namely the *regional scale*. The population dynamics at local scale are largely determined by birth and death rates, while at the level of the MP, mainly dispersal and migration play an important role. The dynamics of the MP, i.e. the shifting occupancy of suitable patches, is mainly determined by colonization and extinction.

Although the MP concept has a history going back to the early part of the 20th century (Hanski & Simberloff 1997), the term "*metapopulation*" was introduced by Levins in 1969 (Levins 1969, 1970) in order to describe and predict the population dynamics of species occupying naturally patchy habitats, such as mountaintops and to gather more insight into the dynamics of biological plagues. Levins' work laid the basis for modern MP theory. After the publication of the Levins (1969) model, it lasted for another twenty years before the concept broke through in population biology (see Hanski & Simberloff 1997). The classic MP concept of Levins (1969, 1970, Figure 10), which assumes a large number of small and hence extinction-prone local populations connected by not-too-much migration occupying equally connected patches (see appendix 8), is now seen as a special case, possibly an uncommon special case (Hastings & Harrison 1994, see appendix 8 for an in-depth discussion).

Because of the large interest of ecologists for metapopulations during the past 20 years, the MP concept has been extended in order to encompass a wider class of population structures (Harrison & Taylor 1997, Hanski & Gilpin 1997, Hanski 1999, Elmhagen & Angerbjörn 2001), **whereby not the dynamics of extinctions and colonization is put central, but the interactions between local populations via migration or dispersal of individuals**.

For this reason, the empirical studies were reviewed and several alternative models were proposed (e.g. Harrison and Taylor 1997). It was assessed that **true** metapopulations range between *classic* and *source-sink* with *mainland-island* in between (Hanski & Simberloff 1997).

- Classic metapopulations: a network of sites, with local dynamics occurring at a much faster timescale than MP dynamics; all populations have a significant extinction risk.
- Mainland-island MP (Figure 10): one large permanent population (the mainland) acts as source from where other smaller populations (islands) are (re-) colonized. Dispersal is thus unidirectional.
- Source sink: where some sites have a negative growth rate at low density in the absence of immigration and in others the growth rate at low density is positive; the latter support the former through emigration.

Thus a system tends more towards a source-sink MP as the contribution of immigrants to the population becomes more unequal among the sites (Bullock *et al.* 2002).

Regional dynamics other than metapopulations include *patchy populations* (Harrison and Taylor 1997) and *non-equilibrium* or *remnant systems* (Eriksson 1996, Harrison and Taylor 1997).

- Patchy populations (Figure 10): where there is a single population distributed among sites in a region; these show no independent dynamics and dispersal among sites is very high, so extinction of local populations is very rare. In essence, it is one spatially structured population.
- Non-equilibrium or remnant systems (Figure 10), where populations are independent and there is no, or extremely little, migration among sites. As a result, local extinctions are not balanced by (re-)colonizations and non-equilibrium metapopulations are instable in time.

Freckleton and Watkinson (2002), in addition, proposed a classification of spatial dynamics from regional to local dynamics, specifically for plants (classic MP, mainland-island MP, shifting cloud or remnant, island, patchy and extended local populations).

The MP concept has thus been broadened to recognize that all species have local and regional dynamics. However, some authors caution against encapsulating all regional dynamics within the MP family, because it assumes that MP theoretical predictions and modeling approaches are valid in all cases (e.g. Bullock *et al.* 2002).

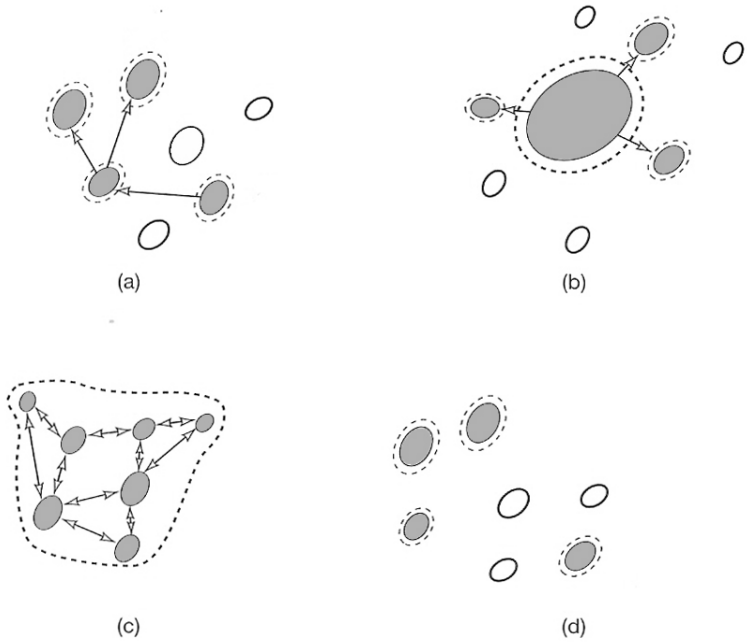

Figure 10. Different kinds of metapopulations. Closed circles represent patches of habitat; filled = occupied; unfilled = vacant. Dashed lines indicate the boundaries of 'populations'. Arrows indicate migration (colonization). (a) Classic MP; (b) Mainland-island MP (common); (c) Patchy population; (d) non-equilibrium MP (differs from a in that there is no recolonization), often occurring as part of a general regional decline. Modified from Harrison (1991).

CRITICISM REGARDING THE MP THEORY

Although the MP concept is now the dominant paradigm in population ecology, it is not undisputed in the literature. A few of the critics are summarized in the appendix 9.

Furthermore, it is not clear what role the MP theory has to play in plant ecology. While the MP concept has been extremely influential and is mostly developing in the study of animal populations (Hanski 1999), less empirical studies of plants have addressed its predictions (Husband & Barrett 1996, Eriksson 1996, but see for instance Bossuyt & Honnay 2006). Plants differ from animals in many respects (see appendix 9). As a result, there is a growing body of literature questioning the applicability of the MP concept for plant populations (Husband & Barrett 1996, Bullock *et al.* 2002, Freckleton & Watkinson 2002, Ehrlén & Eriksson 2003, Freckleton & Watkinson 2003).

MP THEORY AND CONSERVATION BIOLOGY

For many species in man-dominated landscapes, natural habitats occur in small, spatially separated fragments and the species that inhabit these fragments may function as metapopulations. Therefore, MP theory has come to lend ideas on how to manage populations in fragmented habitats and how to design reserve systems (Caughley 1994, Hanski 1999). Operational concepts for conservation biology that have been derived from MP theory are the **minimum amount of suitable habitat** (**MASH**) necessary for MP persistence (Hanski *et al.* 1996), the **minimum viable metapopulation size** (**MVMP**) or the minimum number of interacting local populations necessary for the long-term persistence of the MP (Hanski *et al.* 1996), the **metapopulation capacity** of a landscape, which predicts the persistence of a given species in a given landscape according to the biological properties of the species (Hanski & Ovaskainen 2000) and more recently the **patch quality value** (Hanski & Ovaskainen 2003).

In practice, however, the use of these concepts may degenerate into specious 'magic numbers'. A more constructive approach is to use MP models to rank alternative scenarios of landscape change in terms of persistence of a focal species. One may ask, for instance, whether the entire removal of one large habitat patch is more detrimental to a MP than reducing the areas of several patches (note the connection to the SLOSS rule). The ETIB inspired the rules of refuge design discussed above. Analogously, the MP theory led to predictions about the relative performance of particular species in particular fragmented landscapes based on relatively simple

but spatially realistic models. There are reasons to expect the latter sorts of predictions to be more helpful than the island biogeographic rules of refuge design (see appendix 10).

To illustrate: the proportion of occupied patches by a MP increases according to dispersal and migration facilities between the different patches. For species persistence at the landscape scale, the colonization rate must be higher or at least equal to the extinction rate. If the *isolation* of the different populations is high, the patch area must be increased to lower the extinction rate. If, in contrast, the *patch area* is small, the extinction rate will be high and thus the connectivity of sites (corridors, see below) must be increased to increase the colonization rate (Hanski & Simberloff 1997).

The general effect of the use of MP theory in conservation biology has thus been to draw attention to landscapes and networks, as opposed to individual reserves in isolation, for which the island metaphor of island biogeographic theory is appropriate. The rise of the MP concept has served and continues to serve a useful function by forcing conservation biologists to gather data that are important to effective conservation strategies of individual species – movement rates from site to site, relative reproduction and mortality rates at different sites, and the like (Hanski & Simberloff 1997).

For a more detailed comparison of the MP theory to ETIB, we refer to appendix 11.

2.2.5. Ecological networks

The former practice of nature conservation focusing on individual sites and managing them in respect of their unique communities has been abandoned. From the theoretical ecological paradigms described above, a new territorial planning strategy emerged in the beginning of the eighties: the ecological network. This strategy is considered as a response to the effects of habitat fragmentation. Nature conservation should be thought not only as species protection and site protection, but also as the management of coherent spatial structures (Jongman, 1995). Today, it is clearly evident that biodiversity can only be preserved by a global management of the territory. Hence, the crucial task is to attain a functional connectivity maintained by biological and geophysical interrelations (Endels, 2006).

According to Opdam (2006), an ecological network is a set of ecosystems of one type, linked into a spatially coherent system through flows of organisms, and interacting with the landscape matrix in which it is embedded. Hence, the ecological network is a multi-species concept, linking ecosystems, whereas the term habitat network as defined by Hobbs (2002) and Opdam (2002) refers to the habitat of a single species.

When we consider the superposition, at a regional scale, of several ecological networks defined for several species and habitats, we can talk about a kind of “metanetwork”, with a dynamic structure (some habitats can disappear while others appear). Globally, at the biogeographical region scale, this metanetwork must keep its coherence and quality, which are evaluated by the evolution of habitat quality and target species population number (Dufrêne, 2000).

An ecological network may be single purpose (Jongman, 1995) or multipurpose, in term of species and/or habitats, but the term itself implies that the network coherence is based on ecological processes (Opdam, 2006).

UTILITY AND FUNCTIONS

With respect to species diversity, a landscape is ecologically functional if two conditions are met. First, the spatial pattern of the landscape should support the ecological processes required for resilient populations of a selection of target species, and the spatial scale that is ecologically relevant to that target. Second, the changes that are associated with evolution of the spatial configuration of the landscape do not push the long-term persistence probability of the target populations to an unacceptably low level. Thus, with respect to species diversity, sustainable development of landscapes should comply with these two conditions. A third condition is related to the transfer of knowledge : local and regional actors deciding about landscape and land use changes should be able to apply these conditions in a complex planning and design process, even in the absence of expert knowledge about ecological processes (Opdam, 2006).

The concept of ecological networks appears as a functional response to habitat fragmentation effects on species communities. In this way, it is considered as a framework of ecological components, e.g. core areas, corridors and development zones, which provide the physical conditions necessary for ecosystems and species populations to survive in a human-dominated landscape (Jongman et Pungetti 2004).

The size of habitat patches is of major importance. Indeed, a large surface guarantees the local population viability and can improve possibilities for dispersion of specimens between the populations (Endels, 2006). One may say that in ecological networks local risks are spread over the whole network (Opdam, 2006). Planning is the key factor to establish ecological networks, since creating ecological networks requires an established planning system, be it regional or local (Endels, 2006).

2.2.5.1. Configuration and structure of ecological networks

The concept of ecological networks is rather considered as a territorial planning tool aiming at partitioning the landscape in objective zones. In general, at least three types of zones corresponding to three functions are considered:

- The **central zones** are zones containing species populations and habitats of high patrimonial value with a high conservation status, where preservation of biodiversity should be the top priority. These zones deserve a strong conservation status;
- The **development zones** (or associated zones) are zones of lower biological value but containing an important potential for biodiversity. These zones need a priori a lower level of protection than central zones. In these zones the coexistence between different objectives is possible;
- The **ecological corridors** are different landscape structures, with variable form and size (linear or tortuous, large or narrow) corresponding to structural links which, penetrating the landscape, maintain or restore the natural connectivity (see below).

The protection of habitats and species, however, is affected by many factors interrelated with each other. Environmental variations can be influenced not only by planning, but also by administrational decisions, community values, environmental attitudes, political and economic situations (Endels, 2006).

A key feature of ecological networks is that they can have different configurations and still serve the same goal. This is due to the variation in four physical features of ecological networks: total network area, quality, network density and permeability of the matrix (Opdam *et al.* 2003). Together, these features constitute the spatial cohesion of the landscape. Opdam *et al.* (2003) argued that this parameter is a useful indicator for the ecological sustainability of landscapes to species. In planning, these four features can be used as four spatial strategies to design ecologically sustainable landscapes. (Opdam, 2006)

Another key feature is that ecological networks can be delineated at any spatial scale. Species differ with respect to the spatial dimensions of their networks (Vos *et al.*, 2001*)*. For small species, sustainable ecosystem networks have a local to regional spatial scale. Larger species need ecological networks on larger spatial scales, which may encompass several countries. Also, disturbances are scale dependent, with resilience to climate change demanding cohesion on the biogeographical scale (Opdam & Wascher, 2004).

To conclude, the development of ecological networks ultimately aims at nature conservation; the former is only a tool to reach the latter. Ecological networks are one of the possible measures to tackle the decline of species and habitats. Hence, a combination of several measures is the best practise for ensuring alternative solutions to the problem of environmental fragmentation (Jongman & Pungetti, 2004).

2.2.5.2. Specific attributes of corridors: the corridor theory

One approach to solve the problem of fragmentation is to establish ecological corridors that link various critical habitats and facilitate the movement of species between them (Pirot *et al.*, 2000). Foppen *et al.* (2000) propose to define corridors as “a setting in chain of the habitats and resources of a species, which are composed of landscape structures different from the matrix,

outcome for positive purposes from the point of view of the exchange of the propagules of the species (individuals, seeds, genes)"

Ecological corridors, such as linear patches of some habitat types joining greater areas of those habitats or small patches acting as stepping-stones, play a fundamental role in the dispersal and the genetic and demographic connectivity of metapopulations of some species and may thus contribute very substantially to their survival. (WECI, 2000).

Corridors are linear elements of which physiognomy differs from adjacent environment: the matrix. They permit dispersion of animal and plant species between two habitat patches (Clergeau & Désiré, 1999). Corridors can be natural (rivers, peaks, passages of animals,…) or artificial (roads, high voltage lines, hedges, ditches,…). Most of them are organised in networks and their linearity confers them a particular role in the circulation of flows of substances or organisms. Forman (1995) gives five main functions for corridors: habitat, conduit, filter, sink and source.

Corridors are supposed to facilitate dispersal between patches through surrounding matrix landscape and thus to reduce isolation (e.g. Saunders & Hobbs, 1991; Aars & Ims, 1999; Burel, 1996; Gilbert *et al.* 1998; Haddad, 1999b). This concept became one of the most important battlegrounds in conservation (Mann & Plummer, 1995). The functional definition of the term corridor (e.g. Merriam, 1991) differs from structural definitions (see Forman & Godron, 1986; Baudry & Merriam, 1988), which are widespread in corridor literature. It can be assumed, that corridors are more important for less mobile species than for species with high vagility (Burbrink *et al.* 1998). We can also assume, that corridors are more important for habitat specialists, than for generalists (fragmentation sensitive species) (Beier & Noss, 1998). It can been concluded, that functional definitions of the term corridor depend on properties of the species and are thus species specific (Burbrink *et al.* 1998).

The overall management objective in a corridor is the maintenance of ecosystem structure, function and integrity. Most of the time corridors are part of a larger landscape structure : an ecological network. In this network, the matrix, in liaison with the ecological corridor, can also permit the connection between critical habitats. The corridors usually require special protection and management to ensure that the linkages are maintained (Pirot *et al.* 2000).

The tacking into account of biological connection zones, recognised for their functional value, and also for their landscape aesthetic quality, appears currently as a goal for the territory management. It should guide the management of complex spaces, by limiting the need of compensation measures in the future (Clergeau & Désiré, 1999).

CONFIGURATION AND STRUCTURE

Corridors are landscape elements, among matrix and patches of target habitat (Forman & Godron, 1986). They are features that connect core areas like "bridges", enabling species to migrate and communicate. Ecological corridors can be very diverse: linear forested ecosystems associated to water courses, roads, railways or field borders, but also small patches of natural or semi-natural habitats found in agricultural land or even cultures where rotation periods or lack of intensive management makes them apt to maintain a wide away of wild species. We recognize three structural types of corridors:

- Linear corridors – continuous elements distinctively different from the surrounding nature parts and not intensively used (rivers, tree lines, hedges, etc.);
- Landscape corridors – landscape belts connecting core areas;
- Stepping stone corridors – not continuous in structure but enabling ecological network to function (system of water habitat types important for migratory birds etc.) (SINP, 2004)

One may classify methods of design of ecological corridors in two main categories, which rise from convergent interest of two large branches of ecology for the nature conservation problem: the landscape ecology, on one hand, and the animal and behavioural ecology, on the other hand. For the specialist of the last, each landscape portion may operate as a corridor for one given species insofar as it presents a sufficient degree of environmental quality to permit some individuals of this species to take it during its dispersion (Corsi *et al.* 2002)

The role played by a corridor depends of its structure, its place in the landscape and the biological characteristics of the concerned species. This role also depends of its place in the network of linear elements. This network is characterised by its linearity, the number and quality

of their connections, and the quality of their elements. The whole of these elements defines the different possible ways to go from one point to another point, and thus probabilities of individual movements. (Burel, 2000)

Hindmarch and Kirby (2002) distinguish 3 functional types of corridors :

- Simple dispersion corridors, which are particularly used by young vertebrates and imply permanent movement from one zone to another;
- Reproduction corridors, which are habitat segment of sufficient quality to permit reproduction of species inside corridors linking one habitat network to another;
- Area expansion corridors, which are large surfaces of continuous natural habitat permitting an evolutionary area expansion, for example in the case of a climate change.

Certainly, any strip of land that has the same habitat properties as the species' usual habitat should enhance gene flow between two larger areas, as the species in question will simply use the corridor for living and reproduction as any other habitat (e.g. Ims & Andreassen, 1999). However, corridors are often considered to be linear (one dimensional) structures (line corridors) (Forman & Godron, 1986). Unfortunately, some species are sensitive to edge effects and thus a strip of habitat may lose its habitat function if it becomes too narrow. Landscape elements serve as corridors, when they increase exchange rates between habitat patches (Haddad, 1999b). One-dimensional landscape elements without habitat properties could thus be functional corridors, when movements are increased compared with extra-corridor movements (Beier & Noss, 1998). This is well known for animals with high mobility like birds or mammals (e.g. Andreassen *et al.* 1998; Brooker & Brooker, 1999; Skagen *et al.* 1998), using linear structures as orientation cues or shelter (Butterweck, 2000).

SCIENTIFIC BASIS

Dawson (1994) suggests that the corridor concept emerged from numerous ecological theories such as ecological niches, insular biogeography, metapopulations theory, source and sink theory, and lately, landscape ecology.

Such as for the metapopulations paradigm, the ecological corridor concept has conducted scientists to the development of numerous models, but field data are still very scarce (Simberloff, 1992).

However, studies comparing invertebrate movement along corridors with movements in arable land are rare (e.g. Haddad, 1999b). The results with Abax parallelepipedus (Coleoptera Carabidae) indicate that a corridor increases movement out of the habitat and thus serves as a means for migration. For plants, corridor effectiveness is quite variable among the studied taxa and it is dependent on the dominating dispersal strategy of the species. For the dispersal of forest species, a broad continuous hedgerow, directly attached to the old habitat complex is surely more favourable (Glück & Kreisel 1988; Burel, 1989; Burel & Baudry, 1990; Charrier *et al.* 1997)

CRITISCISM

The success of the corridor concept lays mainly in that it stimulated reflexion about environmental conservation methods (Soulé, 1991). So, we may be surprised to note that there is no agreement about the possible configuration and the operation of these corridors, and that growing doubts seem to appear about their scientific basis (Dawson, 1994; Beier & Noss, 1998). This situation is unfavourable for the scientific research and slows down, in an important way, the development of sustainable ecological policies. Thus, it is urgent to clarify the range and the definition of corridors, like it's interest on the conservation point of view.

There are few theoretical or experimental data showing that habitat patches linked by corridors operate differently compared to habitat patches that are distinctively isolated from each other by the landscape matrix. This poses a problem from the point of view of the validity of the corridor as ecological conduit. In spite of scientific uncertainties and logics relating to it, the corridor concept is integrated perfectly into traditional approaches of the regional planning and meet the approval of ecologists (Hindmarch & Peinkowski, 2000).

EFFECTS ON SPECIES

These corridors play a role in the biological exchanges between habitat patches, for a considered species or group of species. Indeed, structural elements which are used as corridors by large mammals are not used in the same way by small rodents or insects. In function of their movement capacity (mode of locomotion or speed) and their habitat constraints (such as moisture for batrachians), species can use different kinds of corridors (Clergeau & Désiré, 1999). Corridors can be habitats for some species, while they may act as barriers for others (Paillat & Butet, 1994). So, one same geographical reality can take different values according to species; the concept of corridor has more a functional than structural dimension (Clergeau & Désiré, 1999).

Precise knowledge about relations between corridor and organisms are restricted to populations or individuals of some species, and there is no empirical study which assess the effects of corridors on the biodiversity in its whole. However, even if a landscape is managed for the conservation of one single species, we have to keep in mind the complexity of its organisation (Diamond, 1976; Soulé, 1991).

Some habitats or landscape features that act as corridors for some invertebrate species, may act as barriers or filters for the dispersal of other species, so a policy to maintain those landscape features should not be exclusive, aiming at the maintenance, restoration or building-up of mosaics of different habitat types, with great habitat diversity and corridor diversity (WECI, 2000).

For birds, the concept of corridor seems to be less pertinent because these species are very mobile. They need adequate habitat patches distributed on their axes of flight, more than really linear corridors. For this group, it is necessary to recognize the importance of habitat mosaics from the point of view of their functional needs (Hindmarch & Kirby, 2002).

Table 1. Pro- and contra-arguments for ecological corridors (EC) (cfr. Burel, 2000).

Advantages of EC	**Disadvantages of EC**
• Improve movements of individuals in a fragmented landscape • Increase immigration rate to isolated habitat patches • Facilitate the continuity of ecological processes • Are used as habitats by a lot of animal and plant species • Render services for the operation of ecosystems	• Can facilitate dispersion of undesirable species, diseases or genes • Increase the exposition of animals and plants to predators, competitors and parasites • Play a sink role for some species • Facilitate propagation of perturbations

PERSPECTIVES

The conclusions of the Workshop on the Ecological Corridors for Invertebrates (2000) were that ecological corridors should be integrated into conservation policies alongside with protection of hot-spots for biodiversity. Ecological corridors are necessary but not enough for the conservation of many invertebrate species. Ecological corridors need to be also integrated in other sectoral policies, in particular agricultural policies, forestry, transport and spatial planning. The maintenance of traditional landscape features should be given priority to the creation of new corridors. Active habitat restoration of corridors needs to be properly regulated and integrated in legislation, both in the general framework of ecological networks and in agroenvironmental policies or ecological compensation. policies following negative developments. Agriculture areas, particularly in zones of intensive agriculture should be priority target areas for restoration of corridors. It is suggested that at least 5 to 7 % (depending on the region) of agricultural areas - if possible 5 to 7 % of each farm - be restored for conservation of agro-biodiversity, so that those areas may gain in habitat diversity and serve as refuge for e.g. invertebrates. Action for restoration of corridors needs to be properly negotiated with the people that will be involved in their setting up and management (in particular farmers). Maintenance of natural ecological succession should be part of the management of some ecological corridors. Some areas of intensive agriculture need to be made more permeable to some species of invertebrates. More information and research is needed for the setting up of ecological networks, but this should not be an excuse for not acting now. Many natural corridors that are now blocked by infrastructures (dams, roads, railroads, canals, etc) should be properly adapted to recover their lost functions.

For invertebrate species, priority should be given to the setting up of corridors at the local and regional scale, as well as in transfrontier areas. (WECI, 2000)

SOME TYPES OF CORRIDORS

Hedges and fields borders.

In the west of France and in England, hedges networks have been widely studied for a large number of animals and plants. Hedges are the habitat of a large number of forest organisms (Pollard *et al.* 1974; Forman, 1984). Some reptile species are even exclusively found in the hedges of the west of France (Saint-Girons, 1976). They are sources of seeds for the recolonisation of abandoned crops (Baudry *et al.* 1993), filters for the movement of beetles between fields (Frampton *et al.* 1995), seasonal shelters for numerous insects (Lefeuvre *et al.* 1976), barriers against material flows (Burel *et al.* 1993) or wind-dispersed insects (Brunel, 1979). Their conduit role was showed for forest beetles (Petit, 1998a), little mammals (Paillat, 1997), and also for water and nutrients flows (Burel, 2000).

Roads and road verges

Roads and road verges play at the same time the role of barrier, shelter, and conduit for a large number of invertebrates. Mader (1988) has showed that even paved roads of low width can constitute a barrier for a Lycosidae (spider). This effect is less strict when the road centre is grassed. Munguira *et al.* (1992) have showed in Dorset and Hampshire, in England, that road edges and central bands accommodate a large diversity of diurnal butterflies and zygenes. The richness, density and diversity of populations depend of the diversity of reproduction sites, of the berm width and of the abundance of nectariferous plants. In the Netherlands, Eversham & Tefler (1994) have showed that regularly mown road edges, with a mosaic of naked soil and first stage vegetation, although isolated since 50 years from heathland patches, contain more beetle species than current abandoned relict heathland zones. The road verges contain not only the current heathland species, but also rare species. They play two functional roles, that of corridor for movements, and that of shelter zone (Burel, 2000).

River banks

River banks also form corridors, strongly marked in the agrarian landscape, as well by the presence of running water as by the specific vegetation of the river bank, the alluvial zone and its borders. Debinski (1994) has showed, for an endemic butterfly of mountains zones in the USA, of which local populations tend to rarefy, that genetic distance between populations is all the more weak as those are localised along corridors consisted by rivers (Burel, 2000).

Greenways

Greenways are linear landscape structures for multipurpose use, including nature conservation and aesthetics, and recreational and cultural purposes, but exclusively contain linear elements. (Ahern, 2002)

2.3. Social Theory

2.3.1. Introduction and definition

Principally the policy and the management of nature (including biodiversity) have to deal with the relation between man (the human/socio-economic subsystem) and nature (the ecological subsystem). Man (The socio economic system) is an important driver for the development/decline of nature values. Nature in Europe has been transformed by centuries of social practice. Many of the habitat types with high biodiversity, which are considered typical for Europe and are sometimes unique to our continent, are closely connected with traditional social practices concerning the management of land. But society is present even in 'wilderness': the main causes of biodiversity decline (habitat loss, habitat fragmentation, pollution and overexploitation) are a direct result of social processes (Gilbert & Hulst 2006). On the other hand man is highly dependable of nature (ecological subsystem). For this reason society (man) takes measures for the management of nature (defined as policy, actions, …) , like the development of a Natura 2000 policy and network. 'The man' doesn't exist (Idiosyncrasy). In society different images exist of the relation between man and nature and the way this relation has to be managed by society. Problems encountered while implementing the Habitat and Birds Directives and various national legislations has shown that the implementation of biodiversity and ecosystem management policies frequently requires changes in societal systems and structures. They involve a wide variety of stakeholders whose understanding and appreciation of biodiversity is as diverse as Europe's cultural and social matrix. Conservation policies are the product of human decision-making processes.

Social sciences have a lot to offer in support of biodiversity and ecosystem management. The management of biodiversity and ecosystems was traditionally considered to be the exclusive domain of ecologists. But the current biodiversity crisis is a direct result of the way in which society has chosen to interact with its natural environment. If the causes of the problem are social, it stands to reason that the policies striving to solve the problem will need to be based on a solid understanding of social structures and processes, if they are to have any effect. **This sub study wants to give an overview of human/sociological factors that are important for the 'proper' management of Natura 2000 sites in Belgium or could be used for a deeper understanding of current problems with the implementation of the EU directives.**

Different perspectives on different scales can be used to assess the relation between man and nature (individual vs society, local vs global, …). The definition of biodiversity and the understanding of it by man, takes place at a higher general scale. Together with the definition of biodiversity, the goals in relation to biodiversity are set at a global level. These elements are written down in global, border crossing strategies, conventions and agreements (for example The Convention on Biological Diversity, The Millenium Ecosystem Assessment, Ecosystem Approach,…). The translation of these global definitions and goals in legislations and management tools takes place at national/regional level. Legislation is on the one hand based on general (scientific) information. On the other hand, it is effected by a local context, where different actors play different roles. On the most local level, different kinds of situational factors play an important role. Local participation and organization of management are of great importance for the successfulness of the N 2000 network. Some problems, like conflicts on land use, manifests themselves at local scale, while others occur at a higher scale.

We assume that social aspects that operate at a higher scale (Belgium, Europe or global level) also have an influence on the local level. It is important to take into account the links between the different scale levels. The translation of these general aspects to the local level can differ from place to place: available space is for example a more urgent problem in Flanders then in regions with more open space like France or the Walloon region.

In order to be able to give a comprehensive overview of social factors related to biodiversity, we linked the different social aspects to the stages in the policy cycle.

Policy stage	Research focus
Agenda setting	Impact of demographic changes on biodiversity
	Large scale patterns and variations in attitudes and behaviour towards biodiversity between countries/cultures/religions
	Analysis of biodiversity discourse: biodiversity as a topic of public debate
Policy formation	Assumption about the public in the acquisition and use of scientific knowledge by experts
	Interaction between science and policy; effect of new ideas in ecology and social sciences on policy
Policy implementation	The dynamics of decision making processes and conflicts concerning the management of biodiversity
	Public understanding of, and participation in, biodiversity policies and management, including variations in attitudes and behaviour towards biodiversity among stakeholder groups, different social and cultural groups
	Diffusion of innovations, reactions of stakeholder groups towards new methods and ideas concerning land use and biodiversity management
(Policy evaluation)	(Evaluation of biodiversity policies and action plans)

In this chapter we want to explore the different social aspects in relation with biodiversity in general. So far, biodiversity analysis and indicator development have mainly focused on the bioscience aspect, while the causes for the loss of biodiversity have mainly been social and economic.

The questions we want to answer in this chapter are:

- Which social and cultural elements and processes have an impact on biodiversity?
- What does biodiversity mean from a social point of view and what is the state of the current public debate on biodiversity?
- What does the public expect of nature, biodiversity and ecological networks and what is the social valuation of nature and biodiversity?
- What is the knowledge, attitudes and behavior of the public towards biodiversity?

2.3.2. Social and cultural factors influencing biodiversity

We can distinguish social dynamics and processes of change, which have an impact on biodiversity and nature conservation on different scales (global, regional, local). The main causes of the decline of biodiversity are the (indirect) result of social and cultural processes. Social changes and societal conditions that induce biodiversity loss are often the result of social, ideological and technological modernization processes.

We can make a distinction between demographic, economic, sociopolitical and cultural and religious drivers of change. Examples of indirect economic drivers of change are globalization, trade, market… Examples of cultural and religious drivers are beliefs, consumption choices,… Indirect drivers like population, technology and lifestyle affect biodiversity through direct drivers like for example the catch of fish or the application of fertilizers. Changes in the indirect drivers can lead to changes in the direct drivers, and can lead to changes to ecosystems and the services they provide. On their turn these changes can affect human well-being. These interactions can take place at more than one scale, cross scales and time-scales.

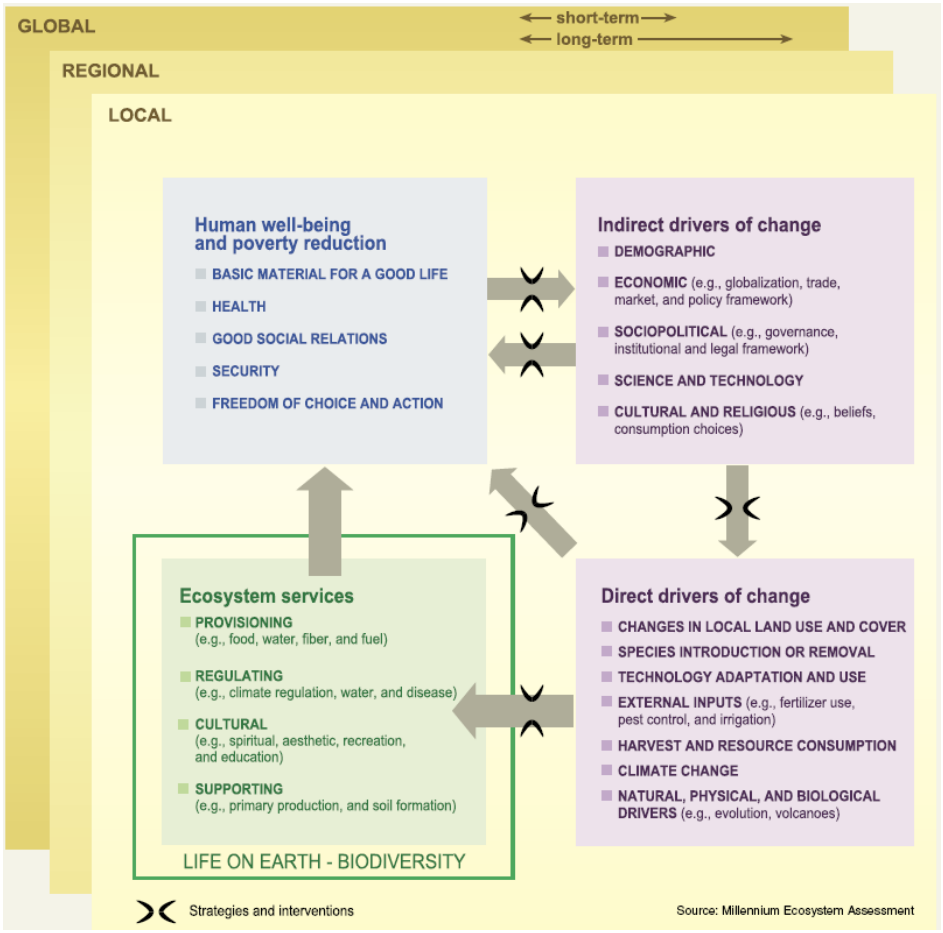

Figure 11 Conceptual framework of interactions between biodiversity, ecosystem services, human well-being and drivers of change.

The most important anthropogenic pressure factors that have a negative impact on biodiversity are:

- Increase of mobility and transport;
- Increase of tourism;
- Less border control, especially within the EU;
- Increase of the offer of goods and products;
- Loss of contact with nature;
- Available means for investigation have been low for a very long time, especially the means for investigating the social aspects related to biodiversity;

The most important dynamics and processes that lie at the origin of the pressure factors are:

- Economic mechanisms as a consequence of liberalization of the world market;
- Demographic changes such as migration, obsolescence of the population,…
- Social processes, patterns on big scale and variations in attitudes and behavior related to biodiversity between countries, cultures, religions;
- Cultural changes like the changes in value-assessment and appreciation of nature and biodiversity;
- Changed dynamics of global – local interaction: the non-stop process of worldwide change led to the arise of new configurations and interactions between global and local institutions and social processes;

Underneath the most important processes and dynamics are reviewed more deeply.

2.3.2.1. Impact of demographic changes on biodiversity

There are many different anthropogenic pressures on biodiversity and the driving forces causing these pressures are diverse. Demographic changes can be identified as a driving force causing anthropogenic pressure on biodiversity. Biodiversity models exhibit a wide range of assumptions concerning population development but the exact contribution of demographic changes have been investigated but there is no consensus yet about the impact of demographic changes on the maintenance of biodiversity. Below the most remarkable demographic processes are reviewed.

The exponential growth of the world population is a first process of demographic change, which has an impact on biodiversity. Demographic changes lead to overexploitation of land (intensive land use) due to intensive agriculture, infrastructure construction for housing, production and mobility. The demands of an increasing human population are responsible for diversion of water, wilderness destruction, water quality problems, and accumulations of pesticide residues. Habitat loss is generally greatest where population density is highest. A study of biodiversity data from 102 countries found that in the most densely populated 51 countries (averaging 168 people per square kilometer), 5.1 percent of bird species and 3.7 percent of plant species were threatened. In the 51 less densely populated countries (averaging 22 people per square kilometer), the proportions of threatened species were only half as high at 2.7 percent and 1.8 percent respectively (United Nations Population Fund (UNFPA), Population and Sustainable Development: Five Years after Rio, 1997).

A second worldwide process is the ongoing rural flight and urban sprawl. Today, for the first time in history, more people live in cities and towns than in rural areas and by 2050 two-third of the world's population will live in cities (UNDP, 2005). These processes have an impact on landscapes, ecosystems and biodiversity because of changed land use and a concentration of people on certain places. A third process of demographic change is the migration on big scale which has increased during the last centuries. Due to an increased mobility more and more people are able to travel around the world and transport goods and services.

In the Western word the ageing society is also a process which has consequences for the existence of ecosystems and biodiversity. In some western countries this trends goes in pairs with a decline of population, individualization and heterogenisation. In the densely populated, industrialized and wealthy Flanders the competition for space is big The score of Flanders of the surface of actual protected Habitat areas is low compared to the Walloon region and Brussels (Natuurrapport, 2007: 173). Compared to the Walloon region, the Flemish region is more densly populated.

2.3.3. Societal valuation and image-forming of biodiversity

The way in which society deals with biodiversity and pays attention to it, influences the attitude of people towards biodiversity and more in detail NATURA 2000 areas. Moreover, the societal appreciation of biodiversity is of importance for the acceptation of certain measures and possible restrictions.

Different aspects have an impact on the concept setting around and the appreciation of biodiversity. Examples of these aspects are:

- Availability of information;
- Perception of nature and nature images;
- Media,…

The social intercourse with biodiversity can be investigated by taking measurements of the societal appreciation en image forming of biodiversity. This appreciation and image forming are influenced by the public biodiversity discourse, the level of knowledge en de acquaintance of knowledge of citizens with relation towards biodiversity.

The biodiversity discourse gives insight in the way society looks at biodiversity. This is determinated by media-news, the public debate, political attention… The last decade there has been a growing concern over the protection and sustainable use of natural resources, most biodiversity is unlikely to survive without receiving more concrete and effective protection. There is a general support for protecting biodiversity and its many components among the public. At a smaller geographical scale, support for protecting biodiversity is heavily influenced by more immediate economic and social impacts of land management decisions on people's live (Bright, 2005). Besides, the level of knowledge of individuals determines their attitude towards biodiversity. Different persons have different ground attitudes towards nature and in addition different perceptions of nature. These differences in perception of nature can be translated in nature images.

In an investigation of the University of Louvain in 1999 in order of the Federal Council for Sustainable Development in Belgium, 33,8% of the respondents declare they have already heard of the concept of biodiversity, 66,2 % never heard of the concept. When we compare Dutch speaking and French-speaking respondents, 28% of the Dutch speaking respondents declare they have heard of the concept 'Biodivesity', compared to 42% of the French speaking respondents (CFDD-FRDO (KUL, ULB) 1999). When we compare the numbers of 1999 with those of 2002 we can state that there is a positive evolution in the awareness on the concept of Biodiversity among the public: +16% French speaking +11% Dutch speaking respondents declare they have already heard of 'biodiversity' (CFDD-FRDO, 2002). In 2005 there was a new Inquiry of sustainable development but the question if the respondent has heard of the concept 'biodiversity' was not queried.

2.3.3.1. Analysis of the biodiversity discourse: biodiversity as topic of public debate

The loss of biodiversity was for a long time a neglected subject in the public debate. Nature conservation and biodiversity have for a long time received less attention then other nature and environmental themes like climate change or small dust particles. Society doesn't experience the loss of biodiversity as an urgent problem and almost never places it in the actual context, but always further away, as well in place as in time. This gave and still gives the loss of biodiversity a minor position on the ranking of important threats for society.

Despite the fact that the loss of biodiversity was a neglected subject for a long time, nature conservation was not a disputed subject in society. Everyone from ecologists to the Conservative camp of politics shared the view that it made sense to protect nature for its own sake. These days, rather than being a point of agreement, nature conservation is riddled with conflict. The reasons for conflicts can partly be explained through social-psychological perspectives (Stoll-Kleemann, 2001). Deeply rooted social-psychological processes are at work in shaping attitudes and behaviour towards protected area management. The major driver that leads to opposition to protected areas are group processes encouraging social identity together with communication and perception barriers which mutually cause and reinforce each other. These core factors are also influenced by emotional and cultural drivers. Examples of cultural drivers are the impression of facing restrictions on day to day decisions due to nature conservation regulations and cultural drivers, such as the challenge to traditional values and habitats (Stoll Kleemann, 2001).

The societal appreciation of nature conservation and biodiversity has grown slowly. From the eighties on often conflicts have arisen between the economic use and the protection of natural resources, by which the public participation en active agitation increased. Since the nineties the public awareness of the need to protect biodiversity strongly increased. In addition to this several international conventions are drawn and engagements have been taken to put a stop to the loss of biodiversity. 'The convention on biodiversity' (Rio de Janeiro, 5 june 1992) probably is the most famous one.

It still is a real challenge to create appreciation and joined responsibility and sensitize the general public about the value and need to protect biodiversity. Communicating about nature and nature conservation is not easy. This has on the one hand to do with the message and the complexity of the message (nature policy, biodiversity,…), and on the other hand also with the sender (the government, the nature organization,…), the receiver (different 'external' partners) and the relation between sender and receiver.

The concept of 'biodiversity' is known by and used by all actors within the nature sector. Also the concept of 'ecological networks' (a crucial concept when talking about Natura 2000) is nowadays widely accepted within the nature conservation sector as the appropriate policy for the conservation of biodiversity. In most European countries it became the leading principle of nature conservation policy (Jongman & Kristiansen, 1998). On the other hand the public is not familiar with the term 'biodiversity'. This is partly due to the complexity of the investigation of biodiversity and the demand of extreme high input of scientific knowledge. Besides this, different dimensions in the concept of biodiversity can be distinguished. There are different possible definitions of the concept of biodiversity, as a result of which unequivocality is absent. Also (policy) goals related to biodiversity aren't always clear and sometimes differ for different regions and areas. Also the identity of the messenger isn't always clear (from who the message come from?): the European Commission, the Flemish or Walloon government, local nature organisations…

Moreover, the receiver isn't unequivocal, but exist out of different target groups, which have different nature images. The receiver isn't always that positive towards nature conservation or nature organisations. Great parts of the population are indifferent towards nature. The opponents and advocates are only small groups in society.

The socio-scientific biodiversity discourse is dominated by political science and ethics. Latter concentrate on the formulation of arguments for an ethical relevance of biodiversity protection. Social and political scientific analyses are primarily focused on the Convention on Biological diversity and its social implications. The concept of biodiversity is analyzed on the basis of different sociological and political scientific theories. Central issues are the enrichment of nature by its social and cultural meanings as well as the politicization and economization of an ecological concern: the concept of biodiversity is defined as the result of a specific socialization of nature in a politically determined environment stamped by power relations and negotiation mechanisms (Artner, A. and Siebert, R. 2006).

2.3.3.2. Knowledge, attitudes and behavior towards biodiversity

Acquisition and use of knowledge by the public

The way in which knowledge is acquired and spread is determing for the valuation and image forming of biodiversity.

- Information: quantity, quality and availability;
- Education;
- Media.

There is an obvious lack of knowledge among the public about biodiversity related issues. Furthermore, increased knowledge about a biodiversity issue does not necessarily translate into a more positive attitude toward protecting biodiversity (Bright, 2005). Knowledge, attitudes and values vary among different groups of people. Several factors such as age, sex, place of residence, education and income can play a role in determining these things.

Education and information are important for the valuation of nature and biodiversity since they educate people about these concepts. One can however question what people do with this knowledge. On the other hand we can question or and which presumptions experts make about the public in the use and the spread of scientific knowledge. The media plays an important role in

the creation of nature images by the general public. Research has indicated that information about biodiversity and nature in general is gained through the traditional media channels.

Attitudes and behaviour

Public support seems critical in the efforts to halt the loss of species. Based on Stern, Dietz and Guagnano's (1995) hierarchical model of environmental concern the objective was to identify the public's environmental values and personal motives for biodiversity conservation. In a questionnaire survey, including 271 persons, three motives were identified: human-well being and recreation, human survival and respect for nature. In multiple regression analyses a biospheric value orientation could partly predict respect for nature, an egoistic value orientation to some extent predicted human survival, whereas only a tendency to explain human well-being was identified. In turn the three motives predicted 39% of the attitude towards conservation of the local biodiversity. It is suggested that the promotion of policies and actions for conservation of individual biotopes and species could benefit from being formulated according to the identified motives (Johansson, 2005 Local People's Motives for Biodiversity Conservation).

The valuation of nature by an individual is mainly influenced by his attitude towards nature. This attitude is affected by the nature perception of people (in relation to the socio-cultural context), the public debate, the media, education and information, … Attitudes and values are two of the most frequently examined human dimensions topics. Differences in attitudes and behavior towards biodiversity are expressed in differences in nature perception. Perception is influenced culturally and preferences on nature and its conservation are partly social. The historical grown society's linkage of nature and homeland as well as the strong bipolarity between productive land and conservation areas reflect the resistance of traditions point of views towards nature. The behavior in relation to nature, which links usages to motivations and behaviors behind hasn't been investigated strongly until now.

2.3.3.3. Perception and ground attitudes

The perception of the stakeholders of nature and nature conservation highly determines the attainability and the management of ecological networks and biodiversity.

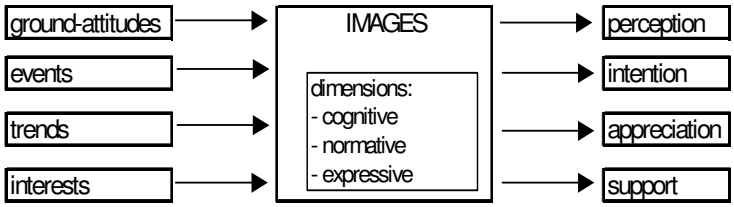

Figure 12 Perception: basic influential factors and effects

Jacobs et al., (2002) give a practical model that reflects the above **theory of perception** as a result of a filtered interaction with the environment (Figure 1). According to Jacobs et al., perception (of nature, organization, …) can be seen as one's position or attitude[20] towards a specific object (e.g. nature conservation measure, organization, …), existing in the empirical world. Man's perception is a result of many aspects. 'Events', or impact/effects as a consequence of change, are one type of these determining factors. Another important influencing aspect of someone's perception is his or her '**ground-attitude'**. The so-called '*ground-attitude'* or *fundamental attitude* of a person can be defined as his or her general view on things. This fundamental attitude of a person is quite stable compared to, for instance, perception, as it is

[20] Attitude is an important thing that helps people to frame their social world and reduce complexity. It helps us to define how we perceive and think about others, as well as how we behave towards them. Given the theory of cognitive dissonance, the relationship between attitudes and behaviour becomes questionable. Nevertheless, attitudes still are one of the strongest indicators for possible future behaviour.

mainly formed through long-term socialization and learning processes and the specific personality of each individual.

A number of environmental philosophers elaborated on the **description of ground-attitudes towards nature**. De Groot (in Jacobs et al., 2002) made a classification of four different ground-attitudes with respect to the relation between man and nature:

- Man as dominant master of nature: people have the right and the knowledge to dominate nature; without people, nature is of no value;
- Man as nature's guard or manager: nature in itself is valuable, but is also – and especially – a resource for people, who therefore must manage nature well;
- Man as nature's companion: nature is 'something else', outside of people, something you may know and with which you can build a respectful and reciprocally equivalent relationship;
- Man as participant to nature: nature is superior to people. Human beings, as being a component of nature, cannot decide on nature affairs.

2.3.3.4. Nature images

Looking at nature and nature management can be described using nature images. "*Images"* can be seen as the vision of individuals or groups on how an object should look like and on what feelings are associated with certain states or forms of the object. Images are concerned with the meaning people put on objects and serve as frameworks that direct and structure the perception and appreciation of an object in cognitive, normative and expressive respect.[21]

Nature images are flexible, not only within social groups, but also within one person. Citizens can, for example, prefer untouched nature, but only within certain circumstances. Research points out that people have an ambivalent attitude towards nature. There is a certain esteem for nature, but at the same time there is a anxiety for nature.

Nature images arise from out a certain perspective or a frame of reference. A frame of reference is composed out of different aspects:

- Values and norms (what does one really thinks is important, behavior rules,…);
- Interests: these are economic interests, but also social and emotional interests;
- Convictions and visions (often implicit);
- Knowledge (on the base of stories, images, associations,…)

In most of the cases these aspects are interrelated. For example, we select information which corresponds with the things we do and value. The way people handle information is thus very flexible (Aarts, 2004).

2.3.3.5. Link between ground attitudes and nature images

Aarts (1998) configured a direct link between ground-attitudes and existing nature (conservation) images. For instance, regarding the nature-image of dominant masters, nature is a robust system, which will always recover spontaneously. These 'masters' are not interested in nature in itself. Guards of nature are afraid of nature. Hence, nature must be controlled. Companions of nature want to protect nature because of it's vulnerability; while participants to nature believe that nature is robust, can develop on it's own, but still needs protection (wild nature). Other research (Filius et al., 2000; Jacobs et al., 2002; de Boer et al., 2002) tried to link nature-images to specific stakeholders. Depending on the ground-attitudes towards nature, the nature-image(s) and the context (e.g. events, trends, …), people will perceive nature somehow or

[21] The cognitive dimension is concerned with the question of how people define the object. The normative dimension is concerned with the question of how to act in respect to the object. The expressive dimension is concerned with the question of what people perceive as beautiful. (Jacobs et al., 2002).

other. Buijs et al. (in Bogaert, 2004) identified the following perceptions of nature: 'nature disserves protection', 'nature is for recreational use', 'nature is beautiful', 'nature is impressive', 'nature is a counterweight for society', 'nature is a source of food and medication'.

2.3.3.6. Conclusion

In conclusion it can be stated that '*the*' nature does not exist. 'Nature' has a different meaning for different people. These differences deserve particular attention when implementing nature conservation strategies, e.g. restoring and maintaining biodiversity.

Although nature conservationists seem to agree on the concept of ecological networks as the leading principle of nature conservation, the conceptualisation and (views on the) practical implementation of these networks did develop differently throughout Europe, as a result of different geographical, natural, economic, political and social conditions. Different definitions of ecological networks can be found in the scientific literature[22]. The named objectives of ecological networks differ from purely ecological reasons (to conserve nature, to protect certain species, ...), to landscape conservation and even recreational or cultural reasons (Jongman & Kristiansen, 1998). The survey of Rientjes et al. (2003) further shows that there is no consensus on the necessity of having corridors, stepping stones and buffer zones within an ecological network. Related to this, nature conservationists also have different opinions concerning the (juridical) implementation of an ecological network (Resource Analysis, 2003; Rientjes et al., 2003).

The perception of social systems, and of their members or participants, can be characterized in the same way as the perception of the organic environment (e.g. nature). In the case of the implementation of an ecological network, these kinds of perceptions may be as important as the perception of nature or nature conservation in itself.

We illustrate this conclusion with the VEN (Flemish Ecological Network) process in Flanders. It is remarkable that most nature organization as well as most agricultural organizations find the fencing of the areas of the VEN fitting within their goals, to the extend the fencing of the ecological structure also leads to the reservation of the agraric structure, and thus results in a greater legal security. The communication around the VEN should take the organization of the whole area as a common goal of the process. The organizations that find the fencing off as fitting within their goals can be identified as 'co-deciders'. The organizations that find the fencing off the VEN-areas conflicting with their objectives are mainly organizations with relative little importance in the rural area (the 'economic' sector) or organizations that hasn't been involved in the process. For this last group informing and participation can certainly avoid conflicts (Resource analysis, 2003).

Nature management doesn't only comprise the management of nature but also the collaboration between people. That's why the processes between the different stakeholders are of great importance for the success of the management. Next to the perception local actors have of nature and nature conservation, the 'coloured' perception actors have of each other (for example farmers versus nature managers and otherwise) plays a prominent role in the feasibility and management of ecological networks. This observation determines partly the attitude and willingness of different stakeholders to work together. Precisely this public involvement and support are necessary conditions for sustainable ecological networks (which cover multifunctional land use) and for the balance between local interests on short term and collective interests on a long term.

➔ [22] In the special issue on ecological networks of the journal "*De levende natuur*" (104, n° 6), an ecological network is defined as "an unbroken system of areas, where nature can develop and plants and animals can thrive without disturbance".

2.4. Legal framework of the use of the soil

Ground as well as the vegetation (on foot) which develops on it are parts of the things in the trade. The ecosystems are considered in right as goods, at least in their physical and vegetable part (Article 518, 520 and 521 C civ.).

The goods can be distributed between the goods belonging to the private individuals (people of private law), and the goods belonging to the moral people of public law (State, areas, communities, provinces, communes, etc). The first have in theory the free provision of their goods, in accordance with the rules of the civil law, while the seconds can manage and have their goods only in accordance with the administrative law (Article 537 C civ.). [23]

The real goods in the trade are the subject of rights in rem, of which most complete is the right of ownership. This one is defined like "the right to enjoy and have the things of the absolute manner, provided that one does not make of it a use prohibited by the laws or regulations" (Article 544 C. civ.).

It thus arises from article 544 and article 537 above mentioned of the Civil code that the occupation and the use of a ground in Belgium are free in the chief of its owner, but subject to all the restrictions that the legislator judges good to impose on the exercise of this right, in order to preserve the general interest (one speaks about "legal constraints of public utility"[24]).[25]

It should be noted that the deprivation of the right of ownership - recognized in international law and by our Constitution (Article 16) as a basic right - can be imposed to an owner only with the help of the respect of the procedures of expropriation, and the payment of a "Juste and preliminary allowance" (Article 16 of the Constitution). On the other hand, it is not the same for the restrictions brought to this right, which should be the subject of compensation only when the legislator envisages it. [26]

The intervention of the authorities to influence the land use is exerted in the compliance with the rules of distribution of the competences fixed by the special law of August 8, 1980. A significant part of their intervention on the land use lies within the scope of administrative police forces like the right of land use planing, environment and the nature conservation regional planning. Among the legal instruments likely to be used by the authorities: the instruments forcing, of which legal constraints of public utility (the statute of site Natura 2000 or the natural zone in the plan of sector); inciting and economic instruments (taxes, subsidies, fiscal measurements); land instruments (expropriation, right of pre-emption, exchange property, regrouping); instruments of sensitizing; instruments of management of the public goods (forest regime, management of the rivers, of the roadway system). [27]

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[23] C.-H. BORN, Le droit de la conservation de la nature, Région wallonne, UCL, SERES, 2006-2007, p. 29.

[24] Legal constraints of public utility are « *les charges imposées, soit par la loi ou le décret, soit en vertu de ceux-ci, à des propriétés dans un but d'intérêt général* » (B. PAQUES, *L'expropriation pour cause d'utilité publique*, Bruxelles, Larcier, 2001, p. 51).

[25] X., Feasability of ecological networks : ecological, economic, social and legal aspects, Bruxelles, Belgian Science Policy, 2005, p. 39.

[26] Recently, this « principle of not compensation of the legal constraints of public utility» seems however called into question by the doctrines and the jurisprudence, which, less categorical, tend to prefer with this principle that of the "right balance" (proportionality) between the requirements of the general interest (nature conservancy) and the right of ownership. See M. PÂQUES, « Propriété et zonage écologique, compensation et indemnisation », *Le zonage écologique*, Bruxelles, Bruylant, 2002, p. 239 et s.

[27] D. TYTECA, M. HERMY, G. MAHY, K. VERHEYEN, F. HAUMONT, Feasability of ecological networks : ecological, economic, social and legal aspects, Bruxelles, Belgian Science Policy, 2005, p. 40.

2.5. Structure of the economic analysis of natural assets

2.5.1. Economic aspects of biodiversity

The value of environmental goods can be decomposed into several components. We can distinguish the use value and non-use value:

- Use value: it incorporates the direct usages (medicinal plants, tourism, minor products …) and indirect usages, such as services of ecosystems (see ecological part), water and oxygen regulation (see ecological part; Costanza et al., 1997), …. Such usages can be present or future. Finally, we distinguish the option value: it comes from the fact that the goods can be available for a future usage, apart from the use value expected. It is a potential benefit.
- Non-use value: we distinguish the existence value and the bequest value. The existence value comes from the fact that the species exist and will continue to exist in the future without consideration of its actual or future utility. The bequest value it is the value of option used by the descendants.

Note that when property rights are vague, usage values have less chance to be materialized because we cannot exclude an improper exploitation making their use non optimal.

We can define the Total Economic Value (TEV) as the use value + the non-use value. The following figure (Figure 11) illustrates the different components of value.

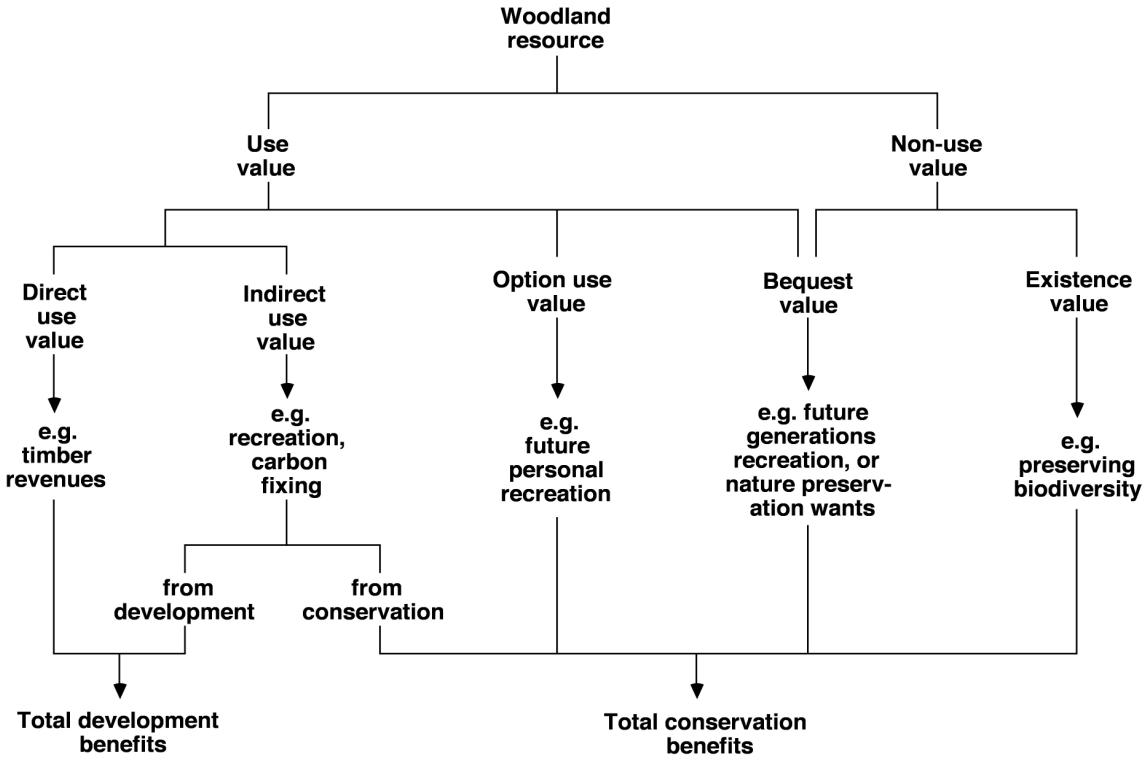

Figure 13. Total Economic Value. Source: Turner R.K., Pearce D. & Bateman I., *Environmental economics. An elementary introduction*, The John Hopkins University Press, Baltimore, 1993.

Because Natura 2000 is a particular implementation of an ecological network, we consider the costs components that were identified in the scope of the ECONET research. The text below is built on the ECONET report, with some specific additions relative to the Natura 2000 network and some more focus on the Walloon situation.

2.5.2. The nature of costs and benefits

Ecological networks allow for the improvement of surfaces and connectivity of natural areas (see ecological part). This has a positive effect on biodiversity and ecosystem functioning. Indeed, ecological networks improve the viability of the populations that constitute the ecosystems. They contribute to enhance their stability and functions, and therefore, they allow improving the services rendered and the benefits provided by ecosystems (Jongman & Pungetti 2004).

Implementation of ENs also has a significant socio-economic impact, in terms of land use and activities that can be developed.

We will present the costs and benefits of ecological network implementation taking the standpoint of society as a whole[28].

2.5.2.1. Costs

2.5.2.1.1. Implementation and direct costs

Direct costs are supported by landowners, which may be a public authority, an organization or a private owner. In the latter case, compensations and subsidies, can be perceived to cover incurred costs. Costs of EN implementation can be divided into four categories, corresponding to the four phases of EN installation[29] .

1. PREDESIGNATION PHASE

The constitution of ENs is preceded by scientific studies to designate and delimitate the sites that will make part of the network. This preliminary diagnostic phase will also serve to define management objectives of the site. The costs linked with this phase are essentially salary costs as well as cost of the material that will be used by the researchers. Obviously they are dependent upon the quantity of work accomplished as well as duration of the research; therefore, they may vary from site to site.

In the Walloon Region, these costs will be at charge of the regional or communal budget.

2. MANAGEMENT PLANNING AND ADMINISTRATION

This phase is essentially administrative. It is necessary to prepare and examine the projects and strategies and to define management plans of the sites. Next comes the work necessary for consulting and meetings with public authorities and municipality representatives. Those costs are essentially due to salary, representation, meetings, etc. As for the first phase, they vary from case to case, depending on the progress of research, areas to be covered, etc.

The costs of those first two phases correspond to non-operational charges, i.e., salary, scientific personnel, office material, etc. Their assessment is difficult, due to the diversity of stakeholders, actions to be taken and material to be purchased, and depend on the actual situation. However, they can be estimated to lie between 10 and 25 % of the global implementation cost[30].

Appendix 1 includes a table with the different activities linked with the designation and the management of Natura 2000 sites.

3. IMPLEMENTATION OF THE EN

This represents the most important costs for the community. It includes the financing of maintenance and restoration measures of the various zones of the EN. Generally speaking, management is accomplished by the owner of the land, who bears the costs and signs a management contract with authorities. Such a contract incorporates the tasks to be accomplished

[28] We envisage all costs incurred or supported, and all benefits perceived, independently of who bears or receives them

[29] From the final report on Natura 2000 Financing, by the Task Group on article 8 (November 2002).

[30] COLAS S., HERBERT M., *Le coût de la gestion courante des principaux milieux naturels ouverts*, Espaces Naturels de France, 2 février 2002, p. 1.

by both parties, as well as financial support granted to the owner (i.e., subsidies). When public authorities are the owner, they will incur the financing of the project.

The work activities to be conducted in those zones are of two types: conservation and restoration.

Conservation of the zones

This approach consists in maintaining the natural and semi-natural habitats in their present state.

The maintenance of Natura 2000 zones is one of the most expensive activities in the implementation, at least during the first years of the project . Indeed, it is a hard and continuous work, which requests qualified labour and appropriate machinery. Generally this maintenance is performed by the owner of the site who has to pay the costs and who engages himself in the management contract with the authority. This contract defines the task to accomplish by the two parts (the owner and the authority) to maintain the zone in ideal conditions and the financial help (some from the regional authority, other from the EU) granted to the owner. When the authority is the owner, it will have to care for the management and bear the costs.

Restoration of the zones

In some cases the habitats can be in an unfavourable state of conservation state and must be restored. The costs generated by such a restoration are often important at the start. However, in subsequent phases, costs tend to decrease since after restoration everything that is required is site management.

This phase of restoration is only possible with the agreement of the owner. In the case where it is necessary to intervene and that the owner is opposed, the regional authority can decide to buy the site to manage it correctly[31].

In the Walloon Region (WR), for the period 1997-2001, an average of 107 ha of plot was bought per year for a mean value of 4653 €. The areas owned by the WR, especially affected to nature conservation, represent around 7000 ha. The purchase of sites for natural reasons is also made by associations like Natagora or by the municipalities. They obtain subsidies from the WR by contract. From 1995 to 2001, 1 355 741 € have been allocated to the concerned beneficiary. These amounts permitted to cover, at the rate of 50 % of the exposed price, the acquisition of 680 hectares of sites (most of them have been erected in natural reserves. For 2003, the budgets of the Walloon Region were around 914 000 € instead of the 2 219 000 € requested to buy plots.

Table 2 below gives a general survey of the amounts spent by the WR on the sites they bought.

Table 2. Coûts d'entretien et de restauration des terrains achetés (Cordonnier A., Note de synthèse, MRW/DGATLP/DNF, 2007)

Année	Entretien/Gestion courante (€/ha)	Restauration/Aménagement (€/ha)	Matériel/Equipement (€/ha)	Surface en RND
1999	30,6	20,1	1,2	5775 ha
2000	59,8	20,8	2,1	6411
2001	69,8	37,5	50,4	6453
2002	109,39	282,39	18,82	6542
2003	77,38	125,42	6,88	6567
2004	110,93	98,10	18,87	6626
2005	96,83	116,17	5,90	6847
2006	106,34	78,98	5,68	6865
2007	98,75	85,50	9,18	6865
moyenne	70,91	91,69	12,21	

Some costs must be added for the implementation of corridors. If these zones are present, they only need to be maintained. If not, they have to be created. We have to think of the best way to allow the species to move. It is possible to create bridges or tracks to allow for free circulation,

[31] In the Walloon Region, around 150 ha have been bought by the WR in 2002 (in Brisack D., *Impacts économiques de la mise en place des réseaux écologiques*, Louvain-la-Neuve, 2003 (mémoire de licence, inédit), p. 48.

which has a cost. It is also needed to intervene on land belonging to farmers or particulars who have to be compensated. Their plots could as well be bought by the regional authority. Finally, it is sometimes necessary to install wire fencing or plant hedges. It is possible to compensate these costs with subsidies (cf. infra).

4. "OCCASIONNAL" MANAGEMENT COSTS

Those costs cover situations that were unforeseen in management and expense planning. They would be incurred by owners or by public authorities. Their importance varies from place to place; however, they only represent a small part of total costs.

Costs of phases 3 and 4 are not easy to estimate because they depend on the biotope concerned, the state of the land, available material, etc. They can be assessed through reference to other similar projects or previous studies. Care must be taken to make the characteristics of existing projects correspond to those of the new project to be evaluated (in terms of biotope and required measures).

2.5.2.1.2. Negative impacts – indirect costs

Account must be taken of the loss of revenues linked with the forsake of particular activities which are judged incompatible with the implementation of an EN, such as intensive farming, polluting industrial activities, unsustainable forest management, etc. This has consequences on employment and economic development of the region under concern.

We can estimate those costs using the opportunity cost method (i.e., considering the revenue that will be lost due to the cessation of those activities), or through the amount of compensation that should be paid for this sake, or by calculating the loss of real estate value of the field.

2.5.2.1.3. Conclusion

We can say that the costs related with the implementation of ENs are mainly of two types: administrative costs and those due for restoration and management of the sites. Administrative and restoration costs are those that will require the most important budget at the outset, but these costs will tend to decrease as the implementation of the network progresses. Indeed, as soon as the EN is implemented, the management costs will be the most significant to incur. Below, we present a recapitulative table (Table 3) with the different costs associated to ENs in the Walloon Region. We see the situation from the standpoint of expenses made by the Region; this is why the acquisition costs and the premiums granted are taken into account.

Type de dépenses		**Terrains et différentes zones (ZC, ZL, ZD)***	**Forêt**	**Agriculture**
Frais de recherche, cartographie,…		Elevés au départ, tendent à diminuer. Les montants varient au cas par cas, en fonction des zones, du temps,…		
Investissement – Acquisition		En 2002, le total des investissements en achats de terrains s'est élevé à environ 1 million d'euros (achats de la RW et des associations).		
Exploitation	**Restauration - Entretien**	D'après les chiffres de la RW, ces frais s'élèveraient à 1,15 millions d'euros en 2002.		
	Compensations	Au cas par cas	En 2002, pour les propriétaires publics et privés, les subventions se sont élevées à 1,97 millions d'euros.	Pour 2002, le montant des primes agri-environnementales allouées s'est élevé à 8,226 millions d'euros en Région Wallonne.
Coûts socio-économiques		Au cas par cas, en fonction du type de terrain, des possibilités perdues,…		

* ZC = Zone Centrale, ZL = Zone de Liaison and ZD = Zone de Développement

Table 3. Les différents coûts de la mise en place des réseaux écologiques. (MRW, rapport d'activité de la DGA, 2001).

From this table one can notice that the most significant costs are thus those relative to land exploitation, which includes maintenance but mainly the compensations paid by the Walloon Region, which are indeed the most significant expenses incurred by the Region (see below). The land purchase costs will go on decreasing, because the number of fields to be acquired will

diminish, at least in the long term. On the contrary, the conservation costs are expected to go on increasing in the short term, due to increase in the surface area to manage, but will tend to stabilise in the long term. Those figures must be considered carefully, although they provide us with a rough estimate of the budgets that will need to be devoted to ecological networks.

2.5.2.2. Benefits

2.5.2.2.1. Socio-economic, direct benefits

Socio-economic benefits of a particular site are not restricted to the site itself; they are also a source of profit for the local and regional economy. Indeed, the expenses of a local economy beneficiate to many persons through the purchase of goods and services. A study was undertaken by the European Commission in the scope of the Natura 2000 network (Institute for European Environmental Policy – IEEP, 2002), to assess the types of benefits or opportunities that can be derived from the implementation of ENs. Hereafter we present a non-exhaustive overview of that study.

1. EMPLOYMENT LEVEL

A non-negligible number of employments can be created through the installation of an EN[32]. The creation of new work positions is more a social benefit; however it implies strong economic repercussions as well. Employment opportunities include those that are **directly linked** to site management, such as guardians, the personnel in charge of conservation, and educators.

Other examples are the people who take in charge the management of the site, its protection and the improvement of the quality. We have also to add the nature guides, who will guide and inform the public.

Those jobs may also incorporate the work connected with agriculture and land production, fisheries, as well as the workforce in charge of services on the site, such as hotels, guest houses, restaurants. In this case, we do not obtain a direct monetary value, but instead, a number of job positions created, which is a good indicator of the surplus transmitted to the region by the project.

The number of jobs created varies clearly from one country to another but also in function of the nature of the activities and the size of the network. It depends also of links existing between, on the one hand, the regional and local economies and the tourist planning, and on the other hand, on initiatives from local actors to achieve the opportunities inherent to environment.

Indirect jobs are also induced as a consequence of tourists' exepnditures. For example we have the case of a society that delivers marketing services for the producers of local goods. The earnings constituted with the salary of these employees will be directly, or indirectly, spent in the local economy, which implies additional jobs[33].

2. INVESTMENTS AND EXTERNAL FUNDS

The ecological network can be a key tourist attraction bringing external funds and in favour of the diversification of the local economy. Indeed, the management and the development of sites are supported by local, regional or national funds and investments as well as European programs funds. On the one hand, such investments can include equipments related to visitors (such as centers who promote the consciousness-raising on environmental questions and encourage tourism), pedestrian ways and cycle lanes or other investments related to the offer of goods & services (local products, hotels or guided visits). All those investments concern the local amenity and global interest of the zones. On the other hand, there are the benefits coming from the intrinsic investments which include the management and the protection as well as the conservation or restoration works.

3. TOURISM

[32] European Conference: "Promoting the Socio-economic Benefits of Natura 2000", Brussels, 2002.

[33] Some have called this phenomenon the multiplicator effect because it is amplified in relation to the initial impact.

Quite viable tourism activities are compatible with the management of most nature protection sites[34]. Tourism can generate high revenues and employment in the region. Generally, secondary benefits have a stronger economic impact than the benefits obtained directly from management of the site. This can be explained for example by the expenses made by the tourists outside of the site (hotels, transportation, food, other goods and services). Of course, this depends on each particular site, on its location and attractiveness, etc. All of those opportunities for additional revenues provide local populations with economic incentives, in such a way as to enable them to implement nature management practices that are more favourable to local flora and fauna.

Those benefits can be estimated in comparison with those generated by existing projects of tourism-related exploitation of natural sites, or through simulation of the number of entrances as function of the fee.

Nevertheless, some practices are harmful for the nature so it is important to make these actions of promotion with care because in the extreme, they can imply negative impacts for the ecological aspects.

4. PRODUCTS AND LOGOS

A lot of benefits can come from products of the conservation of natural zones. The consumers are ready to pay for products that have a particular identity or to which a story is attached. It goes very well with products or marks directly associated to a region. We may think of quality labels, regional products, and biological products as opposed to products of intensive agriculture. For example, in Belgium, the turnover resulting from biological agriculture is estimated at 62.5 million Euros per year. The number of biological farmers is continuously growing as well. The surface area occupied by biological agriculture, even if still limited, shows significant increase (500 ha in 1985, 5 000 ha in 1996, 18 000 ha in 1999, 21 000 ha in 2002 and around 22 500 ha in 2005)[35] [36].

5. PRODUCTION AND EXPLOITATION

The majority of benefits result from exploitation of resources of the network as such (Moons et al. 2002). Depending on the situation, they originate from agricultural or forest exploitation, fishing, or hunting. Indeed, among the main advantages of ENs is the fact that many human activities are still perfectly compatible. Due to the diversity of EN components, it is certainly not possible to give a comprehensive view of all such activities. In the next sections we will, among other, concentrate on two of those aspects, i.e., agriculture and forestry[37].

What must be assessed is the revenue increase allowed by EN implementation. Substantial benefits can be derived from natural sites conservation.

2.5.2.2.2. Environmental, indirect benefits

Indirect benefits pertain to goods and services provided by ecosystems (see ecological part). These are the functions fulfilled by ecosystems that allow for the maintenance of life on Earth and sustain economic activities such as thermal regulation, climatic regulation, oxygen regulation, water cycle, etc. Implementation of ENs contributes to quality and quantity improvement of natural ecosystems and thus allow for improving the benefits associated with those. Such indirect benefits exert their effects on the (very) long term and participate in the increase of the quality of life of the whole Planet. Beneficiaries are therefore society in general, at the world level and on the long term.

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[34] European Conference: "Promoting the Socio-economic Benefits of Natura 2000", Brussels, 2002.

[35] For more details, see Appendix 9 of the Econet report.

[36] Cellule Etat de l'Environnement Wallon, *Rapport analytique sur l'état de l'environnement wallon 2006-2007*, MRW – DGRNE, Namur, 2007, p. 56.

[37] Those two sectors represent the highest proportion among the various components of the network. For example, only in the Walloon Region, forest areas (32%) and useful agricultural surface (45%) account together for 77% of the territory[37].

Advantages of ENs can be quantified by using direct valuation methods such as contingent valuation, in order to perceive how much people would be willing to pay to maintain or improve the services rendered by natural habitats and ecosystems[38].

Another method consists in considering as benefits the costs avoided as a result of measures taken to prevent a pollution or loss of habitat. As a final alternative, for each considered ecosystem, one can attempt to identify the services they provide for, in order to adopt appropriate methods and to estimate their monetary value increase linked with EN implementation[39].

2.5.2.2.3. Conclusion

The benefits associated with EN implementation will be perceived mainly on a mean to broad scale: the region in the case of socio-economic (direct) benefits and the world's society in the case of environmental (indirect) benefits. The difficulties to estimate such benefits should be stressed: no single universal evaluation method exists; instead, choices and assumptions must be made for every particular situation. Only after performing the case study we will be able to know which category of benefit is predominating; there exists no a priori method to detect this beforehand.

We should bear the attention to the fact that the list of benefits such as we established is certainly not exhaustive and reflects only a part of the value that we can attribute to environmental goods. Indeed, we account herein mainly for direct and indirect use value but we omit or under-estimate the option and non-use values (bequest and existence).

Finally, we have to add that in the long term, there is a difference between costs and benefits. Often, the costs will be huge and incurred immediately. Conversely, the benefits will only be perceptible in the future. This delay may be a barrier for the local actors to invest time and money in the Natura 2000 project. That is why it is so important to draw attention on the benefits.

2.5.3. The Discount problem

After all components of costs and benefits have been evaluated, we can compute the Net Present Value (NPV) of the project, i.e., over an adequate time horizon, we sum up the net yearly benefits (benefits minus costs), each multiplied by the appropriate discount factor.

Discounting is necessary for homogeneity of economic valuation. It allows for putting at the same level present and future amounts of money. The discount rate represents the social preference with respect to time: the higher the discount rate, the most important is the depreciation of the future. The general formula of the NPV is as follows:

$$NPV = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+r)^t}$$

- C_t , B_t – marginal costs and benefits associated with EN implementation, with respect to the initial situation;
- r – discount rate;
- n – number of years.

Discounting is often criticized in environmental management. Indeed, when the rate value is high, the result is to strongly decrease the present value of future amounts. A high discount rate discourages investment, especially when it implies high initial expenses, while benefits would occur only after some years. Expenses made in the scope of environmental conservation purposes, because they would have their positive effects only in the long term, would thus be discouraged.

One can assume that public authorities, who would subsidise a given project, would expect a return at least equivalent to other alternative investments. The interest rate on financial markets is

[38] This method, however, entails several biases and limits. See Appendix 2 of the Econet report.

[39] Costanza et al. (1997) have developed a methodology that allows calculating the average annual specific (i.e., per ha) values for several types of ecosystems, accounting for the services they render, cf. infra.

often taken as a reference towards discounting[40]. However, a commonly advocated drawback of the interest rate is that it only reflects the preferences of present generations with respect to time. Therefore it can be reasonably admitted, for public projects, to take into consideration a lower discount rate that will account more adequately for general long-term welfare[41].

2.5.4. The situation of target actors

We can also add some financial elements that are not incorporated in the previous enumeration of costs and benefits. These elements constitute a cost for one actor and a benefit for another one. We cannot include them in our previous analysis; otherwise it would imply double accounting of certain elements[42]. However, those elements are of major importance when seen from the standpoint of a particular actor. In the following, we discuss elements and for each, we will identify to whom it beneficiates and to whom it costs.

2.5.4.1. Subsidies

Premiums are a cost for public authorities who pay them. In Belgium, those who pay and manage such premiums are the Regions. They are a financing source for the beneficiaries (farmers, forest owners, local authorities, etc). Indeed, if we wish to favour management and operation measures that are more oriented towards environmental conservation, this often implies profitability loss for the owner. This loss is compensated by the system of premiums. Among these, in the Walloon Region, are agri-environmental measures[43], premiums granted in the scope of sustainable forest management[44], and other operations and decisions in the Region[45].

2.5.4.2. Expropriation

In cases where it is absolutely essential (from an ecological standpoint) to intervene on a given area, whereas the owner shows strong opposition, public authorities may decide to buy the land in order to manage it appropriately. This thus implies a cost for public authorities and a revenue for the owner.

2.5.4.3. External funds

Site management and development are supported by local, regional or national funds and investments, but also by European funding programmes. These are thus a financing source for site owners and managers, but a cost for the paying authority or organism.

2.5.4.4. Synthesis

To evaluate the economic situation of EN implementation from the standpoint of a target actor, we would have to consider all costs and benefits that have significance for him/her, and thereafter calculate the net present value for that actor. In summary,

- Direct costs: land owner, public authorities who deal with the project;
- Indirect costs: land owner, residents (local economy);
- Direct benefits: owner, residents (local economy);
- Indirect benefits: society as a whole;
- Premiums: cost for public authorities, benefit for owners;
- Acquisition: cost for public authorities and organisations, benefit for the owner;
- External funds: cost for paying organisation, benefit for the owner.

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[40] Hanley et al., op. cit., p.16.
[41] Hanley et al., op. cit., pp.129-130.
[42] For example, premiums are granted to compensate management and restoration costs.
[43] See Appendix 1 of this report.
[44] Ministère de la Région Wallonne - Direction de la Nature et des Forêts and see Appendix 2 of this report.
[45] Ministère de la Région Wallonne – Direction des ressources naturelles et de l'environnement and see Appendix 10 of Econet report.

2.6. The value of nature

From particular to general we will see in this section different ways of valuating the diverse components of biodiversity.

2.6.1. Value per species

As we have already said, there is an economic problem to evaluate biodiversity. Most of human activities are priced while we are tempted to ignore species conservation values due to the non-existence of prices. Dangerous sentence by Jakobsson and Dragun: "No price means no value![46]". Is it right?

The challenge for the economist is to establish how such species value might be identified and compared with the value of other human activities which harmfully affect the survival of those species. We have to value species for a variety of uses and reasons and at last the combination of both use and non-use value will constitute the total economic value.

The problem is that even if individual species create huge benefits to society, those benefits are rarely reflected in the market or in government policies with a suitable rate of wildlife resource use (whenever there is no overexploitation of wildlife resources).

The progress in economic theory permits now to place monetary values on benefits which are not exchanged in markets. There are a lot of valuation methods but one is more accurate in appropriate contexts, i.e., the contingent valuation method, which can estimate non-use values. This method is simple in its principles, i.e., we have to question people about their values for environmental goods through surveys and direct questioning.

In 1996, a study was conducted by Jakobsson and Dragun in Australia with the contingent method. They asked the population about their willingness to pay for the conservation of about 700 species (estimated number of all endangered species of flora and fauna from Victoria). Three methods[47] were used to estimate the mean and median willingness to pay and the aggregate results are as follows:

Household	**Aggregation**	**Individuals**	**Aggregation**
Minimum	Maximum	Minimum	Maximum
$ 160 million	$ 386 million	$ 340 million	$ 821 million
($ 118/household)	($284/household)	($ 118/individual)	($ 284/household)

Table 4. Aggregate mean estimates for protection of all flora and fauna using discrete choice valuation data ($ per year). Jakobsson & Dragun, 2001, p. 221.

Fortunately for nature, the figures from Table 4 show a strong interest in the conservation of endangered species. It could mean that an increase in expenditure on species conservation is possible.

Some people added comments to their questionnaires and it showed that the respondents were conscious of the existence of other species, environmental issues and social problems that also need expenditures. They took these points into account to determine their willingness to pay. What is more, about half the respondents made comments such as "all species should be protected, not just one" and "concerned with conservation as a whole so it is difficult to value species individually" (Jakobsson & Dragun, 2001).

Nevertheless we have to be careful with the results because respondents were not particularly presented with substitutes for the goods to be valued in the survey. So, it is possible that there was an overestimation of true willingness to pay.

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[46] JAKOBSSON K. M. & DRAGUN A. K., *The Worth of a Possum : Valuing Species with the Contingent Valuation Method*, Environmental and Resource Economics, Vol. 19, 2001, p. 211.

[47] First method: The Henemann formulae, second method: integrate the cumulative distribution function of the probability of saying 'yes' to the given discrete choice amount and third method was the non-parametric method devlopped by Kriström. For details see JAKOBSSON K. M. & DRAGUN A. K., *op. cit.*, p. 217-223.

2.6.2. Value of ecosystem services

After the species level, we go to a higher level, the value of ecosystem services. Ecosystem services contribute to human welfare, directly and indirectly and for that reason they correspond to a part of the total economic value of the planet. Because they are not completely 'captured' in commercial markets or adequately quantified in terms comparable with economic services and manufactured capital, policy decisions often attribute a too low weight to them. In the long term, such a negligence may compromise the sustainability of humans in the biosphere.

In one sense we can say that the total value of the services to the economy is infinite because without them humanity cannot survive.

In 1997, Costanza and coworkers performed a synthesis of diverse studies on valuation of ecosystem services and from this synthesis, they estimated values for ecosystem services per unit area by biome, and then multiplied by the total area of each biome and summed over all services and biomes (Costanza et al., 1997). We can say that these estimations represent a minimal value, which is most likely to increase. For the analysis, the experts grouped ecosystem services into 17 main categories. We can find these groups in a table which includes only renewable ecosystem services, excluding non-renewable fuels and minerals and the atmosphere. The table summarizing the ecosystem services and functions used in the study can be found in Appendix 3.

What are exactly ecosystem services? They consist of :

"*flows of materials, energy and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare. […] we can consider the general class of natural capital as essential to human welfare. Zero natural capital implies zero human welfare because it is not feasible to substitute, in total purely 'non-natural' capital for natural capital. Manufactured and human capitals require natural capital for their construction. Therefore, it is not very meaningful to ask the total value of natural capital to human welfare, nor to ask the value of massive, particular forms of natural capital. It is trivial to ask what is the value of the atmosphere to humankind, or what is the value of rocks and soil infrastructure as support systems. Their value is infinite in total. However, it is meaningful to ask how changes in the quantity or quality of various types of natural capital and ecosystem services may have an impact on human welfare. Such changes include both small changes at large scales and large changes at small scales*" (Costanza et al., 1997) (see ecological part).

More concretely for the estimation of the total value of ecosystem services, the authors needed estimations of the total global extent of the ecosystems themselves; then they made an aggregated classification scheme with 16 primary categories as shown in Table 2 to represent current global land use (See Appendix 3).

As a synthesis from those computations, the experts (Costanza et al., 1997) estimated that at the current margin, ecosystems services provide a value of at least US$ 33 trillion dollars[48] annually. The majority of the value of services they could identify is currently outside the market system, in services such as gas regulation (US$ 1,3 trillion yr^{-1}), disturbance regulation (US$ 1,8 trillion yr^{-1}), waste treatment (US$ 2,3 trillion yr^{-1}) and nutrient cycling (US$ 17 trillion yr^{-1}). About 63 % of the estimated value is supplied by marine systems (US$ 20,9 trillion yr^{-1}). Most of this comes from coastal systems (US$ 10,6 trillion yr^{-1}). About 38 % of the estimated value comes from terrestrial systems, mainly from forests (US$ 4,7 trillion yr^{-1}) and wetlands (US$ 4,9 trillion yr^{-1}). […]. Table 2 from Appendix 3 reports only the average values.

The attempt to estimate the total current economic value of ecosystem services is limited for some reasons presented in the document. It is not the place to discuss them here but one them deserves to be mentioned: "if we actually lived in a world that was ecologically sustainable, socially fair and where everyone had perfect knowledge of their connection to ecosystem services, both market prices and surveys of willingness-to-pay would yield very different results

[48] For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US$ 16-54 trillion (10^{12}) per year, with an average of US$ 33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global gross national product total is around US$ 18 trillion per year.

than they currently do, and the value of ecosystem services would probably increase" (Costanza et al., 1997)….as already said.

In the light of these figures, it is clear that ecosystem services present a significant fraction of the total contribution to human welfare on the Earth. That is why we have, at this stage, to give the natural capital stock that produces these services adequate weight in the decision-making process. If not, current and future human welfare may drastically suffer. Furthermore, we can see that additional research is needed in this study area.

2.6.3. Value per ecosystem

To continue our analysis of the value of biodiversity, this section will go through the value of the habitats examined by Balmford and other experts in a summary of different studies (Out of the 300 studies considered initially, the article only retains five of them, based on some criteria that ensure, among others, that private benefits of conversion of natural habitats for human use are not neglected).

The two first studies (on tropical forests in Malaysia) permit us to make this first observation: in total, the total economic value (TEV) of forest was some 14 % greater when placed under more sustainable management (at ~ $ 13 000 compared with $ 11 200 ha^{-1}).

Other studies allow drawing conclusions in the same sense for different habitats, sometimes with even higher benefits generated by sustainable management. There are presented in Appendix 4 with more details and figures. From this article two messages can be derived. Firstly, the paucity of empirical data on the central question of the changes in delivery of goods and services arising from the conversion of natural habitats for human use and secondly, we can find that in every case examined, the loss of nonmarketed services outweighs the marketed marginal benefits of conversion, often by considerable amounts (Balmford et al., 2002).

Moreover, with data from the FAO and the WWF, the experts found that five of the six biomes (temperate/boreal forest, seagrass, tropical forest, marine, freshwater, mangroves) measured have experienced net losses since the Rio summit, with the mean rate of change across all measured biomes running at -1,2 % per year, or - 11,4 % over the decade (see Figure 12 below). Therefore, the ability of natural systems to distribute goods and services upon which we depend is decreasing obviously.

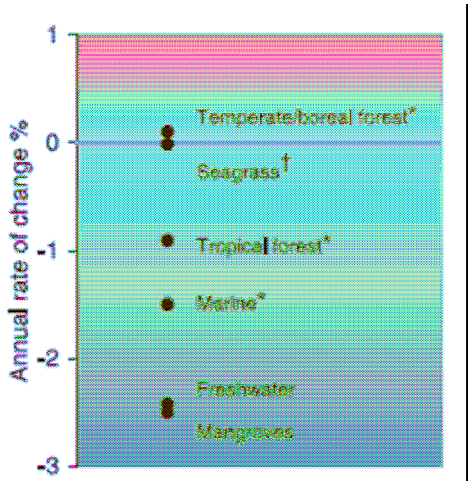

Figure 14. Recent global estimates of the annual rate of change in area or the abundance of associated vertebrate populations for six biomes. Note that the biomes that have declined deliver valuable ecosystem services.
For Temperate/boreal forest, Tropical forest and Marine, values plotted are the mean of habitat and population-based estimates. Finally, note that little confidence can be attached to the value of Seagrass (Source: Balmford et al., 2002).

From the same the studies we can say that a single year's habitat conversion costs the human enterprise of the order of $ 250 billion that year, and every year in the future, and that in net terms. Despite the overall of benefits for society the planet is continuing to lose natural ecosystems. There are three main reasons to that.

Firstly, there are lacks of information to better inform policy decisions as already said above. Secondly, findings in the studies highlight the fundamental role of market failures in driving habitat loss. Therefore, conserving the habitats in a relatively intact state will often need compensatory mechanisms to mitigate the impact of private, local benefits foregone, especially in developing countries. And finally, the private benefits of conversion are often exaggerated by intervention failures.

We agree with the fact that to safeguard relatively intact ecosystems and habitats, we have to maintain the remaining habitats in protected areas and we know too that it costs money. As mentioned by Balmford, the world spends (in 2000 US$) ~$ 6,5 billion each year on the existing reserve network[49]. The experts calculated the costs of properly managing existing terrestrial protected areas and expanding the network to cover around 15 % of land area in each region. They found that a globally effective network would necessitate an approximate annual expenditure of between ~$ 20 billion and $ 28 billion and the estimated mean total cost of an effective, global reserve program on land and at sea is some $ 45 billion per year. In return, the hypothetical global reserve network would ensure the delivery of good and services with an annual value (net of benefits from conversion) of between ~$ 4400 billion and $ 5200 billion, i.e., more than 100 times more than the cost (Balmford, 2002).

2.6.4. Value of a nature-reserve in the local context

Value of a nature reserve – as habitat – is relatively difficult to assess. There are a lot of studies in the literature but it often considers tropical species and habitats, not those located in Europe or nearby the ecological network concerned. Moreover, most of the ecosystem valuation is performed through assessment of the corresponding services. Concerning forests, a lot of studies are talking about exotic essences from other continents.

Nevertheless some information can be found. Often, to assess habitats and reserves, experts use people's willingness to pay to maintain habitats in healthy condition. In a study made in Australia with the willingness to pay, the next statements were observed: "Interestingly, the willingness to pay for scrubland turned out to be quite similar to the current market price for land of that type. The market price really represents the consumer's willingness to pay to use land for productive agriculture – it is the opportunity cost of preserving the habitat. But South Australians were not willing to pay the market price for grassy woodlands habitats. Willingness to pay for wetlands is more difficult to assess, as there is a limited market value for wetlands[50]".

As we can see, interesting findings can be made with the WTP method. However, we have to be careful because the given value will depend on gender, age and family situation of the respondents. Moreover, the data and method used to set up the model is important. "There are cases where it is really inappropriate, in circumstances that are highly emotive for example, because then you're measuring people's emotional responses to something that's very important to them – or belief systems. You don't ask people to trade-off something that is incredibly important to them[51]".

To conclude this part, we will add a comment that will permit to go deeper in our thoughts on biodiversity assessment. This comes from a recent article (Courchamp, 2006) from the University of Paris.

As we know,

"*overexploitation of living species (i.e., human exploitation exceeding the species' regeneration capacity) is a major threat to biodiversity, yet theory predicts that economic extinction (exploitation cessation) will usually precede ecological extinction (population disappearance). As populations become more sparse, it is increasingly costly to exploit them, and*

[49] Yet, half of this is spent in the United States alone. Globally, despite increased expenditure since the Rio Summit by both international institutions and private foundations, available resources for existing reserves fall far short of those needed to meet basic management objectives. Moreover, terrestrial and marine reserves currently cover only around 7,9 % and 0,5 % of Earth's land and sea area, […], well below the minimum safe standard considered necessary for the task of maintaining wild nature into the future (Balmford, 2002).

[50] PEDDIE C., *How do locals value their habitat?*, Ecos, 127, 2005, p. 24.

[51] PEDDIE C., *op. cit.*, p. 25.

exploitation ceases to be beneficial. In the absence of natural extinction risks at low population size (e.g., demographic stochasticity), exploitation cessation allows for the species' recovery. However, less-abundant species could suffer disproportionately from exploitation if their rarity makes them systematically more valuable. We postulate that because rarity makes living species attractive, their (over)-exploitation can remain profitable, rendering such species even rarer, and driving them to extinction.

This human-generated feedback loop is similar to the Allee effect, an important process in basic ecology and applied conservation biology. […]. Therefore, human activities cannot create an Allee effect; at most, they can push species into density ranges where their natural Allee effect will be expressed. On the contrary, we show here that humans can induce a purely artificial Allee effect in rare species through the 'paradox of value'. We call it the anthropogenic Allee effect (AAE). Although familiar to economists, the paradox of value – also called the 'water and diamonds paradox' (water has much value in use but none in exchange, while the opposite is true for diamonds) – is absent from ecological theory" (Courchamp, 2006).

Some examples explaining this theory are presented in Appendix 5.

3. Natura 2000

3.1. Framework of the Bird and the Habitat Directives

A result obligation

The European Union has set itself the target in 2003 to halt biodiversity decline in Europe until 2010 (Göteborg summit). The declining biodiversity is mainly the result of the loss or decreasing quality of territories of species.

At EU level, this task has been performed by the so-called 'Birds Directive' (Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds) and the so-called 'Habitats Directive' (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

The Birds Directive aims at the total protection of all the birds living at the wild state on the territory of the European Union (except Greenland) with some exceptions strictly defined and subjected to the control of the Commission. It comprises a series of appendices. The first enumerates the 181 species and subspecies threatened of disappearance or vulnerable because either of their restricted geographical distribution, or of their weak population. These birds enjoy a reinforced protection : the Member States have to ensure that they do not make the object of direct attacks but also to ensure the perenniality of their habitats (Article 4) [52]. The safeguarding of the habitats appearing essential achieving this goal, the directive states an obligation for the Member States to take "measures of special conservation" for the habitats of the 175 species, considered as most vulnerable of Europe and recoveries in appendix I, for purposes "to ensure their survival and their reproduction in their surface of distribution". The States must in particular classify in special protection areas (SPAs)"the territories most adapted in a number and surface with the conservation" of these species. They must take similar measures with regard to the migrating species whose arrival regular is not taken again with appendix I, in order to protect as well their surfaces from reproduction as of moult and wintering or the zones of relay in migration (Article 4.1 and 4.2).

The avifauna not being the only one to undergo an accelerated decline, the Council adopted in 1992 one second directive, whose object is " contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora (...)" (Article 2, § 1st). It prescribes the obligation for the Member States, "to maintain or restore, at favourable conservation status, natural habitats[53] and species of wild fauna and flora of Community interest[54]" (Article 2, § 2). Conscious of the stakes in question, the directive envisages however that the measurements taken under the terms of the directive must however hold account "of the economic, social and cultural requirements, as well as regional and local characteristics" (Article 2, § 3).

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[52] C.-H. BORN et F. LAMBOTTE, « La conservation de la nature en Région wallonne », chapitre de l'ouvrage collectif L'urbanisme et l'environnement*, v°du R..P.D.B., *sous la dir. de B. JADOT et F. HAUMONT, à paraître (automne 2006).

[53] "*Natural habitats means terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural*" (art. 1, b, Habitats directive).

[54] The concepts of habitats and species of community interest are defined by art. 1st, c) and g) of the Habitats directive. All these habitats and species appear in the appendices of the directive, or are likely to appear in it. Some are regarded as "priority", taking into account the fact that a great part of their surface of natural distribution is located on the European territory of the Community (article 1st, d) and h)). They are indexed by an asterisk in the appendices. Their protection is stricter (*cfr. infra*).

Article 3 (92/43/EEC)
1. A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.
The Natura 2000 network shall include the special protection areas classified by the Member States pursuant to Directive 79/409/EEC.

The strategy selected consists in setting up, on a European scale, a "coherent ecological network[55]" called "Natura 2000"[56]. It is composed, on the one hand, of the special protection areas (SPAs) envisaged by the Oiseaux directive, and, on the other hand, of a new type of protected surface, the special areas of conservation (SACs), intended to protect the types of natural habitats and the habitats of animal and vegetable species of Community interest aimed by the Directive "Habitats". The space configuration of the network and measurements of conservation which are carried out there are a function above all the ecological requirements of these species and these habitats, which constitute the criteria of selection of the zones[57] and dictate measurements of conservation to be taken within these last. These requirements are evaluated by "biogeographic area" in order to guarantee the ecological coherence of the network[58]. Contrary to what is the case for the SPAs, the procedure of designation of the SACs is not only national, the selections being controlled the Commission and of an ad hoc Committee - the Committee "Habitats"[59].

The ecological network aims thus "to ensure bio-diversity through the conservation of natural habitats and of wild fauna and flora on the territory of the Member States"[60]. More specifically, the directive "Habitats" states that "measurements aim to ensure to maintain or restore, at favourable conservation status, natural habitatsand species of wild fauna and flora of Community interest. (Article 2, § 2) This objective constitutes a result obligation[61] in the chief of the Member States (Article 2 of the Birds directive; art. 2, § 2, and 3, § 1, of the Habitats directive). That implies the

[55] On the concept of ecological coherence of the network Natura 2000, see C.-H. BORN, "La cohérence écologique du réseau Natura 2000", in COLL., *Natura 2000 et le droit, Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004, pp. 163 et s.

[56] Article 3, §1st, of the Habitats directive.

[57] Voyez, Ch.-H. BORN « La marge d'appréciation des Etats membres lors de la procédure de désignation des zones spéciales de conservation », note sous C.J.C.E., 7 novembre 2000, *Amén*., 2001, p. 60

[58] The European Community counts, since widening, nine biogeographic areas. The Walloon Region is situated on the biogeographic, continental (in the south of the Sambre-and-Meuse furrow) and the Atlantic (in north) area. A chart and information on these areas are available on http://europa.eu.int/comm/environment/nature/home.htm.

[59] Currently, the lists of sites of Community importance were adopted for the areas macaronesian, alpine, Atlantic and continental. See for these two last, decisions 2004/798/CE and 2004/813/CE from December 7th 2004 (*J.O.U.E*., L 382, 28/12/2004 et L 387, 29/12/2004). The Walloon Region is thus entirely covered by a list of SCI. It will be noted that these lists are not complete for certain types of habitats or certain species. They will thus be supplemented in the future.

[60] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000 – Les dispositions de l'article 6 de la directive «Habitats» 92/43/CEE*, Luxembourg, Commission européenne, 2000, p. 18.

[61] About the notion of result obligation, see the directive definition in the EC Treaty: « A directive shall be binding, as to the result to be achieved, upon each Member State to which it isaddressed, but shall leave to the national authorities the choice of form and methods. » (art. 249 ECT).

obligation to seek and deploy all the means - legal but also technical and financial - that are at disposal to reach the ecological result concerned. [62]

Favourable conservation status

The concept of favorable conservation status is capital in the Natura 2000 structure. It constitutes at the same time the objective to be reached on each site for the species and habitats natural for which it was selected, and the reference to determine if the obligations envisaged in the law are respected (in particular as regards prevention of deteriorations and the disturbances, and as regards active management). [63] It is an objective and scientific concept, which cannot be the subject of an arbitrary interpretation. It differs according to whether it acts of the state of conservation of a natural habitat or a species.

Being the subject of a precise definition in the directive Habitats[64], the conservation statuts can be defined, in a simplified way, as the *effect* on a species or a type of natural habitat of the influences - biotic, abiotic or human - which act on a habitat or a species and which can affect their long-term distribution and their survival in Europe. It is regarded as favorable if a whole of objective elements indicate that the surface of distribution and the surfaces covered by the habitat or that the dynamics of population of the species are stable or progress, and that the conditions for their long-term maintenance are met[65]. This means more than only to avoid the extinction of the species: it is necessary that the species / the habitat is "in good health" in the geographical surface considered[66].

The applicability of the concept of state of conservation favorable to the birds is not envisaged directly by the Habitats directive. They are the concepts of "survival" and "reproduction" (as well as the "needs for protection" of the sites of reproduction and migration of the migrating species) which are used by the Birds directive. We think that, in order to simplify the concepts, it would be good to also use the concept of conservation status for the birds, but by adapting it, if necessary, with specificities of the avifauna.

This scientific and nonarbitrary concept must be determined, according to the Commission, on the basis of best knowledge available and best judgement of the experts. It recommends establishing, on this basis, measurable values of reference of the favorable state of conservation (surfaces minimum of habitats, minimum level of total population, etc), in order to be able to evaluate if the situation of the species or the habitat is stable or improves compared to this situation of reference[67]. The evaluation of the conservation status is thus purely scientific and

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[62] C.-H. BORN, « La transposition et l'application du régime Natura 2000 en Région wallonne : entre espoir et déconvenues », in, J. DUBOIS et S. MALJEAN-DUBOIS (dir.), *Natura 2000 : de l'injonction européenne aux négociations locales*, Paris, La Documentation française, 2005, p. 73.

[63] C.-H. BORN, *Guide juridique des zones protégées en Wallonie*, Jambes, Ministère de la Région wallonne, 2005, p. 183.

[64] See art. 1, e and i, Habitats directive.

[65] See art. 1er bis, 6° and 10°.

[66] On this notion see COMMISSION EUROPEENNE, *Assessment, monitoring and reporting of conservation status – Preparing the 2001-2007 report under Article 17 of the Habitats Directive (DocHab-04-03/03 rev.3)* en ligne sur internet ; COMMISSION EUROPEENNE, *Guidance document on the strict protection of animal species of community interest provided by the 'Habitats' Directive 92/43/EEC Draft Version 4*, novembre 2005, p. 11.

[67] For more detail on the way of evaluating the favorable conservation status and in particular the space scale to take into account see COMMISSION EUROPEENNE, *Gérer les sites Natura 2000 – Les dispositions de l'article 6 de la directive «Habitats» 92/43/CEE*, Luxembourg, Commission européenne, 2000, pp. 18-19 et 27-29. For a more detailed and scientific explanation of the indicators of the state of conservation, see RAMEAU J.-C., GAUBERVILLE C. & DRAPIER N., *Gestion forestière et diversité biologique. Identification et gestion intégrée des habitats et espèces d'intérêt communautaire*. M.R.W., Namur, 2000, pp. 28 et s.

must be justified compared to these indicators and with the contribution of the site to the ecological coherence of the network Natura 2000.[68]

Like confirmed by the Commission[69], the obligation to reach the favorable conservation status can imply in certain cases for the Member State to have to take measurements of improvement and restoration in order to reach these values of reference if the species or the habitat is currently in an unfavourable conservation status.[70]

The conservation regime

Article 6 of the directive "Habitats" constitutes the heart of the conservation regime of the Natura 2000 sites. It founds the protection regime which must prevail in the "special areas of conservation" (SACs), and, under certain aspects, in the "special protection areas" (SPAs). [71]

The §1er of this provision states the obligation for the Member States to adopt active, positive measures of conservation (active management of the sites by measurements such as the mowing, the extensive pasture, etc.) in the SACs. The obligation is not applicable in the SPAs, which have their own regime on this point[72], appreciably comparable. These measurements must at least include lawful, administrative or contractual measurements. They can also include, "if necessary", management plans. The whole structure must in any event fulfill the ecological requirements of the species and the habitats for which the site was indicated[73].[74]

The § 2 of article 6 imposes the adoption by these same States, in the SACs as in the SPAs, of suitable measurements to avoid the deterioration of the habitats and the significant disturbance of the species for the protection of which the zones were indicated ("negative" measurements).

The § 3 and 4 of article 6, applicable in SPAs[75] as in SACs, define the conditions under which a plan or a project can derogate from the protection regime: any plan or project “likely to have a significant effect” on a declared site of Community importance[76] (and not connected to its management) must be the subject of a “appropriate assessment of its implications” on the conservation status of the site. Whatever are the form and the author, the assessment must be"appropriate as regard with the site’s conservation objectives[77]", which necessarily implies that it is justified scientifically compared to these objectives.

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[68] C.-H. BORN, *Guide juridique des zones protégées en Wallonie*, Jambes, Ministère de la Région wallonne, 2005, p. 183.

[69] COMMISSION EUROPEENNE, *Assessment…*, p. 9

[70] It will be considered that the restoration is the conversion of a habitat not noted by the Habitats Directive into a natural habitat or of Community species of interest, the improvement being the passage of an existing habitat of Community interest of a state of conservation given towards a more favorable state of conservation.

[71] See C.-H. BORN, « Les problèmes liés à la transposition de l’article 6 de la directive ‘Habitats’ », Observations sous C.J.C.E., 6 avril 2000, aff. C-256/98, Commission c/ République française, *Amén.*, 1/2001, p. 22

[72] See article 4, § 1and 2, of the directive 79/409/CEE of the Council, 2nd april 1979, on the conservation of wild birds (J.O.C.E., L 103, 25.4.1979) (Birds directive)

[73] See for exemple N. de SADELEER et C.-H. BORN, *Droit international et communautaire de la biodiversité*, Paris, Dalloz, 2004, p. 511 et s.

[74] C.-H. BORN, « Plans de gestion des sites Natura 2000 Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006)

[75] Article 7 Habitats directive.

[76] The sites are declared of Community importance when they are taken as such by the Commission in the list which it made in agreement with the Member States under the terms of article 4, § 2, of the directive "Habitats". The mode of prohibition and exemption (within the meaning of article 6, § 2, 3 and 4 of the directive "Habitats") applies as of the publication of the list from the Official Journal, and thus before the site is the subject of a designation like SAC (Article 4, §5, of the directive "Habitats").

[77] On the concept, contents and the fixing of the objectives of conservation, see C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l’honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

If the conclusions of the assessment are negative, the plan or project must be rejected[78] by the competent national authority, except in case of "imperative reasons of overriding public interest" (and in the absence of alternative solutions[79]).[80]

Article 6.3, second sentence of the Habitats directive requires that the authority has “ascertained” of the absence of significant effect[81] of the plan or the project on the site, and thus establishes a substantial standard of protection of the sites Natura 2000 to strictly frame its *discrétionnaire* capacity[82]. If the evaluation is not able to prove the absence of risk for the site, the authority has only the following choice: either the project or the plan must be refused, delocalized or together with conditions likely to guarantee that no attack with the integrity of the site will take place[83]; either an exemption, in conformity with article 6.4 of the directive Habitats, must be requested. The *discrétionnaire* capacity of appreciation of the authority is thus closely bound[84] by the conclusions of the assessment of implications, if at least this one is "appropriate".[85]

The direct effect of this provision was confirmed by the ECJ (at least article 6.3) [86] and by the Council of State (Article 6.2 to 4) [87]. The authorities are thus held to respect these provisions. This protection does not involve however direct obligations for the private individuals.

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[78] Article 6, § 3, « In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned (…) ». The wording of the article implies, according to us, that the plan or project, if it is likely to have significant effects on the site, must be approved or authorized expressly by the proper authority, this, even if the legislation in force as regards authorization to exploit does not envisage it. The correct transposition of article 6, § 3, of the directive "Habitats" thus imposes, according to us, with the Member States to envisage, for these plans and projects, a system of authorization or approval express (specific or not: a modification of the legislation as regards authorization to exploit can be enough) in more of the system of evaluation of the incidences. In this sense see N. de SADELEER, op. cit., p. 629.

[79] See C.-H. BORN, « La notion de « solutions alternatives » dans l’article 6, §4, de la directive Habitats », observations sous CJCE, 26 octobre 2006, aff. C-239/04, Commission c/ République portugaise.

[80] See C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l’honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

[81] On the concept of significant effect and attack to the integrity of the site, see C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l’honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

[82] For an analysis in the same direction of the two directives, see conclusions of Mrs. prosecuting attorney KOKOTT in a business relating to a site sheltering a population of Corncrake (aff. C-209/04, conclusions deposited on October 27, 2005, items 61-62).

[83] In a number of cases, the imposition of measurements of attenuation of the impact in the shape of condition or specifications to respect by the applicant of the licence or the promoter of the plan is capable to make possible the exercise of the activity considered, in so far as their scientific relevance can be shown by the applicant. With defect, the doubt will oblige the authority to refuse the licence or the plan or to grant an exemption. One should not however confuse measurements of attenuation - which aim at limiting the impact of the activity in order to make it nonsignificant - with measurements of compensation - which intervene as soon as deterioration is caused with the site -, under penalty of seeing authorizing plans and projects of purely deprived or minor interest in violation of article 6.4, Habitats directive.

[84] On the dependent competence of the authority within the framework of the suitable evaluation see BORN, C.-H., « Observations sur l’arrêt ‘Râle des genêts’ de la Cour de justice du 29 janvier 2004 », *Amén*., 2004/3, p. 155-159

[85] See C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l’honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

[86] C.J.C.E., 7 septembre 2004, “mer de Wadden”, point 69. In the sites suggested by the Member States at the Commission but not yet retained like SCI, the Court judged that this provision was not applicable for them, in accordance with what provides article 4, § 5, of the directive (C.J.C.E., 13 janvier 2005, aff. C-117/03, *Societa Italiana Dragaggi SpA et al.,* point 30). Taking into account the decisions of the Commission adopting the list of SCI for the continental and the atlantic areas, this jurisprudence will have only one null range in Belgium (entirely covered by the list of SCI), except if sites were still to be added.

[87] C.E., 4 avril 2001, n° 94.527, *asbl L’Erablière et crts.*

Critical analysis

Natura 2000 is conceived to promote the *conservation* of biodiversity, while integrating human activities from the viewpoint of sustainable development. Therefore, it aims at sustainable conservation of habitats and species of community importance, taking account of (i) economic, social and cultural requirements and (ii) regional and local circumstances. The same protection regimes are applicable in SACs and SPAs (Kuindersma *et al.* 2004). Art. 6 of the HD describes the main protection formulas for these Natura 2000 sites: in general, only activities may be performed which can have no significant impact on the natural values of the sites.

From an ecological point of view, the HD and BD may be very powerful means to preserve populations of rare and endemic species. Moreover, the Natura 2000 network can provide all Europeans with basic environmental services, such as clean water and air. Within Europe, these directives are the strongest intruments for nature conservation (shown by the fact that the European Commission takes Member States to Court if they do not meet the obligations).

Under pressure of the European court of Justice, the member states have proceeded to implement these nature conservation goals into their national legislation (although in some places these have still not been sufficiently transposed yet, see WWF 2006). However, the directives contain open, still unclear criteria and only a few member states have established a number of interpretation guidelines. A more detailed definition of for instance “favorable conservation status”, adding more to the already existing definitions of the HD itself, can hardly be found (Neven *et al.* 2005).

The selection of Natura 2000 sites has to be primarily made on scientific (ecological) basis. However, this has caused several problems and uncertainties (pers. comm. N. Boone, L. De Beck & D. Paelinckx, *INBO*), for instance:

- Habitat types as defined by Europe (Annex I) are not always unambiguously to interprete: species composition may vary considerably between the member states. This problem is partly solved by the distribution of the “Interpretation manual of European Union Habitats” (e.g. European Commission 1996)
- Several vegetation types are not included in the European list of habitat types (Annex I). For instance, *calthion palustris* was taken out of the list because of large opposition by the agricultural sector in France and the UK. In Flanders, this vegetation type is therefore indicated as ‘Regionally important biotope’.

In theory, only when there are equivalent possibilities from the ecological point of view, a decision may be based on e.g., economical or societal grounds (see below for an in-depth discussion of these issues in Belgium).

> Article 10 (92/43/EEC)
> Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to **improving the ecological coherence af the Natura 2000 network**, to **encourage the management of features of the landscape** which are of major importance for wild fauna and flora.
> Such features are those which, by virtue of their **linear and continuous structure** (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as **stepping stones** (such as ponds or small woods), are **essential for the migration, dispersal and genetic exchange** of wild species.

A negative aspect of the delineation of sites at the national level is the discontinuity in many cases of what is intended to be a network. Indeed, the Natura 2000 sites are meant to be the core areas of a coherent Europe-wide ecological network, ensuring ecological connectivity from Russia to the Atlantic and from the North Cape to the Mediterranean (Rientjes 2005). The HD itself points out the importance of connectivity between sites (Art. 10 of HD), but the EC has so far given priority to the designation process over the issue of connectivity. Moreover, there is no explicit reference in the HD to ‘*spatial* coherence’ of the Natura 2000 network and ‘coherence’ is interpreted differently by the EC, the member states and NGOs (Zwaan 2004). At the moment, the EC regards ‘coherence’ merely as including all relevant habitat and species in protected sites.

In addition, the designation of sites is treated as a statistical and scientific process rather than a planning process, concerned with the quantity rather than the connectivity of sites (Zwaan 2004).

However, Article 10 is gaining more attention (Zwaan 2004), there are several cross-border Natura 2000 sites (like 'de Vallei van de Grensmaas' between Flanders and the Netherlands and 'La Vallée de l'Attert' between Wallonia and Luxembourg) and an increasing number of Member States or regions is working on the development of national ecological networks (e.g. The Netherlands, Flanders, Germany). But, there is a need for cross-border cooperation and coordination in order to achieve an ecologically 'sound' network (Figure 13; Zwaan 2004, Leibenath *et al.* 2005, Lintz & Leibenath 2005, Rientjes 2005).

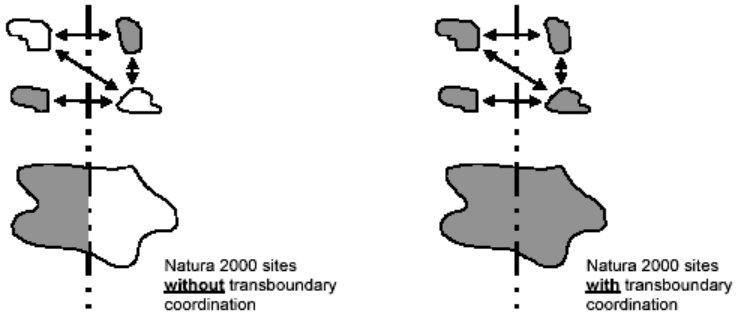

Figure 15. Coordinated designation and management of Natura 2000 sites across borders (From Lintz & Leibenath 2005).

As stated by the WWF (2006) "the major achievement of the BD and HD is that Europe now has a huge common network of protected areas, with common goals and procedures to achieve them, in a unique and unprecedented attempt to work together to achieve nature conservation and sustainable development at a continental scale: Natura 2000" (although site designation has not been completely fulfilled yet, see below and WWF 2006). However, the mere delineation of Natura 2000 sites hasn't stopped biodiversity to decline in Europe. For instance, in the period since the application of the BD to Flanders until 2000, three of the Annex I breeding birds in Flanders, needing protection, had become extinct (Symens 2000 and see also Martens 2002). The next task is thus to put in place regulations by each Member State in order to ensure the survival of habitats and species. Major gaps had been found by a survey by the WWF (2006, using over 30 questions for assessing the implementation status of each country) in the overall context of management issues, such as "elaboration of adequate management plans, species conservation measures and plans, and sufficient consideration of Article 6 assessments for plans and projects".

A positive aspect of the application of the BD and HD in Europe, is that the need for reporting to the EC has given rise to more monitoring programs (see for instance Martens 2005 for an status of the bird populations in Flanders). In addition, the obligation of the implementation has enabled all Europeans to recognize the value of conserving our natural heritage (WWF 2006).

In the following paragraph, a chronological overview is given of the process of delineation of the Natura 2000 network in Belgium, in order to unravel the field of tension between ecological targets and socio-economic purposes.

3.2. Transposition of the directives into regional law

3.2.1. Site selection and designation

3.2.1.1. Legal procedure

3.2.1.1.1. Sélection

L'initiative de créer un réseau européen de zones protégées a été prise au départ par la Communauté européenne, en 1979 (directive Oiseaux), puis reprise et améliorée en 1992 (directive Habitats). Le régime Natura 2000, en tant qu'obligation de droit communautaire, s'impose donc à tous les Etats membres, dont la Belgique. Les Régions étant compétentes en matière de conservation de la nature, il leur appartient de transposer et d'appliquer les directives Oiseaux et Habitats.[88]

Le législateur wallon a confié la charge de sélectionner et de désigner les sites Natura 2000 (ZPS et ZSC) au Gouvernement wallon (art. 25, § 1 et 2, de la loi du 12/7/1973).

La Wallonie est à cheval sur les régions biogéographiques atlantique (nord du sillon Sambre-Meuse) et continentale (sud du sillon Sambre-Meuse). Sur les 200 types d'habitats naturels repris dans l'annexe I de la directive Habitats, 44 sont présents en Région wallonne, dont 10 sont reconnus comme prioritaires. La Wallonie compte par ailleurs 63 espèces d'oiseaux reprises dans l'annexes I de la directive Oiseaux (dont deux sont classées prioritaires – ce que ne prévoit pas la directive -, à savoir le Butor étoilé et le Râle des genêts). Sur les 200 autres espèces animales et 500 espèces végétales figurant dans l'annexe II de la directive Habitats, seules 31 sont présentes en Région wallonne (dont la Loutre, plusieurs espèces de chauve-souris, quelques libellules, le Triton crêté, le Lucane cerf-volant, la Moule perlière d'eau douce, le Flûteau nageant et le Brome épais). Aucune n'est prioritaire. C'est sur base de ces données que 239 sites ont été sélectionnés par le Gouvernement wallon et transmis à la Commission, les 26 septembre 2002 et 4 février 2004. Leur surface totale est de 220.000 hectares environ, ce qui correspond à un peu moins de 13 % du territoire wallon. [89]

Deux procédures[90] distinctes de désignation comme site Natura 2000 sont prévues, sur base de différents critères :

- l'une relative aux habitats d'oiseaux (art. 25, § 2, de la loi du 12/7/1973)
- l'autre relative aux types d'habitats naturels et aux habitats d'espèces autres que les oiseaux (art. 25, § 1er, de la loi du 12/7/1973).

1. CRITERES DE SELECTION

A. Habitats d'oiseaux :

Le Gouvernement est tenu de désigner comme site Natura 2000 les territoires les plus appropriés en nombre et en superficie au regard des besoins de conservation des oiseaux que l'on rencontre sur le territoire de la Région wallonne, figurant à l'annexe XI, ainsi qu'au regard des besoins de protection des oiseaux migrateurs dont la venue est régulière en Région wallonne, figurant également à l'annexe XI, en ce qui concerne leurs aires de reproduction, de mue et d'hivernage et les zones de relais dans leur aire de migration.

B. Types d'habitats naturels

Le Gouvernement est tenu de faire figurer dans sa proposition une liste de sites susceptibles d'être identifiés comme « sites d'importance communautaire » conformément à l'article 4, § 1er, de la directive Habitats (art. 25, § 1er, de la loi du 12/7/1973). Un site d'importance communautaire (SIC) est un site qui, dans la ou les régions biogéographiques auxquelles il appartient :

- contribue de manière significative à maintenir ou rétablir dans un état de conservation favorable un habitat ou une espèce protégé et

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[88] C.-H. BORN, *Guide juridique des zones protégées en Wallonie*, Jambes, Ministère de la Région wallonne, 2005, p. 187.

[89] C.-H. BORN et F. LAMBOTTE, « La conservation de la nature en Région wallonne », chapitre de l'ouvrage collectif *L'urbanisme et l'environnement*, v°du R..P.D.B., sous la dir. de B. JADOT et F. HAUMONT, à paraître.

[90] Sur la sélection des sites dans cette région, voy. ORBAN DE XIVRY, E., « La procédure de sélection des sites en Région wallonne », *in* X., *Natura 2000 et le droit…*, *o.c.*, p. 117-139 ; BORN, C.-H., *Guide juridique…, o.c.*, p. 187 et s.

- peut contribuer de manière significative à la cohérence du réseau Natura 2000 et/ou contribue de manière significative au maintien de la diversité biologique dans la ou les régions biogéographiques concernées (définition plus complète, voir art. 1bis, 13°, de la loi du 12/7/1973).

La sélection initiale des sites abritant ces habitats doit être faite obligatoirement et uniquement sur la base des critères scientifiques. Ceux-ci sont établis dans l'annexe X de la loi.

2. MARGE D'APPRECIATION DU GOUVERNEMENT[91] :

Ainsi que l'a confirmé la jurisprudence, la marge d'appréciation du Gouvernement pour sélectionner les sites Natura 2000-ZSC[92] ou ZPS[93] est de nature strictement scientifique. Aucune considération socio-économique (affectation au plan de secteur en zone urbanisable, propriétaire privé influent, projet immobilier,…) ne peut en principe justifier l'exclusion du réseau Natura 2000 d'un site correspondant aux critères ZPS ou à ceux de l'annexe X.[94]

Le Gouvernement dispose cependant d'une certaine marge d'appréciation dans l'application même des critères scientifiques de sélection des futures ZPS[95] ou de l'annexe X de la loi et dans la prise en considération des « informations pertinentes ».

3.2.1.1.2. Désignation

Tous les sites Natura 2000 « sont désignés par un arrêté du Gouvernement », appelé « arrêté de désignation » (art. 25, § 1 et 2 et art. 26, § 1er, de la loi). Chaque arrêté concerne donc un seul site, et lui est spécifiquement adapté. Cet arrêté est un document central, dont dépend en grande partie la réalisation des obligations de résultat qui pèsent sur la Région wallonne. Aucune modalité de participation autre que des mesures d'information de nature générale sur Natura 2000 n'est prévue quant au contenu même de l'arrêté : aucune enquête publique ni aucune consultation des communes et des administrations concernées n'est prévue explicitement.

L'arrêté contient obligatoirement :

1. le nom propre du site;
2. les types d'habitats naturels d'intérêt communautaire que le site abrite et pour lesquels le site est désigné, en précisant, le cas échéant, les habitats naturels prioritaires présentes dans le site ;
3. les espèces d'intérêt communautaire que le site abrite et pour lesquelles le site est désigné, en précisant, le cas échéant, les espèces prioritaires présentes dans le site[96];
4. les critères scientifiques ayant conduit à la sélection du site;
5. la localisation géographique exacte du site (avec les numéros de parcelles cadastrales), ainsi que des principaux types d'habitats naturels qu'il abrite[97], reportée sur une carte au 1/10.000ème;

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[91] Sur ces questions, voyez C.-H. BORN, « La marge d'appréciation des Etats membres lors de la procédure de désignation des zones spéciales de conservation », Observations sous C.J.C.E., 7 novembre 2000, aff. C-371/98, The Queen & Secretary of State for the Environment, Transport and the Regions, *ex parte* First Corporate Shipping (« Estuaire de Severn »), *Amén.*, 1/2001, p. 57.

[92] C.E., 4 avril 2001, n° 94.527, *ASBL L'Erablière & Commune de Nassogne* ; 1er juin 2001, n° 96.097, *ASBL L'Erablière et crts*. Voy. aussi *Doc. Parl. W.*, 250 (2000-2001), n° 1, *Exposé des motifs*, p. 17. Au niveau communautaire, voy. notamment C.J.C.E., 7 novembre 2000, aff. C-371/98, « Estuaire de Severn », publié sur http://curia.eu.int/fr/content/juris/index.htm).

[93] Voy. notamment C.J.C.E., 11 juillet 1996, aff. C-44/95, *Regina & Secretary of State for the Environment, ex parte Royal Society for Protection of Birds*, « Lappel Bank » , *Rec.*, 1996, I, p. 3805.

[94] C.-H. BORN, *Guide juridique des zones protégées en Wallonie*, Jambes, Ministère de la Région wallonne, 2005, p. 193-194-195.

[95] C.J.C.E., 19 mai 1998, aff. C-3/96, *Commission c/ Pays-Bas*, *Rec.*, I, p. 3031, point 61.

[96] LAMBOTTE et NEURAY considèrent que la confidentialité de ces données eût été préférable dans certains cas, comme l'autorise notamment la Convention d'Aarhus du 25 juin 1998 sur l'accès à l'information, la participation du public au processus décisionnel et l'accès à la justice en matière d'environnement (art. 4, § 4, al. 1er, h) (F. LAMBOTTE et J.-F. NEURAY, « Le décret Natura 2000 », in COLL., *Actualité du cadre de vie en Région wallonne. Aménagement du territoire et urbanisme, évaluation des incidences sur l'environnement, Natura 2000*, Actes du colloque de Namur des 17 et 18 octobre 2002, Bruxelles, Bruylant, 2003, pp. 321-372, p. 337, note 75).

6. les interdictions particulières applicables dans ou en dehors du site ainsi que toute autre mesure préventive à prendre dans ou en dehors du site conformément au régime préventif à mettre en place ;
7. les objectifs du régime de gestion active à mettre en place ;
8. les moyens proposés pour atteindre les objectifs du régime de gestion active ;
9. la commune concernée;
10. la commission de conservation concernée.

Le Gouvernement peut, après l'avis de la commission de conservation concernée, revoir les prescriptions visées aux points 6 (interdictions et mesures préventives), 7 (objectifs de gestion active) et 8 (moyens proposés pour la gestion) en fonction de l'évolution des connaissances scientifiques, des techniques de gestion ou de l'état de conservation du site (art. 26, § 1, dernier al., de la loi). L'arrêté de révision est soumis aux formalités de publicité de la désignation et, le cas échéant, à la procédure de concertation avec les propriétaires et occupants prévue lors de la fixation du contenu du régime de gestion active.

Les prescriptions visées aux points 5 (localisation / périmètre du site et des principaux habitats qu'il abrite), 6 (interdictions et mesures préventives) et 7 (objectifs de gestion active) précités de l'arrêté de désignation reçoivent, à l'instar des prescriptions des plans de secteur, une valeur réglementaire (art. 26, § 1, al. 2, de la loi) [98], et sont donc obligatoires pour tous[99], y compris toute autorité statuant sur une demande d'autorisation individuelle. Les autres prescriptions (notamment les habitats et espèces que le site abrite et les moyens de gestion proposés) ont valeur individuelle.[100]

L'arrêté de désignation doit être publié intégralement au Moniteur belge (y compris les cartes délimitant le site et localisant les habitats)[101], et notifié par lettre recommandée à la poste au collège des bourgmestre et échevins de chaque commune concernée[102] dans les deux mois qui suivent la publication de l'arrêté. Dans les deux mois de la notification de l'arrêté aux communes concernées, la désignation du site (et non l'arrêté tout entier) doit être:

- notifiée par lettre recommandée à la poste aux propriétaires et occupants concernés[103]. Cette notification est faite par le directeur du Centre extérieur de la DNF ou son délégué[104] ;
- annoncée par voie d'affiches aux endroits indiqués dans l'arrêté de désignation et à l'administration de chaque commune concernée.

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[97] A priori, les termes « habitats naturels » ne visent pas que les habitats naturels d'intérêt communautaire présents sur le site, mais aussi les autres habitats naturels au sens de la définition de l'article 1bis, 2°, de la loi.

[98] Sur la question de savoir s'il est opportun de donner une valeur réglementaire aux objectifs de gestion active, voy., pour une réponse négative, B. JADOT, « Mise en place du zonage écologique et coexistence de législations distinctes », in C.E.DRE (dir.), *Le zonage écologique*, actes du colloque de Gembloux du 29 mars 2001, Bruxelles, Bruylant, p. 215, note 26. Pour une réponse plus nuancée, voy. P.-Y. ERNEUX, « La gestion active des sites », in COLL., *Natura 2000 et le droit, Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004, p. 242.

[99] *Doc. Parl. W.*, 250, 2000 – 2001, *Avis du Conseil d'Etat*, n° 1, p. 115.

[100] Sur la nature de l'arrêté de désignation, voyez F. LAMBOTTE et J.-F. NEURAY, « Le décret Natura 2000 », in COLL., *Actualité du cadre de vie en Région wallonne. Aménagement du territoire et urbanisme, évaluation des incidences sur l'environnement, Natura 2000*, Actes du colloque de Namur des 17 et 18 octobre 2002, Bruxelles, Bruylant, 2003, p. 343.

[101] La Cour de justice a considéré que la publication au Moniteur belge des cartes délimitant les ZPS (et donc *a priori* des sites Natura 2000 en général) était indispensable pour donner aux périmètres une « force contraignante incontestable » (C.J.C.E., 27 février 2003, aff. C-415/01, Commission c/ Belgique, points 22-24).

[102] C'est-à-dire sur le territoire de laquelle s'étend tout ou partie d'un site Natura 2000 (art. 1er bis, 22°, de la loi).

[103] C'est-à-dire respectivement tout titulaire d'un droit de propriété sur un bien immobilier présent dans le site, et tout titulaire d'un droit d'usufruit, d'emphytéose de superficie, d'usage, d'habitation, de concession, d'un bail à date certaine ou d'un bail à ferme relatif à un bien immobilier présent dans un site Natura 2000 (art. 1er bis, 25° et 26°, de la loi).

[104] Art. 2, § 1, de l'AGW du 20 novembre 2003 relatif aux modalités de la concertation préalable à l'élaboration des contrats de gestion active et à la constatation de l'inexécution des mesures de gestion active.

L'arrêté de désignation (en entier) doit être transcrit, à l'initiative et à la charge de la Région wallonne, sur le registre du conservateur des hypothèques dans l'arrondissement duquel il est situé. Aucun délai de transcription n'est fixé.

3.2.1.2. Scientific criteria

The selection of Natura 2000 sites is primarily made on scientific (ecological) basis. Only when there are equivalent possibilities from the ecological point of view, a decision may be based on e.g., economical or societal grounds.

In Belgium, the Regions (Walloon, Flemish and Brussels Capital) are authorized for nature conservation, except if it considers the North Sea, for which the Federal Government is responsible.

Furthermore, Belgium lies in two biogeographic zones: the Atlantic zone (the main part) and the continental zone (Figure 14). For Flanders, only *Voeren* (*Les Fourons*) belongs to the Continental zone.

In Table 5, an overview is given of the procedure prescribed by the European Commission (Article 4 of HD) for the demarcation of the Natura 2000 network. Reference is also made to specific additions to this procedure in the Walloon and Flemish nature legislation. One big difference between Wallonia and Flanders is that the first has not demarcated SPAs and SACs but only 'Natura 2000' sites.

In the next paragraphs, we describe the scientific 'red lines' which were followed by the Walloon and Flemish nature administration in order to make a list of proposed Sites of Community Importance (pSCIs).

Table 5. Procedure for the demarcation of Natura 2000 sites with reference to specific articles from the HD. For Flanders this can be found in Chapter 5 of the Flemish Natuurdecreet (Anonymous 2002): Art. 36bis

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Article 4 of HD	***Flanders***
Proposal of sites 'eligible for identification as Sites of Community Importance' *Art. 4 (1)* ***On the basis of the criteria set out in Annex III (Stage 1) and relevant scientific information****, each Member State shall propose a list of sites indicating which natural habitat types in Annex I and which species in Annex II that are native to its territory the sites host. For animal species ranging over wide areas these sites shall correspond to the places within the natural range of such species which present the physical or biological factors essential to their life and reproduction. For aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction. Where appropriate, Member States shall propose adaptation of the list in the light of the results of the surveillance referred to in Article 11.* ***ANNEX III (92/43/EEG)*** *CRITERIA FOR SELECTING SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE AND DESIGNATION AS SPECIAL AREAS OF CONSERVATION* *STAGE 1: Assessment at national level of the relative importance of sites for each natural habitat type in Annex I and each species in Annex II (including priority natural habitat types and priority species)* *A. Site assessment criteria for a given natural habitat type in Annex I* *(a) Degree of representativity of the natural habitat type on the site.* *(b) Area of the site covered by the natural habitat type in relation to the total area covered by that natural habitat type within national territory.* *(c) Degree of conservation of the structure and functions of the natural habitat type concerned and restoration possibilities.* *(d) Global assessment of the value of the site for conservation of the natural habitat type concerned.* *B. Site assessment criteria for a given species in Annex II* *(a) Size and density of the population of the species present on the site in relation to the populations present within national territory.* *(b) Degree of conservation of the features of the habitat which are important for the species concerned and restoration possibilities.* *(c) Degree of isolation of the population present on the site in relation to the natural range of the species.* *(d) Global assessment of the value of the site for conservation of the species concerned.* *C. On the basis of these criteria, Member States will classify the sites which they propose on the national list as sites eligible for identification as sites of Community importance according to their relative value for the conservation of each natural habitat type in Annex I or each species in Annex II.* *D. That list will show the sites containing the priority natural habitat types and priority species selected by the Member States on the basis of the criteria in A and B above.*	by the Institute for Nature Conservation (*Instituut voor Natuurbehoud*) ↓ Provisional establishment: '*Vastleggingsbesluit*' **(§1)** ↓ Public enquiry by the Flemish Government within 30 days **(§2-5)** ↓ Collection of the advices, remarks and objections by the administration authorized for nature conservation, followed by a motivated advice by this administration to the Flemish Government. This advice includes advice of the IN concerning the proposed changes. ↓ Definitive establishment: '*Vastleggingsbesluit*' within 60 days **(§6)** = '*Aanwijzingsbesluit*' for SPA ↓ Publication in the State Journal within 30 days **(§7)**
Submission of the list of 'proposed SCIs' (pSCIs) to the EC **+ Publication of a reference list with the present habitats of Annex I and species of Annex II per member state.** This list will serve as basis to assess if the list of sites 'eligible for identification as sites of community importance' proposed by the member states is representative for the occurring habitats and species. If necessary, the member states are asked to propose additional areas. *Art. 4 (1) The list shall be transmitted to the Commission, within three years of the notification of this Directive, together with information on each site. That information shall include a map of the site, its name, location, extent and the data resulting from application of the criteria specified in Annex III (Stage 1) provided in a format established by the Commission in accordance with the procedure laid down in Article 21.*	**§8**

Article 4 of HD	***Flanders***
Art. 4 (4) Once a site of Community importance has been adopted in accordance with the procedure laid down in paragraph 2, the Member State concerned shall designate that site as a ***special area of conservation (SAC)*** *as soon as possible and within six years at most, establishing priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of Natura 2000, and in the light of the threats of degradation or destruction to which those sites are exposed.*	↓ Designation of the sites of this Community list as SAC by the Flemish Government within 3 months (in total within 6 years after the notification of the directive): '*Aanwijzingsbesluit*' **(§9)** ↓ Publication in the State Journal **(§9)** ('*Aanwijzingsbesluit*' for SAC-H replaces '*Vastleggingsbesluit*' **§10**)

Figure 12. The Belgian territory belongs to two Biogeographic Zones: the Atlantic and the Continental ones. The lists of proposed Sites of Community Interest (pSCIs), as delivered by the Member States to the EC, are evaluated per Biogeographical Zone, in the light of the reference list of habitats and species of these zones.

3.2.1.2.1. Scientific procedure in the Walloon region

Most of the information is based on Dufrêne *&* Gathoye (2004a).

The mission of identification and cartography of all the sites which were likely to be eligible for the Natura 2000 network was entrusted at the end of March 2002 to the *Centre de Recherche sur la Nature, la Forêt et le Bois* (CRNFB – administrative service), in order to supplement the surfaces already indicated in June 2001 to the European Commission by the Walloon Region. The time was very short (deadline: end of June 2002) because of the slowness of politicians for decision making.

The criteria to be taken into account are defined in the two Directives concerned. They are based on lists of habitats and species of community interest for which the Member States must indicate sites in a sufficient number to guarantee their good state of conservation and the operation of the network. Two types of criteria are thus used: biological criteria like lists of habitats and species, and structural criteria to evaluate the coherence of the network.

A. BIOLOGICAL CRITERIA

The Walloon Region had to identify all the sites that include priority habitats of community interest.

For the species of the HD, the measures to be taken had to relate to, at the same time, the areas of reproduction, the areas of feeding as well as the possible areas of migration. In certain cases, the populations are limited to precise sites. In other cases, such as for example bats, the species use various elements of the landscapes and the ecosystems during their life, which singularly complicates the identification of perimeters of Natura 2000 sites.

Designations for the species of the BD had to relate to at the same time areas of nesting and areas which shelter the species migrating and/or wintering.

The HD in addition defines in its Appendix III a series of criteria to identify the eligible sites to the Natura 2000 network. These criteria utilize the percentage of surface occupied by the targeted habitat on the site, the percentage of surface compared to total surface or % of the regional population, the degree of conservation of the habitats and habitats of species, the degree of insulation of the population... So a whole series of criteria which aims at being ensured

of the coherence of the Natura 2000 network for the contribution to the maintenance of the biodiversity by the conservation of the natural habitats as well as fauna and flora (Article 2, the EEC 92/43).

B. STRUCTURAL CRITERIA

For an ecological network to be effective, it should allow for the persistence of the populations of species or the operation of the ecosystems concerned. That supposes important surfaces of cores areas (what limits the rate of extinction) or a strong connectivity between these cores areas (what allows the recolonisations). It is this subtle balance between surface and connectivity that should be defined according to the biological aims targeted and to the socio-economic constraints.

In Wallonia, except for some cases like the 3 or 4 large forest solid masses or the 3 large military camps, the biodiversity of high interest occupies very limited and largely dispersed areas. To maintain a certain functional connectivity is thus essential and this connectivity must be articulated around the most natural topographic structures.

It was decided to base itself on the oro-hydrographic network to define the principal structure of Natura 2000 network because, if the ways of dispersion of genes and individuals are multiple, topography and relief (broad plains, valleys, deep valleys, cirques of the sources, cols and undulations of the top-plates) are landscape structures largely used in an active or passive (wind) way by the species to disperse. In addition, a great part of the biodiversity is distributed along the hydrographic network and the relief that it generates with initially the zones of sources, which ensure connectivity between various oro-hydrographic basins, the riverine zones along the valleys and the strong slopes generated by the relief. Lastly, the wet environments are among the most threatened areas in Wallonia and must be protected because many species and habitats targeted by the European Directives are related to these wet environments.

C. IDENTIFICATION OF PROVISIONAL CONTOURS

The ideal step would imply a systematic cartography of the territory to identify all the sites and the potential zones that shelter the habitats and the habitats of species. Considering the deadlines to be respected, another approach was implemented. Provisional contours are identified on the basis of all the data bases available to the *Centre de recherche Nature, Forêt et Bois* (CRNFB) and knowledge of the network of naturalists mobilized through the activities of the *Observatoire de la Faune, de la Flore et des Habitats* (OFFH).

All the available digitised cartographic supports (protected zones, data bases of the Sites of High Biological Interest (*Sites de Grand Intérêt Biologique* – SGIB), ecological networks, cartography of the sensitive habitats in the ZPS, detailed data bases of the species targeted by the Directives (butterflies, dragonflies, amphibians, fish, bats) and sometimes on paper supports (biological evaluation maps, soils maps, *Plans Communaux de Développement de la Nature* (PCDN) not digitalized) were used to define provisional contours.

For the birds, a specific work of synthesis was made to identify all the sites which contain species of the BD or important during the migration.

D. SUBDIVISION INTO SITES

For Natura 2000, one privileges the definition of great geographical entities which offer many advantages related on management (sufficient size to mobilize human or material resources to develop the activities of concerted management, to have much more flexibility of management in the site) and to the possibilities of sensitization and local appropriation (implementation of LIFE projects, Rural Development Plan (*Plan de Développement Rural* – PDR)...). The cutting of a more or less continuous network in "sites" is rather arbitrary. One chose to base oneself on the oro-hydrographic basins to define homogeneous entities, but that is not an absolute constraint when for example well-defined forest solid masses occupy the heads of sources of several oro-hydrographic basins. The administrative limits (municipalities, quarterings...) pose real problems of management because historically, the rivers often were at the origin of these administrative limits (right-of-way on the bridges) and from a biological point of view, it would be aberrant to manage in a not concerted and not integrated way the two sides of the same river. The logic of

the oro-hydrographic basins will ensure also certain coherence with other environmental policies like obviously the management of water for the implementation of the "Water" Framework Directive.

E. FIELD'S CHECKING AND DIGITALIZATION

A checking on the field has been quickly carried out to confirm the presence of habitats answering the criteria of the HD and to modify initially definite contours so that they correspond at best to the objective targeted.

During the fieldwork, one had identified:

- **Major zones** which correspond to habitats or habitats of species in good condition of conservation;
- **Potential zones to restore** either to reach a sufficient critical size, which ensures the long-term maintenance of the state of conservation, or to ensure an important connectivity between major zones;
- **Zones with constraints** which by their localization will automatically undergo constraints of use or positive measures of management because they are inserted into the heart or too close to major or potential zones and that certain work which could be carried out there will have an effect automatically;
- An **operational perimeter** that is based on objective elements of structure of the landscapes so that the limits of the site are most objective possible.

The perimeters are then digitalized on numerical support (1/10.000 scale) and are confronted with different other sources of information like the "sector plan" (*Plan de secteur*) or the air photographs to specify contours and to identify the possible problems which ask complementary field work, for example when the assignment in the sector plan is contradictory with the statute of Natura 2000 site.

F. ANALYSIS OF THE NETWORK SPATIAL COHERENCE.

A first analysis of the coherence of the network is carried out to evaluate how are distributed the habitats and the habitats of species in the oro-hydrographic basins by crossing the perimeters with the biological data available. Another analysis is carried out on a regional scale to check the general coherence of the network, connections between the 3 major hydrographic basins (the Scheldt, the Meuse and the Rhine), connections between the under-basins (Ourthe, Lesse, Amblève,...).

G. DEFINITION OF LEVELS OF PRIORITY

According to the presence of priority habitats or presence of populations of species, various levels of priority are identified in the sites. One distinguishes:

- **Zones of very high biological interest** (thus of very high priority) which include the priority habitats, surfaces of the habitats or the habitats of species in good condition of conservation or minimal areas to restore and areas protected by other legislations;
- **Zones of high biological interest** (thus of high priority) which include habitats or habitats of species in an average state of conservation but necessary to ensure the coherence of the short-term network or to reach a sufficient critical size or areas of connection of strong biological potential;
- **Zones of average biological interest** (thus of average priority) which shelter habitats and habitats of species already well represented, important areas of connection in the long-term, areas of potential constraints or buffer zones.

H. LIMITS OF THE IMPLEMENTED APPROACH

Without detailed cartography of the habitats or precise inventory of the populations of species, nor evaluation of the potentialities for restoration, it is impossible to immediately complete a work of irreproachable scientific quality.

A priori, the production of final perimeters should result from a detailed analysis of existing, potential, biological constraints and certain socio-economic constraints to define realistic biological objectives. And it is from these precise biological objectives that the actions to

implement, perimeters which should profit from it, and indicators of adequate monitoring should be derived. This procedure required many long-term jobs impossible to implement with the means and the time that were available. The goal of the mission entrusted to the CRNFB was thus to define best possible Natura 2000 sites perimeters on the basis of existing information. A priori, these perimeters should be more specified throughout the procedure leading to the drafting of the designation decrees.

In the HD, the procedure of identification of the sites does not envisage consultation of the landowners/sites managers to obtain their agreement. It is first a scientific inventory of the sites which could be the subject of a designation. In addition, considering the time limits, it was impossible to consult all the people who have information. It is already a very broad diversity of collaborators who could and knew mobilize themselves to complete this enormous work.

3.2.1.2.2. <u>Scientific procedure in the Flemish region</u>

The delineation of SPAs was based on the best available information at that time concerning the presence of 27 breeding bird species of Annex I of BD and important concentrations of migratory or overwintering birds (Van Vessem & Kuijken 1986). Maps were made by the administration for spatial planning and environment *('Administratie Ruimtelijke Ordening en Leefmilieu' - AROL*).

The demarcation of SACs was conducted in two phases. In first instance, these delineation were followed:

- For this proposal, the *IN* gathered available data from a.o. *Afdeling Natuur* (*AMINAL*).
- Based on the "Interpretation manual of European Union Habitats" (European Commission 1996) and the comparison of the habitat types occurring in Flanders with the CORINE habitat types (Hermy 1993)
- The basic principle was to include sites which contained at least one well developed form of a habitat type of Annex I and/or which were representative for Flanders, or containing several habitat types. The total surface was aimed to consist for more than 80% of habitat types of Annex I (Martens 2001).
- As far as possible, the proposed delineation took account of the proposed delineation for the ecological network aimed at in Flanders: *de Groene Hoofdstructuur* and the *Biologische waarderingskaart* (*BWK*) (Martens 2001).
- Due to the highly fragmented character of nature in Flanders, often complexes of sites were proposed instead of big habitat entities: with a rather similar habitat type and within the same geographical entity or when the sites are more broadly related to each other like the midstream of rivers (Martens 2001). In these complexes, point-shaped, and scattered habitats of *Triturus cristatus* and line shaped habitats of freshwater fish were combined with proposed sites.
- Recommendation to not include sites with species of Annex II of which the viability could not be proved (single observations by just one person): e.g. *Vertigo moulinsiana* and the moss *Drepanocladus vernicosus*.
- Exact procedure: see Anselin & Kuijken (1995), based on Hermy & Kuijken (1993, 1994).

In second instance, after the *met redenen omkleed advise* of the EC, the completion and adaptation of the delineation proposals of 1996 was primarily intended for the habitat types and species for which the evaluation had proved 'insufficient'. At the same time, one aimed at the amelioration of the cover of a number for Flanders very valuable habitat types and species and at increasing chances for sustainable protection and management. This was to be achieved by more connected units and ecologically related systems and the inclusion of buffer zones against external influences. A number of criteria were established for formulation and evaluation of the proposals (Martens 2001).

In this second stage of this delineation process, more consultation of (or even interference with) other sectors may be discerned. The main reason may be that only at this stage, the implications of Natura 2000 were increasingly being understood by policy makers after problems in the ports of Antwerp (Deurganckdok, see for instance Meire *et al.* 1998) and Zeebrugge.

Scientific procedure applied for the preparation of this second list of proposed sites (Anselin *et al.* 2000, Heutz & Paelinckx 2005):

- Habitat types (of Annex I) in the "Interpretation manual of European Union Habitats" (European Commission 1996) were compared with the habitat typology of the *Biologische Waarderingskaart* (*BWK*) (1st version: De Blust *et al.* (1985); 2nd version: Paelinckx *et al.* (*in prep.*)). In addition, old forest sites were identified by comparing de location of current forests with old maps (Ferraris). The *IBW* set up a methodology to allocate the Flemish forest vegetation to one of the habitat types of Annex I (Vandekerkhove & De Keersmaeker 2000). Per habitat type (of Annex I), selections were made of the recent digital *BWK* (2nd version). For these habitat types for which no recent *BWK* map was available, or for which a 'translation' to the *BWK* was impossible, or which corresponded to more than one *BWK* code, additional information was sought within the *IN* and *AMINAL*.
- The presence of species (of Annex II) and their populations was assessed using data of fauna and flora databases, local information, publications and expertise of *Afdeling Natuur* (*AMINAL*) and several external specialists.
- For more details about the exact procedure, we refer to Anselin *et al.* (2000).

A 'system approach' was carried out: not only present habitats, but also potential habitats (after restoration or appropriate management) were included. Furthermore, an overlay was made with digital aerial photographs (1999) in order to achieve a logical delineation. As a result, concentrations of buildings, built-on lots, subsectors with building licences, roads, etc. were not included into the delineation, as far as possible (Martens 2001 and for an illustration: see Box 1). The intended buffer zones were, however, only minimalistically delineated (Martens 2000, WWF 2000).

BOX 1. Illustration of the efforts made during the second stage of the process in order to achieve a 'logical' delineation.
During the delineation procedure of the pSCIs, there has been no official contribution of the *VLM*. In spite of that, there are several lines of evidence proving a direct or indirect input from the *VLM*:
Informal consultation has had place in several regions, as a result of which pieces of land were omitted from or included in the second list of sites eligible as SCIs, or as a result of which border corrections were made. For instance, in the land consolidation project ('*ruilverkavelingsproject*' - *RVK*) 'Grootloon', a big part of the surface of the first delineation was omitted from the second delineation, in order to safeguard land destinated for agricultural landuse against orders or prohibitions which are inevitably linked with the SAC-H status. However, another part was just included because it was meant for creation of 'new nature' in the *RVK*.
In other cases, where there had not even been informal consultation, it was clear that *ANB* had used the data gathered by inventarisations of the *VLM* in the framework of *RVK* projects. For instance, a part of the area involved in the *RVK* project 'Sint-Lievens-Houtem' was included as site eligible as Sites of Community Importance (SCI) in 2002 (and not in 1996) without informal consultation. However, overlaying this map with the detailed map of the *RVK*, one can see that the area included as site eligible as SCI, corresponds exactly with the area set free for nature in the *RVK* project. The other way around, areas have been omitted from the list of sites eligible as SCIs because thorough inventarisation of nature values in the framework of a Nature arrangement plan ('*Natuurrichtplan – NIP*') prove that the sites were not as important for inclusion (e.g. the *NIP* 'Meetkerkse Moeren')
However, in a few rare cases, discrepancies between the RVK and the SCIs have been created, by a lack of cooperation (e.g., the *RVK* 'Weelde-Zondereigen' where 6 ha of land set for agriculture has been assigned as SCI).

Recognized, terrain acquiring organizations were asked by Afdeling Natuur to do suggestions, although the timespans were too short for sound scientifical foundations. NGOs, among which the WWF have proposed extra sites on their own initiative. De cooperation with NGOs may be considered as relatively good (WWF 2000).

For this list, the objective was to include minimum 25% of the total area/number of populations of a specific habitat/species in the member state and the specific biogeographical region. A comparison of these percentages with these of the first delineation were indicated in a matrix, so as to indicate the improvements in the reviewed proposal of sites (pers. comm. Els Martens).

The delineation of this second list of proposed sites was more detailed than the first list of 1996. The areas digitalized in 1996 at 1/50.000 were re-digitalized at 1/10.000, thereby performing necessary border corrections in order to avoid discussions about the delineation.

3.2.1.3. Review of what happened

In what follows, we describe the procedure followed by the Flemish and Walloon governments to implement the BD and HD and to delineate the Natura 2000 network. In appendix, this is described for the Brussels Capital Region and the North Sea.

3.2.1.3.1. Steps taken in the Walloon region

Between 1987 and 1989, 13 Special Protection Areas (SPAs) were initially indicated, in application of the BD, that is to say 468.000 ha of which 180.000 ha of sensible areas for the protection of 52 species of the BD in Wallonia. But there was no juridical protection of these 13 SPAs, because they were not published in the State Journal (*Moniteur*) (Anonymous, ?). 101 species of the BD are present in Wallonia of which 2 priority species : the Great Bittern (*Boraurus stellaris*) and the Corn Crake (*Crex crex*) (Dufrêne *&* Gathoye, 2004a).

The HD was implemented in the Walloon law by the 6th December 2001 Decree, which modified the Law on Nature Protection of the 12th July 1973. In Wallonia, a great number of the natural and semi-natural habitats with high patrimonial value, present on the territory, are targeted by the HD. 44 habitats of community interest, of which 10 are priority habitats, are present. They cover practically all the types of environments and ecological situations (Dufrêne *&* Gathoye, 2004a). 31 species of the directive Habitats are present in Wallonia. The biological groups are diversified and representative of different environments, complementary to the habitats (Anonymous, 2007d).

A. RESULTS OF THE SCIENTIFIC SELECTION

Initial selection on exclusively scientific basis covered a surface of 281.346 hectares (either 16,6% of Wallonia). Following some inter-cabinets discussions, some parts were withdrew from the sites for socio-economic considerations (Born, ?).

For example:

- Several sites were withdrawn for the interest of the quarries sector: calcareous grasslands, calaminarian grasslands, sandpits...;
- Some municipalities, e.g. in Walloon Brabant, had “good contacts” with the regional authorities and answered to withdrawn all Natura 2000 sites present on their territory;
- Some private areas were withdrawn in the interests of influential real estate agents;
- Areas were withdrawn because of projects of public infrastructures such as motorways…

B. THE WIDE LIST OF NATURA 2000 SITES.

At the end of June 2002, a wide list of sites covering a surface initially of 223.000 ha, and then supplemented to reach approximately 230.000 ha, has been given by the cabinet to the Walloon Government for evaluation and analysis. These 230.000 hectares were added to the 58.000 hectares already indicated (Dufrêne *&* Gathoye, 2004a).

At the beginning of July, an analysis site by site was carried out with an evaluation of the potential economic impact of designations. It was then requested from the CRNFB to establish a classification of the various sites. A fast analysis has led to establish a classification in three categories (A = 160.000 ha, B = 59.000 ha and C = 55.000 ha) (Dufrêne *&* Gathoye, 2004a).

It is in particular on the basis of this classification that the Walloon Government commits itself, on July 18, 2002, on a list of sites and a surface ranging between 215.000 and 220.000 ha (Dufrêne *&* Gathoye, 2004a).

C. SUBMISSION OF A LIST OF PSCIS TO THE EUROPEAN COMMISSION.

On September 26, 2002, the Walloon Government makes the decision to define a list of 231 sites covering 217.672 hectares (either 12,7 % of the Walloon territory). On the basis of this decision, the CRNFB has geographically prepared the most coherent possible network cutting in the most homogeneous units and a new coding of the sites (Dufrêne & Gathoye, 2004a).

Complements are brought on February 3, 2004 to answer insufficiencies identified by the European Commission. This decision relates to a surface of 3500 ha (Anonymous, 2007d).

The Natura 2000 network counts therefore 239 sites then covering 220.828 ha (either almost 12,9 % of the Walloon territory). On December 7, 2004, the European Commission adopts the list of the sites concerning the Atlantic and Continental biogeographic areas. None of the Walloon proposals is rejected. The decision relates to the sites indicated under the terms of the Directive Habitats. The SPA’s are directly integrated into the Natura 2000 network (Anonymous, 2007d).

A last decision, bearing on a surface of 100 ha, is made on March 24, 2005. The Natura 2000 network currently counts 240 sites that represent 220.944 ha (either 13% of the regional territory) (Anonymous, 2007d).

D. CRITICAL POINT OF VIEW OF NGOS ABOUT THE DELINEATION

Some NGOs gave critical opinions about the way the first steps of N2000 have been implemented.

- Within the framework of the implementation of the HD, the perimeters of the SPAs are re-examined. More than 154.000 ha of significant zones previously inventoried were taken again whose more than 114.000 ha overlap the proposed pSCId for the HD. The revision of the 13 framework perimeters and the cores and sensitive zones that they contain is carried out in a nontransparent way and within the framework of the application of another directive. This revision in addition involved the disappearance of considerable significant zones and cores. These invaluable zones are thus found without statute of protection.
- There is confusion in the cartography of the SPAs and pSCIs. (Anonymous, ?)
- Throughout process of designation, the Walloon Region showed no transparency. The interval of time between the declaration of September 26, 2002 and the transmission of the Natura 2000 cards at the Commission left time for the Region to re-examine the contents and the cartography of the sites without any visibility (Anonymous, ?).
- For the part of the Walloon Region located in Continental zone, the list of the sites suggested is overall satisfactory, except for 3 habitats (xeric sands calcareous grasslands (6120), calaminarian grasslands (6130), mixed forests with oaks and alders (91F0)) and for a species (*Triturus cristatus*). The case of the bats should be better studied in regard to the lack of designation of sites of reproduction (majority of the sites of wintering having been taken again) (Anonymous, ?).
- For the part of the Walloon Region located in Atlantic zone, considerable sites disappeared in particular in the Dyle valley, the Scheldt basin and the area in the south of Binche. An insufficiency is noted for the designation of sites for the alluvial forests (91E0), the crested triton and a fish (bitterling). A detailed analysis should be carried out for the *Nardus* grasslands (6230) and a fish (chub) (Anonymous, ?).

All these remarks were submitted to the Commission in the name of environmental associations: RNOB, Aves, IEW and WWF. With regard to the designation of the pSCIs, these remarks were defended during the biogegraphic meeting organized by the European Commission in Brussels Tuesday May 13, 2003.

3.2.1.3.2. <u>Chronology of the steps taken in the Flemish region</u>

All area calculations are based on Van Reeth & Goethals (2006).

A. DELINEATION OF SPECIAL PROTECTION AREAS OR SPAS IN FLANDERS

Based on: NARA 1999 (Anselin *et al.* 1999), Symens 2000, NARA 2003 (Tack *et al.* 2003), NARA 2005 (Van Reeth & de Bruyn 2005), Overview of species per SPA (Anonymous 2005b) and Van Reeth & Goethals (2006).

<u>* 02/04/1981</u>

The BD is applicable in Flanders.

<u>* 1986</u>

Proposal of the Institute for Nature Conservation (*Instituut voor Natuurbehoud – IN*) to the Belgian Government concerning delineation of SPAs (Van Vessem & Kuijken 1986).

* There has been no formal consultation for this delineation, only interadministration and intercabinettary consultation (pers. comm. Els Martens, *ANB*).

<u>* 17/10/1988</u>

Decision of the Flemish Executive ('*Besluit van de Vlaamse Executieve – B.Vl.Ex.*' (B.S. 29/10/1988): Anonymous 1988): designation of SPAs ('***Aanwijzingsbesluit***') following Art. 4 of

BD: **23 sites** covering **97.272 ha**. Flanders was one of the first regions to designate SPAs (Natura 2000 barometer: EC 1996).

- made for **27 bird species of Annex I** (of which 8 important species were put on a list of 'prioritary' species, which was compiled for selection of projects for co-financing) and **20 species of Annex II** occurring in Flanders.
- 4 of these sites were indicated in 1984 as Ramsar sites

* 20/09/1996

Decision of the Flemish Government ('*Besluit van de Vlaamse Regering – BVR*' (B.S. 12/10/1996)) adding another site to the '*non-integrally protected*' SPAs: '*poldergraslanden en hun microreliëf*' (no additional surface).

* 23/06/1998

Decision of the Flemish Government (B.S. 25/07/1998) for developments in the port of Antwerp: 507 ha deleted from SPA and compensated with a new SPA site of 740 ha ➔ total surface = (97.272 – 507 + 740) ha = **97.505 ha**.

* 17/07/2000:

Decision of the Flemish Government (B.S. 31/08/2000) for developments in the port of Zeebrugge: 282 ha deleted from SPA and compensated to the same SPA site for 520 ha ➔ total surface = (97.505 – 282 + 520) ha = **97.743 ha**, round up to 97.745 ha.

* 24/01/2001

The European Commission approved the sixth Environment Action Programme (*'Milieuactieprogramma' – MAP*) which laid down that the member states had to establish a management plan for every SPA at the very latest in 2004. In Flanders, this was interpreted by indicating the establishment of Nature Objectives Plans (*Natuurrichtplannen*) for all SACs in the *Wijzigingsdecreet*.

* 22/07/2005

Decision of the Flemish Government (B.S. 12/09/2005): adding a new SPA: 'Kustbroedvogels te Zeebrugge-Heist': 498 ha ➔ total surface = (97.745 + 498) ha = **98.243 ha** = 7.3 % of the total area of the Flemish Region (13.522 km²).

For an overview of the habitats and species per site: see Anonymous (2005b).

Remark: the Decision of the Flemish Government of 1988 for the designation of SPA makes a distinction between 7 *integral* and 16 *non-integral* SPAs. According to Art. 36bis, § 13 of the *Natuurdecreet* (Anonymous 1998, 2002), the total area within the perimeter of the integral sites is indicated as SPA. In contrast, in the non-integral sites, only the green destinations on the regional spatial zoning plan (*gewestplan*) and a number of specific habitat types (indicated per site), have SPA status (Art. 1, § 3 of the *BVR* of 17/10/1988), but according to Art. 36ter, the total area of all SPA have to be taken into account for project assessments (pers. comm. E. Martens).

At the moment, a lot more information is available about the presence and abundance of bird species in the Flemish Region than there was in 1988, when the SPAs were designated. The last inventory of 'important bird areas' of Birdlife International indicated that in Flanders several 'important bird areas' fulfill all the criteria for delineation as SPA (Symens 2000). Because the BD states that all relevant sites have to be indicated, it is highly possible that extra sites will be indicated in the future (Decleer 2007).

B. DELINEATION OF SPECIAL AREAS OF CONSERVATION (SACS)

Based on Anselin *et al.* (1999) for a review of the first stage of delineation of proposed Sites of Community Interest or pSCIs and De Roo (2001) and Tack *et al.* (2003) for the review of this list (from 2000 onwards).

* 21/05/1994

The HD is applicable in Flanders.

* 1995

Proposal of the *IN* to the Flemish Region concerning inventarisation and delineation of pSCIs (Anselin & Kuijken 1995). This proposed delineation included **40 sites**, covering **59.480 ha**.

* 12/07/1995

The Flemish Council for Nature Conservation (*Vlaamse Hoge Raad voor Natuurbehoud*) unanimously approved the proposal of the *IN*.

*** 14/02/1996**

Decision of the Flemish Government: first list of pSCIs (**40 sites** with a total area of **70.069 ha**) approved.

- 73% of the total area was located in the provinces of Antwerp and Limbourg
- Ca. half of the area corresponded with a green destination on the Flemish spatial zoning plan
- Ca. 30.000 ha thereof was also indicated as SPA (source: answer of the Minister of Environment to a question of J. Malcorps in the Flemish Council: *Vlaamse Raad – Vragen en Antwoorden*).
- In this *BVR*, no surfaces of the sites were published. When re-digitalising these sites, the surface was recalculated and assessed to cover **70.069 ha** (Van Reeth & Goethals 2006).
- designated for **44 habitat types of Annex I (of which 8 priority habitats)** and **20 species of Annex II** occurring in Flanders
- A number of territories of fish and bat species which were proposed (as points and lines) by Anselin and Kuijken (1995) were not withdrawn in this principal decision of the Flemish Government.

* 25/04/1996

Announcement of the names and data of the Flemish sites to the permanent representative of Belgium.

* 29/05/1996

The complete files were sent by the Belgian permanent representative to the appropriate services within the European Commission (Databank Natura2000, Instituut voor Natuurbehoud, 1996), together with the data concerning 3 Brussels, 58 Walloon and 1 federal site(s).

* May 1998

Formal approval of the EC regarding the reference list of habitats and species for both the Atlantic and Continental Biogeographic regions of Belgium (Anselin & Dufrêne 1998).

* 1999

Scientific evaluation by the ETC-NC in Paris during the seminar for the Atlantic biogeographic region.

* 23/07/1999

'proof of default' ('*ingebrekestelling*') by the European Commission (by letter) directed upon the Belgian Government (ref. 20.1299/XI/016513 – DG ENV.D.2) because of insufficient submission (mainly in Wallonia, Tack *et al.* 2003): insufficient surface of the habitats (especially forest and valley grasslands) and an insufficient number of populations of species in Flanders (for an overview of these: see De Roo 2001, p. 390-391).

* Sept. 1999

Demonstration of the results of the scientific evaluation by the ETCNC: each member state received a list of habitats and species of which the area or the number of populations, respectively were insufficient in the first list of pSCIs to the commission:

- Less than 20% of the total area/number of populations of a specific habitat/species in the member state and the specific biogeographical region was viewed a problematic
- Between 20 and 60% was further discussed case-by-case during the biogeographical seminars
- More than 60% was considered as sufficient

* 10/02/2000

met redenen omkleed advice (*'met redenen omkleed advies' – MROA*): Concerning BD (source: coordinated answers of the Flemish Ministres to a question of C. Decaluwe in the Flemish Council: *Vlaamse Raad – Vragen en Antwoorden*):

- conversion of Art. 4: status of the designated SPAs
- inadequate transposition of HD and BD in the Flemish legislation: see De Roo (2001): especially Art. 6 of HD.
- conservation goals (Art. 6) in the domain 'Zwarte Beek'
- lacune in the federal legislation concerning the protection of exotic species (for which a slight adaptation of the Flemish rules was necessary)

- no official notification of the sites to the Flemish citizens by a publication in the State journal ('*Staatsblad*') (De Roo 2001).

* 17/07/2000

Decision of the Flemish Government for expansion of an industrial zone in Oostende (Plassendale): 17 ha dropped and compensated for 76 ha ➔ total surface = (70.069 – 17 + 76) ha = 70.128 ha.

* 09/2000:

Press release in which was announced that Belgium would be summonsed to appear in European Court of Justice (De Roo 2001).

* 06/11/2000

Additional 'proof of default' ('*ingebrekestelling*') by the EC upon the Belgian government (see De Roo 2001, p. 390-391): this and not the former proof of default, was the most important for Flanders because this proof of default specifically indicated shortcomings.

- For 15 habitat types and 9 species of Annexes I and II, respectively, additional area had to be designated: e.g. habitat types 2110, 2310, 2330, 6430, 7110 and species: several bat species and *Triturus cristatus* (see Martens 2001).

* March 2000

Start-up of the administrative preparation phase for the review of the pSCIs, under authority of the Minister of Environment. Under coordination of Els Martens (*AMINAL*, *Afdeling Natuur*), the authorities in charge of the management of the sites and having information about habitats and species, were brought together: *AMINAL*, *Afdeling Natuur* and *Afdeling Bos & Groen*, the Institute for Nature Conservation (*IN*) and the Institute for Forest and Wildlife (*IBW*). These authorities discussed during several meetings on this topic.

* Sept. 2000

Finalization of the administrative preparation phase: a list, including maps (1/10.000), of the total reviewed sites (including the existing sites proposed in 1996 as reviewed when necessary and the additional sites) was made up (Anselin *et al.* 2000) and presented to the Flemish Minister of Environment, Vera Dua (*Agalev*, 1999-2004): **45 sites**, covering **108.738 ha** (Anselin *et al.* 2000).

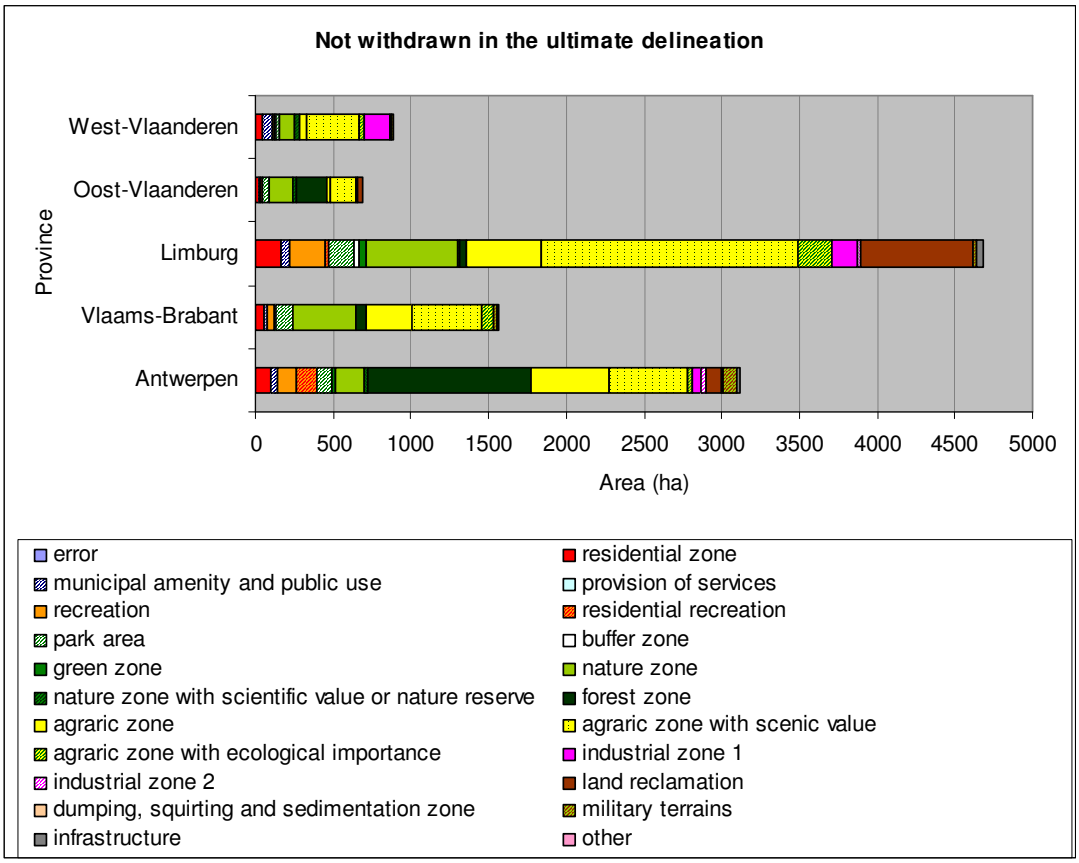
* End 2000

A 'consultation board' group (**'*klankbordgroep*'**) was established at two levels (given in order of chronology).

- Level 1: **'*Ontwerpbesprekingen*'**: discussion of this proposed list of sites within an administrative working group ('*Administratieve werkgroep*'): the steering committee of the strategic project '*Verweving en Afbakening - VER-AF*', in which the administrations of forest and horticulture (*Afdeling Bos & Groen*, *Afdeling Land*, *Administratie Land- en tuinbouw - ALT*) and the '*Vlaamse Landmaatschappij*' (*VLM*), the coordinators of *VER-AF*, were involved. The strategic project *VER-AF* was erected under the cabinet of the Minister of Environment, in order to demonstrate that the pSCIs laid within the planned nature and forest structure (*Vlaams Ecologisch Netwerk* or *VEN* and *Verwevings- en Ondersteuningsnetwerk*, *IVON*), thus that the Natura 2000 delination was well-found.
- Level 2: **Inter-cabinettary consultation** (*interkabinettaire werkgroep – IKW*, which precedes the decision making of the Flemish Government and in which, in principle, all political parties are represented at each level, e.g. agriculture, …): During this process, several administrations were consulted (*administratie Natuurlijke Rijkdommen en Energie*, *administratie Waterwegen en Zeewezen*, *administratie Wegen en Verkeer*, *afdeling Ruimtelijke Planning* of the *Administratie Ruimtelijke Ordening, Huisvesting en Monumenten en Landschappen - AROHM*).

Under the legislature of Dua as Minister of Environment, **another 'consultation group'** was set up, including representatives of agriculture, nature, environment and industrial associations (e.g., the '*Boerenbond*', '*Natuurpunt*'), but also local land owners (which united them in the association '*Landelijk Vlaanderen*'). This group was informatively consulted in order to discuss bottlenecks, under the form of information sessions and there was also a consultation with the Flemish Environment & Nature Council (*MINA-raad*).

a)



b)

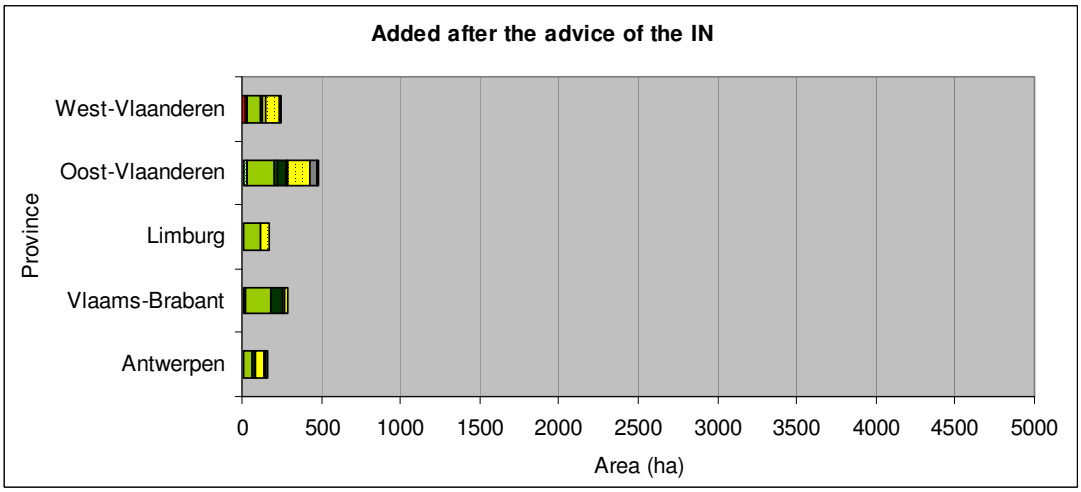


Figure 13. Structures taken out from (a) or added to (b) the proposal of pSCIs by the Institute for Nature Conservation (*IN*), obtained by a comparison of the advice by the IN in 2000 with the final delineation of pSCIs in 2001 and laid over Flemish the spatial zoning plan.
'Residential zone' = codes 01**; 'municipal amenity and public use' = 02**; 'provision of services' = 03**; 'recreation' = 04**, except for 'residential recreation' = 0402 & 0403; 'park area' = 05**; 'buffer zone' = 06**; 'green zone' = 0700, 0731, 0733, 0734, 0735; 'nature zone' = 0701, 0710, 0730, 0732, 0736-0740; 'nature zone with scientific value or nature reserve' = 0702; 'forest zone' = 08**; 'agraric zone' = 0900, 0916, 0930, 0931; 'agraric zone with scenic value' = 0901, 0911-0915; 'agraric zone with ecological importance' = 0910; 'industrial zone 1' = 10**; 'industrial zone 2 (small companies)' = 11**; 'land reclamation' = 12**; 'dumping, squirting and sedimentation zone' = 13**; 'military terrains' = 1400; 'infrastructure' = 15**; 'other' = 16**, 17** and 777*.

As a result of these consultations, a number of specific structures were taken out from the proposed delineation (Figure 15):

- agricultural areas which were not concerned as 'habitat-worthy', were not withdrawn in the delineation proposal, in general, the administrations involving agriculture were not very happy to see the Natura 2000 network covering yellow agriculture destinations: *Afdeling Land* and *ALT* set conditions for their acceptance of this list: some areas should be assigned to *IVON* instead of *VEN* (De Roo 2001). However, also through the nitrate directive, there was a growing realisation that agriculture also had to care of the environment;
- there was (hard) opposition of *Afdeling Bos & Groen* to agree with the surface of forests included in the delineation;
- 'hard' destinations (houses in nature areas, industrial area, …) near the edges of the sites were taken out from the maps (*pers. comm.* E. Martens, *ANB* and N. Boone, *IN*), but this does not mean that no hard structures are still included in the Flemish Natura 2000 network, for instance, areas with high nature potential, but which were not yet built-on or for which no building licenses were approved, were still included in the list if it could not be proven that already enough surface of the specific habitat type was already included.

At the insistence of the Flemish Government, it was decided to request for an **independent 'peer review'** by a scientific commission of external experts (superseded by Prof. Dr. R. Verheyen – UA, organized by *Afdeling Natuur* and performed in parallel with the IKW). This peer review had to give an answer to the question if (a) the applied method was scientifically sound and (b) enough sites were selected for a possible approval by the EC. In fact, the scientific basis and interpretation used by the *IN* was questioned by other administrations (pers. comm. K. Sannen, *ANB*). For this peer review, all possible scientific information was consulted. The answers were positive, which was unexpected and not desired by some authorities. This peer review even advised to extend the delineation in order to create more clarity for the people in the field, e.g. extend sites up to river borders or the other way around, omit small areas devided by a waterway or a railway from the core area (pers. comm. E. Martens, *ANB*).

Besides the consultations listed above there was **no formal overall public consultation** (pers. comm. E. Martens, *ANB*).

*** 04/05/2001**

Decision of the Flemish Government ('*Beslissing van de Vlaamse Regering*'): approval of the complete list of pSCIs (reviewed and additional sites) and submission of this list to the European Commission. This list included **38 sites** with a total area of **101.891 ha** (Overview of species per BD site, Anonymous 2005a).

DG Environment had set the deadline for this second submission at July 2000; the Flemish Government had delayed this deadline to early April 2001 (within the framework of the approval of the Rural Development Programme 2000-2006, which was in Wallonia related to the delineation of Natura 2000 sites).

- designated for **44 habitat types of Annex I (of which 8 priority habitats)** and **22 species of Annex II** occurring in Flanders
- 101.891 ha = 7.5 % of the total area of the Flemish Region (13.522 km²)
- Compared to the first list of sites from 1996, 10.000 ha were omitted (mainly because of corrections from the adaptation of the scale from 1/50.000 to 1/10.000) and 42.000 ha were added (see De Roo 2001, p. 389).
- Analogous maps at 1/20.000 were distributed to the local authorities.
- Inclusion of the deletion and compensations in the site 'Schelde- en Durmeëstuarium van de Nederlandse grens tot Gent' because of the building of the Deurganckdok: 4149 ha in 1996 and 60.007 ha in 2001 (Van Reeth & Goethals 2006).
- 36.635 ha is delineated as SPA and as pSCI, therefore, the total area indicated for Natura 2000 is 163.040 ha.

*** 24/05/2002**

Formal Decision of the Flemish Government concerning the proposed sites **= '*Vaststellingsbesluit*'**, including the names of sites, location, habitats and species for which the site is designated and overview maps

This decision came nearly two years later than the date planned (July 2000) for definitive approval of this Decision by the Flemish Government (decided by the Flemish Government after the MROA of the EC concerning publication of the SPA maps, see De Roo (2001)).

* 17/08/2002

Publication of the '*Vaststellingsbesluit*' of May 2002 in the State journal, together with the maps of the proposed sites (merely to indicate to the EC that they have been made public): '*Besluit van de Vlaamse regering tot vaststelling van de gebieden die in uitvoering van artikel 4, lid 1, van Richtlijn 92/43/EEG van de Raad van de Europese Gemeenschappen van 21 mei 1992 inzake de instandhouding van de natuurlijke habitats en de wilde flora en fauna aan de Europese Commissie zijn voorgesteld als speciale beschermingszones*'.

Maps at scale 1:20.000 have been passed on to the provinces and town councils. For an overview of the habitats and species per site: see Anonymous (2005a).

*** 07/12/2004**

Evaluation of the proposed sites by the EC and **approval of these sites as SCIs** (Eur-Lex Publication L382 of 28/12/2004 and L387 of 29/12/2004).

The deadline for the list of SCIs was first set at October 2000 and later September 2001.

The sites, approved by the EC as sites of community importance (SCIs) thus do not yet have the status of special areas of conservation (SACs) in Flanders. The decision of the Flemish Government which has to definitively assign these sites as SACs ('*Aanwijzingsbesluit*') is still under preparation.

Although Art. 36ter §§ 2-4 (*Natuurdecreet* – Anonymous 1998, 2002) already apply to these SCIs (preventive conservation measures and appropriate assessments in case of plans of projects) as stated in Art. 36bis § 15, it would be a tremendous improvement for the users and all administrations concerned with these SCIs if an '*Aanwijzingsbesluiten*' would be published. For instance, the positive and pro-active conservation measures (Art. 36ter § 1) still do not apply to third persons (private owners).

Therefore, *ANB* is now preparing a '*Procedurebesluit*', which would establish the procedure for indication ('*aanwijzing*') of the sites as SPAs, the drawing up of conservation goals ('*instandhoudingsdoelstellingen*' – *IHDs*, see below) and the way they should then be published with the objective to publish a decision for each site and not for the whole list together as originally indicated in the Decree for Nature Conservation.

3.2.1.4. The resulting Natura 2000 network in Belgium

In Table 6 and 7, we give an overview of the European habitat types and species for which Special Areas of Conservation had to be delineated in Belgium.

3.2.1.4.1. Analysis of the network in Wallonia

Currently, 120.000 hectares (60%) of the 199.757 hectares identified like ZSC correspond to habitats of Appendix 1 of the HD. Only 30% of these 120.000 hectares are considered as being in a good state of conservation. The other zones correspond either to habitats of species (including the Birds), or to zones necessary for the spatial structure of the network to ensure a certain continuity or minimum size of certain zones (to be maintained or restore), or to zones of production isolated in the Natura 2000 sites (Dufrêne *&* Gathoye, 2004b).

The forests dominate in the Natura 2000 sites. More than 70% of the network consists of forests of which two thirds are occupied by leafy trees (116.000 hectares) and a third is dominated by coniferous trees (43.000 hectares)! That accounts for 30% of the total Walloon forests (Dufrêne *&* Gathoye, 2004b).

The other major soil occupations are agricultural land (11,4%) and grasslands (8,1%). Peatlands (2,1%), transition vegetations (1,7%), urbanised areas (1,6%), shrubs and heathlands (1,3%), marshes (0,3%), stagnant and running waters (0,3%), semi-natural grasslands (0,3%) and quarries (0,1%) are less represented (See graph in appendix) (Anonymous, 2007d).

The biggest part of existing peatlands and semi-natural grasslands in Wallonia are included into Natura 2000 areas. Natura 2000 involves less than 60% of the area of existing marshes and

heathlands. Quarries and agricultural land are not very concerned (less than 5%) (See graph in appendix) (Anonymous, 2007d).

The analysis of the distribution of the different zones of the sector plan in the Natura 2000 network show us that, logically, the rural zones dominate in the Natura 2000 sites with approximately more of two thirds of forests and 15% of agricultural zones. More than 32.000 hectares of agricultural zones profit from the statute of Natura 2000 sites, which represents less than 4% of the whole of the agricultural zones existing in Wallonia. The 8479 hectares assigned to the public services represent in fact the various army grounds of which three larger (Elsenborn, Marche-en-Famenne and Stockem-Lagland) are biologically remarkable sites. Lastly, the urbanisable zones (economic, habitats, leisure and extraction zones) represent 1778 hectares together. These zones were generally selected because of their high biological interest and because they were either under very difficult ecological conditions (strong slopes, alluvial beds of rivers), or that the economic speculation is abandoned or was already carried out (old quarries), or that the site profits already from a statute of protection (natural reserves, wetlands of biological interest or underground cavities of scientific interest) (Dufrêne *&* Gathoye, 2004b).

The first report about the conservation status of community interest habitats present in Wallonia has been established during 2007. It specifies that almost all these habitats are in a very bad, unfavourable state of conservation, except for inland dunes (2330), some rivers (3260 and 3270), xerothermophilous formations with *Buxus* (5110) and caves (8310) (Dufrêne & Delescaille, 2007).

3.2.1.4.2. Analysis of the network in Flanders

In general, Flanders has to a great extent accepted and applied the ecological principles of the HD. This is illustrated by the fact that Flanders has also included into the network sites 'potentially' including a Natura 2000 habitat type. This may be the result of the fact that (pers. comm. G. Raeymaekers, *FOD Veiligheid Voedselketen, Volksgezondheid en Leefmilieu*):

- annex III of the HD was interpreted in a very strict sense (while other countries did not make a total assessment
- one was planning the Flemish Ecological Network (*Vlaams Ecologisch Netwerk – VEN*).

As a result, many proposed LIFE projects could be carried out in Flanders.

In summary, Flanders has delineated sites for following habitats and species:

- 44 habitat types of Annex I of the HD (Annex I of the Flemish Nature Decree or *Natuurdecreet*, Anonymous 2002).
- 18 animal and four plant species of Annex II of the HD (Annex II of the *Natuurdecreet*, Anonymous 2002).
- 66 bird species of Annex I of the BD (Annex IV of the *Natuurdecreet*, Anonymous 2002).

Furthermore, the Flemish government needs to protect 30 animal and four plant species of communautary importance of Annex IV of the HD (Annex III of the *Natuurdecreet*, Anonymous 2002).

3.2.1.4.3. Continuity of the network

Since in Flanders, the delineation of sites was prepared by the INBO at the province-level, this might have caused some discontinuities at the province borders. For instance, because Vlaams-Brabant has relatively large forest complexes, smaller forest fragments were not included in the list in this province, while in e.g. West-Vlaanderen fragments of this size were included (pers. comm. N. Boone, *INBO*). Also in Wallonia, delineation differs considerably from one region to the other (e.g…..).

Despite advice of the *INBO* to the Walloon government in order to join cross-border pSCIs, the result is a large discontinuity across the language border. The reason may be that Wallonia has plenty of large forests more to the South (pers. comm. De Beck, *INBO*).

The consultation of neighboring countries for the delineation of the network, has been minimal (pers. comm. D. Paelinckx, *INBO* and WWF 2006).

In appendix 16, an overview is given of the status of the Natura 2000 network in our neighbouring countries.

Table 6. The European habitat types (Annex I) present in Belgium. W = the Walloon Region, F = the Flemish Region, Br = the Brussels Capital Region, Fed = the Belgian Federal State (authorized for the North Sea). C = Continental Biogeographic zone, A = Atlantic zone. A part of Wallonia, only is Atlantic, while in Flanders, only the region of *Voeren* (*Les Fourons*) belongs to the Continental zone (Figure 14). The surfaces are from Dufrêne & Gathoye (2002a) for Wallonia, INBO (2007) for Flanders, Gryseels (2002) for the Brussels Capital Region and Decleer (2007) for the North Sea. The indication of the major threats is taken from Sterckx *et al.* (2007) and from "*les Cahiers d'habitats Natura 2000 de la Région wallonne*" (unpublished, CRNFB, 2006).

N°	Prioritary?	Surface (ha)						Name as published in the Official Journal (Eng)	Some threats
		W-C	W-A	F-A	F-C	Br (A)	Fed (A)		
1110		-	-	-	-	-	x	Sandbanks which are slightly covered by sea water all the time	water pollution, port infrastructure, disturbance of birds, sand extraction, intensive fishery
1130		-	-	638,0	-	-	-	Estuaries	erosion, dredging, urbanisation, water pollution
1140		-	-	808,8	-	-	x	Mudflats and sandflats not covered by seawater at low tide	water pollution, disturbance by e.g. recreation, beach heightening, erosion resulting from dredging, exotic species
1310		-	-	62,0	-	-	-	Salicornia and other annuals colonizing mud and sand	port extension and dredging works, increased sedimentation and decreased inundation dynamics
1320		-	-	9,7	-	-	-	Spartina swards (*Spartinion maritimae*)	out-competition of *Spartina maritime* with *Spartina townsendii*, loss of ecotope, erosion by e.g. waterway deepening
1330		-	-	478,8	-	-	-	Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)	port extension and dredging works, disturbance of birds, changes in natural dynamics
2110		-	-	3,7	-	-	-	Embryonic shifting dunes	hard coast defence constructions, intensive beach cleaning, high recreation pressure, artificial sand fixation
2120		-	-	485,8	-	-	-	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")	habitat fragmentation, over-recreation, nitrogen deposition increasing fixation, hard coast defence constructions, heightening of the beach with coarse-grained sand
2130	*	-	-	784,8	-	-	-	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	intensive trampling or grazing (rabbits), eutrophication, desiccation
2150	*	-	-	37,4	-	-	-	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	lack of management, eutrophication, over-recreation, overgrazing, intensive agricultural use
2160		-	-	635,3	-	-	-	Dunes with *Hippophae rhamnoides*	spontaneous succession to dune forest, invasive exotic species
2170		-	-	3,7	-	-	-	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	*Hippophae* dominance, desiccation, long-term inundation
2180		-	-	635,3	-	-	-	Wooded dunes of the Atlantic, Continental and Boreal region	intensive recreation and forest exploitation, planting of exotic trees, competition with other exotic species (from e.g. gardens)
2190		-	-	37,4	-	-	-	Humid dune slacks	*Hippophae* or *Salix* dominance, desiccation, long-term inundation, dune fragmentation or fixation, over-recreation, eutrophication
2310		< 50	15-20	667,6	-	-	-	Dry sand heaths with *Calluna* and *Genista*	nitrogen deposition, lack of wind dynamics by forest plantations, habitat fragmentation, intensive recreation, urbanisation
2330		< 50	50	1719,9	-	-	-	Inland dunes with open Corynephorus and Agrostis grasslands	nitrogen deposistion, lack of management resulting in spontaneous forestation, over-recreation, fragmentation, urbanisation
3110		< 5	5 ?	476,3	-	-	-	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	Eutrophication

N°	Prioritary?	Surface (ha)						Name as published in the Official Journal (Eng)	Some threats
		W-C	W-A	F-A	F-C	Br (A)	Fed (A)		
3130		< 50	5 ?	782,4	-	-	-	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	Eutrophication, physical destruction, bank rectification, draining, disturbance of water supply, fill, pollution
3140		150	?	27,4	-	-	-	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	Eutrophication, trampling, disturbance of water supply, draining, darkness, pollution, reshaping
3150		150	250	402,0	-	-	-	Natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation	Eutrophication, silting, pollution, fill, draining, disturbance of water supply
3160		50	-	-	-	-	-	Natural dystrophic lakes and ponds	Eutrophication, silting, pollution, fill, draining, disturbance of water supply
3260		> 500	-	91,9	15,9	-	-	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Homogenisation, pollution, disturbance of water supply, bank reshaping, river rectification, cleaning out, invasive species
3270		50	< 10	-	-	-	-	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation	Homogenisation, pollution, disturbance of water supply, bank reshaping, cleaning out, river rectification, invasive species
4010		2000	10	1499,6	-	-	-	Northern Atlantic wet heaths with Erica tetralix	abandonment, spontaneous forestation, plantations, draining, eutrophication, urbanisation, fire
4030		2500	100 ?	7799,8	-	<1	-	European dry heaths	abandonment, spontaneous forestation, plantations, eutrophication, urbanisation, fire
5110		500	1	-	-	-	-	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	Evolution to the forest, excessive deforestation
5130		50-100	-	1,3	-	-	-	Juniperus communis formations on heaths or calcareous grasslands	closing of the environment, deficit of regeneration, over-grazing, excessive wood harvesting, excessive fire
6110	*	200	1	-	-	-	-	Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi	Direct destruction, urbanisation, road making-up, over-frequentation, closing of the environment, natural forestation, exotic invasive species
6120	*	20	-	-	-	-	-	Xeric sand calcareous grasslands	Direct destruction, urbanisation, road making-up, over-frequentation, manuring, closing of the environment, natural forestation, exotic invasive species, compressing
6130		350	-	-	-	-	-	Calaminarian grasslands of the Violetalia calaminariae	Direct destruction, urbanisation, fill, moto-cross
6210	(*)	8004	< 5	64,3	31,8	-	-	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Habitat fragmentation, abandonment, closing of the environement, coniferous plantation, natural forestation, agricultural intensification, extraction activities, urbanisation, invasion by social *Poaceae, eutrophication, bad management, insive species*
6230	*	1000	< 10	112,8	-	-	-	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	Abandonment, natural forestation, coniferous plantation, agricultural intensification, ploughing, sowing, fertilizing, invasion by social *Poaceae*
6410		> 500	< 5	134,6	-	-	-	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	agricultural intensification (fertilizing, eutrophication, grazing, draining), urbanisation, direct destruction, abandonment, natural forestation, plantations
6430		> 5000	< 100	2236,4	31,8	7	-	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Eutrophication and pollution of rivers, draining, bank reshaping, cleaning out, ruderalisation, invasive species, total abandonment (natural forestation)
6510		5-10.000	?	1028,4	47,8	<1	-	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	Excessive fertilizing, grazing, excessive mowing, abandonment, natural forestation, coniferous plantation
6520		1000		-	-	-	-	Mountain hay meadows	Excessive fertilizing, grazing, excessive mowing, abandonment, natural forestation, coniferous plantation

N°	Prioritary?	Surface (ha)						Name as published in the Official Journal (Eng)	Some threats
		W-C	W-A	F-A	F-C	Br (A)	Fed (A)		
7110	*	5005	-	27,8	-	-	-	Active raised bogs	Human activities, peat extraction, draining, coniferous plantation, invasion by *Molinia caerulea*, trampling, fire, atmospheric deposition of nitrogen, climate warming, hydrological perturbation
7120		> 2500	-	8,0	-	-	-	Degraded raised bogs still capable of natural regeneration	Human activities, peat extraction, draining, coniferous plantation, invasion by *Molinia caerulea*, trampling, fire, atmospheric deposition of nitrogen, climate warming, hydrological perturbation
7140		250	-	188,3	-	-	-	Transition mires and quaking bogs	Human activities, peat extraction, draining, coniferous plantation, invasion by *Molinia caerulea*, trampling, fire, atmospheric deposition of nitrogen, climate warming, hydrological perturbation
7150		10	± 10	114,8	-	-	-	Depressions on peat substrates of the Rhynchosporion	Human activities, peat extraction, draining, coniferous plantation, invasion by *Molinia caerulea*, trampling, fire, atmospheric deposition of nitrogen, climate warming, hydrological perturbation
7210	*			51,4	-	-	-	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	
7220	*	20	-	14,1	-	<1	-	Petrifying springs with tufa formation (Cratoneurion)	disturbance of water supply, modification of physico-chemical quality of water, eutrophication, silting, trampling
7230		1006	-	99,1	-	-	-	Alkaline fens	draining, conversion into crops or intensive pastures, poplar plantation, natural forestation, peat extraction, flooding, fill, rubbish dump, disturbance of water supply, abandonment, trampling
8150		100		-	-	-	-	Medio-European upland siliceous screes	Direct destruction, stone extraction, peripheric plantations, road construction (scree fixation)
8160	*	> 100		-	-	-	-	Medio-European calcareous scree of hill and montane levels	Direct destruction, stone extraction, peripheric plantations, road construction (scree fixation)
8210		200		-	-	-	-	Calcareous rocky slopes with chasmophytic vegetation	Direct destruction, stone extraction, peripheric plantations, road construction, eutrophication
8220		> 100		-	-	-	-	Siliceous rocky slopes with chasmophytic vegetation	Direct destruction, stone extraction, peripheric plantations, road construction, eutrophication
8230		50		-	-	-	-	Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii	Direct destruction, stone extraction, peripheric plantations, road construction, eutrophication, trampling
8310		-	-	66,0	-	-	-	Caves not open to the public	habitat destruction, disturbance by recreants
9110		26.000	?	8,3	159,2	-	-	Luzulo-Fagetum beech forests	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, problems of natural regeneration
9120		?	± 1500	6929,2	-	-	-	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, problems of natural regeneration, urbanisation, over-frequentation, invasive species

N°	Prioritary?	Surface (ha)						Name as published in the Official Journal (Eng)	Some threats
		W-C	W-A	F-A	F-C	Br (A)	Fed (A)		
9130		< 4500	± 150	1882,8	31,8	195	-	Asperulo-Fagetum beech forests	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, problems of natural regeneration
9150		20007	30	19,8	1,6	3,8	-	Medio-European limestone beech forests of the Cephalanthero-Fagion	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, problems of natural regeneration, exploitation of quarries
9160		> 40.000	< 500	1938,5	31,8	290,8	-	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, draining
9180	*	20008		-	-	-	-	Tilio-Acerion forests of slopes, screes and ravines	trampling, climbing, forestry, clear-cutting, exploitation of quarries, road constriction
9190		?	< 300	1767,5	-	21,7	-	Old acidophilous oak woods with Quercus robur on sandy plains	Conversion into resinous plantations, deer over-density, excessive wood exploitation, soil compressing, lack of dead wood, lack of old trees, draining, clear-cutting, invasive species
91D0	*	2000	< 50	43,0	-	-	-	Bog woodland	draining, disturbance of the water supply, plantation or regeneration of conifers, pollution, fill
91E0	*	2500	± 500	4488,5	31,8	46,2	-	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	soil compressing, draining, habitat fragmentation, surfrequetation, bank management, disturbance of the xater supply, poplar or conifer plantation, invasive species, fill
91F0		5009	-	0,6	-	-	-	Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris)	soil compressing, draining, habitat fragmentation, surfrequetation, bank management, disturbance of the xater supply, poplar or conifer plantation, invasive species, fill

Table 7. Presence of the Annex II species in Belgium: W = the Walloon Region, F = the Flemish Region, Br = the Brussels Capital Region, Fed = the Belgian Federal State (authorized for the North Sea). C = Continental Biogeographic zone, A = Atlantic zone. A part of Wallonia, only is Atlantic, while in Flanders, only the region of *Voeren* (*Les Fourons*) belongs to the Continental zone (Figure 14). Presence/absence data are taken from Dufrêne & Gathoye (2002b) for the Walloon Region, Decleer (2007) for the Flemish Region and the North Sea and Gryseels (2002) for the Brussel Capital Region.

	N°	Prioritary?	W-C	W-A	F-A	F-C	Br (A)	Fed (A)	Name (Lat)	Naam (Ndl)	Nom (Fr)
Mammals	1303		x	x					*Rhinolophus hipposideros*	Kleine hoefijzerneus	Petit rhinolophe
	1304		x	x	x	x			*Rhinolophus ferrunequinum*	Grote hoefijzerneus	Grand rhinolophe
	1308		x	x	x		x		*Barbastella barbastellus*	Mopsvleermuis	Barbastelle commune
	1318		x	x	x		x		*Myotis dasycneme*	Meervleermuis	Vespertillon des marais
	1321		x	x	x	x	x		*Myotis emarginatus*	Ingekoven vleermuis	Vespertillon à oreilles échancrées
	1323		x	x	x				*Myotis bechsteini*	Bechsteins vleermuis	Vespertillon de Bechstein
	1324		x	x	x	x	x		*Myotis myotis*	Vale vleermuis	Grand murin
	1337		x	(x)	x				*Castor fiber*	Europese bever	Castor européen
	1349							x	*Tursiops truncatus*	Tuimelaar	Grand dauphin
	1351							x	*Phocoena phocoena*	Bruinvis	Marsouin commun
	1355		x	x	x				*Lutra lutra*	Otter	Loutre d'Europe
	1361								*Lynx lynx*	Lynx	Lynx
	1364							x	*Halichoerus grypus*	Grijze zeehond	Phoque gris
	1365							x	*Phoca vitulina*	Gewone zeehond	Phoque commun
Amphibians and reptiles	1166		x	x	x	x			*Triturus cristatus*	Kamsalamander	Triton crêté
Fish	1095							x	*Petromyzon marinus*	Zeeprik	Lamproie marine
	1096		x	x	x				*Lampetra planeri*	Beekprik	Lamproie de Planer
	1099				x				*Lampetra fluviatilis*	Rivierprik	Lamproie de rivière
	1103							x	*Alosa fallax*	Fint	Alose feinte
	1106							x	*Salmo salar*	Atlantische zalm	Saumon atlantique
	1134		x	x	x		x		*Rhodeus sericeus amarus*	Bittervoorn	Bouvière
	1145		x	x	x				*Misgurnus fossilis*	Grote modderkruiper	Loche d'étang
	1149			x	x				*Cobitis taenia*	Kleine modderkruiper	Loche de rivière
	1163		x	x	x	x			*Cottus gobio*	Rivierdonderpad	Chabot
Insects	1042				x				*Leucorrhinia pectoralis*	Gevlekte witsnuitlibel	Leucorrhine à gros thorax
	1041		x						*Oxygastra curtisii*	Bronslibel	Cordulie à corps fin
	1044		x						*Coenagrion mercuriale*	Mercuurwaterjuffer	Agrion de Mercure
	1074		x						*Eriogaster catax*	Bosrandspinner	Laineuse du prunellier

	N°	Prioritary?	W-C	W-A	F-A	F-C	Br (A)	Fed (A)	Name (Lat)	Naam (Ndl)	Nom (Fr)
	1060		x						*Lycaena dispar*	Grote vuurvlinder	Cuivré des marais
	1065		x						*Eurodryas aurinia*		Damier de la succise
	1078	*							*Callimorpha quadripunctaria*	Spaanse vlag	Ecaille chinée
	1083		x	x	x	x	x		*Lucanus cervus*	Vliegend hert	Lucane cerf-volant
Molluscs-gastropoda	1014			x	x		x		*Vertigo angustior*	Nauwe korfslak	Vertigo angustior
	1016		x	x	x				*Vertigo moulinsiana*	Zeggekorfslak	Vertigo moulinsiana
	1029		x						*Margaritifera margaritifera*	Beekparelmossel	Moule perlière
	1032		x						*Unio crassus*	Bataafse stroommossel	Mulette épaisse
	4056								*Anisus vorticulus*	Platte schijfhoren	Anisus vorticulus
Mosses and lichens	1393		x	x	x				*Hamatocaulis vernicosus*	Geel schorpioenmos	Hypne brillante
	1381		x						*Dicranum viride*	Beukengaffeltandmos	Dicrâne vert
Higher plants	1614				x		x		*Apium repens*	Kruipend moerasscherm	Ache rampant
	1831		x	x	x				*Luronium natans*	Drijvende waterweegbree	Flûteau nageant
	1882		x						*Bromus grossus*	Zware dreps	Brome épais
	1903		x	x	x				*Liparis loeselii*	Groenknolorchis	Liparis de Loesel

3.2.2. Protection and management regime

3.2.2.1. Régime de gestion active

3.2.2.1.1. Principes

Le régime de gestion active[105] est défini comme l'ensemble des mesures mises en place pour maintenir ou rétablir, dans un état de conservation favorable, les types d'habitats naturels et les espèces pour lesquelles le site a été désigné (art. 1er bis, 20°, de la loi du 12 juillet 1973).

La mise en œuvre[106] de ce régime de gestion active doit permettre d'atteindre les objectifs de gestion active prescrits dans l'arrêté de désignation (point 7°) pour les habitats et espèces protégés pour lesquels le site a été désigné.

Ces objectifs, de nature purement écologique, sont constitués par :

- pour les sites Natura 2000 amenés à devenir des ZSC : les exigences écologiques des types d'habitats naturels de l'annexe VIII et des populations des espèces de l'annexe IX présents sur le site ;
- pour les sites Natura 2000 amenés à devenir des ZPS : la survie et la reproduction dans leur aire de distribution des oiseaux rencontrés dans le site, la protection des aires de reproduction, de mue et d'hivernage et les zones de relais dans l'aire de migration des oiseaux migrateurs dont la venue est régulière dans le site (art 26, § 1er, al. 2, 7° de la loi du 12 juillet 1973).

Concrètement, les objectifs de gestion active consistent en l'état physico-chimique et biologique qui doit être maintenu ou rétabli sur le site de façon à satisfaire les exigences écologiques précitées des espèces et habitats pour lesquels le site a été désigné.[107]

L'établissement des objectifs de gestion active doit guider la définition des mesures techniques de gestion scientifiquement appropriées (travaux ordinaires de gestion et travaux de restauration éventuels, tels que opérations de fauche, de pâturages, de débroussaillage, de gestion au niveau d'eau,…) à prendre pour atteindre ces objectifs.[108]

Le régime peut être mis en œuvre par une série de moyens, de nature juridique cette fois, proposés dans l'arrêté de désignation en fonction des exigences économiques, sociales et culturelles ainsi que des particularités locales (art. 26, § 1er, al. 2, 7° et 8°, de la loi du 12 juillet 1973). Il s'agit en d'autres termes des instruments juridiques encadrant la mise en œuvre des travaux de gestion et de restauration. Ces moyens peuvent consister notamment dans :

- l'élaboration d'un contrat de gestion active ;
- la réforme des mesures de gestion des sites dont la Région assure directement ou indirectement la gestion ;
- la mise sous statut de réserves naturelle ou forestière ;
- l'adoption par le Gouvernement de mesures particulières de gestion active (art. 26, § 1er, al. 2, 8°, de la loi du 12 juillet 1973).

Le contrat de gestion active est une sorte de contrat administratif[109] multipartite ou « collectif » par lequel le Gouvernement et une série de propriétaires et occupants s'accordent sur la nature, la programmation et le financement des travaux d'entretien, d'amélioration et de restauration à réaliser pour atteindre les objectifs de gestion active.[110]

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[105] Sur ce régime, voyez C.-H. BORN, « Plans de gestion des sites Natura 2000 Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006)

[106] Sur le champ d'application dans le temps, voyez art. 25, § 1er, al. 3 et art. 25, § 2, al. 2, de la loi du 12 juillet 1973)

[107] En ce sens, voy. COMMISSION EUROPEENNE, *Gérer les site Natura 2000*…, op. cit., p. 54.

[108] C.-H. BORN, *Guide juridique des zones protégées en Wallonie*, Jambes, Ministère de la Région wallonne, 2005, p. 203.

[109] En ce sens, P.-Y. ERNEUX, « La gestion active des sites », in COLL., *Natura 2000 et le droit*, Bruxelles, Bruylant, 2004, p. 266.

[110] On notera qu'au départ, il était question de qualifier le contrat de gestion active de « plan de gestion du site », ce qui situe mieux la nature du contrat de gestion active. Le projet de décret « Natura 2000 » a préféré l'expression « *contrat de gestion active* » à l'expression « *plan de gestion* » entre autres « *pour éviter tout risque de confusion avec les plans de gestion élaborés pour les réserves naturelles* » et « *mettre l'accent sur la coopération entre, d'une part, les propriétaires et occupants concernés et, d'autre part, la Région* » (Doc. Parl. W., Exposé des motifs, session (2000-2001) 250, n° 1, p. 22).

3.2.2.1.2. Etapes de la mise en place du régime de gestion active

A. PREMIERE ETAPE : L'ADOPTION DE L'ARRETE DE DESIGNATION

La première étape de la mise en place du régime de gestion active consiste dans la définition des objectifs du régime de gestion active (OGA) applicables au site, et plus particulièrement aux différentes unités de gestion (UG). Ceci implique l'adoption formelle de l'arrêté de désignation et sa notification aux propriétaires et occupants (art. 26, § 3, de la loi).[111]

B. DEUXIEME ETAPE : CONCERTATION SUR LES MOYENS (JURIDIQUES) DE GESTION ACTIVE

Les partenaires et acteurs de la gestion active du site ont donc le choix entre divers moyens juridiques de gestion active. Plusieurs moyens différents peuvent être utilisés pour la gestion d'un même site.[112] Le choix des moyens s'opère au terme d'une procédure de concertation avec les propriétaires et occupants concernés, en tenant compte des exigences économiques, sociales et culturelles et des particularités locales (art. 26, § 3, al. 3, de la loi du 12 juillet 1973).

L'AGW du 20 novembre 2003 relatif aux modalités de la concertation préalable à l'élaboration des contrats de gestion active et à la constatation de l'inexécution des mesures de gestion active organise la procédure en plusieurs étapes :

- le directeur du Centre de la DNF invite les propriétaires et occupants concernés par le site à une réunion de concertation ;
- lors de cette réunion, le directeur vérifie que tous les propriétaires et occupants concernés par le site sont présents ou valablement représentés, et acte, le cas échéant, tout accord sur le choix des moyens de gestion active proposés. Il n'y a accord que si :
  - tous les propriétaires et occupants concernés sont présents ou valablement représentés
  - ET que le choix des moyens recueille l'assentiment unanime de ceux-ci ;
- En cas d'accord, les propriétaires et occupants désignent de commun accord un notaire chargé, par le directeur, notamment de l'élaboration d'un projet de contrat de gestion active. Le notaire convoquera le directeur, les propriétaires et occupants concernés et un représentant de la commission de conservation à une réunion de négociation ;
- En cas de défaut d'accord, lors de la réunion de concertation, celui-ci est acté par le directeur. Le Gouvernement est dès lors habilité à prendre certaines mesures.

La loi définit la portée de la concertation : « la concertation a pour objet d'identifier, parmi les moyens proposés par l'arrêté de désignation (…) et compte tenu des exigences, économiques, sociales et culturelles ainsi que des particularités locales, les moyens appropriés à mettre en œuvre dans le site pour atteindre les objectifs du régime de gestion active du site (…) » (art. 26, § 3, al. 3, de la loi du 12 juillet 1973).

Globalement, l'ensemble des moyens juridiques proposés est approprié pour atteindre les objectifs de gestion active. Mais en tenant compte des particularités locales et autres exigences, certains moyens seront vraisemblablement plus appropriés que d'autres. La concertation doit permettre de faire cette sélection de manière efficace.

La concertation a donc pour objectif de localiser les moyens juridiques de gestion active, c'est-à-dire d'identifier parcelle par parcelle ou par groupe de parcelles quel est in concreto le moyen juridique le plus adapté.

C. TROISIEME ETAPE : NEGOCIATION DU CONTRAT DE GESTION ACTIVE

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[111] Si en théorie la loi n'interdit pas de mettre en œuvre des mesures de « gestion active » avant la désignation des sites par un arrêté de désignation (par ex. au travers de MAE), il semble difficile d'envisager en pratique la conclusion formelle d'un contrat de gestion active (au sens de la loi) avant cette désignation. Formellement, la loi prévoit en effet que le mécanisme des réunions de concertation et de négociation ne s'enclenche qu'à partir de la notification de la désignation du site aux propriétaires et occupants concernés (art. 26, § 3, de la loi). En outre, c'est l'arrêté de désignation qui définit les objectifs du régime de gestion active, qui pour rappel, constituent le cadre juridique et technique qui va guider la définition des mesures techniques (travaux) de gestion. A défaut, le directeur ne dispose pas des informations scientifiques nécessaires pour proposer un projet de contrat.

[112] P.Y. ERNEUX, *op. cit.*, p. 243 ; Ch.-H. BORN, *Guide juridique …*, p. 204.

Si le contrat de gestion active est choisi comme moyen juridique de gestion active, une réunion de négociation est organisée par le notaire au plus tard trois mois après la réunion de concertation. La procédure est la suivante :

- Le notaire soumet à l'accord des propriétaires et occupants concernés et du directeur un projet de contrat de gestion active rédigé à partir des données scientifiques transmises par le directeur (art. 2, § 4, al. 3 de l'AGW du 20 novembre 2003) ; ils peuvent proposer des amendements sur les mesures techniques (art. 3, § 1, al. 2 de l'AGW du 20 novembre 2003) ;
- Il n'y a accord sur le projet de contrat que si :
  - tous les propriétaires et occupants concernés sont présents ou valablement représentés
  - ET que le projet emporte l'adhésion de tous les propriétaires et occupants concernés (art. 2, § 2, al. 2 et 2, § 5, a contrario de l'AGW du 20 novembre 2003).
- En cas d'accord, le notaire dresse un acte authentique et le transcrit à la conservation des hypothèques
- A défaut d'accord, une procédure de médiation est organisée. Si au terme de celle-ci aucun accord n'est obtenu, le notaire acte ce défaut, le Gouvernement est dès lors habilité à prendre certaines mesures.

Le contrat doit au moins contenir, entre autres (art. 27, § 1er, de la loi du 12 juillet 1973 ; AGW du 20 novembre 2003 relatif au contenu du contrat de gestion active) :

- 5° la description des travaux de gestion ordinaire du site et des subventions qui s'y rapportent ;
- 6° la description des éventuels travaux extraordinaires de restauration et d'amélioration à réaliser et des subventions qui s'y rapportent ;
- 7° un programme indiquant la nature, la localisation des interventions et les délais d'exécution ;
- 8° la répartition des travaux entre les propriétaires, les occupants et éventuellement la Région wallonne (…)

Une question importante concerne la marge de manœuvre dont disposent les partenaires pour établir le contenu technique du contrat de gestion active, en particulier la nature des travaux, leur programmation dans le temps et les techniques nécessaires pour les réaliser.

L'élaboration de ces éléments, cœur du régime de gestion active, doit se faire à partir des données scientifiques transmises par le directeur. La marge d'appréciation du directeur et donc du notaire pour définir les mesures techniques est limitée par le contenu des objectifs de gestion active définis dans l'arrêté de désignation, qui ont valeur réglementaire et s'imposent à ces personnes. L'obligation de résultat de la Région wallonne implique que ces mesures techniques soient organisées de façon à atteindre ces objectifs de gestion active. L'espace de négociation s'en trouve dès lors réduit au choix entre les alternatives techniques qui permettent d'atteindre un même objectif[113].

D. QUATRIEME ETAPE : MESURES PRISES PAR LE GOUVERNEMENT EN CAS DE DESACCORD LORS DE LA CONCERTATION ET/OU DE LA NEGOCIATION

La situation qui risque de se présenter le plus souvent dans le cadre de l'élaboration du contrat de gestion active est celle d'un désaccord soit lors de la concertation (ou d'absence ou non représentation d'au moins un propriétaire ou occupant) (art. 2, § 5, de l'AGW du 20 novembre 2003), soit lors de la négociation (art. 3, § 6, de l'AGW du 20 novembre 2003). Ce désaccord doit faire l'objet d'un acte formel (art. 2, § 5 et 3, § 6 de l'AGW du 20 novembre 2003). En outre, une médiation du président de la commission de conservation compétente peut être organisée par le notaire en cas de désaccord lors de la négociation (art. 3, § 2 de l'AGW du 20 novembre 2003).

Conformément à l'obligation de résultat qui pèse sur la Région wallonne, en cas de désaccord ou d'échec de la médiation, le Gouvernement est alors tenu de prendre les mesures appropriées pour atteindre les objectifs du régime de gestion active en cas de défaut d'accord acté d'un ou plusieurs propriétaires et/ou occupants sur le choix des moyens à mettre en œuvre ou sur le projet de contrat de gestion active (art. 26, § 4, de la loi du 12 juillet 1973 ; art. 4, al. 1, de l'AGW du 20 novembre 2003).

Le contenu des mesures n'est pas limitativement énuméré, ce qui laisse au Gouvernement une large marge de manœuvre. Parmi celles-ci figure la possibilité pour le

[113] Ch.-H. BORN, *Guide juridique des zones protégées en Wallonie*, op. cit., p. 208.

Gouvernement de conclure un contrat de gestion active avec les propriétaires et occupants qui se sont « majoritairement exprimés » en faveur d'un tel contrat lors de la réunion de concertation et de négociation. Les mesures que doit prendre le Gouvernement à l'égard des autres propriétaires et occupants qui ne sont pas « d'accord »[114] pourraient quant à elles consister en l'exécution des travaux prévus dans le contrat initial par la Région wallonne ou par un sous-traitant, la prise en location du bien par la Région wallonne, la mise à disposition du site à la Région wallonne ou à une association chargée de la gérer, la vente du bien, l'expropriation[115].

Des contraintes potentiellement très importantes pourraient donc être imposées à celui qui refuse de signer un contrat de gestion active ou de participer à tout autre moyen prévu lors de la concertation (agrément en réserve naturelle, …). En définitive, l'agriculteur se trouve face à une alternative, soit il entre dans une mécanisme contractuel, s'engage à gérer lui-même certaines parties du site et peut à ce titre bénéficier des avantages financiers qui pourront y être liés[116] (MAE et indemnités compensatoires pour le régime préventif) soit il refuse et risque dès lors de se voir imposer certaines mesures de gestion par voie unilatérale, sans incitant financier cette fois et avec le risque de perdre la maîtrise foncière sur certains terrains. Ceci pose question en ce qui concerne la nature véritablement contractuelle du contrat de gestion active[117].

3.2.2.2. Régime de protection[118]

3.2.2.2.1. Principes

Le régime préventif applicable aux sites Natura 2000 est défini comme l'ensemble des mesures, mises en place par ou en vertu des articles 28 et 29 [de la loi du 12/7/1973], pour prévenir la détérioration des habitats naturels, la perturbation significative des espèces pour lequel le site a été désigné, ou toute autre atteinte significative au site (art. 1er bis, 19°, de la loi du 12/7/1973). Il comporte trois volets :

- un régime préventif général, comportant lui-même deux types de mesures de prévention, principalement sous forme d'interdictions (art. 28 de la loi du 12/7/1973)
- un régime d'évaluation appropriée des incidences des plans et projets susceptibles d'affecter significativement le site (art. 29 de la loi du 12/7/1973)
- un régime de concertation pour corriger d'éventuelles incompatibilités entre l'arrêté de désignation du site Natura 2000 et les prescriptions à valeur réglementaire d'un ou plusieurs plans en vigueur.

Enfin, un régime strict de dérogation est prévu pour permettre, sous certaines conditions, l'adoption de plans ou l'autorisation de projets justifiés par des raisons impératives d'intérêt public majeur alors qu'ils portent atteinte à l'intégrité d'un site Natura 2000.

3.2.2.2.2. Quand le régime préventif entre-t-il en vigueur ?

En principe, le régime préventif prévu par les art. 28 et art. 29, § 2, de la loi (transposant respectivement les mesures générales de prévention (art. 6 §2 dir. Habitats) et le mécanisme d'évaluation appropriée des incidences (art. 6 §3 dir. Habitats)) s'applique seulement à partir de *la publication de l'arrêté de désignation comme site Natura 2000* (art. 25, § 1er, al. 2, et § 2, al. 2, de la loi du 12/7/1973). L'adoption de cet arrêté est donc capitale pour assurer la protection du site.[119]

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[114] C'est-à-dire non présents ou valablement représentés lors de la concertation ; pas d'accord sur le choix des moyens de gestion active ou pas d'accord sur le contenu du contrat proposé

[115] Voy. les exemples in *Doc. Parl. W.,* Rapport, session (2000-2001)250, n° 49, pp. 61-62.

[116] Art. 31 de la loi du 12/7/73.

[117] Voyez P-Y. ERNEUX, *op. cit.,* p. 266. L'auteur conclut par l'affirmative en considérant que les contrats de gestion active sont des contrats administratifs « synallagmatiques » et solennels.

[118] Voyez F. HAUMONT, « La protection des sites en Région wallonne », in COLL., *Natura 2000 et le droit. Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, Actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004

119 La loi prévoit que le régime de prévention s'applique aux sites désignés comme sites Natura 2000, même si ceux-ci ne sont pas ultérieurement reconnus comme SIC par la Commission (art. 25, §1er, al. 2, de la loi du 12 juillet 1973). Cette disposition est d'une utilité toute théorique dès lors qu'aucun des sites proposés par le Gouvernement et retenus comme SIC n'a encore fait l'objet d'un arrêté de désignation. C.-H. BORN, « Le régime

Dans l'attente de l'adoption des arrêtés de désignation, divers mécanismes et dispositions peuvent utilement être mis en œuvre aux fins pallier aux risques importants de dégradation qui menacent les sites Natura 2000.[120]

En tout état de cause, en dehors de ces mécanismes spécifiques, une autorité ne pourrait, à l'occasion de la délivrance de tout permis d'urbanisme ou de lotir, violer l'article 6, § 2 à 4, de la directive Habitats, qui a été reconnu comme ayant effet direct en Région wallonne suite à la jurisprudence « Tenneville » du Conseil d'Etat[121]. Pour rappel, la Cour de justice a confirmé la possibilité pour un juge national de vérifier le respect par un Etat membre du paragraphe 3 de l'article 6 précité à l'occasion de la délivrance d'autorisations[122] dans les sites retenus comme sites d'importance communautaire[123].

3.2.2.2.3. Régime préventif général

INTERDICTION GENERALE DE DETERIORATION OU DE PERTURBATION

« Dans les sites Natura 2000 », il est interdit à toute personne – de droit privé ou public – « de détériorer les habitats naturels et de perturber les espèces pour lesquelles les sites ont été désignés, pour autant que ces perturbations soient susceptibles d'avoir un effet significatif eu égard aux objectifs de la section 3 de la loi » (à savoir le maintien ou le rétablissement dans un état de conservation favorable des types d'habitats naturels et d'espèces protégés

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provisoire des futurs sites Natura 2000 en droit interne. Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006)

120 L'art. 84, § 1, al. 4, 12°, et 452/27 du CWATUP : il s'agit du principal mécanisme de protection provisoire, mais qui reste incomplet car il ne vise que les atteintes à la végétation.

Le défrichement et la modification de la végétation120 sont soumis à permis d'urbanisme (et donc, en Région wallonne, au système d'évaluation des incidences, lequel comprend désormais un volet Natura 200021) dans les « habitats naturels d'intérêt communautaire visés par l'article 1erbis de la loi du 12 janvier 1973 sur la conservation de la nature et proposés au sens de l'article 25, § 1er, de ladite loi, tant qu'ils ne sont pas couverts par un arrêté de désignation pris en application de l'article 26 de la même loi » (art. 84, § 1, 12°, et 452/27, nouveau, du CWATUP). Ce libellé ne vise donc a priori que les types d'habitat naturel d'intérêt communautaire, visés à l'annexe VIII de la loi (correspondant aux habitats de l'annexe I de la directive Habitats), mais pas les habitats d'espèces d'intérêt communautaire visées à l'annexe IX de la loi (annexe II de la directive Habitats) ni les habitats d'oiseaux visés à l'annexe XI de la loi (annexe I de la directive Oiseaux). La publication au Moniteur belge de la liste des sites proposés par la Région wallonne le 31 juillet 2004 a permis de résoudre le problème d'opposabilité qui risquait de se poser à l'égard des personnes à qui ladite liste n'avait pas été notifiée. L'identification des habitats eux-mêmes au sein du site, non publiée à ce jour, même sur internet, pourrait cependant poser des problèmes d'opposabilité dans les cas non évidents.

Voyez C.-H. BORN, « Le régime provisoire des futurs sites Natura 2000 en droit interne. Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006). Voyez également C.-H. BORN et F. LAMBOTTE, « La conservation de la nature en Région wallonne », chapitre de l'ouvrage collectif L'urbanisme et l'environnement, v°du R..P.D.B., sous la dir. de B. JADOT et F. HAUMONT, à paraître.

121 C.E., n° 94.527, ASBL L'Erablière & Commune de Nassogne, 4 avril 2001 ; n° 96.097, ASBL L'Erablière et crts, 1er juin 2001 (affaire « Tenneville »). Le premier arrêt a été confirmé au fond par l'arrêt C.E., n° 139.465, ASBL L'Erablière & Commune de Nassogne, 18 janvier 2005. Dans le même sens, voy. C.E., 30 juillet 2002, n° 109.563 , Apers et crts. Voyez C.-H. BORN, « Le régime provisoire des futurs sites Natura 2000 en droit interne. Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006)

122 C.J.C.E., 7 septembre 2004, aff. C-127/02, Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels c. Staatssecretaris van Landbouw, Natuurbeheer en Visserij ("mer de Wadden"), point 70.

123 C.J.C.E., aff. C-117/03, 13 janvier 2005, Società Italiana Dragaggi SpA e.a. contre Ministero delle Infrastrutture e dei Trasporti, Regione Autonoma del Friuli Venezia Giulia („Dragaggi").

Il s'ensuit que, en Région wallonne :

- avant leur désignation comme site Natura 2000, les autorités sont déjà tenues d'éviter, dans les futurs sites Natura 2000 (ZPS et ZSC), toute détérioration d'habitats naturels ou toute perturbation significative d'espèces pour lesquelles le site est désigné (art. 6, § 2, de la directive). Cette obligation ne s'applique cependant pas directement aux particuliers, qui ne sont donc pas passibles de sanctions pénales en cas de détérioration ou de perturbation sur le site, sauf violation des articles 2 et 3 de la loi sur la protection des espèces ;
- l'évaluation appropriée des incidences doit être exigée pour tout plan ou projet non directement lié à la gestion du site et susceptible, individuellement ou en conjugaison avec d'autres plans ou projets, d'affecter significativement un site devant être désigné comme site Natura 2000 ;
- les autorités compétentes ne peuvent donner leur accord sur des plans ou des projets que si elles se sont assurées que ces plans et projets ne porteront pas atteinte à l'intégrité d'un site devant être désigné comme site Natura 2000.

Voyez C.-H. BORN, « Le régime provisoire des futurs sites Natura 2000 en droit interne. Rapport belge », actes du colloque de Volos des 19-20 mars 2004, Bruxelles, Bruylant, à paraître (2006).

sur le site) (art. 28, al. 1, de la loi). Les autorités et administrations sont tenues de respecter cette interdiction dans l'exercice de leurs prérogatives et la gestion des biens publics[124]. En revanche, selon l'exposé des motifs, pour des raisons de sécurité juridique, l'interdiction générale de détériorer les habitats (passible de sanction pénale) ne serait applicable, géographiquement, qu'aux activités exercées dans les sites Natura 2000[125]. Formellement, le texte de l'article 28, al. 1, de la loi, ne limite pourtant pas l'interdiction à ces seules activités[126]. Bien que l'articulation ne soit pas explicite, il faut considérer que la seule forme de dérogation possible à cette interdiction est celle prévue par l'article 29, § 2, de la loi.[127]

INTERDICTIONS PARTICULIERES ET AUTRES MESURES PREVENTIVES

Les arrêtés de désignation indiquent « les interdictions particulières applicables dans ou en dehors de chaque site ainsi que toute autre mesure préventive à prendre dans ou en dehors du site pour éviter la détérioration des habitats naturels et les perturbations significatives touchant les espèces pour lesquels le site a été désigné » (art. 28, al. 2, de la loi).

Le *champ d'application géographique* des interdictions particulières et autres mesures préventives appropriées peut donc s'étendre en dehors du site à l'égard d'activités qui risquent d'entraîner une détérioration ou une perturbation significative. Du point de vue des *destinataires* des interdictions et mesures préventives, celles-ci s'imposent, du fait de leur valeur réglementaire, non seulement aux particuliers, mais aussi à toutes les autorités et administrations dans l'exercice de leurs prérogatives et la gestion des biens publics.

Le *contenu* des interdictions et des « mesures préventives » particulières est susceptible de varier d'un site à l'autre – l'on peut parler d'un régime « à géométrie variable » –, en fonction des objectifs de conservation de chaque site. Celles-ci devraient donc être adoptées, en fonction à la fois des exigences écologiques de chaque espèce et habitat pour lesquels le site a été désigné[128], de leur état de conservation, de l'effet, le cas échéant cumulé, des activités considérées ainsi que des caractéristiques locales du site. Elles doivent toutefois tenir compte des « exigences économiques, sociales et culturelles ainsi que des particularités régionales et locales » (art. 2, § 3, de la directive Habitats) et donc être, selon nous, adéquates et *proportionnées* par rapport à l'objectif poursuivi.[129]

NOTION DE DETERIORATIONS ET DE PERTURBATIONS

Sans entrer dans le détail[130], selon la Commission européenne, les détériorations et les perturbations « *doivent être évaluées au regard des objectifs de la directive* » et, de façon

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[124] Ceci est particulièrement important pour toutes les activités à risque exercées par les pouvoirs publics qui ne nécessitent pas de permis, tels que le curage des rivières, les travaux publics non soumis à ou exonérés de permis, l'entretien des biens publics et de la voirie (y compris les épandages de sels de déneigement et la fauche des bords de route), la gestion et l'exploitation courantes des forêts domaniales ou communales, l'utilisation de produits toxiques dans le milieu naturel, la gestion hydraulique des rivières, les opérations de rempoissonnement, l'organisation de manifestations sportives ou culturelles, etc. La question de l'impact de l'interdiction sur l'exercice des activités militaires (de compétence fédérale) dans les sites désignés comme sites Natura 2000 n'est pas examinée ici. L'adoption de plans à valeur indicative (non soumis à l'évaluation Natura 2000) est à ce titre soumise à ladite interdiction (*Doc. Parl. W.*, session 2000 – 2001, 250, n° 1, *Exposé des motifs*, p. 11).

[125] *Doc. Parl. W.*, session 2000 – 2001, 250, n° 1, *Exposé des motifs*, p. 13 et p. 24.

[126] On devrait en effet l'interpréter comme limitant l'interdiction de détériorer des habitats d'intérêt communautaire aux seuls habitats présents dans les sites Natura 2000, l'interdiction ne portant pas sur des activités mais sur leur *effet*. Une interprétation conforme à l'article 6, § 2, de la directive Habitats semble appuyer cette interprétation. En ce sens, voy. F. HAUMONT, « La protection des sites en Région wallonne », in *Natura 2000 et le droit*, Actes du colloque de droit comparé organisé à Louvain-la-Neuve le 26 septembre 2002, Bruxelles, Bruylant, pp. 303-304. *Contra* : E ORBAN de XIVRY, *op. cit*., p. 136.

[127] Ch.-H. BORN, Guide juridique des zones protégées en Wallonie, op. cit., pp. 219-220.

[128] La littérature scientifique ainsi que diverses études spécifiques donnent des indications précieuses sur les exigences écologiques des espèces et habitats visés par Natura 2000. En particulier, voy. J.-C. RAMEAU, C. GAUBERVILLE & N. DRAPIER, *Gestion forestière et diversité biologique. Identification et gestion intégrée des habitats et espèces d'intérêt communautaire.* M.R.W., Namur, 2000.

[129] Ch.-H. BORN, Guide juridique des zones protégées en Wallonie, op. cit., pp. 220-221.

[130] Voyez Ch.-H. BORN, Guide juridique des zones protégées en Wallonie, op. cit., pp. 222-223. ; C.-H. BORN, *Natura 2000, Région wallonne*, v° du Guide de Droit immobilier, Diegem, Story-Sientia, 2005, 73 pp ; F. HAUMONT, « La protection des sites », *op.cit.*

plus précise, au regard « *de l'état de conservation des habitats et espèces concernés Au niveau du site, le maintien de l'état de conservation favorable doit être évalué à la lumière des conditions initiales fournies dans le formulaire standard de données Natura 2000*[131]*, au moment où le site été proposé en vue d'une sélection ou d'une désignation, compte tenu de la contribution du site à la cohérence écologique du réseau. Cette notion doit être interprétée d'une manière dynamique à la lumière de l'évolution de l'état de conservation de l'habitat ou des espèces »*[132]

3.2.2.2.4. Evaluation appropriée des incidences

Selon l'art. 29, § 2, de la loi, « tout plan ou projet soumis à permis, qui, au regard des prescriptions à valeur réglementaire de l'arrêté de désignation d'un site Natura 2000, est non directement lié ou nécessaire à la gestion du site mais est susceptible d'affecter ce site de manière significative, individuellement ou en conjugaison avec d'autres plans et projets, est soumis à l'évaluation des incidences prévue par la législation organisant l'évaluation des incidences sur l'environnement dans la Région wallonne, eu égard aux objectifs de conservation du site et selon les modalités fixées par le Gouvernement (…). L'autorité compétente ne marque son accord sur le plan ou le projet qu'après s'être assurée qu'il ne porte pas atteinte à l'intégrité du site concerné ».

Cette évaluation doit donc se faire dans le cadre de la législation générale organisant l'évaluation des incidences sur l'environnement en la Région wallonne, c'est à dire le Code de l'Environnement, le décret du 11 mars 1999 relatif au permis d'environnement et certaines dispositions du CWATUP relatives à l'évaluation des incidences des plans et schémas d'aménagement. Cette législation générale a été modifiée pour inclure un volet Natura 2000[133], mais n'est pas expressément articulée ou coordonnée avec la loi du 12 juillet 1973.

Nous décrivons dans cette section les exigences de la loi du 12 juillet 1973, nous reviendrons plus tard sur leur application dans la législation générale sur l'évaluation des incidences[134] et les interrogations que ce mécanisme suscite.

CHAMP D'APPLICATION

La loi vise « tout plan ou projet soumis à permis, qui, au regard des prescriptions à valeur réglementaire de l'arrêté de désignation d'un site Natura 2000, est non directement lié ou nécessaire à la gestion du site mais est susceptible d'affecter ce site de manière significative, individuellement ou en conjugaison avec d'autres plans et projets »

Un **plan** est défini comme la « décision qui fixe par des dispositions à valeur réglementaire l'affectation et les modes d'utilisation de parties déterminées du territoire wallon » (art. 1er bis, 27°, de la loi). Une liste indicative et non exhaustive de plans est donnée par cette disposition[135]. La référence aux seuls plans à caractère réglementaire, limite le champ d'application de l'article 29, par rapport au prescrit de l'article 6, § 3, de la directive Habitats, qui s'applique à « tout plan ».

La notion de **projet** n'est pas définie dans la loi. La loi restreint le champ d'application de l'évaluation appropriée aux seuls projets « **soumis à permis** ». La notion de permis est définie comme une autorisation individuelle accordée en vertu de la législation applicable en Région wallonne pour une activité, une exploitation, une construction ou un ouvrage (art. 1er

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[131] En Région wallonne, la fiche écologique publiée sur Internet avec les périmètres des sites proposés donne déjà des indications utiles. Voy. les explications relatives à ces fiches sur http://mrw.wallonie.be/dgrne/sibw/sites/Natura2000/formulaire.html.

[132] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000…*, p. 26-27.

[133] En matière de planification, ce volet est prévu, s'agissant des plans réglementaires, aux art. 42, 5° et 50, § 2, 5°, du CWATUP. En matière d'autorisations, voy. le contenu minimum de la notice d'évaluation des incidences et de l'étude d'incidences prévu respectivement aux annexes I et II de l'AGW du 4 juillet 2002 organisant l'évaluation des incidences sur l'environnement dans la Région wallonne (*M.B.*, 21/9/2002) (« évaluation ») et le formulaire de demande de permis d'environnement ou unique (valant notice d'évaluation des incidences), prévu par l'AGW du 4 juillet 2002 relatif à la procédure et à diverses mesures d'exécution du décret du 11 mars 1999 relatif au permis d'environnement (*M.B.*, 21/9/2002) (« procédure »).

[134] Voyez Ch.-H. BORN, Guide juridique des zones protégées en Wallonie, op. cit., pp. 223-235.

[135] Sont compris dans la notion de plan : les plans d'aménagement du territoire (plans de secteur et plans communaux d'aménagement, à l'exclusion des schémas) ; les règlements (régionaux et communaux) d'urbanisme; les permis de lotir; la classification des terrils en vertu du décret du 9 mai 1985 concernant la valorisation des terrils ; la programmation des travaux effectués par les wateringues en vertu de la loi organique du 5 juillet 1956; la planification prévue par la législation relative au remembrement des biens ruraux.

bis, 28°, de la loi)[136]. L'on notera que la notion de « projet soumis à permis » visée par la loi exclut du mécanisme de l'évaluation appropriée les installations et activités de classe 3 (soumis à déclaration) en vertu du décret du 11 mars 1999 relatif au permis d'environnement. Cette exclusion paraît contraire à la directive Habitats, celle-ci visant « tout projet », sans distinguer s'il est ou non soumis à permis[137].

Le plan ou le projet doit être **non directement lié ou nécessaire à la gestion du site**. La gestion doit donc être entendue, en droit wallon, comme le régime gestion active du site, qui transpose cette disposition de la directive. Un plan ou un projet ne peut ainsi être soustrait au régime d'évaluation appropriée que s'il est directement lié ou nécessaire à la réalisation des objectifs de gestion active fixés pour le site.

Le caractère « **susceptible d'avoir un effet significatif individuellement ou en conjugaison avec d'autres plans ou projets** » a été interprété par la Cour de justice. Selon elle, un plan ou un projet non directement lié ou nécessaire à la gestion d'un site doit être considéré « comme susceptible d'affecter ce site de manière significative » lorsqu'il « risque de compromettre les objectifs de conservation de celui-ci ». « L'appréciation dudit risque doit être effectuée notamment à la lumière des caractéristiques et des conditions environnementales spécifiques du site concerné par un tel plan ou projet » [138].

FORME ET CONTENU[139]

L'évaluation appropriée de l'impact sur les sites Natura 2000 doit être intégrée, le cas échéant, au document d'évaluation requis par cette législation (formulaire de demande de permis d'environnement ou unique, notice d'évaluation des incidences, étude d'incidences, rapport sur les incidences environnementales,…) et donc être soumise aux formalités de procédure requises selon les cas. La législation générale applicable en matière d'évaluation des incidences a été modifiée pour comprendre un volet Natura 2000[140].

Bien que l'article 29, § 2, n'utilise pas ce terme, l'évaluation doit être « appropriée » eu égard aux « objectifs de conservation du site » concerné, ainsi que l'exige l'article 6, § 3, de la directive Habitats, directement applicable. L'évaluation appropriée « Natura 2000 » doit contenir une analyse spécifique de l'impact potentiel du projet ou du plan sur tous les sites Natura 2000 susceptibles d'être affectés. Elle doit être « appropriée » eu égard aux objectifs de conservation du site concerné (art. 6, § 3, de la directive Habitats ; art. 29, § 2, de la loi du 12/7/1973) [141], ce qui signifie qu'elle doit analyser spécifiquement les effets du plan ou projet sur chaque habitat et chaque espèce pour lesquels le site a été désigné et non de façon abstraite[142].

CONSEQUENCES SUR LA DECISION DE L'AUTORITE

L'article 29, § 2, de la loi instaure une obligation de conformité de la décision de l'autorité aux objectifs de conservation du site. L'autorité compétente ne peut en effet marquer son accord sur le plan ou projet soumis à l'évaluation qu' « après s'être assurée qu'il ne porte pas

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[136] Sont comprises notamment : les autorisations accordées en vertu de la loi du 28 décembre 1967 relative aux cours d'eau non navigables ; les permis de valorisation des terrils délivrés en vertu du décret du 9 mai 1985 concernant la valorisation des terrils ; les permis de recherche et les concessions de mines prévus par le décret du 7 juillet 1988 sur les mines ; les permis d'environnement et uniques ; les permis d'urbanisme. Il faut y inclure également les plans de réhabilitation des décharges. En effet, aux termes de l'article 42, § 1, al. 3, du décret du 27 juin 1996 relatif aux déchets, le plan de réhabilitation approuvé selon les modalités fixées par le Gouvernement vaut permis d'environnement et permis d'urbanisme (art. 1bis, 28°, de la loi).

[137] Sur cette question et les possibilités d'y remédier, voy. C.-H. BORN, *Guide juridique…, op. cit*., pp. 226-227.

[138] C.J.C.E., 16 septembre 2004, aff. C-192/02, « mer de Wadden » précité, point 49.

[139] Voyez C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l'honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

[140] Voyez C.-H. BORN, *Guide juridique…, op. cit*., pp. 62-70.

[141] La Commission a donné des indications très utiles à ce sujet dans son commentaire de l'article 6 de la directive (COMMISSION EUROPEENNE, *Gérer les sites Natura 2000…, op. cit.*, p. 37 et s.) et dans son Guide méthodologique d'évaluation appropriée des incidences (COMMISSION EUROPEENNE, *Évaluation des plans et projets ayant des incidences significatives sur des sites Natura 2000…, op. cit.*).

[142] Selon la Cour de Justice, l'évaluation appropriée implique que « *doivent être identifiés, compte tenu des meilleures connaissances scientifiques en la matière, tous les aspects du plan ou projet pouvant, par eux-mêmes ou en combinaison avec d'autres plans ou projets, affecter les objectifs de conservation du site concerné* » (C.J.CE., 7 septembre 2004, aff. C-127/02, point 54.)

atteinte à l'intégrité du site concerné » (art. 29, § 1er, al. 3, de la loi)[143]. La Cour de justice a eu l'occasion de préciser ce critère dans son arrêt « mer de Wadden », relatif à un projet de pêche à la coque. Selon elle, « *les autorités nationales compétentes, compte tenu de l'évaluation appropriée des incidences de la pêche mécanique à la coque sur le site concerné au regard des objectifs de conservation de ce dernier, n'autorisent cette activité qu'à la condition qu'elles aient acquis la certitude qu'elle est dépourvue d'effets préjudiciables pour l'intégrité dudit site. Il en est ainsi lorsqu'il ne subsiste aucun doute raisonnable d'un point de vue scientifique quant à l'absence de tels effets* »[144].

Si l'évaluation n'est pas à même de prouver l'absence de risque pour le site, l'autorité n'a que le choix suivant : soit le projet ou le plan doit être refusé, délocalisé ou encore assorti de conditions de nature à garantir qu'aucune atteinte à l'intégrité du site n'aura lieu[145] ; soit une dérogation, conforme à l'article 6.4 de la directive Habitats, doit être sollicitée. Le pouvoir d'appréciation discrétionnaire de l'autorité est donc étroitement lié par les conclusions de l'évaluation des incidences, si du moins celle-ci est « appropriée ».[146]

3.2.2.2.5. Dérogations

Des dérogations au régime préventif applicable dans les sites Natura 2000 peuvent être accordées seulement sous certaines conditions. Celles-ci sont au nombre de trois et sont cumulatives.

ABSENCE DE SOLUTIONS ALTERNATIVES

La dérogation ne peut être accordée que s'il n'existe aucune solution alternative au plan ou projet, y compris les alternatives de localisation (les plus intéressantes), voire l'alternative « zéro ». Dans l'évaluation de l'existence de solutions alternatives, doit être privilégiée la conservation des habitats et espèces protégés sur le site concerné, et non les aspects socio-économiques, ce qui n'exclut pas, que soient pris en compte les coûts de la solution alternative, conformément au principe de proportionnalité et à l'obligation de tenir compte des exigences socio-économiques dans la mise en œuvre du réseau Natura 2000 (art. 2 de la directive Habitats)[147]. La Cour de Justice a confirmé qu'il appartient bien à l'autorité

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[143] Il est à noter que l'article 6, 3, de la directive Habitats ajoute que les autorités ne marquent leur accord sur le plan ou le projet que « (…) après avoir pris, le cas échéant, l'avis du public ». La procédure générale d'évaluation des incidences en Région wallonne, ainsi que les différentes procédures d'adoption de plan et de délivrance de permis prévoient, à quelques exceptions près, diverses mesures de consultation du public *a priori* suffisantes au regard de ce prescrit.

[144] C.J.C.E., 16 septembre 2004, aff. C-192/02, « mer de Wadden » précité, point 61. La Cour ajoute que « le critère d'autorisation prévu à l'article 6, paragraphe 3, seconde phrase, de la directive habitats intègre le principe de précaution (voir arrêt du 5 mai 1998, *National Farmers' Union e.a.*, C-157/96, Rec. p. I-2211, point 63) et permet de prévenir de manière efficace les atteintes à l'intégrité des sites protégés dues aux plans ou aux projets envisagés (…)» (point 58). Cette position de la Cour a aussi été affirmée, en termes moins explicites, dans son arrêt du 24 janvier 2004, aff. C-209/02, *Commission c/ Autriche* (« Râle des genêts »), *Amén.*, 2004/3, pp. XXX, obs. C.-H. BORN.

[145] Dans nombre de cas, l'imposition de mesures d'atténuation de l'impact sous la forme de cahier de charges ou de conditions à respecter par le demandeur du permis ou le promoteur du plan est à même de rendre possible l'exercice de l'activité envisagée, pour autant que leur pertinence scientifique puisse être démontrée par le demandeur. A défaut, le doute obligera l'autorité à refuser le permis ou le plan ou à octroyer une dérogation. Il ne faut toutefois pas confondre les mesures d'atténuation – qui visent à limiter l'impact de l'activité de façon à le rendre non significatif – avec des mesures de compensation – qui interviennent dès qu'une détérioration est causée au site –, sous peine de voir autoriser des plans et projets d'intérêt purement privé ou mineur en violation de l'article 6.4, de la directive Habitats.

[146] Voyez C.-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l'honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006)

[147] La Commission estime que les critères économiques ne « peuvent être considérés comme ayant priorité sur les critères écologiques » (COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 43). La Cour de Justice ne s'est pas prononcée sur cette question délicate. Cependant, son avocat général Mme Kokott semblait favorable, dans ses conclusions dans l'affaire C-239/04, Commission c/ République portugaise, à un test de proportionnalité, considérant que « *en ce qui concerne les alternatives ainsi sélectionnées, le choix ne doit pas obligatoirement se porter sur l'alternative qui affecte le moins l'intégrité de la zone concernée (…). Ce choix exige plutôt une mise en balance entre l'atteinte à l'intégrité de la ZPS et les raisons impératives d'intérêt public majeur pertinentes* ». Elle ajoute que « *c'est la question de savoir si des raisons impératives d'intérêt public majeur exigent précisément la réalisation de cette alternative [souligné par elle] ou si elles peuvent également être satisfaites par une autre alternative – plus respectueuse de l'intégrité de la ZPS – qui est décisive (…). Cette*

compétente d'apprécier la pertinence de ces solutions alternatives proposées, et de rechercher, le cas échéant, des solutions alternatives qui ne sont pas envisagées dans l'évaluation appropriée.[148]

RAISONS IMPERATIVES D'INTERET PUBLIC MAJEUR

Le plan ou projet doit se justifier par des « raisons impératives d'intérêt public majeur, y compris de nature sociale ou économique »[149], lesquelles incluent en tout cas la santé de l'homme, les conséquences bénéfiques primordiales pour l'environnement et la sécurité publique (art. 29, § 2, al. 5, de la loi). Elles peuvent aussi inclure d'autres motifs, y compris socio-économiques.

Le concept peut être circonscrit de la façon suivante :

- *impératifs* signifie que la réalisation du plan ou projet *s'impose*, au regard d'une mise en balance des intérêts liés à sa réalisation, d'une part, et des intérêts de la conservation du patrimoine naturel commun de l'Union européenne, d'autre part.
- d'intérêt *public* signifie à l'exclusion d'intérêts strictement privés, ne contribuant pas à l'intérêt général, par exemple un projet immobilier ou d'extraction local. Selon la Commission, les activités socio-économiques doivent viser l'accomplissement d'obligations spécifiques de service public[150].
- *majeur* signifie, *supérieurs* aux objectifs des directives Oiseaux et Habitats, à savoir préserver le patrimoine naturel commun de l'Union européenne. Selon la Commission, ne peuvent être majeurs que des intérêts *à long terme*[151].

Si le site concerné a été désigné pour assurer la conservation d'habitats et espèces prioritaires (mentionnés par un astérisque dans les annexes VIII (habitats) et I, IX et XI (espèces)), les conditions de dérogation sont plus strictes (art. 29, § 2, al. 5, de la loi). Ne peuvent être invoquées pour autoriser le plan ou projet que des raisons liées à la santé humaine, la sécurité publique (inondations menaçant la sécurité des personnes, risques d'incendies, etc.), des conséquences primordiales pour l'environnement ou toute autre raison impérative d'intérêt public majeur, *après avis de la Commission européenne*.

MESURES COMPENSATOIRES

Ces mesures revêtent deux caractéristiques essentielles :

- elles sont compensatoires, c'est-à-dire qu'il s'agit selon la Commission, de « mesures spécifiques d'un projet ou d'un plan qui viennent s'ajouter aux mesures normales prises pour mettre en œuvre les directives « nature ». Elles visent à contrebalancer les effets négatifs d'un projet et à assurer une compensation correspondant exactement aux effets négatifs sur l'habitat ou l'espèce en cause (…) »[152] ;
- elles doivent permettre d'*assurer la cohérence globale* du réseau Natura 2000 : selon la Commission européenne, à cet effet, les mesures compensatoires doivent « viser : a) dans des proportions comparables, les habitats et espèces ayant subi des effets négatifs, b) concerner la même région biogéographique et le même Etat membre c) assurer des fonctions comparables à celles qui ont justifié les critères de sélection du site concerné »[153].

3.2.2.2.6. <u>Concertation en cas d'incompatibilité avec des plans en vigueur</u>

« En cas d'incompatibilité » entre les prescriptions à valeur réglementaire d'un plan (au sens précité) en vigueur et celles d'un arrêté de désignation (notamment les interdictions

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comparaison implique que les différentes alternatives de la sélection restreinte soient examinées sur la base de critères scientifiques comparables en ce qui concerne leur impact sur la zone concernée et les raisons d'intérêt public pertinentes <u>respectives</u> (…) »

[148] C.J.C.E., 26 octobre 2006, aff. C-239/04, Commission c/ République portugaise, point 39.

[149] Sur cette notion, voy. COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 44-45. Ni la Cour de justice des Communautés européennes, ni le Conseil d'Etat n'ont donné à ce jour une interprétation claire de cette notion.

[150] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 45.

[151] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 45.

[152] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 46.

[153] COMMISSION EUROPEENNE, *Gérer les sites Natura 2000, …, op. cit.*, p. 47. Pour plus de détails sur ce point, et sur la notion de cohérence écologique du réseau Natura 2000, voy. C.-H. BORN, « La cohérence écologique du réseau Natura 2000 », *op. cit.*, p. 193 et s.

particulières et les objectifs de gestion active qu'il prescrit), le Gouvernement est tenu d'organiser une *concertation* entre les « services concernés de l'administration régionale », selon des modalités qu'il doit fixer, le cas échéant, dans un arrêté (art. 29, § 1er, al. 1er, de la loi). La loi n'indique pas comment l'incompatibilité est constatée ni en quoi elle consiste exactement.

A l'issue de la concertation, une proposition de mesures destinée à garantir l'intégrité du site doit être adoptée. La proposition doit être transmise à la commission de conservation concernée pour avis. Aucun délai n'est prévu. Le contenu de la proposition n'est pas spécifié dans la loi, mais celle-ci doit en tout cas « *garantir l'intégrité du site* » (art. 29, § 1er, al. 3, de la loi).

Au terme de cette concertation, le plan concerné doit être soumis au régime spécifique d'évaluation appropriée des incidences des plans visé par l'article 29, § 2, de la loi dans trois hypothèses, à savoir quand :

- la commission de conservation concernée estime que la proposition de mesures correctrices qui lui a été soumise ne suffit pas pour garantir l'intégrité du site ;
- la commission de conservation n'a pas rendu l'avis requis dans les deux mois de la notification de la proposition de mesures ;
- aucune proposition de mesures n'a été transmise à la commission de conservation.

Les suites de l'évaluation ne sont pas expressément prévues.

3.2.2.3. Mise en œuvre et suivi

En ce qui concerne la mise en œuvre des régimes de protection et de gestion du réseau, la législation n'est guère développée. Force est de constater que la loi ne décrit que les grandes lignes des mécanismes de contrôle ou de management. A ce jour aucun arrêté d'exécution n'a pris le relais.

Ainsi elle ne se prononce pas sur la forme que prendront les mesures préventives, ni sur l'autorité qui sera en charge de ce régime.

En outre, en ce qui concerne le régime d'évaluation des incidences, on a vu que la problématique Natura 2000 était appelée à s'intégrer dans les mécanismes existants. Les législations en la matière n'accordent cependant que rarement un droit d'avis à l'administration compétente. Ainsi, tandis que la législation sur le permis d'environnement requière un avis de la DNF sur la complétude[154] des dossiers ainsi que sur l'opportunité[155] de certains projets, en matière de permis d'urbanisme ou de plan d'aménagement du territoire, le CWATUP ne prévoit pas de mécanisme similaire.

S'agissant du régime de gestion, la loi sur la conservation de la nature décrit le cadre juridique, les outils juridiques qui pourront être utilisés mais elle n'intègre pas de référence aux mesures et travaux techniques nécessaire au maintien ou à la réhabilitation des sites dans un état de conservation favorable. Si les objectifs de gestion active sont énumérés dans l'arrêté de désignation, la loi ne prévoit pas de plan de gestion global à l'échelle du site. Aucune autorité n'est par ailleurs désignée pour assurer le suivi et assumer la responsabilité de chaque site en particulier.

On peut supposer qu'une partie de ces questions seront réglées par le Gouvernement qui dispose en la matière de certaines habilitations, mais il semble qu'il eut été opportun voire nécessaire pour assurer la cohérence et l'effectivité de la protection et de la gestion des sites de compléter la loi.

En matière de suivi, si la directive « Habitats » impose une obligation de surveillance et de transmission des résultats des régimes de protection et de gestion[156], la loi sur la conservation de la nature ne semble s'être que peu préoccupée du suivi du réseau Natura 2000.

Ainsi, on ne trouve trace du suivi des sites que dans la définition de la mission des commission de conservation qui est de « *surveiller l'état de conservation des sites Natura 2000, afin d'assurer leur maintien ou leur rétablissement, dans un état de conservation favorable, en tenant particulièrement compte des types d'habitats naturels prioritaires et des*

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[154] Art. 3, al.2 de l'arrêté du Gouvernement wallon du 4 juillet 2002 arrêtant la liste des projets soumis à étude d'incidences et des installations et activités classées.

[155] Art. 2, §5 de l'arrêté du Gouvernement wallon du 4 juillet 2002 arrêtant la liste des projets soumis à étude d'incidences et des installations et activités classées.

[156] Art. 11 et 17 de la directive.

espèces prioritaires et en prenant en considération les exigences économiques, sociales et culturelles ainsi que les particularités locales. » (art. 30 de la loi) Leur composition reflète un diversité qui s'apparente plus à un souci de participation qu'à un réel suivi scientifique et le texte ne donne aucune indication sur les méthodes et moyens dont disposeront ces commissions pour s'acquitter de leur tâche.

3.2.2.4. State of the art

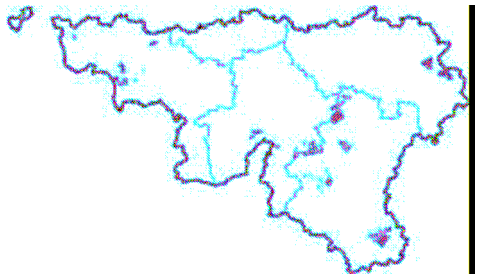
3.2.2.4.1. <u>In the Walloon Region: elaboration of designation decrees.</u>

A. PILOT SITES

The Walloon Region entrusted to several university teams the elaboration of pilot designation decrees. The work of these university teams was to enclose on May 1, 2004. It related to 20 pilot sites. So, 10.000 ha of "pilot sites" have already been the subject of inventories and for those, the designation decrees are being negotiated with the various actors of Natura 2000 (Anonymous, 2005c).

List of pilot sites

BE32002 Vallée de l'Escaut en aval de Tournai
BE32006 Bois d'Enghien et de Silly
BE32012 Bord nord du bassin de la Haine
BE32017 Vallée de la Haine en aval de Mons
BE33035 Plateau des Hautes-Fagnes
BE33037 Camp militaire d'Elsenborn
BE34003 Vallée de l'Ourthe entre Hotton et Barvaux
BE34008 Camp militaire de Marche-en-Famenne
BE34010 Plaine de Ny
BE34029 Haute-Wamme et Masblette
BE34036 Haute-Lesse
BE34037 Haute-Lomme
BE34057 Marais de la Haute-Semois et Bois de Heinsch
BE34058 Camp militaire de Lagland
BE34065 Bassin supérieur de la Vire et du Ton
BE34066 Vallée du Ton et Côte bajocienne de Montquintin à Ruette
BE35018 Bassin de l'Hermeton en aval de Vodelée
BE35034 Vallées des Ruisseaux de Rempeine et de la Scheloupe
BE35037 Vallée de la Wimbe
BE35038 Bassin de la Lesse entre Villers-sur-Lesse et Chanly



To carry out the whole of the inventories, the Walloon Region engaged in March 2005, 20 people in charge of the cartography of Natura 2000 areas. Currently, this cartography is in progress on 40.000 ha and should enclose during the end of 2007. The priority was given to sites most concerned by agriculture, in term of surface.

The 20 people were divided into 7 teams distributed on all the Walloon territory. For questions of organization and timing, there is no systematic making of contact with the farmers. Indeed, the passages of the scientists are rather fast and single: they draw up simultaneously the cartography and the state of conservation of the site.

The cartography of the totality of Natura 2000 areas is envisaged in the 6 to 8 next years. The deadline for the elaboration of the whole of designation decrees was the end of 2010 but that will not be already possible any more…

B. DIALOGUE WITH THE PARTNERS

Before the elaboration of designation decrees, the *Division Nature et Forêts* (DNF) does not contact directly the owners because of the problems encountered during the crossing between the *Plan de Localisation Informatique* (PLI) and N2000 and in order not to create inequality of treatment. In fact, the Walloon Region charged SRFB and NTF with sensitizing forests owners with N2000, and FWA with sensitising farmers.

On the initiative of the minister Lutgen and of the DNF, a series of meetings between the various N2000 partners was organised. The first meetings began on June 16, 2005 and various associations were involved: *Fédération Wallonne de l'Agriculture* (FWA), *Inter-Environnement Wallonie* (IEW), *Société Royale Forestière de Belgique* (SRFB), *Nature Terre Forêts* (NTF). The main discussed topics were:

- First project of Designation decree for the N2000 site of Lesse valley between Villers-sur-Lesse and Chanly
- Suggested management measures
- Notebooks of habitats and species

REMARKS

The implementation of the Natura 2000 network is a unique opportunity to define coherent objectives as regards to nature conservation and to identify and cartography the spinal column of what should be the Walloon ecological network.
However, Natura 2000 network does not have the ambition to cover the whole of the Walloon biological heritage. Other initiatives are necessary to supplement the inherent actions with Natura 2000 (local or sectoral), in particular for species and important habitats not identified as being of Community interest. The strategy of the nature conservation in Wallonia is not limited to Natura 2000 operation. It is on the level of other sectoral policies (the agricultural regroupings, the modes of subsidy in favour of agriculture, sylviculture, the management of the rivers, the rehabilitation of careers after exploitation, the management of the borders of communication infrastructures, the rehabilitation of the industrial waste lands...) that actions compatible with the nature conservation must also be implemented. It is because the legislation is defective or sometimes not respected in these various activity sectors, that the actors of the nature conservation try to take over but it is a solution that is neither sustainable, nor efficient if the managers directly concerned do not adhere to the actions to implement.

3.2.2.4.2. In the Flemish Region: Definition of conservation goals

Up till now, only for the sites where a Nature Objective Plan (*Natuurrichtplan* or *NRP*) has been performed (for six of the Flemish SCIs), the conservation objectives are formulated. In the meanwhile, decision makers make use of the reference work of Heutz and Paelinckx (2005) for assessment of the state of conservation and for setting the conservation goals.

In Flanders, the concept of NRPs has been disputed and the Flemish nature administration decided to not extend this procedure to all SCIs. One is now working hard to list the conservation goals for all SCIs before 2010 (pers. comm. K. Sannen, *ANB*).

3.3. Difficulties with the legal translation of scientific reality

3.3.1. Long-term evolution of the sites and the perimeters and measurements

Nature is the result of the biological evolution, started since several billion years and which produced, by complicated mechanisms and always very badly understood, million species with which we divide planet. It is this extraordinary diversity which the policy of nature conservation wants to maintain, not only in its current state, necessarily transitory since is to it a dynamic process, but also in its future state. To preserve nature, it is thus to preserve the existing inheritance and the conditions of the biological evolution.[157]

In law the technique of ecological zoning can be defined as the designation of zones to which various legal obligations favorable to the nature conservation or the management of the environment are assigned.[158]

However each environment has a proper structure and an irreplaceable role in natural balance that the traditional legal categories are not able always to apprehend. Ecology thus escapes by its dynamic and processual character from legal rationality, made of fiction, simplification and fragmentation.[159] Any strategy of conservation must be sufficiently flexible to adapt to the infinite variety of living and its evolution.

Once the Natura 2000 network set up, this one could not thus remain fixed. The ecological dynamics of the ecosystems hardly allows it, particularly in a context of climatic reheating, brought to cause important modifications in the surface of distribution of the species and the natural habitats of Community interest. With term, the relevance of designations of SPAs and SACs could for this reason be partially called into question. In a laconic way, the Habitats directive provides that "the Commission (...) carries out the periodic evaluation of the contribution of Natura 2000 to the achievement of the aims had to articles 2 and 3. (...)", this implies that an evolution of the network is possible.

Sites will thus be brought to be *added* to the network Natura 2000. 160 That can prove to be essential to ensure the achievement of the objectives of conservation of the two directives. In this respect, the Walloon law does not exclude that new sites Natura 2000 are indicated in the future, in so far as the procedure of designation envisaged is observed161.

Is the *withdrawal* of sites of the network possible?

Whereas the declassification of the SPAs does not make the object of any specific procedure, and is not allowed that in the conditions established by the Court of Justice in its stop "Leybucht"[162], the declassification of a SAC is apprehended expressly by the Habitats directive in its article 9, which provides that, in the context of the evaluation by the

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[157] E. SERUSIAUX, « La nature ? » in Ministère de la Région wallonne, *Le grand livre de la nature en Wallonie*, Tournai, Casterman, 1995, p. 21.

[158] D. MISONNE, « Le zonage en droit de l'environnement : inventaire et critères de désignation » in CEDRE, *Le zonage écologique*, actes du colloque de Gembloux du 29 mars 2001, Bruxelles, Bruylant, p. 13.

[159] N. DE SADELEER, « Introduction », in CEDRE, *Le zonage écologique*, actes du colloque de Gembloux du 29 mars 2001, Bruxelles, Bruylant, p. 5.

[160] Ainsi, bien qu'elle ne le prévoie pas expressément, la directive Oiseaux n'exclut pas qu'un Etat membre doive, suite à une évolution naturelle ou liée à l'état de conservation d'une espèce d'oiseau de l'annexe I, classer comme ZPS de nouveaux sites, compte tenu notamment « *des tendances et des variations des niveaux de population* » de cette espèce (art. 4, § 1, al. 3, de la directive Oiseaux). La directive Habitats prévoit expressément cette hypothèse, en disposant que les Etats membres « *suggèrent, le cas échéant, l'adaptation de [leur proposition de liste nationale] à la lumière des résultats de la surveillance visée à l'article 11* », laquelle porte précisément sur l'état de conservation des espèces et habitats naturels présents sur leur territoire.

[161] Le délai imparti pour désigner les sites correspondant aux ZPS (21 janvier 2003) (art. 25, § 2, de la loi) n'étant pas de rigueur, les désignations faites ultérieurement restent valables.

[162] Sur ce point, voy. E. ORBAN de XIVRY, « La procédure de sélection des sites en Région wallonne », in COLL., *Natura 2000 et le droit, Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004, pp. 117 et svts.

Commission of the contribution of the network to the objectives of the directive, " *a special area of conservation may be considered for declassification where this is warranted by natural developments noted as a result of the surveillance provided for in Article 11*.". The directive thus excludes the withdrawal from sites for other reasons that ecological. The Walloon Region transposed this assumption expressly (Article 25, § 5, of the law of July 12, 1973). [163]

En région wallonne, en ce qui concerne les régimes de protection, la loi sur la conservation de la nature (art. 26, §1er, al. 4) prévoit que le Gouvernement peut, après l'avis de la commission de conservation concernée, revoir les prescriptions visées aux points 6 (interdictions et mesures préventives), 7 (objectifs de gestion active) et 8 (moyens proposés pour la gestion) en fonction de l'évolution des connaissances scientifiques, des techniques de gestion ou de l'état de conservation du site. L'arrêté de révision est soumis aux formalités de publicité de la désignation. En outre, la loi établit un mécanisme de révision du contrat de gestion active de façon à pouvoir revoir le contrat en fonction de l'évolution des mêmes éléments, ou si les objectifs de gestion active du site précisés dans l'arrêté de désignation ont été révisés pour les mêmes motifs. (art. 27 §4)

3.3.2. Incertitude scientifique et principe de précaution

« Politics is the art of taking good decisions on insufficient evidence » Lord Kennet.
Devoted by the Declaration of Rio from June 13, 1992, the principle of precaution states that the absence of certainty, taking into account scientific knowledge of the moment , should not delay or to be opposed to the adoption of measures intended to prevent a risk presenting certain liking of gravity for the environment.
The application of this principle is particulary important for the conservation of biodiversity because of the immense gaps characterizing current knowledge in this field. The irreversible character of certain effects of the human activities on biodiversity requires anticipatory measurements before the extent of the effects was proven. [164]

The scientists share this vision and make these difficulties one of the characteristics of the biology of the conservation. Thus Michael Soulé qualifies it "crisis discipline". Its intention is of saying that it acts of a discipline pressed by time and that "in such a discipline, it is often necessary to act without a total knowledge of the problems, because waiting to collect all the data before acting can appear disastrous. It is thus necessary to work with information available and the best possible intuition, while tolerating a great part of uncertainty ". [165]

The principle of precaution was expressly devoted in directive 92/43/CEE "Habitats", like by caselaw relative to this directive.

Thus, article 6.3 of the directive states « *Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public* ».

The term " *having ascertained* " used in article 6.3, has important legal consequences in what it obliges the authority to do a strict application of the *principle of precaution* in case of doubt as for the impact of the project or the plan. This situation is called, one imagines it, to frequently arise in the Natura 2000network, taking into account the incomplete character of knowledge on the ecology of the species and habitats of Community interest and on the impact of a number of human activities.

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[163] C.-H. BORN, « La cohérence écologique du réseau Natura 2000 », in COLL., *Natura 2000 et le droit, Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004, pp. 192-193.

[164] N. de SADELEER, C-H. BORN, *Le droit international et communautaire de la biodiversité*, Paris, Dalloz, 2004, pp. 71-73.

[165] G.K. MEFFE, D. RONALD CARROL and al., *Principles of conservation biology*, Sunderland, Massachusetts, Sinauer associates Inc., 1997, pp. 22-23; G.K. Meffe, "Crisis in a crisis discipline", *Conservation Biology*, 2001, 15, pp. 303-304. Voyez également N. de SADELEER, C-H. BORN, *Le droit international et communautaire de la biodiversité*, Paris, Dalloz, 2004, pp. 19-20.

The Court of Justice did not hesitated to judge « The competent national authorities, taking account of the appropriate assessment of the implications of mechanical cockle fishing for the site concerned in the light of the site's conservation objectives, are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects.» (nous soulignons)[166]. One notes the severity of this literal interpretation of the text of the directive: no "reasonable scientific doubt" can remain as for the impact of the project on the integrity of the site. It comes out from it, ultimately, that the burden of proof of harmlessness of a project or a plan rests if not on the applicant, at the very least on the competent authority to approve the plan or the authorization[167]. The obligation to hold account of the cumulative effects of the projects reinforces the difficulty in bringing this proof.[168]

[166] C.J.C.E., 7 septembre 2004, aff. C-127/02, « mer de Wadden », point 61. The Court adds that « *it is clear that the authorisation criterion laid down in the second sentence of Article 6(3) of the Habitats Directive integrates the precautionary principle (…)* » (point 58).

[167] The Court confirmed in its stop "Corncrake" of January 29, 2004 above mentioned. It condemned Austria to the reason that « *Having regard to the content of those expert's reports and in the absence of evidence to the contrary, the inevitable conclusion is that (…), the Austrian authorities were not justified in considering that the planned extension of the golf course in question in the present case (…), was not such as significantly to disturb the corncrake population in the Wörschacher Moos SPA and would not adversely affect the integrity of that SPA.* » (C.J.C.E., 29 janvier 2004, aff. C-209/02, Commission c. République d'Autriche, point 26)

[168] C-H. BORN, « Quelques réflexions sur le mécanisme de protection des sites Natura 2000 contre les incidences des plans et projets », in COLL., *Mélanges en l'honneur de Michel Prieur*, Paris, Dalloz, à paraître (2006). Voyez également C-H. BORN, *Guide juridique…* , *op. cit.*, p. 187-221-237.

3.4. Social dimensions

3.4.1. The primary sector: agriculture, forestry, extraction industry (landscape impacts, use of resources, impact on biodiversity and ecosystems)

We first speak about agriculture and then we will present some pieces of information for forestry. In general for this section we will refer to the Walloon situation taken as an example but in most cases it would be possible to extrapolate to the Flemish situation.

3.4.1.1. Agriculture

We first speak about agriculture and then we will present some pieces of information for forestry. In general for this section we will refer to the Walloon situation taken as an example but in most cases it would be possible to extrapolate to the Flemish situation.

Agriculture

One first remark to make is to note the difference between “cost for the agriculture” and “loss of earnings”. When a farmer has some costs, he has to spend this money, money goes out. Conversely when we speak about “loss of earnings” there is no real flow of money for the farmer, he does not win that money.

To write this section we will lean on a document “Piste pour l’indemnisation des exploitations agricoles touchées par Natura 2000” (DGA, 2006). This document presents some interesting figures based on a reference case , a farmer located in the Walloon average concerning the charge of livestock and mineral manure spreading (that is, 87,9 kg/ha of $N_{mineral}$ and 1,89 UGB/ha or 160,6 kg/ha of $N_{organic}$; this is what we can call the Walloon profile).

Note that if the farmer aims to get a compensation for the reduction of activity imposed on the Natura 2000 part of his land and in the same time raise activity on those that are not integrated in the zone, he has to make that in keeping the “Walloon profile” on the whole areas he manages[169].

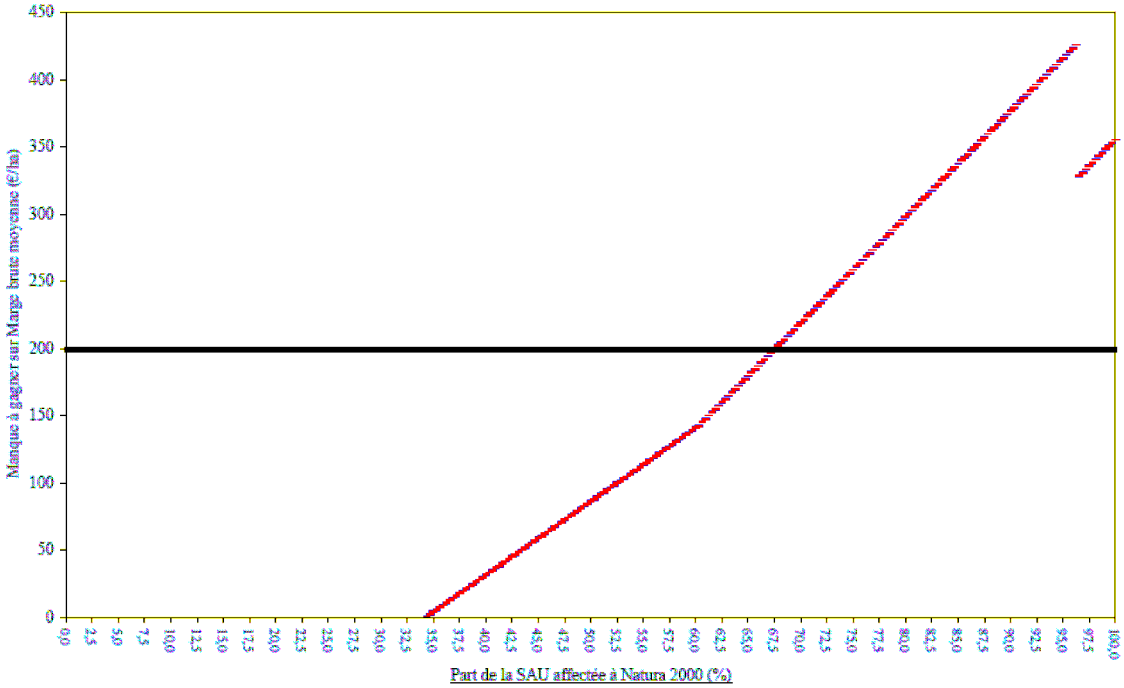
We can see on Figure 16 below the evolution of the loss of earnings (€/ha) in function of the fraction of lands integrated in Natura 2000. The horizontal line is the limit that the compensatory indemnity cannot overtake, that is 200 €.

As we can see the loss of earnings is globally a growing function[170] of the proportion of lands integrated in Natura 2000. This function is strictly monotonous on the gap going from 35 % to 96 %, which makes things easy. We can make some classes of proportions of SAU (Surface Agricole Utile – Useful Agricultural Surface) in Natura 2000 in the Table 8.

Figure 16: Evolution of the loss of earnings in relation to average rough margin (€/ha) in function of the SAU part integrated in Natura 2000

[169] In other terms, the farmer desintensifies in Natura 2000 and intensifies outwards of this zone to stick to the Walloon profile on the whole of the SAU he manages meanwhile respecting the norms of the PGDA (Programme de Gestion Durable de l’Azote). We can question the validity of such a procedure. The model of the Walloon agriculture aims to integrate agricultural production and in the same time environmental protection. By contrast, this approach dissociates the production from the environment to tend to a “Dutch type” agricultural model: on the one hand, intensively managed areas, and on the other hand, areas exclusively devoted to nature protection. Moreover, the pedo-climatic conditions of the Famenne limit the degree of intensification.

[170] Two models were established to obtain this function: (1) PheCFha = 663,39 + 269,08 UGB ha + 8,76 Nminha with a rate of rough margin estimated to 0,662 for the SAu part out of Natura 2000 and (2) $PheCFha_{min}$ = 470,20 + 167,72 UGB ha + 8,01 Nminha with a rate of rough margin estimated to 0,574 for the SAU part in Natura 2000.



Source: DGA, 2006.

Table 8: Single amount of the compensatory indemnity (proposition of the DGA)

% de SAU en Natura 2000	Indemnité compensatoire (€/ha)
Moins de 40 %	30
De 40 % à moins de 60 %	140
60 %[171] et plus	200

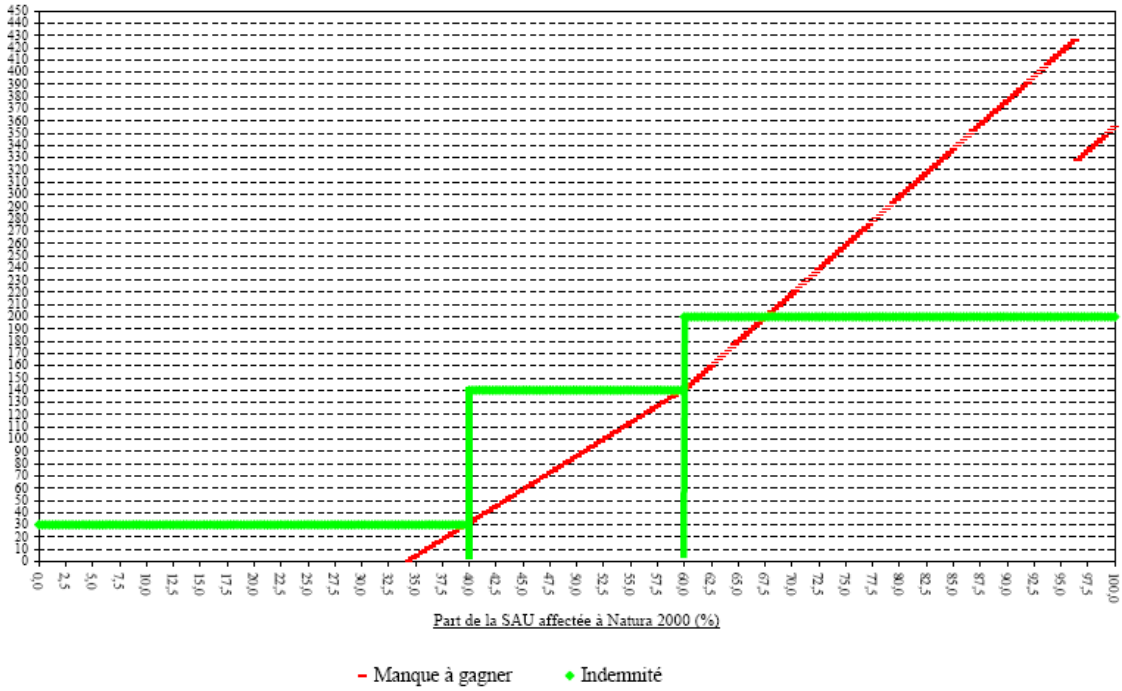
Source: Anonyme, 2006.

It would be interesting for those farmers, of whom more than 70 % of the SAU are in Natura 2000 to reduce the charge of livestock. This with the aim to have a density of livestock on all the area which permit to subscribe to the MAE 7 ("Maitien de faibles charges en bétail" – see Appendix 9 for more details). If we proceed in this way, the percentage of SAU in Natura 2000 from which the loss of earnings reached 200 €/ha goes from 70 % to 75%.
Concerning the first gap, we can observe as well that a compensation is planned for the farmer where it is not justified theoretically. A minimal amount of 30 € is proposed because some variables can make pressure on farmer's revenue and so, it is to be taken in account.

We can see on Figure 17 the loss of earnings and the compensatory indemnity on the same graph.

[171] On notera que la limite de classe de 60 % correspond à un point d'inflexion de la courbe. C'est à partir de là que, selon les hypothèses formulées, l'exploitation atteint le plafond PDGA pour l'azote organique sur la partie non Natura 2000 de ses terres.

Figure 17: Loss of earnings and compensatory indemnity (€/ha) according to the SAU part integrated in Natura 2000 (3 intervals of SAU)



Source: Anonyme, 2006.

For this part, we can add two remarks. **First**, as we can see on Figures 3 and 4, as long as the area integrated in Natura 2000 is lower than 35 % of the SAU, it is not theoretically necessary to give a compensation to the farmer in view of the fact that he would be able to compensate the loss of earnings in intensifying, in the limits of the licence, his activities on the part outside of Natura 2000[172]. On the other hand, beyond 70 % of SAU integrated in Natura 2000, the limit of the 200 €/ha of compensation for the loss of earnings is exceeded.

How many farmers are concerned, which SAU is touched? (figures for the Walloon Region)

- In total, about 5 000 farmers are concerned with the issue of Natura 2000. It represents a little more than 28 100 ha on the whole, of which approximately 25 300 ha are meadows.
- There would be roughly 4 500 farmers of which less of 35 % of the SAU is touched, that is, 90 % of the total of farmers concerned. The aforesaid farmers totalize 17 100 ha of SAU, which represents around 61 % of the total concerned SAU.
- Around 110 exploitations totalizing 3 120 ha, i.e., 2 % of the exploitants but 11 % of the SAU, would have 70 % and more of their SAU in Natura 2000.

If the more concerned farmers, namely the last one, would adopt the MAE n° 7, it would be from around 75 % of the SAU in Natura 2000 that the loss of earnings would cross the limit of 200 €/ha instead of the 70 % previously estimated. There would be only 90 exploitations totalizing around 2 550 ha, that is, 9 % of the SAU in Natura 2000.

The **second** remark is rather a warning. The maximal amount of the compensatory indemnity is about 200 €/ha and it is in all likelihood not sufficient for all the farmers. For some of them, it is even probable that the loss overcomes 400 €/ha, which is a serious issue.

We spoke about the MAE 7 to reduce this loss but this does not fully compensate; that is why we can think of some other instruments. Conversion to biological production for the most

[172] Note that the same remark as above for the intensification can be made. Moreover, the fact that the loss of earnings begins when we gain 35% of the SAU will exert a huge impact. For some farmers who own on the average 100 ha of land, it would mean that the loss of production on 35 ha of their exploitation doesn't hamper the economic viability of their exploitation. The validity of such an argument in questionable!

touched exploitations could be a solution. However we have to keep in mind that there is a risk to reach the upper limit of co-financement established by the European Commission, which for the agro-environmental payments (2nd pillar of the Common Agricultural Policy) include essentially the MAE and "bio" bonus, and which is fixed to 450 €/ha for meadows[173].

To close the analysis of the information proposed by the document "Piste pour l'indemnisation des exploitations agricoles touchées par Natura 2000" (2006) we present in the next table (Table 8) an estimation of the annual volume of Natura 2000 bonus for the agricultural sector in Wallonia for 2006.

Table 9:

% Natura 2000	Indemnity (€/ha)	Nbr of farmers	SAU in Natura 2000 (ha)	Approximate amounts (€) of indemnity	Total SAU of exploitations (ha)
< 40 %	30	4 570	18 400	552 000	297 500
From 40 % to < 60 %	140	200	4 800	675 000	10 000
60 % and more	200	160	4 900	981 000	6 400
Total		4 930	28 100	2 208 000	313 400

Source: « Piste pour l'indemnisation des exploitations agricoles touchées par Natura 2000 » (2006)

This gives an actual estimation of the "annual weight" of the Natura 2000 measure for the programming 2007-2013 of the PDR[174]. Nevertheless, this note of the DGA, does not take into account the fact that the under-using of the equipment and the infrastructures has a cost. Investments have been realized and we have to take them into account because the repayment has to be done, be it within or without Natura 2000.

The MAE

From the point of view of the agri-environmental measures, it is interesting to have a look at the costs of application of the MAE valorizing the ecological network. This point is presented in Appendix 10. Likewise, in the project Econet some measures were proposed. One of those measures was studied by a student. Her conclusions about *the transformation of a species-poor, intensively pastured and fertilized meadow, into a species-rich meadow* are presented in Appendix 11.

3.4.1.2. Forest

In 2006, the convention « Méthodologie d'évaluation du coût des mesures de gestion spécifiques aux habitats forestiers NATURA 2000 (Seconde convention) » made a study on the financial consequences of the implementation of Natura 2000.

Some measures that appear in the preliminary draft of the designation decree are restricting and cannot be considered as "bonnes pratiques sylvicoles" and they were assessed. These measures are the following:

- abattage précoce de peuplements exotiques (R 048)
- installation d'îlots de sénescence (R 056)
- conservation d'arbres « remarquables » (M 056)

Within the framework of the assessment of the financial loss at the scale of a site, it is the site "Bassin de la Lesse entre Villers-sur-Lesse et Chanly" that was choosen as a study case.

Table 9 below summarizes the loss in the management unit ("Unité de gestion UG") of the site of the Lesse.

Several hypotheses were made, some very maximalistical (implying that it probably induces an overestimation of the loss). On this basis and with some more realism, the total financial loss linked to the implementation of Natura 2000 in the forest habitats of the Lesse is estimated, all management units merged, at about 1 000 000 €, i.e., on the average, for the 1764 ha of forest habitats of the site, 575 €/ha. This estimation is for information only and

[173] It would be judicious to consider raising this barrier. This would allow enlarging the range of instruments to prevent the farmers mostly touched by Natura 2000 from being be excessively penalized.
[174] Rural Development Plan

could more or loss vary downwards in function of some parameters (See Appendix 12 for some explanations).

The second table (Table 10) is the same summary for the Walloon Region. We can see that, on a basis of a majority of maximal hypothesis, the loss on the Walloon scale is between 36 and 40 billion € for the 170 000 ha of forester habitats included in the Natura 2000 network, that is a mean cost of 210 to 240 €/ha. As for figures of the Lesse, change of hypothesis to have "minimalistical" hypothesis could vary downwards, probably of an half of the total loss.

Table 8. Results of the cost estimation of Natura 2000 actions in forests for the whole Walloon Region. Source: FUSAGx – Forêt, 2006, p. 54.

Echelle	**Coût (€)**	
	Minimum	Maximum
Coût total	20 000 000 €	40 000 000 €
Coût / hectare	120 €/ha	240 €/ha
Coût / ha / an	4 €/ha/an	8 €/ha/an

Note that to have these figures, we consider a period of time of 30 years.

3.4.1.3. Extraction industries

Some costs will certainly be supported for this type of activities but up till now, no study has been made. It will probably be easier to make an assessment when we will be further in the project.

Table 9. Synthese du préjudice dans les unités de gestion du site Bassin de la Lesse. Source: FUSAGx – Forêt, 2006, p. 40.

	Action et pourcentage d'îlots	Unité de gestion	Propriétaire	Surface feuillue	Chênaie et milieux assimilés	Hêtraie et milieux assimilés	Valeur marchande du bois	Perte de jouissance du fonds	Préjudice global
Mise en place d'îlots de sénescence	R056 (3%)	A4	Indistincts	41,65 ha	100%	0%	4790€	725€	5516€
	R056 (10%)	C2	Rochefort	5,92 ha	100%	0%	2269€	333€	2602€
			Tellin	1,11 ha	100%	0%	426€	62€	488€
			Non identifié	5,38 ha	100%	0%	2062€	303€	2365€
	R056 (3%)	D2	Non identifié	3,11 ha	100%	0%	358€	52€	410€
	R056 (3%)	E1	Rochefort	534,85 ha	50%	50%	62836€	9026€	71862€ --> 13294€
			Tellin	78,23 ha	66%	34%	9129€	1320€	10449€
			Non identifié	198,61 ha	25%	75%	23580€	3352€	26931€
	R056 (3%)	E2	Rochefort	58,25 ha	100%	0%	6699€	983€	7682€
			Tellin	103,21 ha	100%	0%	11870€	1742€	13612€
			Non identifié	5,92 ha	0%	100%	710€	100€	810€
	R056 (85%)	E3	Rochefort	44,34 ha	0%	100%	168449€	15797€	184246€
			Tellin	1,19 ha	0%	100%	4521€	424€	4944€
			Non identifié	13,27 ha	0%	100%	50410€	4727€	55137€
	M056 (10%)	E4	Rochefort	67,29 ha	80%	20%	9665€	1172€	10837€
			Tellin	53,98 ha	80%	20%	7753€	940€	8694€
			Non identifié	17,43 ha	75%	25%	2483€	304€	2787€

--> Compte tenu des 13,08 ha de "non productif" qui devraient être consacrés à la mise en place d'îlots.

	Unité de gestion	Propriétaire	Surface	Essence	Valeur maximale du préjudice
Abandon au TE et actions lisières	A2	Rochefort	0,47 ha	Pin	400€
	A3	Rochefort	4,03 ha	Douglas	2130€
		Tellin	1,80 ha	Pin	2207€
	B1	Non identifié	0,11 ha	Pin	250€
	C2	Indistincts	6,70 ha	Peuplier	12500€
		Indistincts	6,05 ha	Résineux (3/4 Epicéa)	13600€
	D2	Indistincts	0,74 ha	Epicéa (80%) et Peuplier	1700€
	E1	Rochefort	1,09 ha	Diverses	2230€
		Tellin	0,15 ha	?	340€
		Non identifié	3,42 ha	Diverses	7700€
	E2	Indistincts	1,37 ha	Résineux (3/4 Epicéa)	2970€
	E4	Rochefort	6,65 ha	Résineux (2/3 Pin)	9800€
		Tellin	5,63 ha	Pin	7850€
		Non identifié	9,03 ha	Diverses	10500 à 19000€

	Unité de gestion	Propriétaire	Surface	Essence	Préjudice global
Abattage avant TE	A5	Rochefort	65,91 ha	Pin	304224€
		Tellin	18,65 ha	Pin	
	A6	Rochefort	52,44 ha	Pin	278231€
		Tellin	9,16 ha	Pin	
		Non identifié	4,29 ha	Pin	

TOTAL : 1011687€

Table 10. Synthese du préjudice estimé à l'échelle de la Région engendré par la mise en œuvre de la directive Natura 2000. Source: FUSAGx – Forêt, 2006, p. 53.

Milieu	Action	Pourcentage d'îlots	Surface	Valeur marchande du fonds (VMF)	Proportion de forêts domaniales	Préjudice
Hêtraie	Îlots de sénescence	3%	34000 ha	2250 €/ha	10 %	13.380.000 € à 15.840.000 €
Chênaie			77000 ha			
Forêts alluviales		10%	1100 ha	1350 €/ha	10 %	430 000 €
Chênaies pédonculées		10%	2800 ha	1350 €/ha	10 %	189 000 €
Boulaies tourbeuses		100%	600 ha	/	/	0 €
Erablières		100%	900 ha	500 €/ha (si valeur vénale fonds [VVF] = 1000€/ha et VMF=50%*VVF)	0 %	1 077 000 €
Pineraie sur sol calcaire	Abattage précoce		100 ha	1800 €/ha	10 %	672 500 €
Résineux (pessières) sur sols tourbeux	Abattage précoce		1679 ha	2250 €/ha (classes 1 à 4) ou 1800 €/ha (classes 5 et 6)	45 %	5 164 000 €
Résineux (pessières) sur sols paratourbeux	Abattage précoce		1222 ha	2250 €/ha (classes 1 à 4) ou 1800 €/ha (classes 5 et 6)	45 %	4 538 000 €
	Abandon au TE		407 ha			
Résineux (pessières) sur sols alluviaux	Abandon au TE		1625 ha	2250 €/ha (classes 1 à 4) ou 1800 €/ha (classes 5 et 6)	0 %	2 108 000 €
Résineux (pessières) sur argile blanche	Abandon au TE		875 ha	2250 €/ha (classes 1 à 4) ou 1800 €/ha (classes 5 et 6)	14 %	12 590 000 €
	Abattage précoce		1750 ha			
	Pas de contrainte		875 ha	/	/	0 €
Forêts exotiques	Perte de jouissance du fonds à ne pas indemniser		2157 ha	2250 €/ha (classes 1 à 4) ou 1800 €/ha (classes 5 et 6)	24 %	2.331.000 € à 3.640.000 €
					Total:	36.508.500 à 40.277.500 €

3.4.2. The secondary sector: manufacture, transformation (use of resources, pollution)

Some costs will certainly be supported for this type of activities but up till now, no study has been made. It will probably be easier to make an assessment when we will be further in the project.

3.4.3. The tertiary sector (tourism, education, socio-cultural values)

Some costs will certainly be supported for this type of activities but up till now, no study has been made. It will probably be easier to make an assessment when we will be further in the project.

3.4.4. The consumers, tourists, landowners and hunters

In this section we will present some costs supported by people on a local view.

3.4.4.1. The hunters

For the years 2002-2003 there were 15 772 hunting permits for the Walloon Region and 2200 societies of hunting (Delwasse, 2004).

Doesn't hunt who wants!! The costs beared by the hunters are of two types: the occasional expenses and the recurrent ones.

We can see below a summary (Table 12) of the different recurrent expenses and a table with the economic impact of hunting in the Walloon Region is given in Appendix 13.

Table 11: summary of the different recurrent expenses. Source: Delwasse, 2004, p. 52.

Dépenses	**Proportion des chasseurs concernés**	**Budget annuel moyen (italique = budget median)**
Assurance RC "chasseur"	10-0 %	€ 5-0
Permis de chasse + taxe provinciale	10-0 %	€ 245,41
Participation dans une (des) société(s) de chasse	76,00 %	€ 2 70-0
« Chapeau » Munitions	10-0 % 10-0 %	€ 70-0 € 20-0
Entretien des armes	52,00 %	€ 14-0
Equipement vestimentaire Accessoires	10-0 % 10-0 %	€ 25-0 € 10-0
Carburant	10-0 %	€ 499,35
Chiens	49,00 %	€ 631,44
Hôtel Restaurant	31,11 %	€ 697,42 € 654,61
Vin et autres boissons	56,44 %	€ 458,83
Cadeaux Participation dans une (des) associations	56,82 % 80,89 %	€ 256,35 € 107,14
Livres et magazines	80,89 %	€ 124,94
Tir aux clays	33,78 %	€ 20-0
Chasse à l'étranger	51,00 %	?
Budget moyen total = pondéré par la proportion de chasseurs concernés par chaque poste de dépenses		€ 5 856,12
Budget moyen minimum = uniquement les dépenses exposées par tous les chasseurs		€ 2 044,76
Budget moyen maximum = toutes les dépenses		€ 8 015,49

We will see now what can change with the application of Natura 2000 and for what we have to pay attention.

The fragmentation of the territory and isolation of zones of huge ecological value are negative factors for the preservation of biodiversity. We can present the situation from two points of view. The hunters may be in favour of network and the absence of ecological network may be harmful.

The effects of the improvement of the ecological network will be double in fact. It permits to some endangered species (partridge, quail or hare) to find again a place in regions that

were favourable at the departure. Secondly, it allows raising the size of biotopes and populations of game species that are still present.

Conversely, the first bad impact of the absence of a network is the disappearance of a certain number of species. Secondly, the absence of network has the consequence that the hunters have to feed animals and that for two reasons:

- Complete the deficient alimentation of animals
- Move away the game from culture.

As we can see there are no ecological obstacles to improve an ecological network from a hunters' point of view. Nevertheless, there are some economical obstacles which can be easily overtaken with regional aids and agro-environmental bonus (bonus can cover the loss of productivity).

Hunters consider two other types of obstacles: practical obstacles and esthetical obstacle.

- *From the practical point of view* the best situation is the one where the hunter is the owner and the farmer of his hunting territory. If the hunter is not the owner of the territory on which he is the holder of the hunting right, he does not have a lot of means of pressure on the owner to make some works for the improvement of the network. The hunter has to convince the owner of the legitimacy of such things and that he will make the maintenance himself afterwards. We can see that it is better to be the owner of the territory to facilitate the implementation of the ecological network. Secondly, it is easier to adjust the territory if we are the farmer. If the farmer is himself hunter, he will have the willingness to make things right and the troubles caused by this will be more easily accepted. If the hunter is not the farmer it is impossible for him to make any transformations without the agreement of the farmer. The best situation is the one where the hunter is the owner who manages the territory. After that remains the question of who will be responsible of the maintenance of installations.
- *From an esthetical point of view* late mowing of roadside, hedges or maintenance of embankment can make problem. Some people prefer spaces well mowed than a lot of wild and untidy flowers. These kinds of practice are harmful for game. But it is certainly less important and it can be easily overcome.

To conclude this point we can say that a raise in the game population can lead to bigger economical impacts. Nevertheless hunting territory would not be bigger.

3.4.4.2. Tourists & consumers

Tourism will probably be touched by the implementation of Natura 2000. Costs are difficult to assess and up till now no study has been made.

Moreover, all economic actors surrounding consumers and tourists[175] will undergo some costs that will have impact on the well-being of the latter.

3.4.4.3. Landowners

See part "Loss of real estate"

3.4.5. Loss of real estate

In 2005, a student (F. Loozen[176]) made her dissertation on Natura 2000, in parallel with the ECONET project. Some observations were made by her about the loss of real estate.

The optimal scenario proposed by the ecologists planned, for Wallonia, the transformation of some agricultural lands into meadows. For the sample study site (zone of Nivelles), the economists evaluated the land area that underwent an assignment change with respect to the spatial zoning plan ("plan de secteur") as 5-8 ha. It appeared that the real estate values for these two categories of sites are different. From the information in 2003[177] concerning the property sales in Belgium, the mean price of an agricultural land was 1,64 €/m², while the mean price for a meadow was 1,44 €/m². From then on, the difference of real estate value

[175] See the system analysis to know the different actors involved.

[176] LOOZEN F., *Impacts de la mise en place des réseaux écologiques sur un acteur cible : les agriculteurs*, Louvain-la-Neuve, 2005 (mémoire de licence, inédit).

[177] Service Public Fédéral Economie, Direction Générale Statistique et Information Economique: http://statbel.fgov.be/pub/d4/p440y2003_fr.pdf

could be estimated to 0,2 €/m², that is 2000 €/ha. However, with the data for the zone of Nivelles, the mean sale value of an agricultural land was 1,89 €/m² and 1,80 €/m² for meadows. The proposed change by the ecologists lead from then on to costs of -9 €/m², that is 900 €/ha. On an area of 5-8 ha, the total cost would be of 900 €*5-8 = 45 072 €. We should be careful that this cost has to be distributed between several farmers.

At the same time (year 2004-2005), the student asked to some farmers the question about the loss of value of the real estate for lands situated on Natura 2000 sites. The answer is reported in Appendix 14. For the moment, we cannot say anything more but a study was initiated, in which we asked the opinion of some representative lawyers from the Walloon Region. The results could be discussed later and analyzed by the sociologic team.

4. Practice

4.1. Articulation and coordination with other policies

4.1.1. Les principles

4.1.1.1. The integration principle

Registered in several international, Community or national texts, the principle of integration constitutes the principal legal basis of the obligation of the States to hold account of biodiversity in their space planning.

The declaration of Stockolm precise in the 13th principle that "*In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and coordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve environment for the benefit of their population*". [178]

In Community legislation, it is new article 6 of the treaty that gives to him the character of general principle of Community legislation by prescribing that "*Environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities referred to in Article 3, in particular with a view to promoting sustainable development.*"[179]

In national law, the legislation relating to the environmental impact assessment is generally presented like the mechanism of integration par excellence. And the Walloon decree of 27 May 2004 relating to the Book 1st of the Code of the Environment lays out in its D.2 article that "*the requirements {of safeguard and environmental protection} are integrated in the definition and the implementation of the other policies of the area*".

Concretely, the obligation of integration aims at the whole of the policies, strategies, actions and plans carried out by an authority. The regional legislations codifying the right of the environment (Flemish and Walloon Regions) stipulate indeed that the principle of integration aims the "*policies of the Region*"[180].

This integration must be carried out *at each stage of the « development process »* (Principle 4 of the declaration of Rio) or the "*national decision-making*" (art.10. a. of the CBD). The Community legislation is more precise: integration must have place on the level of the definition and the implementation of the Community policies and activities (Article 6 EC). Lastly, integration must be respected by all the competent authorities with one of the above mentioned stages of the decision-making process. No level of power - executive, legislative, legal - escapes from the obligation to integrate the environment, as well on the horizontal level as vertical.

With regard to the implementation of the principle, the authors agree to deduce from the principle of integration the obligation for the States to put all the means necessary so that the requirements of environmental protection are taken into account in an effective way through sectoral policies.

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[178] Principe 4 of the Rio declaration states that « *In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.* ». Article 10, a, of the CBD states that « *Each Contracting Party shall, as far as possible and as appropriate: (a) Integrate consideration of the conservation and sustainable use of biological resources into national decision-making;* » (see also art. 6, b).

[179] On the jurisprudential level, the Court of Justice based, implicitly or explicitly, on the principle of integration, to recognize the possibility for the Community institutions of adopting measures having partially milked with the environment on a provision other than the article 175 CE. See CJCE, 29 mars 1990, aff. C-62/88, *Grèce c. Conseil*; 24 novembre 1993, aff. C-405/92, *Mondiet* (pêche maritime); 19 septembre 2002, aff. C-366/00, *Huber* (mesures agri-environnementales).

[180] Art. D.2, al. 3, du Livre Ier du Code de l'environnement ; art. 1.2.1, § 3, du décret du 5 avril 1995 contenant des dispositions générales concernant la politique de l'environnement.

In practice, one can affirm that the principle of integration contains two obligations of procedural nature at least:

- *to identify and assess the environmental impacts of the decisions concerned and to evaluate the extent to which they can compromise the achievement of the environmental objectives*. This double evaluation is done mainly by mechanisms of impact assessment of the policies, plans, programs and projects. It results from this a corollary obligation from motivation of the decisions taken with the glance of the incidences, in the body of the decision or the administrative file which accompanies it[181] ;
- to make so that, formally, *the environmental and socio-economic interests* are duly and equitably represented in the decision-making process specific to the sectoral policy concerned[182]. Even if a broad capacity of appreciation is left in the States to adapt this process, integration seems to necessarily have to take place:
    - on the one hand, by the establishment of *procedures of public participation* and/or *consultation of expert authorities as regards environment*;
    - on the other hand, by the adoption of mechanisms of *articulation* and *coordination of the decisions* at the same time vertical - i.e. between all the levels of capacity concerned - and horizontal - between the qualified administrations for each sector concerned, including the environmental protection. These mechanisms are very diverse. One distinguishes mainly:
        - mechanisms of *sectoral and intersector planning* (being used as reference common to the various administrations);
        - mechanisms of *articulation between decisions* (hierarchy of the standards, formal obligation of taking into account of the other decisions, etc.) ;
        - procedural mechanisms of *setting in conformity of the contradictory decisions*;
        - mechanisms of impact assessment;
        - *institutional mechanisms of coordination, co-operation and consultation;*
        - the *fusion of the instruments*[183].

In this direction, integration is initially *procedural and institutional*. But ultimately, the rigour of the measures adopted by the State within the framework of its policy of environmental integration *will rise initially from the obligatory function and ambitious of the environmental standards which must be the subject of an integration and not of the principle of integration itself.*

As regards must thus be integrated:

- all standards of environmental, ecological or landscape quality applicable in a site or a given landscape[184]. These standards of quality define a state of the environment or landscape which it is important to maintain or restore by directing the decision-making in all the activities sectors so that, individually or cumulatively, the decisions taken do not compromise the realization of these standards of quality;
- all standards of protection applicable to an element of biodiversity. In part the provisions of protection of the animal and vegetable species[185] as well as the regime

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[181] In the sense of an obligation of motivation, de SADELEER, 1999, p. 283.

[182] In this senss, see article 13.2 of the Draft Convention IUCN, stating that "*the Parties shall ensure that environmental conservation is treated as an integral part of the planning and implementing activities at all stages and at all levels, giving full and equal consideration to environmental, economic, social and cultural factors*". See also in community law, WASMEIER, 2001, p. 162 ; ALVES, 2003, p. 139.

[183] See as regards ecological zone, the inventory of the mechanisms of articulation in Walloon law established in JADOT, 2002.

[184] For exemple : qualitative aims of water surface fixed by the Walloon Government under the terms of art. D.156, § 1er, du Code de l'eau ou des objectifs de gestion active fixés dans les arrêtés de désignation des sites Natura 2000 (n° XXX).

[185] See in Walloon Region art. 2 et s. de la loi du 12 juillet 1973 sur la conservation de la nature.

applicable to all the zones protected under the terms of the legislation on the nature conservation, the water or the protection of the real inheritance.

4.1.1.2. Principle of articulation with orther legislations

There are number of landuses. And as much legislations which govern them. The law on the nature conservation is not indeed the only one to apply to the natural or semi-natural environments. Several administrative policies of planning or protection coexist thus on the same territories, in a way more or less coordinated by the legislator himself or general principles[186]. We synthesize the general principles organizing the interactions between legislation when there is no specific mechanism.

4.1.1.2.1. Hierarchy of the standards

Belgian legal scheduling is structured around a basic rule founded by our Constitution:

- any standard have to respect the Constitution
- any act with guiding value (for example a plan of sector) have to respect the laws and decrees (Article 159 of the Constitution)
- any decision of individual nature (for example a licence) must comply with the higher rules: laws, decrees and lawful acts, including when the individual act and the payment are founded on distinct legislations. [187]

4.1.1.2.2. Independence of administrative policies

In the absence of hierarchical relationship between the applicable legislations, jurisprudence devoted the principle of the absence of preeminence of one or the other of the legislations, each one remaining autonomous. [188] An authority can thus subject a land to a mode of zoning without being, in theory, braked neither by the existence nor by the application of another legislation. [189]

In theory thus, an authority could for example create a protected zone without taking account of the regulations already in force on the site, or adopting a plan without holding account of an existing protected zone. The specific temperaments and mechanisms make rather theoretical these two assumptions.

4.1.1.2.3. Administrative policies addition

From the point of view of management, all the constraints envisaged by the various legislations applicable to the site must be respected simultaneously. Concerning the protected zones, when two modes of zoning apply[190], they will be appropriate to respect the strictest mode of protection. If the obligations of the two modes are of the same hierarchical level, one will make a cumulated application of both. In the event of contradiction, it will be according to us necessary to revise one of the two modes. [191]

4.1.1.2.4. Temperaments

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[186] B. JADOT, « Mise en place du zonage écologique et coexistence de législations distinctes », in CEDRE, *Le zonage écologique*, actes du colloque de Gembloux du 29 mars 2001, Bruxelles, Bruylant, pp. 205 et s.
[187] On the difficulties in determining if act has an individual or lawful value, see B. JADOT, *op. cit*., pp. 212-215.
[188] C.E., 8 février 1974, n° 16.236, *Huriaux-Ponselet*.
[189] B. JADOT, *op. cit*., p. 207.
[190] Voyez C.E., 8 octobre 1993, n° 44.405, *SA Charbonnages du Bois-le-Duc* ; C.E., 27 novembre 1992, n° 41.210, *Van Der Linden d'Hooghvoorst et crts*.
[191] C.-H. BORN, *Guide juridique…, op. cit*., p. 45.

Several mechanisms, problems or principle come to moderate these general principles which one saw that the application was not always more obvious.

CONSTRAINING VS INDICATIVE

In the event of conflict between documents having indicative value and the acts in constraining matter, the latter carry it. The difference between the two decisions must however adequately be justified.

POSTÉRIOR DÉCISION

A posterior decision can implicitly repeal for the future a former decision of the same hierarchical or lower level. The cases of application can however only be rather rare. Indeed, it is necessary on the one hand that no mechanism of abrogation clarifies former decision exists and on the other hand the forms and procedures observed to allot the initial statute must be applied at the time of implicit abrogation. [192]

ASSET RIGTHS, LICENCE RÉVISION AND WITHDRAWAL

The question of the acquired rights occurs when a preexistent individual decision is contradictory and handing-over of cause by a mode of protection worked out subsequently and unilaterally by the Government.

On this assumption, the Council of State and the Supreme court of appeal present an opposite jurisprudence. The Council of State[193] devotes the principle of the intangibility of the individual situations and estimates that the individual authorizations remain and can be implemented. The Supreme court of appeal[194] judges for its part that the decree or the law, even posterior, applies and can prohibit the implementation of a licence.

In any event, the legislator can envisage specific mechanisms allowing, in certain circumstances, the revision or the abrogation of a validly delivered licence. He can also envisage mechanisms of transitory right. [195]

4.1.2. L'articulation et la coordination avec les autres politiques

4.1.2.1. Aménagement du territoire et permis d'environnement

Nous avons mentionné plus haut les principes qui régissent l'articulation de polices administratives. L'aménagement du territoire est le lieu où ces principes trouvent particulièrement application. Nous décrivons ici ces applications ainsi que les mécanismes spécifiques mis en œuvre par le droit de l'aménagement du territoire et le droit de l'environnement.

4.1.2.1.1. Zone de protection et plan

LE PLAN PRECEDE LE REGIME DE PROTECTION DE LA ZONE

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[192] B. JADOT, *op. cit*., pp. 216-218.

[193] C.E., 31 mai 1995, n° 53.462, *Longrie* ; C.E., 5 juin 2000, n° 87.749, *Van Geet*. (Ph. BOUVIER, *Eléments de droit administratif*, Bruxelles, De Boeck Universités, 2002, p. 112). Several time, the Council of State considered that a decree of classification like site does not make obstacle with the execution of a licence build delivered before, voy. C.E., 25 février 1992, n° 38.820, *SA Ismay* ; C.E., 30 avril 1992, n° 39.263 et 29 octobre 1992, n° 40.885, *asbl Croix-Rouge de Belgique et SA Hotel Clingendael Waldorf*.

[194] Cass., 5 octobre 1995, *Pas.*, I, p. 894 ; Cass., 11 juin 1998, *Arr. Cass.*, 1998, p. 669 ; *R.W.* 1998-1999, p. 406. See also in this sense, Corr. Louvain, 23 décembre 1974, *R.W.*, 1974-1975, col. 2145, note L.P.S. ; Cass., 1e février 1977, *Pas.,* 1977, I, p. 591 ; Cass. Ch. réunies, 19 mars 1980, *Arr. cass.*, 1979-1980, p. 894, concl. LIEKENDAEL; *Pas.*, 1980, I, p. 885.

[195] In Walloon Region for permis d'urbanisme, see art. 245, 2° du CWATUP ; for permis de lotir, art. 54, 1° du CWATUP ; for permis d'environnement ou unique, art. 65 du décret du 11/03/1999 et 132bis du CWATUP.

Les prescriptions des plans d'aménagement ont valeur réglementaire. Si l'acte créant la zone protégée a valeur individuelle, elle doit respecter celles-ci. Ceci ne s'oppose pas à la création d'une zone protégée dans une zone destinée à l'urbanisation, si ce nouveau statut n'empêche pas radicalement la réalisation de la destination de la zone.[196]

Exemple : la création d'une réserve naturelle agréée dans une zone agricole n'est pas exclue pour autant qu'elle ne s'oppose pas à tout type d'agriculture dans la périmètre protégé.

Si la décision de protection a valeur réglementaire, la règle du cumul s'applique au profit du régime le plus strict.

Exemple : la désignation d'un site Natura 2000 dans une zone de loisirs. Les actes et travaux autorisables ne pourront qu'être ceux qui respectent le dénominateur commun entre l'arrêté Natura 2000 et le plan de secteur.[197]

Notez que pour les sites Natura 2000, la loi sur la conservation de la nature (art. 29, §2) prévoit un régime spécifique de concertation entre les administrations en cas d'incompatibilité entre les dispositions à valeur réglementaire d'un arrêté de désignation et celles d'un plan d'aménagement en vigueur.

LA PROTECTION DE LA ZONE PRECEDE L'ADOPTION DU PLAN

L'élaboration des plans de secteur doit se fonder sur une analyse de la situation existante de droit et de fait, y compris donc les zones protégées. L'autorité qui adopte le plan doit donc motiver sa décision au regard de cette situation existante.

En ce qui concerne l'articulation des deux polices, on appliquera les principes généraux, si la destination de la zone inscrite au plan est compatible avec le régime de protection existant, les deux régimes se cumulent. Si le nouveau zonage est incompatible avec la protection de la zone, il ne pourra entraîner la suppression de la zone protégée que pour autant que la procédure à suivre pour la suppression de cette zone ait été respectée.

Exemple : l'inscription du tracé d'une voie de communication ou d'une nouvelle zone d'activité économique dans le périmètre d'une réserve existante ne pourra se faire qu'après la suppression de la réserve suivant la procédure de sa création.

En principe, l'évaluation des incidences des plans et des schémas d'aménagement du territoire devrait permettre d'éviter au maximum les incompatibilités.

A ce titre, le CWATUP stipule qu'une étude d'incidences doit être réalisée lors de toute adoption ou révision d'un plan de secteur ou d'un plan communal d'aménagement[198] (art. 42, al. 2, 46, § 1, al. 1, 50, § 2, al. 1 et 53).

S'agissant des aspects relatifs aux zones protégées, l'étude doit comprendre au minimum :

- une analyse des *« problèmes environnementaux liés à l'avant-projet de plan de secteur [plan communal d'aménagement] qui concernent les zones revêtant une importance particulière pour l'environnement telles que celles désignées conformément aux directives 79/409/CEE et 92/43/CEE* ». Ceci vaut pour toutes les zones protégées, y compris les sites Natura 2000, même si ceux-ci sont situés en dehors de l'aire couverte par le plan.
- Les objectifs de la protection de l'environnement pertinents et la manière dont ils sont pris en considération dans le cadre de l'élaboration du plan
- Les incidences non négligeables probables (effets secondaires, cumulatifs, synergiques, à court, à moyen et à long terme, permanents, temporaires tant positifs que négatifs sur l'environnement, y compris entre autres la diversité biologique, la faune, la flore, les sols, les eaux, les paysages et les interactions entre ces facteurs)
- Les mesures à mettre en œuvre pour éviter, réduire ou compenser les effets négatifs précités

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[196] C.-H. BORN, *Guide juridique…, op. cit*., p. 49.

[197] F. HAUMONT, « La protection des sites en Région wallonne », in COLL., *Natura 2000 et le droit, Aspects juridiques de la sélection et de la conservation des sites Natura 2000 en Belgique et en France*, actes du colloque de Louvain-la-Neuve du 26 septembre 2002, Bruxelles, Bruylant, 2004, p. 324.

[198] En principe, la révision d'un plan de secteur, ainsi que l'adoption ou la révision d'un plan communal d'aménagement sont dispensées, respectivement par le Gouvernement ou par le conseil communal, de faire réaliser l'étude d'incidences si ces plans projetés ne sont pas « *susceptibles d'avoir des incidences non négligeables sur l'environnement* ». Toutefois, est présumé avoir des incidences non négligeables sur l'environnement le plan projeté « *dans le périmètre duquel se situe une zone désignée conformément aux directives 79/409/CEE et 92/43/CEE* » (c'est-à-dire un site Natura 2000) (art. 46, § 2, al. 1 et 3, et 50, § 2, al. 4 et 5, du CWATUP).

- La présentation des alternatives possibles et de leur justification.

Le CWATUP exige par ailleurs un rapport sur les incidences environnementales lors de l'adoption ou la révision du schéma de développement de l'espace régional et des schémas de structure communaux (art. 14, § 1, al. 2, et 17, § 1, al. 2, et 18, al. 2 et s. du CWATUP, non encore entrés en vigueur ; art. 15 et 18, al. 1, du CWATUP). Son contenu est le même que pour l'étude d'incidences des plans.

4.1.2.1.2. Zone de protection et permis

LE PERMIS PRECEDE LE REGIME DE PROTECTION DE LA ZONE

Voyez 3.1.2.4.

LA PROTECTION DE LA ZONE PRECEDE L'OCTROI DU PERMIS

En application du principe de hiérarchie des normes, toute autorité statuant sur une demande de permis, décision individuelle, est tenue de respecter les dispositions légales et réglementaires existante.

Des mécanismes de consultation de certaines administrations permettent d'étoffer la protection.[199]

En outre, les demandes de permis doivent être accompagnées d'une évaluation des incidences sur l'environnement qui permettra à l'autorité de prendre sa décision en toute connaissance de cause et de la motiver.

S'agissant des aspects relatifs aux zones protégées[200] :

- Pour les projets soumis à permis d'environnement/unique, le formulaire de demande, qui vaut notice d'évaluation des incidences, comprend un volet Natura 2000 qui doit obligatoirement être rempli. Le formulaire de demande de permis unique impose en outre de relever la présence de biens classés et de zones écologiquement sensibles, et d'évaluer l'impact sur les habitats sensibles et sur le réseau écologique.
- Pour les projets soumis à notice d'évaluation des incidences (permis d'urbanisme, de lotir, etc.), celle-ci doit indiquer la présence de zones protégées et, pour certaines, évaluer leur qualité biologique, évaluer la compatibilité du projet avec leur régime, et décrire les mesures palliatives le cas échéant.
- Pour les projets soumis à étude d'incidences, celle-ci doit décrire le milieu biologique, évaluer l'impact sur celui-ci, ainsi que sur les réserves naturelles et forestières et sur les sites Natura 2000, esquisser les solutions alternatives et décrire les mesures palliatives le cas échéant.

Sous réserves des conditions liées à l'application du régime de protection des sites Natura 2000 développées dans un point précédent, l'autorité n'est cependant pas formellement liée par les conclusions (mêmes négatives) de l'évaluation des incidences, pour autant qu'elle motive adéquatement le permis au regard des incidences sur l'environnement et des objectifs du Code de l'environnement.

Dans le cadre des permis d'environnement et unique, l'imposition de conditions sectorielles et particulières[201] permet de réduire voire de supprimer les risques d'impacts sur les zones protégées. L'article 123 du CWATUP permet également l'imposition de conditions au permis d'urbanisme, sur avis du fonctionnaire délégué.

Enfin, le CWATUP prévoit des règles spécifiques, pour la zone forestière et la zone agricole au plan de secteur, qui doivent être respectées par l'autorité compétente lorsqu'elle délivre un permis. En particulier, il est prévu expressément que la préservation des caractéristiques d'un « *site voisin reconnu sur pied de la loi* » du 12/7/1973 « *ou des directives 79/409/CEE Oiseaux et 92/43/CEE Habitats* » (site Natura 2000) ne peut être mise en péril par la délivrance :

- en *zone agricole*, d'un permis d'urbanisme relatif au boisement, à la culture intensive d'essences forestières, à la pisciculture, aux refuges de pêche et aux activités récréatives de plein air ainsi qu'aux actes travaux qui s'y rapportent (art. 452/35, al. 2, du CWATUP)
- en *zone forestière*, d'un permis d'urbanisme relatif aux constructions indispensables à la surveillance des bois, à leur exploitation et à la première transformation du bois,

[199] Voyez C.-H. BORN, *Guide juridique…, op. cit*., p. 52 et 56-58.
[200] Pour le détail, voyez C.-H. BORN, *Guide juridique…, op. cit*., pp. 62-70.
[201] Art. 2 al. 4 ; 4, al. 1 ; 4 et 5, §2 ; 6 et 7, §2 du décret du 11 mars 1999.

à la pisciculture et aux refuges de chasse et de pêche (art. 452/42, al. 2, du CWATUP).

4.1.2.2. Eau

S'appliquant tant aux eaux intérieures de surface qu'aux eaux de transition, aux eaux côtières et aux eaux souterraines, la directive 2000/60/CE du Parlement européen et du Conseil du 23 octobre 2000 établissant un cadre pour une politique communautaire dans le domaine de l'eau[202] (ci-après directive cadre sur l'eau) vise à établir un cadre de protection qui « prévienne toute dégradation supplémentaire, préserve et améliore l'état des écosystèmes aquatiques ainsi que, en ce qui concerne leur besoin en eau, des écosystèmes terrestres et les zones humides qui en dépendent directement » (article 1, a).

L'un des éléments les plus remarquables de la directive-cadre[203] consiste dans l'obligation de conservation des écosystèmes aquatiques qu'elle prescrit aux Etats membres. D'une part, ceux-ci sont tenus de prévenir la détérioration de l'état de toutes les « masses d'eau » de surface – sauf exception prévue par la directive. D'autre part, ils doivent protéger, améliorer et restaurer toutes les masses d'eau de surface en vue d'atteindre un bon état chimique et écologique de l'eau au plus tard en 2015, sous réserve d'une série d'exceptions et sauf report des obligations prévues par la directive[204] [205].

De façon remarquable, la *directive-cadre sur l'eau* oblige les Etats membres à établir un système global de planification stratégique de la gestion intégrée des ressources en eaux de surface et souterraines, fondé sur une approche par bassin hydrographique à l'échelle du continent européen[206].

Tout le territoire européen se voit découpé, d'une part, en districts hydrographique – eux-mêmes le cas échéant divisés en sous-bassins hydrographiques – et, d'autre part, en « masses d'eaux » de surface et souterraines. C'est donc un véritable système de planification spatiale de la gestion et de la protection des ressources en eau que met en place la directive-cadre sur l'eau. La caractéristique de cette planification spatiale est d'être, d'une part, obligatoire et, d'autre part, de reposer sur des critères scientifiques.

Un *plan de gestion du district hydrographique* (article 13) doit être adopté au plus tard pour 2009. Il comporte une série d'éléments descriptifs[207], prescriptifs[208] et programmatiques[209]. C'est par le biais des *programmes de mesures* par bassin ou sous-bassin que les Etats membres devront définir les moyens concrets qu'ils mettront en œuvre pour atteindre les objectifs environnementaux de la directive (article 11)[210].

Le mécanisme instauré par la directive-cadre établit les bases d'une véritable « approche écosystémique » de la gestion des ressources en eau[211].

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[202] *J.O.C.E.*, n° L327, 22.12.2000. Sur la directive-cadre sur l'eau, voy. DROBENKO, 2000 ; GRIMEAUD, 2001 ; LEPRINCE, 2001 ; VANDERSTRAETEN, 2002 ; NAIM-GESBERT, 2002 ; GRIMEAUD, 2004 ; NEURAY, J.-F., 2005.

[203] NAIM-GESBERT, 2002, p. 14.

[204] Article 4, § 1er, a, i et ii, et § 7 de la directive-cadre.

[205] Le concept de bon état écologique de l'eau se définit par rapport à des paramètres non seulement physico-chimiques mais aussi biologiques et hydromorphologiques, englobant ainsi les principales composantes de l'écosystème aquatique. Le bon état écologique est atteint lorsqu'il présente « *de faibles niveaux de distorsion résultant de l'activité humaine* » qui « *ne s'écartent que légèrement* » du « *très bon état écologique* » (voy. le tableau 1.2. de l'annexe V). Le très bon état écologique est un état de référence défini par les scientifiques et qui correspond approximativement à l'état du cours d'eau, du lac ou des eaux côtières en conditions quasi naturelles.

[206] Sur la gestion par bassin hydrographique, voyez LEPRINCE et PAQUES, 2002.

[207] Le plan doit comporter une description générale des caractéristiques du district hydrographique, incluant notamment la description et la cartographie des masses d'eaux concernées dans le bassin sur la base d'une classification scientifique ; un résumé des pressions et incidences importantes de l'activité humaine sur l'état des eaux de surface et des eaux souterraines ; l'identification et la représentation cartographique des zones protégées (annexe VII, points 1 à 3).

[208] Le plan indique la liste des objectifs environnementaux fixés au titre de l'article 4 pour les eaux de surface, les eaux souterraines et les zones protégées, y compris, en particulier, l'identification des cas où des exemptions ou dérogations ou report dans le temps sont prévus (point 5).

[209] La plan indique un résumé du ou des programmes de mesures adoptés au titre de l'article 11, notamment la manière dont ils sont censés réaliser les objectifs fixés en vertu de l'article 4 (point 7).

[210] Chaque programme de mesures comprend les « mesures de base » et, si nécessaire, des « mesures complémentaires ».

[211] En ce sens DROBENKO, 2000, p. 388.

Ainsi, les plans sont spatialement élaborés sur une base scientifique et « écosystémique », à savoir le bassin hydrographique.

D'autre part, un mécanisme de réactualisation tous les six ans du plan de gestion et des programmes de mesures, sur la base d'une évaluation *ex post* et des programmes de surveillance de l'état des masses d'eaux (article 11.8 et 13.7 et annexe VII, B.2) concrétise la mise en œuvre d'une une gestion « adaptative » des ressources en eau en fonction des résultats obtenus lors du suivi.

Enfin, la directive-cadre prévoit d'importantes mesures en faveur d'une participation étendue du public au processus d'élaboration des plans de gestion de district hydrographique (article 14), le législateur ayant considéré que « *le succès de la [directive-cadre] requiert (…) l'information, la consultation et la participation du public, y compris des utilisateurs* »[212].

La directive-cadre constitue de surcroît un outil essentiel de mise en œuvre du réseau Natura 2000. Elle oblige en effet les Etats membres à intégrer les objectifs de conservation des sites Natura 2000 « aquatiques » parmi les objectifs environnementaux à atteindre à l'échelle du bassin hydrographique pour 2015[213]. Ceci permet d'améliorer l'efficacité des mesures de conservation prises dès lors qu'elles se fondent sur une approche par bassin versant et non sur une approche limitée au site à protéger. En outre, elle impose d'établir et de maintenir à jour un registre des zones protégées, et en particulier des sites Natura 2000. Les zones protégées doivent être cartographiées et inclues dans les plans de gestion hydrographiques. Enfin, le type et l'ampleur des pressions anthropogéniques importantes auxquelles les zones protégées sont soumises doivent être évaluées dans le cadre de l'étude d'incidences des activités humaines.[214]

4.1.2.3. Agriculture

Les interactions entre les activités agricoles et le réseau écologiques apparaissent principalement en ce qui concerne la préservation des prairies permanentes, de la qualité des cours d'eau ainsi que des éléments du maillage écologique. Il s'agit donc de contrôler les épandages d'engrais, l'utilisation de pesticides, le labour des prairies et les travaux sur les arbres et les haies.

En matière environnementale, les activités agricoles sont contrôlées via la nécessité d'obtenir des permis d'environnement ou d'urbanisme pour certaines installations ou activités, dont l'arrachage et la destruction de petits éléments du paysage, les rejets d'eaux usées ou les captages d'eau.[215]

On a rappelé plus haut que dans le domaine des autorisations d'environnement ou d'urbanisme, l'interaction avec le réseau Natura 2000 se fait via l'évaluation des incidences :

- pour les projets soumis à permis d'environnement/unique, le formulaire de demande, qui vaut notice d'évaluation des incidences, comprend un volet Natura 2000 qui doit obligatoirement être rempli. Le formulaire de demande de permis unique impose en outre de relever la présence de biens classés et de zones écologiquement sensibles, et d'évaluer l'impact sur les habitats sensibles et sur le réseau écologique ;
- pour les projets soumis à notice d'évaluation des incidences (permis d'urbanisme, de lotir, etc.), celle-ci doit indiquer la présence de zones protégées et, pour certaines, évaluer leur qualité biologique, évaluer la compatibilité du projet avec leur régime, et décrire les mesures palliatives le cas échéant ;
- pour les projets soumis à étude d'incidences, celle-ci doit décrire le milieu biologique, évaluer l'impact sur celui-ci, ainsi que sur les réserves naturelles et forestières et sur les sites Natura 2000, esquisser les solutions alternatives et décrire les mesures palliatives le cas échéant.

D'autres normes spécifiques s'adressent aux agriculteurs notamment en matière de pesticides ou de gestion durable de l'azote en agriculture. En dehors du Code de l'eau étudié supra, une loi du 11 juillet 1969 relative aux pesticides et aux matières premières pour

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[212] Considérant 14 du préambule.

[213] Elle exige des Etats membres de façon incontestablement impérative, qu'ils « *assurent le respect de toutes les normes et de tous les objectifs* » en ce qui concerne les zones protégées (lesquelles incluent les sites Natura 2000) endéans les quinze ans de l'entrée en vigueur de la directive *« sauf dispositions contraires dans la législation communautaire sur la base de laquelle les différentes zones protégées ont été établies »* (article 4.1, c).

[214] Commission européenne, « La nouvelle directive cadre de l'eau et ses implications pour Natura 2000 », Natura 2000, 14, avril 2001, Bruxelles.

[215] D. TYTECA, M. HERMY, G. MAHY, K. VERHEYEN, F. HAUMONT, *Feasibility of ecological networks : ecological, economic, social and legal aspects*, Brussels, Belgian science Policy, 2006, p. 47.

l'agriculture, l'horticulture, la sylviculture et l'élevage règle la matière. Elle est néanmoins trop peu restrictive que pour lutter efficacement contre les excès de pesticides[216] et ne prends pas en compte les exigences du réseau Natura 2000.

Particularité du milieu agricole, l'écoconditionnalité pourrait contribuer à y intégrer les préoccupations de conservation de la nature. Il s'agit d'un mécanisme en vertu duquel l'octroi d'un avantage est subordonné à l'observation de conditions environnementales déterminées. Sa force réside dans la nature économique de la sanction qu'il prévoit, à savoir la suppression dudit avantage.[217]

Depuis l'adoption du règlement 1782/2003, tout agriculteur percevant des paiements directs est tenu de respecter deux types d'exigences à caractère environnemental. D'une part les exigences réglementaires en matière de gestion telles que précisées à l'annexe III du règlement et d'autre part les bonnes conditions agricoles et environnementales telles que définies au niveau national ou régional par les Etats membres.

Si les directives Oiseaux et Habitats figurent à l'annexe III du règlement, en Région wallonne, la conditionnalité telle que définie l'article 7 de l'arrêté ministériel du 7 juillet 2006 portant application de la conditionnalité prévue par l'article 27 de l'arrêté du Gouvernement wallon du 23 février 2006 mettant en place les régimes de soutien direct dans le cadre de la politique agricole commune, de même que la « Note explicative du formulaire de déclaration de superficie » fournie aux agriculteurs ne reprennent que très partiellement les dispositions transposant ces directives. Seules six exigences y sont mentionnées, visant principalement les habitats. Il n'y figure notamment rien en ce qui concerne la protection des espèces sensibles, pas plus qu'une référence à l'interdiction générale de détériorer les habitats naturels et de perturber les espèces visées à l'article 28 de la loi sur la conservation de la nature.

Soulignons enfin qu'il existe un mécanisme d'aides spécifiquement destiné à l'environnement, il s'agit des mesures agri-environnementales inscrites dans le plan de développement rural cofinancé par l'Union européenne dans le cadre de la PAC. Ces aides pourraient être une des sources du financement de la gestion des sites Natura 2000.

Les primes agri-environnementales sont octroyées pour des engagements volontaires. Cela signifie concrètement que les primes ne pourront en aucun cas être attribuées pour le respect de dispositions imposant l'engagement en question

Un problème naît dès lors lorsqu'il s'agit de financer le coût de mesures préventives, c'est-à-dire des mesures de protection relatives aux habitats agricoles. Celles-ci sont en principe appelées à être imposées par la voie réglementaire, sous forme d'interdiction ou de soumission à autorisation. Or, il arrive souvent que les mesures préventives Natura 2000 constituent en même temps une ou plusieurs des conditions de la méthode agroenvironnementale, ce qui rend en principe leur octroi impossible pour les cofinancer, puisque leur mise en œuvre est imposée et non volontaire.

4.1.2.4. Sylviculture

En ce qui concerne les forêts, l'intégration de la biodivesrité passe principalement par des mesures telles que le maintien des peuplements feuillus indigènes, le développement d'îlots de sénescence, l'augmentation du volume de bois mort et la préservation de la quiétude. Actuellement, ces préoccupations ne sont que très peu prises en compte.

Le régime juridique de la gestion des bois et forêts en Région wallonne est principalement fonction de leur propriétaire. La plupart des bois appartenant à une personne de droit public est soumise au « régime forestier », régime de gestion particulier mis en œuvre par l'administration régionale via un plan d'exploitation, l' « aménagement forestier ». La forêt privée est gérée directement par le propriétaire dans le respect des règles édictées par le législateur et le Gouvernement, mais aucun plan de gestion n'est obligatoire.[218] En région wallonne, le Code forestier de 1854 reste d'application. Une profonde révision est actuellement en cours. En ce qui concerne la prise en compte de la biodiversité, les orientations sont les suivantes l'intégration de plusieurs mesures de police et de conservation des bois pour éviter toute dégradation écologique ou paysagère. Entre autre : limitation de la

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[216] Idem.

[217] N. de SADELEER, C-H. BORN, Le droit international et communautaire de la biodiversité, Paris, Dalloz, 2004, p. 646. Voyez les notes 70 et 71.

[218] D. TYTECA, M. HERMY, G. MAHY, K. VERHEYEN, F. HAUMONT, *Feasibility of ecological networks : ecological, economic, social and legal aspects*, Brussels, Belgian science Policy, 2006, p. 48.

surface des mises à blanc, adaptation des essences forestières aux conditions climatiques et pédologiques locales, limitation du drainage, modalités pour l'utilisation des amendements et des pesticides, interdiction de brûler des rémanents. En outre, le nouveau code réglementera de façon plus stricte la circulation en forêt ; il organise la procédure de constatation et de répressions des infractions, de même que la surveillance des propriétés privées par les agents de la Région wallonne. Enfin, en parallèle, la réforme prévoit l'exonération des droits de succession dus sur les forêts privées, l'objectif étant de favoriser le maintien des forêts et des arbres présentant un intérêt pour la gestion durable. Elle constituera, sans aucun doute, un incitant majeur à limiter les « mises à blanc » des parcelles boisées lors d'une succession.[219]

Signalons enfin que le Centre de Recherche de la Nature, des Forêts et du Bois et la Division Nature et Forêts de la Direction Générale des Ressources Naturelles et de l'Environnement ont réalisé un complément[220] à la circulaire 2619. Ce complément décrit les normes de gestion pour favoriser la biodiversité dans les bois soumis au régime forestier. Elle est de stricte application dans les forêts domaniales ; elle est proposée au travers des plans d'aménagement aux propriétaires publics non domaniaux.

[219] Note d'orientation relative à la modification du Code forestier présentée en Gouvernement wallon le 19 juillet 2007.
[220] http://environnement.wallonie.be/publi/dnf/normes.pdf

4.2. *Social analysis of the management of N 2000 sites*

4.2.1. Problem description: social aspects and processes in management of N-2000 sites

The basic question is which social and human related aspects play a role in the succeeding of the management of Natura 2000 sites on a local scale? Or, which social aspects are responsible for the difficulties in the process of implementation of Natura 2000 on the terrain? The social questions related to the management of biodiversity that shall be treated are the following:

- Which is the social situation on the terrain (actors, historic facts…) and what is the impact of the social situation for the succeeding of certain management measures?
- In which way and to which degree social processes like demographic changes, urbanization… plays a role in the succeeding of the management and does it differ between the Flemish and the Walloon region?
- Are there any differences in attitude and behavior between different groups, different degrees of involvement and co-responsibility?
- What are the power relations between the different actors? Does different parties have conflicting interests? Is there public support for management of the terrain? Are there any conflicts on the terrain?
- To which degree the principle of NIMBY (not in my backyard) occurs on the field?
- How is the management organized or how should it be organized from a social point of view?
- What is the support, co–responsibility for the management of Natura 2000 sites on a local scale and what is the form (co-operation in the management, impact on the implementation…)?
- What is the impact (the effects) of Natura 2000 on a local scale (actors – property situation)? On which time scale effects have to be expected? (Which effects?)
- Are there societal structures and systems like property rights, use rights, adapted local management?
- Are there much international pressure but little (national/local) political interest for nature conservation?

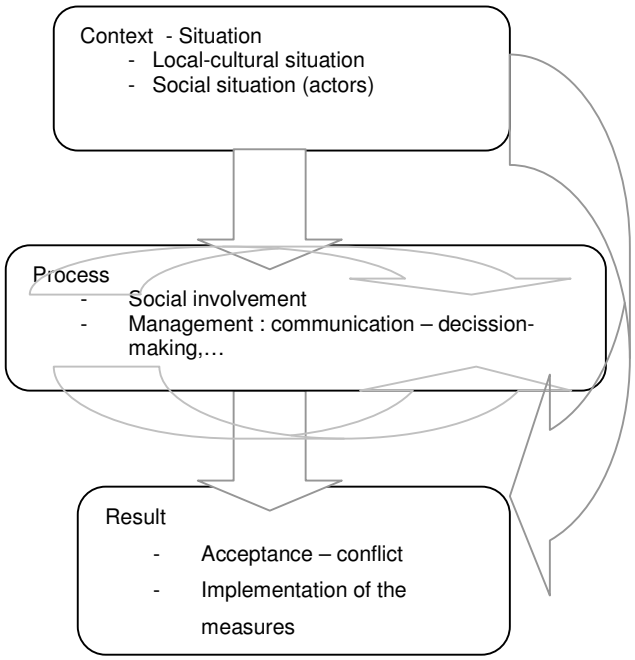
4.2.2. General overview of local aspects that influence the implementation of NATURA 2000

To answer the question why the implementation of Natura 2000 on the field doesn't work properly we have to look at several aspects. As well the context, as the processes, influence the process of implementing measures.

On the one hand we have to take the local context into account. This context is in the first place influenced by cultural, demographic and social factors. The implementation of measures always means a change of local context to a certain degree. This change can be accepted or can lead to a local conflict. The extend in which the measures are excepted will lead to a successful implementation of measures.

On the other hand we have to look at the processes, which play a role within this context. These are in the first place the social processes, which take place between the actors. Elements that shape these social processed are relational aspects, power balances, perception of each other… But also the process related to the measures and the management process, plays an important role for the implementation of measures. This process defines how measures arise, how decisions are made, how is communicated and how it can be better organized.

The different aspects are classified into three different groups: context, process and result. These aspects will be revieuwed one by one and examples will be discussed.



4.2.3. Local context

Category	Parameters
Social environment social situation	Diversity of local actors / groups lokale
	Level of education of the local population
	Employment
	Cohesion –individualism
	Open-Closed society
	Trust in the government
Environment N-2000 area Local – cultural context	Current use of the site
	Accesability of the site
	Ownership (sociale aspects)
	History – binding with the site – Area identity
	Local political context Political imbedding
	Other planning processes

4.2.3.1. Social environment

De implementatie van het Natura 2000 netwerk gebeurt niet alleen binnen een ecologische, economische en juridische context, maar eveneens binnen een sociale context waarin mensen leven, werken, recreëren en wonen. Deze mensen die samen de lokale bevolking vormen, bezitten bepaalde kenmerken die de lokale socio-economische context bepalen.

De samenstelling van de lokale bevolking en de heterogeniteit ervan kan worden uitgedrukt in de diversiteit aan actoren. We kunnen ervan uitgaan dat diverse actoren verschillende standpunten ten aanzien van natuur en natuurbeheer hebben.

De maatschappij is meer dan een verzameling van individuen, en een lokale gemeenschap is dit ook. Een lokale gemeenschap kan een zekere mate van cohesie of kan open of gesloten zijn en de lokale bevolking

De lokale socio-economische context wordt mede bepaald door het opleidingsniveau van de bevolking en de lokale werkgelegenheid. Deze factoren bepalen mee de financiële draagkracht van het gebied.

Voor de implementatie van een natuurgebied met een bepaald beheer is eveneens de houding van de burgers tegenover de overheid van belang.

Uit een onderzoek van Buijs & Volker (1997)221 dat het draagvlak van de Nederlandse bevolking voor natuur en natuurbeleid naging, komen een aantal interessante resultaten naar voor waarbij het draagvlakniveau wordt gekoppeld aan bepaalde bevolkingsgroepen.

Zo kan de bevolking ingedeeld worden in een viertal groepen wanneer naar hun mening wordt gevraag over het natuurbeleid:

- "Sympathisanten (46%): zij ondersteunen het natuurbeleid volledig, en willen vaak nog een stapje verder gaan. Deze groep bestaat vooral uit goed opgeleide stedelingen.
- Mensen die meer recreatieve natuur willen (25%): zij vinden natuur belangrijk, en willen vooral meer natuur voor de recreatie. Veel mensen uit deze groep zijn minder hoog opgeleid.
- Mensen die ene landbouwvriendelijker beleid willen (14%). Deze groep heeft de meeste kritiek op het huidige natuurbeleid. Zij willen minder aandacht voor natuur en meer aandacht voor landbouw. Een kwart van hen is potentiële actievoerder tegen natuurontwikkeling. Vooral boeren en ouderen hebben deze mening.
- Onverschilligen (14%): zij zijn niet geïnteresseerd in de natuur. Ze weten weinig over de natuur en gaan zelf ook weinig de natuur in." (Ibid).

Bewoners van stedelijke gebieden zeggen vaker dat er te weinig natuur in hun omgeving is. Vooral jongeren, maar ook hoger opgeleiden en mannen hebben behoefte aan meer natuur in de eigen woonomgeving.

De Nederlandse bevolking vindt het beschermen van zeldzame soorten en gebieden het belangrijkste doel van het natuurbeleid. Het omzetten van landbouwgrond in natuurgebieden zien zij als een belangrijke maatregel daarvoor. Vooral hoger opgeleiden zijn hier een voorstander van. Bewoners in het landelijk gebied kijken hier kritischer tegenaan, maar ook daar ondersteunt de meerderheid zulke maatregelen. Onteigening van grond als de landbouwer niet wil verkopen, kent weinig medestanders (10%).

Wanneer we bovenstaande onderzoeksresultaten van Buijs et al koppelen aan onze eigen persanalyse en de lezersprofielen, dan blijkt dat het grootste deel van de positieve berichtgeving rond het VEN, namelijk degene die verscheen in één van de drie nationale kranten, eigenlijk voor een groot deel verloren ging aan personen die reeds overtuigd waren van het nut van de implementatie van het VEN. Hun lezerspubliek bestaat immers uit een groot aantal hoogopgeleiden die dan ook nog eens in de meer stedelijke gebieden wonen. Dat is nu net de bevolkingsgroep die volgens de studie van Buijs et al het meeste draagvlak toont voor het natuurbeleid in Nederland. We nemen hierbij aan dat de resultaten ook transponeerbaar zijn naar Vlaanderen. Een groot deel van de negatieve berichtgeving kwam echter terecht bij net die mensen die in het algemeen al weigerachtig staan tegenover het natuurbeleid. Dit zorgde ervoor dat er een verdere dualisering kon optreden tussen voor- en tegenstanders van het VEN.

4.2.3.2. Environment N-2000 area

De locale context wordt niet alleen bepaald door mensen en de kenmerken van deze mensen, maar ook door de relatie van deze mensen met hun omgeving en deze omg

Huidig gebruik van het gebied

Toegankelijkheid van het gebied

221 Buijs, A.E. & Volker, C.M. (1997). *Publiek draagvlak voor natuur en natuurbeleid.* SC-DLO: Wageningen.

Eigendomssituatie

Identity of the area

In the course of their lives, people develop an intricate and rich cognitive structure that embodies their vision of what nature really is, and how it is related to humans. According to environmental philosophers such visions of nature can generally be classified along a continuum that ranges from anthropocentric to ecocentric. (Farmers and low-income groups have to be found to prefer managed natural landscapes with a high degree of human influence, while environmentalists and high-income groups have found to prefer unmanaged natural landscapes with a low degree of human influence (Van den Berg, 1999, images, values and landscape preference. Images of nature, environmental values and Landscape preference: exploring their interrelationships.

Political embedding

Protected areas and their management differ substantially in their autonomy vis-a-vis the political environment. Political autonomy here refers to the degree that a protected area management is the object of political interests and dependent on them. In a highly politicized environment, a protected area may frequently have to adapt to changing conditions. Generally, an enabling political environment is considered necessary for a protected area to function effectively and it can generally be contented that the more favorable the conditions within national and regional politics, the greater the protected areas autonomy, i.e. the lower the degree of its dependence on the political climate. (Stoll- Kleeman, 2006, p 20)

… The political area for protected areas is closely connected to other issues such as indigenous politics, rural development programmes, or industrial exploitation of natural resources. Together they may

Land use

Land ownership

Other planning processes

4.2.4. Process

Category	Parameters
Social process	Perception of actors of each other
	Differences between actors: Differences in attitude, perception, vision, power, complicity, responsability, interests…
	Mutual relations between actors: - Development of groupidentity? - Power relations between actors: do certain actors abuse their power?
	Sigmatization
	Ways of dealing with change in landuse, vieuw, identity…
	Co-responsability of citizens for nature. Development of public support for management and measures
Planning and organisational process	Participational character
	Complicity
	Expected role vs. effective role
	Way of decission taking
	Communication
	Organisation of the management
	Means
	Possible adaptation of social systems and structures

4.2.4.1. Social – relational process

Perceptions of actors of each other

Relations between actors

Power relations between actors

Differences between actors

Cultural drivers : ways of dealing with land use

Joined responsibiliy of citizens for nature/ Medeverantwoordelijkheid van burgers voor natuur

Betrokkenheid van burgers in het beheer van NATURA-2000 gebieden is een vorm van medeverantwoordelijkheid van burgers voor natuur.

We gaan even dieper in op het begrip medeverantwoordelijkheid. Er kunnen verschillende niveaus van medeverantwoordelijkheid onderscheiden worden. Medeverantwoordelijkheid kan gaan over het leveren van een financiële bijdrage voor natuur, maar kan ook gaan over stemgedrag, inspraak, directe verantwoordelijkheid voor een concreet plan of de inrichting of het beheer van het gebied. (Boek Medeverantwoordelijkheid voor natuur, p 57)

Er is een groot verschil tussen de natuuropvattingen die ten grondslag liggen aan het natuurbeleid en de bronnen voor individuele verantwoordelijkheid van burgers voor natuur. Het ecosysteemmodel dat ten grondslag ligt aan het beleid, is iets volledig abstracts en is een product van de wetenschap. Verantwoordelijkheid van burgers voor natuur komt daarentegen voort uit betekenissen die ontstaan in de alledaagse ervaringswereld van mensen. Men voelt meer voor de eigen tuin, de eigen kat,… dan voor een ecosysteem. De verantwoordelijkheid van burgers voor natuur is altijd gericht op iets concreets, terwijl het beleid en de wetenschap die eraan ten grondslag ligt abstract is. Het ecosysteemmodel is volledig theoretisch, terwijl handelingen van mensen juist erg praktisch zijn. Daarenboven willen burgers het resultaat van de eigen inzet direct aanschouwen. Het ecosysteemmodel, terwijl (50 boek).

De implementatie van beleid en management voor het behoud van biodiversiteit vergt verandering van bepaalde maatschappelijke systemen en structuren. Erg belangrijk is dat beleidsmakers niet vertrekken van de vraag ‘hoe kunnen we burgers bewegen tot het dragen van medeverantwoordelijkheid voor natuur?’ maar ‘Hoe kunnen bronnen van (bestaande) verantwoordelijkheid voor natuur worden aangegrepen in het bestaande natuurbeleid?’.
Mensen met andere natuuropvattingen dan deze van de overheid gaan immers niet vrijwillig meewerken aan het natuurbeleid. Indien het gewenst is dat particulieren – maatschappelijke groepen verantwoordelijkheid dragen (voor bepaalde) aspecten van het beleid, moet dit beleid aansluiten bij de opvattingen van deze particulieren.

Protected area management needs the support of the local and neighboring population. This requires a strong recognition of the diversity of views and interests involved and a disposition to follow the much more dynamic and hence less predictable road of collaborative management.

Meaningful involvement of local stakeholders towards the aim of increasing their commitment and ownership of the protected area implies that part of the decision-making power is indeed shared (Stoll-Kleeman, 2006).

The value that natural resource managers and the public place on biodiversity and related natural resources issues depend largely on the facts that exist within a specific context, the desired management objectives for a particular area, and the potential tradeoffs that must be considered for protecting biodiversity. A key question, then, is what does the public think,

know and understand about specific management methods that may have impacts on biodiversity (Bright, 2005).

4.2.4.2. Plan- and organizational process

Participation in biodiversity management / Participatie in biodiversiteitsmanagement

Effectief biodiversiteitsmanagement en ecosysteembeheer moet in staat zijn een antwoord te bieden aan een groot aantal veranderingen: demografische veranderingen, fysische veranderingen, culturele veranderingen,…

Publiek begrijpen van en participatie in biodiversiteitsbeleid en management, incl. variaties in houdingen en gedrag t.o.v. biodiversiteit onder verschillende stakeholdergroepen en verschillende sociale en culturele groepen

Participatie van verschillende actorengroepen in biodiversteitsmanagement, naargelang hun behoeften en de rollen die ze kunnen spelen in biodiversiteitsmanagement

biodiversiteitsmanagement heeft mogelijk een impact op bestaande structuren en kan de economische en sociale situatie in een regio veranderen.

traditionele praktijken met betrekking tot landgebruik

De mogelijkheden (het potentieel) van traditionele kennis voor biodiversiteitsmanagement.

Integratie van het gebruiksaspect binnen biodiversiteitsmanagement: recreationeel gebruik van natuurlijke hulpbronnen.

Verspreiden van innovaties, reacties van stakeholdergroepen t.a.v. nieuwe methodes en ideeën m.b.t. landgebruik en biodiversiteitsmanagement

A lack of participation during the processes of planning and implementing of nature conservation measures is an important factor that fuels opposition.

It is important not only to have people participating in management processes but also to respond to their livelihood needs. Stable livelihoods around a protected area are the best pre-condition for acceptance of use restrictions inside the park. (Stoll-Kleemann, 2006: 29).

Elements for decission making /Beslissingname

Management and governance are crucial to the success of protected areas. Protected area management is still largely the domain of public administrators and biological conservation professionals

Vanuit sociaal oogpunt staan de dynamiek van beslissingnameprocessen en conflicten betreffende biodiversiteitsmanagement centraal.

Sociale en culturele onderhandelingen beïnvloeden beleidsprocessen in termen van het ontstaan van belangen en machtsarrangementen.

De gelijke verdeling van macht tussen verschillende groepen actoren is van groot belang voor het goede verloop van beslissingnameprocessen en heeft een impact op de relaties en de onderhandelingen tussen de verschillende groepen.

Roles (expected roles vs. effective roles)

Management – management approaches (organization of the management)

Management and governance are crucial to the success of protected areas. Protected area management is still largely the domain of public administrators and biological conservation professionals.

Effective solutions for the management of protected areas lie in understanding how individuals, social networks or indigenous communities value these protected areas, especially those who have ownership of, and who directly utilize the living resources on which they depend.

Communication

Means for local management

Adjustment of social systems and structures

4.2.5. Result

Category	Parameters
Implementation of the measures	Degree of execution
	Degree of change
Social support for measures and management	Conflict
	acceptance

4.2.5.1. Implementation of the measures

The implementation of the selected measures is the result of the process of change and is expressed in the degree/ the extent of realization and changes.

The implementation can lead to a

4.2.5.2. Public support for measures

Public support for measures is on a local scale of great importance for the succeeding of management.

Het draagvlakconcept is op lokaal niveau van groot belang voor het al dan niet slagen van het beheer. Draagvlak is een begrip dat vele ladingen dekt en op verschillende niveaus in kaart gebracht en gemeten kan worden, maar op het lokale niveau het meest operationeel is. Draagvlak voor natuur uit zich in de mate waarin mensen bereid zijn maatregelen voor natuurbehoud te accepteren en bereid zijn (mede-)verantwoordelijkheid voor natuur op te nemen.

The public support for measures results in either acceptance of the measures or a conflict on local scale.

Acceptance

When the implementation of measures is supported by all involved actors and by the public in general, we can speak of acceptance. The extend of acceptance is expresssed in the responsibility people have

Conflicts

Conflicts arise from incompatibilities of interest and are part of every social system. The more individual interests and social values are affected, the more biodiversity becomes a source of conflicts, ranging from disputes between local actors to serious conflicts between nations. Het is in de eerste plaats op lokaal schaalniveau dat conflicten ontstaan omtrent de bescherming van bepaalde gebieden en het gebruik van deze gebieden.

The challenge for successful protected area management is peaceful conflict resolution. But a protected area is not a closed system where protected area managers and local population groups can progressively develop agreements on resource-use restrictions based on trust and past experience. Instead non-local actors with political and economic interests intervene in protected areas issues to defend their stakes.

Protected areas function as political arenas for pursuing diverse interests. This gives rise to conflicts with multiple actors and multiple issues, which can have paralytic effects.

Biodiversity conflicts can either focus on the differing preferences, values and objectives of actors, on the options and instruments they choose for action or on a combination of both. Conflicts can be found in a variety of actor relationships and in the pattern of linkages between managing institutions:

conflicts among actors (who holds the power, governance?)

conflicts with the local population (access and use of resources, use and property rights, tourism, ethnic groups,…)

Conflicts between the local population and protected area management or state authorities (conservation against resource-use activities like agriculture, poaching, logging, fishing or collection of medicinal plants);

Conflicts about the legal status and financial compensation; (Stoll –Kleemann, 2006).

De conflicten die kunnen ontstaan binnen NATURA-2000 gebieden hebben veelal betrekking op landgebruik en medegebruik. Conflicten kunnen eveneens betrekking hebben op verantwoordelijkheden inzake beheer. Er is reeds heel wat onderzoek uitgevoerd naar conflicten over natuurlijke hulpbronnen, de aanleidingen en vormen van conflicten.

Conflictbeheersingsmethodes /conflict management

The loss of biodiversity has a significant impact on the viability of socio-economic systems that depend on the various direct and indirect functions of biodiversity that are being harmed (direct, such as provision of food, or indirect, such as tourism). The more individual interests and societal values are affected, the more biodiversity becomes a source of conflicts, ranging from disputes between local actors to serious conflicts that can arise between nations. Actions and decisions are linked at different levels. For example, unbridled local action can create global problems. Similarly, good resource management at one scale may be dissipated by poor practices at another (O'Riordan and Church, 2001, in Stoll-Kleeman, 2006).

There are many different reasons for the rise of conflicts. In general conflicts arise from incompatibilities of interest and are part of every social system. Conflicts can either focus on the differing preferences, values, and objectives of actors, on the options and instruments they choose for action, or on a combination of both.

Conflicts can also be the result of human behavior. Shift attention from the issues and subject of the conflict to the human dynamic. This includes human behavior, the use of power and the process by which decisions are made. Conflicts can be found in a variety of actor relationships and in the pattern of linkages between managing institutions:

Conflicts between actors;

Conflicts within the local population (access and use of resources, use and property rights, tourism, ethnic groups,…);

Conflicts between the local population and protected area management or state authorities (conservation against resource-use activities like agriculture, poaching, logging, fishing, or collection of medicinal plants);

Conflicts due to overlapping or competing uses of resources can lead to opposition to nature conservation strategies. Another source of conflicts are the legal status and financial compensation. The incomplete knowledge or concern for the environmental benefits associated with natural area designation can be another reason. (73th eurosite workshop 'N 2000, conflict management and resolution'). Often there are conflicts between the N 2000 sites and human activities. There are different subjects of conflict:

boundary issues
changing agriculture
fishing
Forestry
Hunting
Recreation

Examples of local conflicts are: open protest and rallies against protected areas, attacks on park guards, poisoning of animals, deliberate burning of forests have become common in may countries. Since the establishment of protected areas often requires explicit restrictions, conflicts with local people can be found everywhere (Stoll-Kleemann, 2001, barriers to nature conservation in Germany).

- Mechanisms behind environmental conflicts:
- the role of information in conflicts;
- how people behave in uncertainty;
- the importance of good will – social capital;
- different ways of relating to stakeholders – who has decision making power and to what extend do they share it;

1. The role of information: Currently much of the decision making for the management of Natura 2000 sites is based on professional/scientific knowledge of habitats and the structures and functions of the site. This is usually seen from the perspective of expert scientific knowledge. There often has been placed a low value on local knowledge both of the habitat and also the social and economic context. This can lead to misunderstandings both of how human activities are carried out and the effect that it is having on Natura 2000 features.
2. People behavior in uncertainty: once people feel uncertain about what change is going to mean for them they feel threatened and take up negotiating position that they think will protect their needs and interests. Whilst people feel threatened they will not share information, communicate openly or think creatively. All essential ingredients for good communication and creative and co-operative conflict resolution.
3. The importance of good will and 'social capital': one of the problems with site designation is the site managers may not know themselves what the implications of the legislation are or how it will affect local stakeholders. Understanding can only develop through dialogue to find out what human activities happen and what effect they have on the features. Local stakeholders are more able to cope with this level of uncertainty if they have developed social capital with the site managers and know that they are of good intent and want to listen, understand and share decision-making.
4. Relations to stakeholders:
    - information giving
    - information gathering
    - consultation
    - shared decision making

One way of relating stakeholders is not better than another, as each has value when used at the right time and at the right way.

By creating the right conditions many seemingly intractable conflicts can be worked through to a mutually acceptable conclusion. Thus, the way that decisions are made affects the outcome.

The challenge for successful protected area management is peaceful conflict resolution. But a protected area is not a closed system where protected area managers and local population groups can progressively develop agreements on resource-use restrictions based on trust and past experience. Instead non-local actors with political and economic interests intervene in protected area issues to defend their stakes. Thus protected areas function as political arenas for pursuing diverse interests.

Because of the various conflicts regarding the implementation of nature conservation measures the main focus of social research lies on **acceptance issues**. This demands for

adapted forms of communication and participation. The integration of sustainable use requires adapted solutions that satisfy both man and nature.

To awaken the public opinion on biodiversity management issues communication and information strategies have to be developed.

In the 1990's just slowly the awareness of the interaction of man and nature as well as the role of society as crucial factor for success in implementing conservation policies has been arisen.

The enclosure or fencing off of areas has traditionally been a prominent approach to conservation but it has received vociferous criticism concerning its ethical assumptions and effects on social justice. However

Protected area implementation therefore entails resolving conflicts with local or non-locale resource users who are potentially affected by these new regulations.

The linkages between biodiversity conservation and local livelihoods are as divers as they are complex, and their framing at the policy level ranges from separation to competition to symbiosis between the two issues (Linking Governance and Management perspectives with Conservation Success in Protected Areas and Biosphere Reserves, Stoll – Kleemann, E.a. 2006).

Aanvaarden van natuurbehoud en beschermde gebieden door die groepen in de samenleving die er het meest door geraakt worden (onderzocht in D'land)
Het analyseren van de factoren achter deze aanvaarding
Publieksevaluatie
Evaluatie van biodiversiteitsbeleid en actieplannen

4.2.6. Conclusion

- Phase of planning (ecosystem approach)
    - Probleem met managementplan en onvolledigheid
    - Agenda setting
        - Knowledge of the interaction between social and cultural processes at a global scale and local biodiversity goals, is low.
        - The loss of biodiversity is mainly investigated from out the field of ecology then from sociology and economy, while causes for the loss of biodiversity and thus also the solutions have to be searched in the social and economical field.
        - Biodiversity is an ambiguous concept. It has several definitions and different stakeholders have different opinions on it. Biodiversity goals play a role on different levels in society.
        - There is a lack of knowledge among the public about biodiversity related issues. Furthermore, increased knowledge about biodiversity issues do not necessarily lead to a more positive attitude toward

protecting biodiversity. The result is that the call for action isn't high in every segment of society.

- Policy formation
  - The relation between the EU-directives and the impact for the local implementation isn't clear for everybody: knowledge about the EU institutions and instruments among stakeholders was low. Also the impact for the local implementation wasn't clear and under-estimated by different actors.
  - On a national scale the directive is often perceived as a threat.
  - The general public perceives the legislation as decided without any societal consensus. Politicians, stakeholders, who oppose the implementation of Natura 2000, strengthen this image.
  - Acceptance of the directive amongst landowners and political will for the national implementation is often lacking.

- Phase of implementation
  - Implementation
  - Local level
    - Local knowledge both on the subject and also the social and economic context is (often) undervalued.
    - The implementation of measures is focused strictly on nature conservation in Natura 2000 areas. Other activities that have socio-economic benefits (e.g. education action, economic activities,…) don't get a place in management plans.
    - The implementation of measures is also related to the relation between humans, especially in a local context.
    - The socio-economic benefits of preserving biodiversity and the local benefits for society are often unclear. Moreover, the implementation of measures threatens the 'private' sphere (e.a. property rights, rights of management, rights of access,…) It is important not only to have people participating in management processes but also to respond to their livelihood needs.

- Protected area management still is mainly the domain of public administrators and biological conservation professionals. A lack of participation during the processes of planning and implementing of nature conservation measures is an important factor that fuels opposition.
- Problem of uncertainty: one of the problems with site designation is the site managers may not know themselves what the implications of the legislation are or how it will affect local stakeholders.
- Once people feel uncertain about what change is going to mean for them they feel threatened and take up negotiating position that they think will protect their needs and interests. Whilst people feel threatened they will not share information, communicate openly or think creatively.

  Local stakeholders are more able to cope with this level of uncertainty if they have developed social capital with the site managers and know that they are of good intent and want to listen, understand and share decision-making. An important factor is then: time to negotiate.
- Power relations are different within the planning process and the decision process.

4.3. Economic instruments

This part is mainly based on the study of Bräuer et al. (2006). It is a European study from the Ecologic[222] - Institute for International and European Environmental Policy - so it is pertinent for our project. It deals only with the Market based instruments but there also exist regulatory instruments, which are complementary.

Note that most environmental law falls into a general category of laws known as "http://www.britannica.com/memberlogincommand and control." Such laws typically involve three elements: (1) identification of a type of environmentally harmful activity, (2) imposition of specific conditions or standards on that activity, and (3) prohibition of forms of the activity that fail to comply with the imposed conditions or standards223.

4.3.1. Introduction

Market based instruments (MBIs) are increasingly discussed in the political debate over future strategies for biodiversity conservation. The reasons for this are twofold. Firstly, MBIs offer policy-makers new ways to reach conservation objectives more cheaply, as MBIs use market forces to pass on incentives. Secondly, MBIs can complement traditional regulatory measures, for example, by generating revenue to fund public conservation management (Bräuer et al., 2006).

In 2006 a study has been conducted for the European Commission to analyse market based instruments for the preservation of biodiversity. The study distinguishes some different instruments such as:

- Taxes, fees and charges;
- Subsidies/support;
- Tradable permits;
- Eco-labelling;
- Financial mechanisms (e.g. green venture capital funds);
- Liability and compensation schemes.

The analysis shows that price-based MBIs are more common than quantity based ones. The most frequently applied instruments belong to [the first] group (taxes, fees and charges) followed by subsidies/support and tradable permits. In the majority of cases, MBIs are applied in the field of habitat and ecosystem conservation. Only one third of the examples are concerned with direct species conservation with a clear tendency toward preserving particular species of fauna rather than flora (Bräuer et al., 2006).

It is not easy to formulate clear recommendations about how to use MBIs because biodiversity is such a diverse good, and policies therefore require to be very much tailored to local needs.

In general MBIs of first category (taxes, fees and charges) can be seen as approaches that are useful to limit damage to existing biodiversity while MBIs of second category (subsidies/support) and fourth category (eco-labelling) foster the provision of increased protection to biodiversity or the enhancement of its quality. In some of these cases, MBIs act as a way of conserving the quality of biodiversity whilst generating income, with the acceptance of stakeholders, which can then be used to fund biodiversity management needs (Bräuer et al., 2006).

In addition to the theoretical considerations, experience in the US with using market based instruments over the past decade has shown that cost savings are present in practice[224]. For example, Carlson et al. (2000) estimate that the policy of the US Environmental Protection Agency to reduce SO_2 emissions by using allowance trading may save $700–800 million per year compared to a command and control programme based on a uniform emission standard (Bräuer et al., 2006).

In the next section, we will present every instrument and for each we will give some comments on the "where and when" to use them.

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[222] The study has been conducted for the European Commission (DG Environment) by Ecologic (Germany) in cooperation with the following institutes: IEEP (UK), GHK (UK)? IVM (NL) and CEI (Czech Republic).

[223] http://www.britannica.com/eb/article-224608/environmental-law (visited in July 2007).

[224] EPA (U.S. Environmental Protection Agency) EPA's acid rain program. Results of phase I. EPA 430-F01-022. Washington, 2001.

4.3.2. MBIs: use, advantages and disadvantages

First we can define what is Market Based Instrument. The EEA defines it as follows: “Market-based instruments seek to address the market failure of 'environmental externalities' either by incorporating the external cost of production or consumption activities through taxes or charges on processes or products, or by creating property rights and facilitating the establishment of a proxy market for the use of environmental service[225]”. MBIs can be divided in two categories, price or quantity based instruments. The categories are illustrated in Appendix 6.

Furthermore, from the study, we remark that while price-based MBIs are well used, quantity based ones are much less common in Europe. Some countries do not use any MBIs for biodiversity conservation and others use them a lot[226]. There are some interesting observations, nevertheless this is not the purpose of this report so for more information, see the document The Use of Market Incentives to Preserve Biodiversity.

Before presenting the advantages/drawbacks of instruments, let us make a first comment. We have to explain how and when the use of a MBI is cost-effective. It will be reasonable to use MBIs instead of traditional command and control instruments only if the cost-effectiveness of the new alternative is higher and if this use improves the efficiency of the nature conservation policy. However, the effectiveness of the instruments has been insufficiently evaluated and the calculation of the true costs has rarely been carried out so limited information about the cost-effectiveness of the different measures is available.

[225] Source: http://glossary.eea.eu.int/EEAGlossary/M/market-based_instrument (August 2007).

[226] This despite the fact that they all run agri-environmental measures operated through European Funds. Ireland, France, Germany, Luxembourg, Spain, Cyprus, Slovakia, Slovenia and Latvia have no market based instruments which are used directly to preserve biodiversity included in the database.

Summary[227]

	Taxes, fees and charges	Subsidies/support, grants and funds	Tradable permits	Eco-labelling	Financial mechanisms	Liability and compensation schemes
Generalities	- Most common instrument used - simple concept - commonly applied, e.g. to extracting minerals from river beds (particularly in Eastern Europe), forestry activities, charges for hunting permits and agricultural use of pesticides and fertilizers	- after taxes, the most frequently used MBI - often the only measure that will work with existing property rights - used extensively in agricultural policy in the European Union but criticized for not being the most efficient use of the available money	- Have proven to be an effective MBI for species conservation - Most common use, internationally = tradable fishing quotas - Also been suggested for sport hunting and fishing	- Two groups are eco-labelled in the international agricultural market: food products and non-food agricultural products[228] - Also forest certification - A common problem is that there may be little monitoring to check what a label is certifying	- Increase in interest in recent years	- Liability regimes result in the internalisation of negative externalities - In general under liability regimes companies have to pay when they cause environmental damage, and so have an incentive to reduce risks - The **EU HD (92/43/EEC)** applies ex-ante i.e. before damage occurs - The **Liability Directive (2004/35/EC)** applies ex-post i.e. after damage occurs
Use	Important to set taxes at a sufficient level	Care has to be taken, however, that the actions carried out under payment actually translate into improvement of biodiversity	/	/	/	/
Advantages	- Should be simple to set up - fair – normally follows the polluter pays rule, tourism charges may be aimed at those who damage resources and should also be concerned with their	- Works well when there are clear objectives and adequate targeting which is area specific, realistic, quantitative and time delimited and flexible and when there is also good advice to participants and	- Tradable permits work well when protecting a single resource with few stakeholder groups who are interested in the resource for the same reason. They may introduce collective	- Potential to affect a whole economic sector with relative small investments, support innovation, proved to work in the organic sector - cost effective - increases consumer choice	- Way of integrating biodiversity concerns in "normal" business - Makes biodiversity-related business more financially attractive with low transaction costs (use of existing systems) - May promote	In general, threats of liability should mean that companies take care not to cause pollution. They may also have to have insurance to cover themselves and this can act as an incentive

[227] BRÄUER et al., *The Use of Market Incentives to Preserve Biodiversity*, Final Report, A project under the Framework contract for economic analysis ENV.G.1/FRA/2004/0081, July 2006, Section 6, p. 31-40.

[228] - food products: coffee, tea, cocoa, fruit & vegetables (fresh and dried) and juices, spices and herbs, nuts, oil crops and derived products (palmoil, sunflower etc.), honey, cereals and grain including rice, alcoholic beverages (wine etc.), sugar, meat, dairy products and eggs.
- non-food agricultural products: flowers, animal feeds (for production of organic meat, dairy products and eggs), grain seeds, natural pesticides and insecticides, cosmetics, textiles (cotton, leather and leather goods), cleaning and washing articles.

	protection	monitoring of effects. - Works well when there is a need to engage private sector actors (e.g. farmers and landowners) in provision of biodiversity public goods – in this case other instruments such as taxes are not appropriate. - It may be possible to tailor subsidies/support to particular conditions and make them at least partially dependent on outputs.	responsibility for stakeholders to comply; - may enjoy higher support than a tax and can allow for flexibility. - With wetland banking, they are likely to be viewed positively by business actors as they allow developments which would otherwise be banned. - For conservation organizations, they may be a means to integrate conservation aims into mainstream business which might otherwise not be allowed	- gives sustainable production methods a market advantage - may be an alternative to banning use of resources	innovation	(through differentiated premiums) to minimize risk. It can encourage the development of markets such as wetland banking
Disadvantages	- May not be cost effective - Need to set at right level - Ineffective if price inelastic (i.e. buying relatively unaffected by price change) - despite the simplicity of the concept, in some cases, charges in particular may need a high degree of monitoring and administration. - Generally very top-down and might not be supported by stakeholders. - May not trigger long term behavioural changes. - Maybe problems with the implementation due to political lobbying.	- Medium term benefit, but no long term security for biodiversity gains and may not change attitudes (e.g. when payments stop actors may well return to their previously damaging practice) - continuous funding and monitoring may be problematic - 100% has to be paid while other MBIs use the power of the market to multiply their investments - needs to be adequately targeted - despite the simplicity of the idea, procedures to distribute subsidies/support may be relatively complex and bureaucratic - relies on interest from stakeholders since not compulsory	- Tradable permits work badly when there are many uses for a resource which have different environmental impacts - Depending on their design, they may also have high transaction costs and inactive markets - substantial administrative and compliance costs in registering owners and keeping track of trades. - With wetland banking in particular, there are problems with defining equivalence of habitats	- Finally depends on consumer interest which often is not high, proliferation of labels, limited number of criteria that can be certified – hard to identify important criteria, difficult to extend to foreign suppliers (trade implications) - limited use in developing countries	- Limited scope due to smaller returns in comparison to other venture capital Investments - Banks may set loan conditions which do not take account of the long-term nature of biodiversity business development - Problems with reconciling public good aspect with commercial investment - Cost effectiveness as far as reaching actual biodiversity aims may be unclear	Taking companies to court is costly and risky. Deciding on the compensatory actions needed can also be difficult

Conclusion: From the examples identified in the study, there is no single type of MBI that should always be used in preference to others, but rather many different types that can work better or worse depending on the particular circumstances and the specific context. When properly designed and used in a suitable context, MBIs can be more cost-efficient than traditional CAC (Command and Control) approaches, due to the greater amount of flexibility allowed to the actors.

Nevertheless, the implementation of MBIs and the creation of a working market remains a challenge, not least for the administration bodies responsible, and they are often applied on a fairly small or local scale.

Many examples of MBIs show that they work best not as a substitute to regulatory approaches, but complementary to them. Given that this is the case, it is worth considering the various options and using some combination of MBIs and regulatory approaches to achieve the desired aims (Bräuer et al., 2006).

Finally, it is worth saying that incentive measures require to be planned with the specific characteristics and requirements of the individual communities and ecosystems targeted in mind. In this respect, some points are to be taken into account:

- setting clear objectives
- defining exactly the good
- considerate economic and social effects
- think about unexpected environmental effects
- take time to make things but not to much
- flexibility
- a good combination of the different types of incentives
- managing and monitoring (against cheating, …)
- make pilot studies
- be credible
- make evaluation of where we are
- have adequate information and effectiveness

4.3.3. Budget of the Walloon and the Flemish Regions

To finance these instruments money is needed. In this section, we consider the budget allocated by the Belgian Regions as well as other European countries for the conservation of biodiversity, especially in the scope of Natura 2000.

First of all, we can specify that according to a communication of the European Commission, the Natura 2000 network costs 6,1 billion € per year[229]. This is a big amount of money and we can assume that it will cost a lot in Belgium too.

4.3.3.1. Flemish Region

For this section, the Flemish Region was contacted, and the information obtained from Dr. Els Martens (Agentschap voor Natuur en Bos).

For the designation of Natura 2000, next to expenses for the staff of the Institute voor Natuur en Bosonderzoek (INBO) and the Agency of Nature and Forest (ANB), there were only internal costs for copies of maps and preparation of CDs sent to the municipalities. A public consultation is also possible for the new designation so there are costs for the publications in media, papers and also copies for the concerned municipalities. Moreover some documents were published: there was a project that developed a brochure on the BD (in 2000) and another with a brochure and a poster on Natura 2000 (in 2004 in cooperation with the WWF).

The personnel of the Agency is charged with several tasks for Natura 2000: they give notice on permits demand and water plan and on laying out plans of natural reserves. They intervene in the processus for the designation of spatial plans and the designation of the VEN (Vlaams Ecologisch Netwerk). They work also for the development of nature objectives plans for Natura 2000, and now for conservation objectives. On the average, there are three persons per province, on the whole 15 persons, but these are not only working for Natura 2000.

240 have a site or a part of site Natura 2000 on their territory. The number of people from the Institute with the expenses can be calculated with the same approach as above for the

[229] Source : www.aeidl.be/documents/euclide/fr/2005/hebdo627.htm (consulted in July 2007).

Agency. At INBO, there is one persone per province to give a scientific support for all the mentioned aspects.

It was not possible for Dr. Martens to give any accurate value because the costs for all activities are always integrated in other plans.

Until now there is no financial compensation, only incentives from the “Rural Development Plan” of the CE (but most of this money goes to agriculture or co-financement for project of the municipalities to fit out or restore Natura 2000 sites.

Another information could be taken from the report “Studie naar de financiële aspecten van de implementering van de Habitatrichtlijn voor het Vlaamse Gewest” but this document dates from 2001. We will not present any figures from it in this report because we think that most updated information exists. A note will be made later.

4.3.3.2. Walloon Region

For the Walloon Region some interesting information about budgets dedicated to Natura 2000 can be found in a note from the Walloon Government approved the 19th July 2007. The object of this note is the: “Information relating to the financing of the implementation of Natura 2000 in the WR between 2007 and 2009”. In 2001, a budgetary assessment has been made: the expenses and losses of revenue were estimated to 401 800 000 BEF (10 millions €) per year. These estimations were analyzed and it was concluded that it was not enough, so figures were reassessed. The budgetary impact is divided in twelve points presented in the note (see Appendix 7 – confidential note):

1. Real estate deduction presented as a loss of earnings for the WR
2. Inheritance rights presented as a loss of earnings for the WR
3. Preparation and elaboration of designation decree
4. Support to the ornithological society AVES
5. Secretariat – commission of conservation
6. Support mission of the implementation of Natura 2000 on the terrain
7. Incentives in forestry
8. Agricultural incentives for the RDP (Rural Development Plan) 2007-2013
9. Incentives for particular measures
10. Restoration in the PDR 2007-2013
11. Implications of Natura 2000 in the PDR: summary of budgets dedicated to Natura 2000 in the PDR
12. Educational notebooks

4.3.3.3. Other European countries

In this section we will only speak about the financial aspects of Natura 2000 but we find interesting to put a general analysis of the situation coming from a report of the WWF (WWF, 2006). A summary concerning the Walloon Region and the Brussels Capital-Region can be consulted in Appendix 8 (The Flemish Region wasn't contacted).

The financing situation for the different European members is as follows:

National budget for Natura 2000 (WWF, 2006)[230]

x: no (not sufficient)
± : inadequate or insufficient

✓ : yes/sufficient
? : no information

In general, it is rare that national funds are specifically earmarked for Natura 2000 in the EU Member States. Ten Member States do not dedicate specific national funds for the implementation of the HD. In some other countries like Estonia, Slovenia and Poland, some funds are reserved specifically for the implementation of Natura 2000, although these funds are very limited.

- In Finland funds are mostly lacking for species conservation measures, many of which fall under Natura 2000.
- In Latvia all Natura 2000 areas are nationally protected areas, therefore all budgets allocated to these areas can – to some extent – be earmarked for Natura 2000.
- In the same way, in Lithuania all funding for protected areas, including Natura 2000 is provided by state budget lines.
- Special funds for Natura 2000 are occasionally appropriated in Slovakia, but for specific measures in an unstrategic, ad hoc manner.
- In Denmark funds are only available for certain aspects of the implementation of Natura 2000, such as forest related issues, and finance laws make no mention of Natura 2000.
- In Greece, the State covers personnel costs as well as the salaries of some of the wardens, who are locally responsible for Natura 2000, as well as some activities in areas within Natura 2000 sites.
- In Italy, no specific funds are in place for Natura 2000, but national or regional funds for existing protected areas can be used for the management of Natura 2000 sites[231].

[230] Country acronyms: AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, ES = Spain, FI = Finland, FR = France, GR = Greece, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = The Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia, TR = Turkey and UK = United Kingdom.

For the study of the WWF, no figures are available because the questionnaire consisted of 32 questions, asking for specific information and in most cases the answers were presented as an overall assessment based on multiple choices.

With more details, interesting values are presented in the "Final Report on the financing of Natura 2000" made by the work group on the Article 8 from the HD.

Firstly, there is a table (Table 5) summarizing different studies found in the literature. Values are presented in link with the size of the network.

Table 12. Updated Literature Review on Costs of Natura 2000. Source: European Commission (2002)

Literature	**Size of the network N2000 (ha)**[232]	**Cost (€/ha/year)**	**Total cost (€ billion/year)**
Goriup (1990)			
Gross ranges based on existing grant-aid provisions	60 500 000	56	3,4
		448	27,1 (max)
Habitat maintenance cost of function of site size	60 500 00	47	2,8
Habitat maintenance cost as function of habitat type	60 500 000	145	8,8
Stones T. et al (1999)			
Basic model	60 500 000	80	4,8
Refined model	60 500 000	85	5,1
Liederman E. (1996)			
	60 500 000	12,5	0,75 (min)
		125	7,5
Thauront M. (2002)	Total of sites		
	20 000	-	7,6

For more details see the Final report on Financing Natura 2000 (European Commission, 2002, p. 9-10)

These studies permit to draw some temporary conclusions (European Commission, 2002):

- Costs associated with sites are likely to be higher in the first few years following their establishment, and are likely to stabilize thereafter.
- Standard management costs tend to be relatively low, compared to land tenure and 'hard' restoration costs, and administration and financial management aspects, although this may be due to fact that the literature has not covered many standard management activities.
- In general, the bigger the area of the site, the lower the cost per hectare, although this will also depend on the types of activities and habitats under consideration.

The same group of experts made an enquiry with member states to obtain an estimation of the expenses that the States expect for the coming years within the framework of efficient management of the Natura 2000 network. The costs of Natura 2000 include not only the restoration and the designation of sites but also the planification and the execution of their management in the long term (Table 6).

While there is an element of uncertainty about these figures, they are likely to be an underestimate for a number of reasons (European Commission, 2002):

- The number and coverage of sites is likely to increase over the coming two years as Member States make further progress with their designation process.
- In the meantime, there are several potentially significant gaps in reporting on costs arising in relation to existing sites (e.g. marine sites) and estimates, e.g. agri-environment funding.
- The estimated costs have not been obtained, in general, from detailed planning on each site to reflect real ecological and socio-economic conditions. More detailed planning could be expected to result in higher estimates.

Over the next few years, EU enlargement is expected to have the effect of significantly increasing the number of areas in need of proper management, including areas facing severe problems due to abandonment or risk of intensification following accession. None of these sites are included in any of the estimates in this report. The data generated by the literature review was compared to and combined with the estimates generated from the Member State

[231] WWF, 2006, p. 25.

[232] Data on net coverage, obtained from the University of Leuven.

questionnaire. The result is a broad-brush range of average values for the cost of managing Natura 2000 in the EU-15 of between € 3,4 billion and € 5,7 billion per year233.

The above information dates from 2002. In 2004, the Commission published another Communication on the Financing of Natura 2000 with updated figures. Here is what is said: "In preparing the cost estimates below, the Commission has drawn on the Report of the Expert Working Group and a questionnaire completed by the Member States. The responses to this questionnaire led to a cost estimate of €3.4 billion per year for EU-15. This figure was extrapolated to calculate costs for the 10 Acceding Countries and resulted in total costs for EU-10 between € 0.63 billion and €1.06 billion per year, bringing the total cost estimate to €4.0 - €4.4 billion per year for the enlarged EU. However, the estimate for the new Member States is open to criticism, because of the assumptions used.

Given the questions about the reliability and comparability of the first estimates, a new questionnaire was sent to both Member States and Accession Countries in June 2003, requesting more detail and justification of the projected figures. Analysis of this information, led to a revised estimate of €6.1 billion per year for EU-25 (Table 3 in Annex 8). The €6.1 billion cost estimate is the most reliable estimation at the time for this Communication. It can and should be further refined. Member States will be asked to review their submissions on the basis of commonly agreed cost estimation methods. The anticipated progress in preparation of management plans in the coming years should provide a sound basis for improving these cost estimates234".

The Table 3 mentioned in this document is reproduced in Appendix 9.

For this section, we also contacted Mrs. Kaemena from the European Commission (DG Environment). She answered that a new enquiry will start at the end of this year and results will probably be available for summer 2008.

Table 13: Average cost per year and hectar (derived from Table 14)

Country	**Area covered by sites (ha)**	Total Cost for all Activities (€)	Cost €/year/ha
Austria	1 365 000	575,02	42,13
Belgium	220 000	158,30	71,95
Denmark	1 168 939	285,72 (224-347)	24,44
Finland	7 465 400	532,00	7,12
France	4 696 900	1 475,49	31,41
Germany	4 910 164	4 892,10	99,63
Greece	3 533 900	2 021,50	57,20
Italy	5 000 000	484,95	9,70
Netherlands	1 733 000	2 491,90	143,80
Portugal	1 956 993	268,52	13,72
Spain	11 811 474	13 00-0	11-6
Sweden	6 222 254	1 927,00	30,97
UK	1 311 500	503,91	38,42
TOTAL respondents	51 395 524	28 616,41	55,68
TOTAL EU-15	60 500 000	33 685,68	55,68

[233] European Commission, *Rapport final sur le financement de Natura 2000*, Groupe de travail de l'article 8 de la Directive « Habitats » (version anglaise et française), p. 12 of the English version.

[234] COMMISSION DES COMMUNAUTES EUROPEENNES, *Le financement de Natura 2000*, Communication de la Commission au Conseil et au Parlement Européen, COM(2004)431 final, 2004, p. 5-6 of the English version.

Table 134. Member States' Estimates: Anticipated Expenditure on Management of Natura 2000 Sites, Jan 2003 to Dec 2012 (European Commission, 2002)

Country (4)	**Number of Natura 2000 sites**	**Area covered by sites (ha) (1)**	**Costs in million Euro, total for 10 years**			
			Management Planning and Administration	**Ongoing Management Actions and Incentives (2)**	**Occasional Capital Investments**	Total Cost for all Activities
Austria	182	1 365 000	92,65	306,34	176,04	575,02
Belgium	243	220 000	18,20	87,60	52,50	158,30
Denmark (7)	254	1 168 939	8,67	208,73 (165-253)	68,32 (51-86)	285,72 (224-347)
Finland	1832	7 465 400	58,00	177,00	297,00	532,00
France (3) (5)	1226	4 696 900	618,72	271,77	585,00	1 475,49
Germany (3)	3994	4 910 164	932,00	2 699,50	1 260,60	4 892,10
Greece	346	3 533 900	142,30	1 761,50	117,70	2 021,50
Italy	2767	5 000 000	25,97	54,29	404,69	484,95
Netherlands	155	1 733 000	1,927	362,70	202,20	2 491,90
Portugal	89	1 956 993	15,25	113,00	14-0	268,52
Spain	1564	11 811 474	1 659,40	8 260,50	3 080,20	13 00-0
Sweden	3508	6 222 254	25,00	641,00	1 261,00	1 927,00
UK	800	1 311 500	59,39	305,03	139,50	503,91
TOTAL respondents	16 706	51 395 524	5 582,55	15 248,96	7 784,74	28 616,41
TOTAL EU-15		60 500 000 (6)				33 685,68
Average cost per year, in million Euro						3 368,57

Notes:
(1) Figures adjusted to remove double counting of areas covered by proposed Sites of Community Importance and SPAs, except in Denmark, Finland, Greece, The Netherlands and UK.
(2) Figures for France, Portugal, Spain, Sweden and UK do not include agri-environment costs, which may be significant.
(3) Figures for France and Germany do not include marine sites beyond territorial waters, as the area for these sites is currently unknown.
(4) Ireland and Luxembourg did not respond in time for this exercise.
(5) Figures do not include land purchase or fire prevention and control expenditure.
(6) Total EU-15 figures for total net coverage of Natura 2000 sites are provided by University of Leuven.
(7) Uncertainties in estimates reflected in presenting the dispersion in results. Cost in marine Natura 2000 areas not included.

(7) Uncertainties in estimates reflected in presenting the dispersion in results. Cost in marine Natura 2000 areas not included.

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Appendix

Appendix 1: Use of the term biodiversity

Mayer (2006) outlines in a coherent concept the way biodiversity should be understood. Three points describe a consistent use of the term biodiversity (Figure A-1):

- *Biodiversity per se* is a general concept, or metaconcept, which cannot be caught in numbers: *the variety of life on earth*. In this context, all different levels of biological classification, be they taxonomical, morphological, functional, or ecological, should be considered, but it does not mean that all biological objects have to be quantified.
- Specific *features* of biodiversity should be distinguished. Quantitative biodiversity assessments are restricted to these features. Features of biodiversity can be clearly defined by specific attributes (e.g. genes, individuals, populations, species arthropods, vascular plants, ecosystem types) and measures (e.g., species richness, evenness, number of individuals).
- Different *thought styles* and disciplines focus on different features of biodiversity, that is, they choose specific attributes and measures (Figure A - 1). It is evident that in zoology, mostly animals are investigated in biodiversity studies. In restoration ecology, plants are primarily the focus (Young *et al.* 2005).

In addition to thought styles, *values* affect the selection of biodiversity attributes, e.g., in a sense that highly valued organisms are more likely to be selected for biodiversity monitoring programs (Figure A - 1). Values play a strong role in some perceptions of biodiversity but are negligible in others. For example, in environmentalism, the primary driver for activity is the value of nature and not the quest for objective descriptions and explanations of natural phenomena. Much confusion arises from some people considering biodiversity as something valuable per se and others seeing it as a virtually value-free parameter for the description of ecosystems.

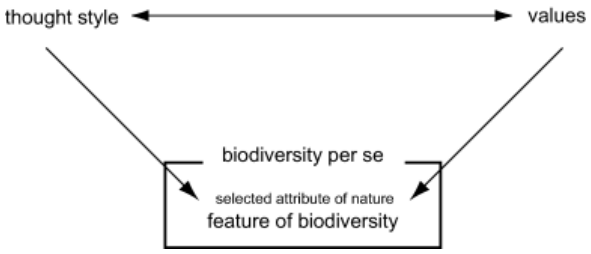


Figure A - 1. Features of biodiversity (e.g., species richness of vascular plants) are part of biodiversity per se, which is a general, unspecific concept. The selection of biodiversity features depends on thought style and values. From: Mayer (2006).

Because of different thought styles and values the term biodiversity should be used as a general concept, not as a specific element of nature. As discussed above, biodiversity is a framework for the variety of life on Earth and in this sense, is not measurable. However, specific features of biodiversity, e.g., the species richness of vascular plants, can be quantified (see above). The selection of these features depends on thought styles and values. This implies that "biodiversity as general concept" should be distinguished from measurable "features of biodiversity." Explicit declarations of selected biodiversity features, in every case quantities are in the focus, are inevitable for an unambiguous use of the term.

Appendix 2: Need for more integrated biodiversity indicators

Given the limitations of ecological indicators to serve as adequate indicators of biodiversity, work is urgently needed to develop a broader set of biodiversity indicators. With the exception of diversity indices based on taxonomic or population measures, little attention has been paid to the development of indicators that capture all the dimensions of biodiversity. An effective ecological indicator should:

- Provide information about changes in important processes
- Be sensitive enough to detect important changes but not so sensitive that signals are masked by natural variability
- Be able to detect changes at the appropriate temporal and spatial scale without being overwhelmed by variability
- Be based on well-understood and generally accepted conceptual models of the system to which it is applied
- Be based on reliable data that are available to assess trends and are collected in a relatively straightforward process
- Be based on data for which monitoring systems are in place
- Be easily understood by policy-makers

Appendix 3: Species richness as a measure for biodiversity

The most common ecological indicator is *total species richness* (TSR). However, TSR only partially captures ecosystem services because:

- what constitutes a species is sometimes not well defined
- it only measures taxonomic diversity, although taxonomically similar species may be ecologically quite distinct
- it does not differentiate among species in terms of sensitivity or resilience to change
- species vary extraordinarily in abundance; for most biological communities, only a few are dominant, while many are rare
- it does not distinguish between species that fulfill significant roles in the ecosystem (such as pollinators and decomposers) and those that play lesser roles. That is, all species are weighted equally, which can lead assigning equal values to areas that have quite different biota.
- it does not differentiate between native and non-native species, and the latter often include exotic, introduced, or invasive species that frequently disrupt key ecosystem services. Ecosystem degradation by human activities may temporarily increase species richness in the limited area of the impact due to an increase in exotic or weedy species, but this is not a relevant increase in biodiversity.
- although native species richness and ecosystem functioning correlate well, there is considerable variability surrounding this relationship
- the value of TSR depends on the definition of the area over which it was measured and may scale neither to smaller nor to larger areas.

Appendix 4: Local species diversity as measures for biodiversity

Simpson's diversity index (D) is the simplest mathematical measure that characterizes species diversity in a community. The proportion of species i relative to the total number of species (p_i) is calculated and squared. The squared proportions for all the species are summed, and the reciprocal is taken:

$$D = \frac{1}{\sum_{i=1}^{S} p_i^2}$$

For a given richness (S), D increases as equitability increases, and for a given equitability D increases as richness increases. Equitability (E_D) can be calculated by taking Simpson's index (D) and expressing it as a proportion of the maximum value D could assume if individuals in the community were completely evenly distributed (D_{max}, which equals S - as in a case where there

was one individual per species). Equitability takes a value between 0 and 1, with 1 being complete evenness.

$$E_D = \frac{D}{D_{max}} = \frac{1}{\sum_{i=1}^{s} p_i^2} \times \frac{1}{S}$$

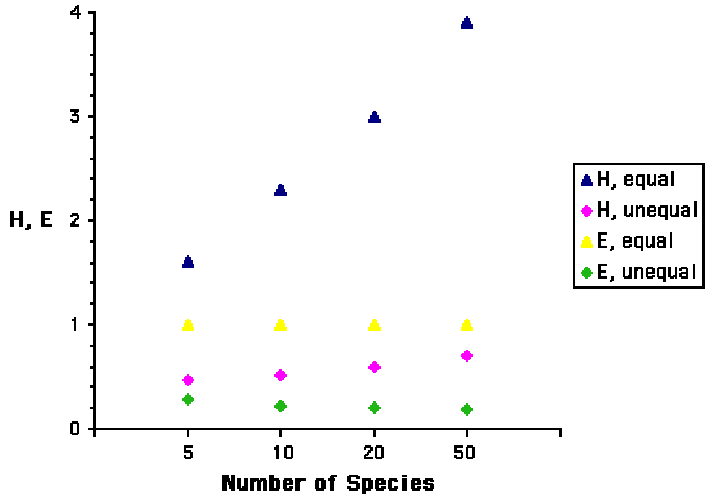
The Shannon diversity index *(H)* is another index that is commonly used to characterize species diversity in a community. Like Simpson's index, Shannon's index accounts for both abundance and evenness of the species present. The proportion of species *i* relative to the total number of species (p_i) is calculated, and then multiplied by the natural logarithm of this proportion ($\ln p_i$). The resulting product is summed across species, and multiplied by -1:

$$H = -\sum_{i=1}^{S} p_i \ln p_i$$

Shannon's equitability (E_H) can be calculated by dividing H by H_{max} (here $H_{max} = \ln S$). Equitability assumes a value between 0 and 1 with 1 being complete evenness.

$$E_H = H / H_{max} = H / \ln S$$

Example: The graph below shows H and E_H for four hypothetical communities, each consisting of 100 individuals. The communities are composed of 5, 10, 20 and 50 species, respectively. For each community H and E_H have been calculated for the case in which individuals are distributed evenly among the different species (i.e., each species makes up an equal proportion of S), and for the case in which one species has 90% of the individuals, and the remaining individuals are distributed evenly. For example, in a community with 10 species in which the species contain equal numbers of individuals, $p = 0.1$ for each species. In a community with 10 species in which one species has 90% of the individuals, $p = 0.9$ for the dominant species, and $p = 0.01$ for the other nine species. The diamonds represent H and $E_H$values for the first case (equal proportions), and the triangles represent values for H and E_H for the second case (unequal proportions).



For the first case, E_H is always equal to one (complete evenness, or equitability), but H increases dramatically as the number of species increases, as we would expect. For the second case, in which one species makes up 90% of the community, the picture is a little different. Here we can see that although H does increase with increasing numbers of species, it does so much more slowly than in the first case. Additionally, E_H decreases as species number increases (since one species always makes up 90% of the community in the second case of this hypothetical example, the remaining species make up some fraction of 10% of the community; as species number increases this fraction becomes smaller and evenness decreases). H and E_H clearly give more information about these communities than would species number (richness) alone.

Appendix 5: Measuring biodiversity over spatial scales: α, β and γ diversity

To investigate trends of biodiversity in space,

α-diversity is the **local diversity**, also called diversity of inventarisation: this is the component of the total (γ) diversity which can be attributed to the (average) number of species found *within* homogeneous sampling units (habitats). To calculate α, species richness or the above described species diversity indices can be used.

β-diversity is the ***between*** **habitat** diversity or **differentiation diversity**: this is the component of the total (γ) diversity which can be attributed to differences in species compositions between ecosystems or along a gradient. β is the result of environmental heterogeneity (in space, time or resources) and niche differences between species at that scale. Movements between spatial entities (dispersal, migration…) may act as homogenizing forces, tending to increase α and decrease β. In this respect, habitat isolation and heterogeneity may influence α and β in a landscape. To calculate β, a number of other indices were developed (like Sørensen's similarity index, Whittaker's index, the Jaccard index, … see Henderson & Seaby 2002).

γ-diversity is the **regional diversity** or **landscape diversity** (in which the landscape is considered as an island). γ is determined by the change in similar habitat types over broad geographic zones.

Appendix 6: Criticism on the Equilibrium Theory of Island Biogeography (ETIB)

Hermy (1986, based on Pielou 1979) summarized these critics into eight categories, questioning:

- The assumption of the model that the appearance of new species on an island is merely the result of immigration and not of indigenous evolution (see also Riddle 2005);
- The assumption of the model that the immigration rate decreases constantly with the number of species. However, the establishment rate of plants on new, mineral soils is initially usually lower than at later points in time;
- The assumption that immigration rate is merely dependent on the degree of isolation is a strong simplification of the reality. It is also likely (although not specified in the original formulation of MacArthur and Wilson's theory) that immigration rates will generally be higher on a large island than on a small island, since the larger island represents a larger 'target' for the colonizers. Also the orientation of the island to the migration of individuals or diaspores, needs to be taken into account;
- The assumption that extinction rate is merely dependent on the area of the island is simply not true. Immigration and extinction are interdependent;
- The assumption that the chance of extinction and immigration is the same for all species;
- The assumption that the number of species and species composition of islands is merely the result of population phenomena (and not of biotic interactions);
- The assumption that the relation between the number of species and the area of an island is independent of variation in habitat quality (heterogeneity);
- The fact that the theory and the literature confirming this theory are exclusively based on animal data (birds in particular).

Appendix 7: Criticism on the recommendations following from the ETIB regarding the design of nature reserves – the SLOSS debate

The suggestions of Diamond were, however, challenged by among others, Wilson's former student Daniel Simberloff, who considered this to be an unproven over-simplification that would damage conservation efforts. Much of the debate hangs on the validity and interpretation of the ETIB, on which these recommendations are based (see also Hermy 1986):

- The simplest criticism follows the lines that the ETIB has been refuted. Hence it provides no firm foundation for the development of conservation policy, except if these theories are adopted as providing formal rules.
- Furthermore, deployment of the ETIB often comes down to the use of species-area equations. Such an approach may give a rough idea of numbers of species on habitat islands, but not which habitats contribute most to richness, nor which species are most likely to be lost from the remnants. However, in planning nature reserves, one has to take into account criteria of rarity, level of naturality, representativity, environmental diversity, population size, conservation status and the availability of territories. Smaller reserves may indeed better respond to the question to conserve native species and unique habitats.
- In addition, Simberloff (1988) pointed out that the suggestions of Diamond relied on the assumption that smaller reserves have a *nested* species composition, i.e., no species occur in a small sample that do not also occur in larger samples. However, ETIB does not require that the species on small islands are a subset of those on large islands. In fact, in its strict interpretation, species on small islands are expected not to be subsets of the larger islands. If each of the smaller reserves had unshared species (no perfect nestedness), then it was possible that two smaller reserves could have more species than a single large reserve, even though each reserve would contain fewer species. Indeed, several empirical results have shown that the best option to maximize diversity is to combine several small reserves than single large areas covering the same total area (e.g., Lomolino 1994). Despite the uncertainties regarding the forces that promote nestedness in species distributions, the phenomenon of nestedness has recently generated much interest among conservation biologists and has, to a large degree, resurrected the SLOSS debate.
- There is now consensus that oceanic islands fundamentally differ from habitat islands ('islands in a sea of habitats modified by man'), see, for instance, Boecklen (1997). The utility of the application to anthropogenic (or natural) habitat patches rests upon the degree to which the basic premise of ETIB – namely, the existence of discrete habitat units spatially separated from sources of colonists – is realized. ETIB as applied to fragmented landscapes, assumes that the matrix separating habitat islands is inhospitable, much as the sea is to colonists of oceanic islands, and so does not contain species or processes relevant to the study at hand (Drake *et al.* 2002). However, there is increasing recognition that the matrix in fragmented landscapes can potentially influence species abundance or composition in the embedded patches (for animals: e.g. Ricketts 2001 and a recent review by Watling & Donnelly 2006 and for plants: e.g. Cook *et al.* 2002 and a recent review by Murphy & Lovett-Doust 2004).

Appendix 8: The classical metapopulation model

A *classic metapopulation* (CM) (or *Levins metapopulation*) is defined as (Husband & Barrett 1996, Hanski & Simberloff 1997, Harrison & Taylor 1997, Elmhagen & Angerbjörn 2001, Baguette 2004):

- a (single-species) 'population' consisting of many instable, local populations (Figure A - 2);
- occupying partly an infinite set of suitable habitat *patches* within an unsuitable, homogeneous environment, the matrix, which individuals can transverse but in which they cannot breed.
- where, at each generation, there is a ***turnover of populations***: local extinction of occupied patches and recolonisation (via dispersal of individuals moving in the matrix) of empty patches – equivalent to deaths and births, respectively, in traditional population dynamics.

The mathematical description of the metapopulation is then:

$$\frac{dp}{dt} = mp(1-p) - ep$$

where p is the proportion (fraction) of population centers (e.g., occupied habitat "islands" or patches), m is the migration (colonization) rate and e is the rate at which local populations go extinct. At equilibrium $p^* = 1 - e/m$. The metapopulation will persist (i.e., $p^* > 0$) only if $e < m$.

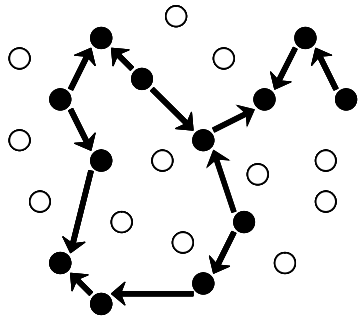


Figure A - 2: Metapopulation model of Levins (1970). Black: 'occupied' patches, white: 'unoccupied' patches

The classic metapopulation model makes a number of strict assumptions:

- All habitat patches are identical: they are all suitable to harbor a local population and are similar in size and degree of isolation. All occupied patches have a constant extinction rate, whereas all empty patches have a constant colonization rate and migration rates are the same between all patches.
- The dynamics of the local populations are not dependent from each other and more specifically, if there is a population, then it has reached its carrying capacity.
- Local dynamics occur at a much faster time scale than metapopulation dynamics, so migration does not influence local dynamics.

Furthermore, when assuming that

- the extinction rate decreases as a function of the areas of the sites with adequate habitats and
- the colonization rate decreases with the isolation of the different sites,

the Levins (1969) model predicts that the fraction of occupied patches at equilibrium decreases with decreasing mean size of the patches and with decreasing density of suitable patches in the matrix. Thus in the view of nature conservation, reserves may not be too small in order to not increase the chance of extinction and not too isolated, in order to not decrease the chance of colonization.

An essential feature of the classic metapopulation model of Levins (1969) is the balance between extinction and (re-)colonization of local populations at regional scale. Hence, the long-term persistence can only occur at the regional or metapopulation level and such metapopulations persist indefinitely because they are buffered against extinction by gene flow between local populations, rescue effects or recolonisation after local extinction.

Because the classic metapopulation theory considers that species persistence in the landscape depends on a high turnover of extinction-(re-)colonization of suitable habitat patches at each generation, the metapopulation dynamics are approximated by binary changes in the state of these individual patches. This approach has allowed rigorous mathemathical analyses of metapopulation dynamics (*metapopulation models*, Baguette 2004).

The metapopulation approach assumes that only those species whose regional distributions can be accounted for solely by extinction and colonization are true metapopulations. The study of metapopulation dynamics therefore demands that investigators study species in which these parameters can be measured. Especially the determination of extinctions of local populations may provide problems, for instance for plant species with a seed bank.

Although the assumptions of the model are very stringent and poorly realistic, a number of natural metapopulations have been demonstrated to behave according to the predictions of Levins (1969), while for many other species, the classic metapopulation model proved to be inadequate. For an overview, see Hanski (1997).

Appendix 9: Criticism regarding the metapopulation theory

Although the metapopulation concept is now the dominant paradigm in population ecology, it is not undisputed in the literature. Here, we summarize a few of the critics in a deliberate order:

- In many studies, systems are considered as (classic) metapopulations while violating the assumptions (Hanski 1997, Baguette 2004).
- Very few studies have really assessed interpatch movement of individuals, despite its importance. This deficiency limits the ability to understand the dynamics of spatially structured populations and to apply that knowledge to conservation efforts (Bowne & Bowers 2004).
- In metapopulation theory (just as ETIB), the landscape is assumed to be binary, i.e. consisting of patches of interest in an unsuitable habitat where species cannot breed. Terrestrial habitat patches, however, are often surrounded by a complex mosaic of other land cover types, which may differ in their resistance to the movement of individuals among the patches and thus the 'effective' isolation of the latter (Wiens 1997). There is now evidence that for some species, the matrix does matter and should not be ignored (e.g. Ricketts 2001). An integration of landscape ecology into metapopulation biology should therefore provide us with realistic models.
- The overall applicability of the metapopulation theory to predict the dynamics of metapopulations in the real, natural world is questioned (Baguette 2004).

Furthermore, it is not clear what role the metapopulation theory has to play in plant ecology. While the metapopulation concept has been extremely influential and is mostly developing in the study of animal populations (Hanski 1999), few empirical studies of plants have addressed its predictions (Husband & Barrett 1996, Eriksson 1996). Plants differ from animals in many respects, for instance

- the level of dispersal: more limited in plants (Eriksson 1996) and using other agents;
- the perception of the landscape: for plants, suitable habitat may be more difficult to define (plants rather respond to gradients of resource quality, thus properties of the patches, or the matrix per se, may be less important than the nature of the landscape mosaic, see Murphy & Lovett-Doust 2004);
- the existence of long-lived life cycle stages such as a seed bank or vegetative ramets, enabling migration not in space, but in time, meaning that a local population may persist for a long time even though the patch has become unsuitable (Eriksson 1996): a phenomenon called 'extinction debt' (Tillman *et al.* 1994).

As a result, there is a growing body of literature questioning the applicability of the metapopulation concept for plant populations (Husband & Barrett 1996, Bullock *et al.* 2002, Freckleton & Watkinson 2002, Ehrlén & Eriksson 2003, Freckleton & Watkinson 2003).

Appendix 10: Metapopulations and conservation biology

The metapopulation theory led to predictions about the relative performance of particular species in particular fragmented landscapes based on relatively simple but spatially realistic models. There are two reasons to expect the latter sorts of predictions to be more helpful than the island biogeographic rules of refuge design. First, the rules of refuge design are static, even those actually flowing from the theory. For example; the fundamental concept in the species-area relationship, which in applications is seen as meaning a fixed number of species in a fixed area. In contrast, the metapopulation predictions explicitly address the dynamics of species survival. Second, the rules of refuge design contrast fixed, general alternatives, whereas the spatially realistic metapopulation models practically force one to compare specific fragmented landscapes. Indeed, the implementation of ecological networks aims at achieving this subtle equilibrium between extinction and colonization rates. Technically, metapopulation capacity is the leading eigenvalue of an appropriate 'landscape' matrix. A species is predicted to persist in a landscape if the metapopulation capacity of that landscape is greater than a threshold value determined by the properties of the species. Therefore, metapopulation capacity can conveniently be used to rank different landscapes in terms of their capacity to support viable metapopulations (Hanski & Ovaskainen 2003).

Appendix 11: Metapopulation theory versus ETIB

The ETIB and metapopulation theory share some key underpinnings: the division of nature into discrete fragments of habitat, with movement of individuals among relatively unstable local populations and allowing for equilibrium at the regional scale. As we mentioned in the text, there are, however, also apparent differences (Hanski 1999):

- As the ETIB deals with communities of different species (its key statistic is species richness), metapopulation theory mainly applies to individual species.
- In ETIB, the mainland is the inexhaustible source of colonizing individuals, while in metapopulation theory, all local populations may act as sources of colonization (to different extents).
- ETIB focuses on processes occurring on one island, while the metapopulation theory considers the metapopulation as a whole.
- ETIB is based on an equilibrium model, while in metapopulation theory, most of the attention is paid to imbalances at local scale.

Much of the criticism of the ETIB could be directed, and has been directed against metapopulation theories, hence it is hard to imagine objective scientific reasons for accepting one while rejecting the other.

There are, however, certain important differences in the applications of these theories:

- Spatial scale: the ETIB was originally developed to explain patterns at large spatial scales, whereas the metapopulation concept is associated with fragmentation of our ordinary landscapes, with which the major part of biologists are more familiar. Metapopulation models of more or less isolated local populations connected by some migration then become the natural choice.
- Following ETIB, conservation planners need to focus on large areas. The main salvation of small sites was the shift by conservationists to the metapopulation paradigm (Hanski & Simberloff 1997).
- Extinction rates on the often large islands considered in ETIB are generally low and difficult to measure, while extinctions of small populations in fragmented landscapes are commonplace and relatively easy to document, providing a strong empirical basis for the metapopulation models.

At present, the metapopulation concept is used widely in conservation, to such a level that many authors see a potential danger in the widespread application of the metapopulation approach to species that might not be spatially structured in the way assumed by the models.

ETIB raised the SLOSS problem: should we aim at establishing a single large or several small reserves with the same total area to maximize the number of species preserved? In the metapopulation context, the question changes to one about persistence in different kinds of patch network. Can habitat subdivision increase, or does it reduce, the probability of long-term persistence? In the metapopulation theory, several of the prescriptions from ETIB are nuanced:

- The prescription that one large reserve is better than several small reserves: increasing subdivision leads to ever smaller populations with increased risk of local extinction, but this might be counteracted by increasing independence (asynchrony) in the dynamics of subdivided local populations enhancing recolonization. Whether habitat subdivision is benefical or not thus depends on how fast extinction risk increases with decreasing population size and on how much there is asynchrony in the dynamics of subdivided populations. We might expect subdivision to be especially beneficial in multispecies communities in which much of the variability in population sizes is generated by interspecific interactions.
- The clustering of reserves and the ‘construction’ of corridors may be beneficial. However, important side effects may be higher risk of spread of diseases, simultaneous extinctions in local populations, reduced habitat diversity and the erosion of genetic variation at regional scale (imagine populations which have been separated for ages and thus locally adapted to their habitat).

Appendix 12: Annex I Habitat types in Belgium

Table 14. European habitat types in Belgium: Natura 2000 code, indication of priority, definition and characteristic species. From: Interpretation Manual (Anonymous 1999 and 2003).

N°	Prioritary?	Definition - general description of the vegetation, syntaxa, abiotic features, origin	Characteristic species animal and plant key species including details of their occurrence on Annexes II and IV (* = priority; # = non-priority from Annex II and IV; + = Annex IV only)
1110		Sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20 m below Chart Datum. Non-vegetated sandbanks or sandbanks with vegetation belonging to the Zosteretum marinae and Cymodoceion nodosae.	Plants: Zostera marina, free living species of the Corallinaceae family. In the Baltic Sea also Potamogeton pectinatus, Ruppia cirrhosa and Tolypella nidifica. Around Tenerife, Halophila decipiens communities Animals: Important wintering habitat for many bird species, in particular Melanitta nigra but also Gavia stellata and Gavia arctica. Resting places for seals. Invertebrate communities of sandy sublittoral (e.g. polychaetes).
1130		Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary. Baltic river mouths, considered as an estuary subtype, have brackish water and no tide, with large wetland vegetation (helophytic) and luxurious aquatic vegetation in shallow water areas.	Plants: Benthic algal communities, Zostera beds e.g. Zostera noltii (Zosteretea) or vegetation of brackish water: Ruppia maritima (= R. rostellata (Ruppietea)); Spartina maritima (Spartinetea); Sarcocornia perennis (Arthrocnemetea). Both species of fresh water and brackish water can be found in Baltic river mouths (Carex spp., Myriophyllum spp., Phragmites australis, Potamogeton spp., Scirpus spp.). Animals: Invertebrate benthic communities; important feeding areas for many birds.
1140		Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders. The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4. Note: Eelgrass communities (11.3) are included in this habitat type.	
1310		Formations composed mostly or predominantly of annuals, in particular Chenopodiaceae of the genus Salicornia or grasses, colonising periodically inundated muds and sands of marine or interior salt marshes. Thero-Salicornietea, Frankenietea pulverulentae, Saginetea maritimae. Sub-types 15.11 - Glasswort swards (Thero-Salicornietalia): annual glasswort (Salicornia spp., Microcnemum coralloides), seablite (Suaeda maritima), or sometimes salwort (Salsola spp.) formations colonising periodically inundated muds of coastal saltmarshes and inland salt-basins. 15.12 - Mediterranean halo-nitrophilous pioneer communities (Frankenion pulverulentae): formations of halo-nitrophilous annuals (Frankenia pulverulenta, Suaeda splendens, Salsola soda, Cressa cretica, Parapholis incurva, P. strigosa, Hordeum marinum, Sphenopus divaricatus) colonising salt muds of the Mediterranean region, susceptible to temporary inundation and extreme drying; 15.13 - Atlantic sea-pearlwort communities (Saginion maritimae): formations of annual pioneers occupying sands subject to variable salinity and humidity, on the coasts, in dune systems and saltmarshes. They are usually limited to small areas and best developed in the zone of contact between dune and saltmarsh. 15.14 Central Eurasian crypsoid communities : Sparse solonchak formations of annual grasses of genus Crypsis (Heleochloa) colonizing drying muds of humid depressions of the salt steppes and saltmarshes (15.A) of Eurasia, from Pannonia to the Far East.	Plants: 15.11 - Salicornia spp., Microcnemum coralloides, Suaeda maritima; 15.12 - Frankenia pulverulenta, Suaeda splendens, Salsola soda, Cressa cretica, Parapholis incurva, P. strigosa, Hordeum marinum, Sphenopus divaricatus; 15.13 - Sagina maritima, S. nodosa, Cochlearia danica, Gentiana littorale, Bupleurum tenuissimum; 15.14 - Crypsis spp, Cyperus pannonicus, Spergularia media, Spergularia marina, Salicornia spp., Lepidium latifolium, Chenopodium spp., Atriplex spp.
1320		Perennial pioneer grasslands of coastal salt muds, formed by Spartina or similar grasses. When selecting sites, preference should be given to those areas supporting rare or local Spartina. Sub-types 15.21 - Flat-leaved cordgrass swards: perennial pioneer grasslands of coastal salt muds, dominated by flat-leaved Spartina maritima, S. townsendii, S. anglica, S. alterniflora. 15.22 - Rush-leaved cordgrass swards: perennial pioneer grasslands of southern Iberian coastal salt muds, dominated by the junciform-leaved Spartina densiflora.	Plants: 15.21 - Spartina maritima, S. alterniflora; 15.22 - Spartina densiflora.

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1330		Salt meadows of Baltic, North Sea, English Channel and Atlantic shores. Aster tripolium can be present or abundant in most subdivisions.	Plants: 15.31 - Puccinellia maritima; 15.32 - Halimione portulacoides, Halimione pedunculata, Aster tripolium; 15.33 - Armeria maritima, Glaux maritima, Plantago maritima, Frankenia laevis, Artemisia maritima, Festuca rubra, Agrostis stolonifera, Juncus gerardii, Carex extensa, Blysmus rufus, Eleocharis spp.; 15.34 - Spergularia marina, Puccinellia distans, P. fasciculata, P. retroflexa, P. maritima, Triglochin maritima, Potentilla anserina, Halimione portulacoides; 15.35 - Elymus pycnanthus (= Agropyron pungens) or E. repens; 15.36 - Atriplex littoralis, A. hastata, Beta maritima, Matricaria maritima.
2110		Formations of the coast representing the first stages of dune construction, constituted by ripples or raised sand surfaces of the upper beach or by a seaward fringe at the foot of the tall dunes.	Plants: 16.2111 - Elymus farctus (Agropyron junceum), Leymus arenarius, Honkenya peploides; 16.2112 - Sporobolus pungens, Euphorbia peplis, Otanthus maritimus, Medicago marina, Anthemis maritima, A. tomentosa, Eryngium maritimum, Pancratium maritimum.
2120		Mobile dunes forming the seaward cordon or cordons of dune systems of the coasts (16.2121, 16.2122 and 16.2123). Ammophilion arenariae, Zygophyllion fontanesii.	Plants: 16.2121- Ammophila arenaria, Eryngium maritimum, Euphorbia paralias, Calystegia soldanella, Otanthus maritimus, Leymus arenarius; 16.2122 - Ammophila arenaria, Echinophora spinosa, Eryngium maritimum, Euphorbia paralias, Cutandia maritima, Medicago marina, Anthemis maritima; 16.2123 - Zygophyllum fontanesii, Euphorbia paralias, Polycarpaea nivea, Cyperus capitatus, Ononis natrix, *Convolvulus caput-medusae, Polygonum maritimum, *Androcymbium psammophilum.
2130	*	Fixed dunes, stabilised and colonised by more or less closed perennial grasslands and abundant carpets of lichens and mosses, from the Atlantic coasts (and the English Channel) between the Straits of Gibraltar and Cap Blanc Nez, and the shores of the North Sea and the Baltic. In the case of the thermo-Atlantic coast, it is logical to include Euphorbio Helichrysion (code 16.222 - thermo Atlantic as far as Brittany) and Crucianellion maritimae (code 16.223 - Strait of Gibraltar as far as the southern Atlantic near Cape Prior in Galicia). Sub-types 16.221 - Northern grey dunes with grass communities and vegetation from Galio-Koelerion albescentis (Koelerion albescentis), Corynephorion canescentis p., Sileno conicae-Cerastion semidecandri. 16.222 - Biscay grey dunes (Euphorbio-Helichrysion stoechadis): dunes on stabilised humus soil infiltrated by dwarf bushes, with Helichrysum stoechas, Artemisia campestris and Ephedra distachya. 16.223 - Thermo-Atlantic grey dunes (Crucianellion maritimae): suffrutescent communities on more or less stabilised soils low in humus of the thermo-Atlantic coasts with Crucianella maritima and Pancratium maritimum. 16.225 - Atlantic dune (Mesobromion) grasslands: various sandy coastal sites characterised by herbaceous vegetation in the form of calcicole mesoxerocline grasslands, poor in nitrogen, corresponding to the communities of Mesobromion found by the sea (penetration of aero haline species); dunal grasslands composed of species characteristic of dry calcareous grasslands (34.32). 16.226 - Atlantic dune thermophile fringes: Trifolio-Geranietea sanguinei: Galio maritimi-Geranion sanguinei, Geranium sanguineum formations (34.4) on neutro basic soils rich in calcium and poor in nitrogen. 16.227 - Dune fine-grass annual communities: sparse pioneer formations (35.2, 35.3) of fine grasses rich in spring-blooming therophytes characteristic of oligotrophic soils (nitrogen poor sand or very superficial soils, or on xerocline to xerophile rocks) (Thero-Airion p., Nardo-Galion saxatile p.,Tuberarion guttatae p.) The vegetation may be a closed cover of grassland, sparse annual grassland on sand or dominated by mosses and lichen; the content of limestone (Ca2+) may vary greatly and is generally diminishing with age and succession towards brown dune systems (dune heathland).	Plants: Aira spp., Anacamptis pyramidalis, Bromus hordeaceus, Carex arenaria, Cerastium spp., Corynephorus canescens, Erodium glutinosum, E. lebelii, Galium verum, Gentiana campestris, G. cruciata, Koeleria spp., Milium scabrum, Myosotis ramosissima, Ononis repens, Phleum arenarium, Polygala vulgaris var. dunensis, Silene conica, S. otites, Trifolium scabrum, Tuberaria guttata, Viola curtisii, V. rupestris var. arenaria; Mosses- Tortula ruraliformis; Lichens- Cladonia spp.
2150	*	Decalcified dunes of France, Belgium and Britain, colonised by heaths of the alliances Calluno-Genistion or Ulicion minoris, and of Iberia, colonised by heaths of the alliance Ericion umbellatae.	Plants: Calluna vulgaris, Carex arenaria, C. trinervis, Erica ciliaris, E. cinerea, E. scoparia, Festuca vasconcensis, Pseudoarrhenatherum longifolium (Arrhenatherum thorei), Ulex australis.
2160		Sea-buckthorn formations of forest colonisation in both dry and humid dune depressions.	Plants: Hippophae rhamnooides.
2170		Salix repens communities (Salicion arenariae), colonising wet dune slacks. Following the lowering of the ground water table or accumulation of drift sand, these communities may develop into mesophilous communities as the Pyrolo-Salicetum (with Pyrola rotundifolia, Viola canina, Monotropa hypopitys) or, into xerophilous Salix communities (with Carlina vulgaris, Thalictrum minus) or into Salix repens communities with Mesobromion elements.	Plant species: Salix repens ssp. argentea (i.e. Salix arenaria).

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2180		Natural or semi-natural forests (long established) of the Atlantic, Continental and Boreal region coastal dunes with a well developed woodland structure and an assemblage of characteristic woodland species. It corresponds to oak groves and beech-oak groves with birch (Quercion robori-petraeae) on acid soils, as well as forests of the Quercetalia pubescenti-petraeae order. Pioneer stages are open forests with Betula spp. and Crataegus monogyna, mixed forests with Fraxinus excelsior, Quercus robur, Ulmus minor and Acer pseudoplatanus or, in wet dune slacks, pioneer forests with Salix alba which develop into humid mixed forests or marsh forests. On southern atlantic coasts, it mainly corresponds to mixed Pinus pinaster-Quercus ilex forests, forests of Quercus suber and Quercus robur or forest stage with Quercus robur or Quercus pubescens. On Baltic coasts also pioneer forests of Alnus spp. or Pinus sylvestris.	Plant species are highly varied and depend on local site conditions
2190		Humid depressions of dunal systems. Humid dune-slacks are extremely rich and specialised habitats very threatened by the lowering of water tables. Sub-types : 16.31 - Dune-slack pools (Charetum tomentosae, Elodeetum canadense, Hippuridetum vulgaris, Hottonietum palustris, Potametum pectinati): fresh-water aquatic communities (cf. 22.4) of permanent dune-slack water bodies. 16.32 - Dune-slack pioneer swards (Juncenion bufonii p.: Gentiano-Erythraeetum littoralis, Hydrocotylo-Baldellion): pioneer formations of humid sands and dune pool fringes, on soils with low salinity. 16.33 - Dune-slack fens: calcareous and, occasionally, acidic fen formations (cf. 54.2, 54.4, in particular 54.21, 54.2H, 54.49), often invaded by creeping willow, occupying the wettest parts of dune-slacks. 16.34 - Dune-slack grasslands: humid grasslands and rushbeds (see 37.31, 37.4) of dune-slacks, also often with creeping willows (Salix rosmarinifolia, S. arenaria). 16.35 - Dune-slack reedbeds, sedgebeds and canebeds: reedbeds, tall-sedge communities and canebeds (cf. 53.1, 53.2, 53.3) of dune-slacks.	
2310		Dunes of the North Sea and Baltic plains, formed of quartzic sands originating in redeposited and reworked glacial drift and outwash. They are highly siliceous in the Netherlands, northern Belgium and north-western Germany, progressively slightly less oligotrophic and with a more continental species assemblage in north-eastern Germany, Poland and the eastern Baltic plain. The dune systems, particularly the large ones, harbour a unique ensemble of interacting communities and harbour many specialised and localised organisms. They have considerably regressed and the remaining examples are fragile and often threatened. Vegetation is dominated by heaths with Calluna and Genista.	Plants: Calluna vulgaris, Genista anglica, G. pilosa
2330		Open formations found on inland dunes with dry siliceous soils, of Atlantic, sub-Atlantic and Mediterraneo-montane distribution, often species-poor and with a strong representation of annuals. It includes formations of unstable Germano-Baltic fluvio-glacial inland sands with Corynephorus canescens, Carex arenaria, Spergula morisonii, Teesdalia nudicaulis and carpets of fruticose lichens (Cladonia, Cetraria) (64.11) and other grasslands of more stabilised Germano-Baltic fluvio-glacial inland dune systems with Agrostis spp. and Corynephorus canescens or other acidophilous grasses (64.12).	Plants: 64.11 - Corynephorus canescens, Carex arenaria, Spergula morisonii, Teesdalia nudicaulis, Cladonia, Cetraria; 64.12 - Agrostis spp., Corynephorus canescens.
3110		Shallow oligotrophic waters with few minerals and base poor, with an aquatic to amphibious low perennial vegetation belonging to the Littorelletalia uniflorae order, on oligotrophic soils of lake and pond banks (sometimes on peaty soils). This vegetation consists of one or more zones, dominated by Littorella, Lobelia dortmana or Isoetes, although not all zones may not be found at a given site.	Plants: Isoetes lacustris, I. echinospora, Littorella uniflora, Lobelia dortmanna, Deschampsia setacea, Subularia aquatica, Juncus bulbosus, Pilularia globulifera, #Luronium natans, Potamogeton polygonifolius; in the Boreal region also Myriophyllum alterniflorum, Drepanocladus spp., Warnstorfia spp. and Fontinalis spp.
3130		22.12 x 22.31 - aquatic to amphibious short perennial vegetation, oligotrophic to mesotrophic, of lake, pond and pool banks and water-land interfaces belonging to the Littorelletalia uniflorae order. 22.12 x 22.32 - amphibious short annual vegetation, pioneer of land interface zones of lakes, pools and ponds with nutrient poor soils, or which grows during periodic drying of these standing waters: Isoeto-Nanojuncetea class. These two units can grow together in close association or separately. Characteristic plant species are generally small ephemerophytes	Plants: 22.12 x 22.31: Littorella uniflora, #Luronium natans, Potamogeton polygonifolius, Pilularia globulifera, Juncus bulbosus ssp. bulbosus, Eleocharis acicularis, Sparganium minimum. 22.12 X 22.32 : #Lindernia procumbens, Elatine spp., Eleocharis ovata, Juncus tenageia, Cyperus fuscus, C.flavescens, C.michelianus, Limosella aquatica, Schoenoplectus supinus, Scirpus setaceus, Juncus bufonius, Centaurium pulchellum, Centunculus minimus, Cicendia filiformis.

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3140		Lakes and pools with waters fairly rich in dissolved bases (pH often 6-7) (21.12) or with mostly blue to greenish, very clear, waters poor (to moderate) in nutrients, base-rich (pH often >7.5) (21.15). The bottom of these unpolluted water bodies are covered with charophyte, Chara and Nitella, algal carpets. In the Boreal region this habitat type includes small calcareous-rich oligo-mesotrophic gyttja pools with dense Chara (dominating species is C. strigosa) carpets, often surrounded by various eutrophic fens and pine bogs	Plants: Chara spp., Nitella spp.
3150		Lakes and ponds with mostly dirty grey to blue-green, more or less turbid, waters, particularly rich in dissolved bases (pH usually > 7), with free-floating surface communities of the Hydrocharition or, in deep, open waters, with associations of large pondweeds (Magnopotamion).	Plants: Hydrocharition - Lemna spp., Spirodela spp., Wolffia spp., Hydrocharis morsus-ranae, Stratiotes aloides, Utricularia australis, U. vulgaris, #Aldrovanda vesiculosa, Ferns (Azolla), Liverworts (Riccia spp., Ricciocarpus spp.); Magnopotamion - Potamogeton lucens, P. praelongus, P. zizii, P. perfoliatus.
3160		Natural lakes and ponds with brown tinted water due to peat and humic acids, generally on peaty soils in bogs or in heaths with natural evolution toward bogs. pH is often low, 3 to 6. Plant communities belong to the order Utricularietalia.	Plants: Utricularia spp, Rhynchospora alba, R. fusca, Sparganium minimum, Sphagnum species. In the Boreal region also Nuphar lutea, N. pumila, Carex lasiocarpa, C. rostrata, Nymphaea candida, Drepanocladus spp., Warnstorfia trichophylla, W. procera. Animals: Odonata (dragonflies and damselflies)
3260		Water courses of plain to montane levels, with submerged or floating vegetation of the Ranunculion fluitantis and Callitricho-Batrachion (low water level during summer) or aquatic mosses.	Plants: Ranunculus saniculifolius, R. trichophyllus, R. fluitans, R. peltatus, R. penicillatus ssp. penicillatus, R. penicillatus ssp. pseudofluitantis, R. aquatilis, Myriophyllum spp., Callitriche spp., Sium erectum, Zannichellia palustris, Potamogeton spp., Fontinalis antipyretica.
3270		Muddy river banks of plain to submontane levels, with annual pioneer nitrophilous vegetation of the Chenopodion rubri p.p. and the Bidention p.p. alliances. During the spring and at the beginning of the summer, sites look like muddy banks without any vegetation (developes later in the year). If the conditions are not favourable, this vegetation has a weak development or could be completely absent.	Plants: Chenopodium rubrum, Bidens frondosa, Xanthium sp., Polygonum lapathifolium.
4010		Humid, peaty or semi-peaty heaths, other than blanket bogs, of the Atlantic and sub-Atlantic domains	Plants: Erica tetralix
4030		Mesophile or xerophile heaths on siliceous, podsolic soils in moist Atlantic and sub-Atlantic climates of plains and low mountains of Western, Central and Northern Europe. Sub-types: 31.21 - Sub-montane Vaccinium-Calluna heaths. Calluno-Genistion pilosae p.(Vaccinion vitis-idaeae p.):Vaccinio myrtilli-Callunetum s.l. i.a. Heaths rich in Vaccinium spp., usually with Calluna vulgaris, of the northern and western British Isles, the Hercynian ranges and the lower levels of the Alps, the Carpathians, the Pyrenees and the Cordillera Cantabrica. 31.22 - Sub-Atlantic Calluna-Genista heaths. Calluno-Genistion pilosae p. Low Calluna heaths often rich in Genista, mostly of the Germano-Baltic lowlands. Similar formations occurring in British upland areas, montane zones of high mountains of the western Mediterranean basin and high rainfall Adriatic influenced areas are most conveniently listed here. 31.23 - Atlantic Erica-Ulex heaths. Ulicenion minoris; Daboecenion cantabricae p.; Ulicion maritimae p. Heaths rich in gorse (Ulex) of the Atlantic margins. 31.24 - Ibero-Atlantic Erica-Ulex-Cistus heaths. Daboecenion cantabricae p.; Ericenion umbellatae p., Ericenion aragonensis; Ulicion maritimae p.; Genistion micrantho-anglicae p. Aquitanian heaths with rock-roses. Iberian heaths with numerous species of heathers (notably Erica umbellata, E. aragonensis) and brooms, rock-roses and often Daboecia. When the rock-roses and other Mediterranean shrubs become dominant they should be classified under sclerophyllous scrubs (32). 31.25 - Boreo-Atlantic Erica cinerea heaths	Plants: 31.21 - Vaccinium spp., Calluna vulgaris; 31.22 - Calluna vulgaris, Genista anglica, G. germanica, G. pilosa, accompanied by Empetrum nigrum or Vaccinium spp.; 31.23 - Ulex maritimus, U. gallii, Erica cinerea, E. mackaiana, E. vagans; 31.24 - Erica umbellata, E. aragonensis, E. cinerea, E. andevalensis, Cistus salvifolius, Calluna vulgaris; 31.25 - Erica cinerea.
5110		Stable xerothermophilous and calcicolous scrubs dominated by Buxus sempervirens, of hill and montane levels. These formations correspond to xerothermophilous Buxus thickets with their fringe associations of the Geranion sanguinei alliance on calcareous or siliceous substratum. They also constitute the natural woodland edge of calcareous dry forests rich with Buxus.In the euro-siberian region, the more open formations are rich in submediterranean plant species. Syntaxa: Berberidion p.p., Amelanchiero-Buxion	Plants: Buxus sempervirens, Prunus spinosa, Prunus mahaleb, Cornus mas, Crataegus spp., Berberis vulgaris, Ligustrum vulgare, Viburnum lantana, Amelanchier ovalis, Geranium sanguineum, Dictamnus albus.
5130		Formations with Juniperus communis of plain to montane levels. They mainly correspond to phytodynamic succession of the following types of vegetation: a) generally, mesophilous or xerophilous calcareous and nutrient poor grasslands, grazed or let lie fallow, of the Festuco-Brometea and Elyno-Seslerietea. b) more rarely, heathlands of the Calluno vulgaris-Ulicetea minoris (31.2).	Plants: Juniperus communis, Crataegus spp., Rosa spp., Prunus spinosa. For a) typical species of the Festuco-Brometea and Elyno-Seslerietea. For b) Calluna vulgaris, Vaccinium myrtillus, Empetrum nigrum, Erica tetralix, Deschampsia flexuosa, Nardus stricta.

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6110	*	Open xerothermophile pioneer communities on superficial calcareous or base-rich soils (basic volcanic substrates), dominated by annuals and succulents of the Alysso alyssoidis-Sedion albi Oberdorfer & Müller in Müller 61. Similar communities may develop on artificial substrates; these should not be taken into account.	Plants: Alyssum alyssoides, Arabis recta, Cerastium spp., Hornungia petraea, Jovibarba spp., Poa badensis, Saxifraga tridactylites, Sedum spp., Sempervivum spp., Teucrium botrys.
6120	*	Dry, frequently open grasslands on more or less calciferous sand with a subcontinental centre of distribution (Koelerion glaucae, Sileno conicae-Cerastion semidecandri, Sedo-Cerastion p.).	Plants: Allium schoenoprasum, Alyssum montanum ssp. gemelinii, Astragalus arenarius, Cardaminopsis arenosa, Carex ligerica, Carex praecox, Dianthus deltoides, Euphorbia seguieriana, Festuca psammophila, Gypsophila fastigiata, Helichrysum arenarium, Herniaria glabra, Koelerion glauca, Petrorhagia prolifera, Sedum reflexum, Silene chlorantha
6130		Generally open natural or semi-natural grasslands 1) on natural rock outcrops, rich in heavy metals (e.g. zinc, lead), 2) river gravels and shingles, 3) on old terrils or spoil heaps around mines. These open grasslands are characterised by a highly specialised flora, with subspecies and ecotypes adapted to heavy metals. The threatened endemic taxa are generally absent from the pioneer vegetation of younger terrils. This pioneer vegetation is not considered to be a priority.	Plants: Viola calaminaria and metallophyte races of Thlaspi caerulescens, Armeria maritima, Minuartia verna, Silene vulgaris, Festuca ophioliticola, Cochleria alpina sensu lato.
6210	(*)	Dry to semi-dry calcareous grasslands of the Festuco-Brometea. This habitat is formed on the one hand by steppic or subcontinental grasslands (Festucetalia valesiacae) and, on the other, by the grasslands of more oceanic and sub-Mediterranean regions (Brometalia erecti); in the latter case, a distinction is made between primary Xerobromion grasslands and secondary (semi-natural) Mesobromion grasslands with Bromus erectus; the latter are characterised by their rich orchid flora. Abandonment results in thermophile scrub with an intermediate stage of thermophile fringe vegetation (Trifolio-Geranietea). Important orchid sites should be interpreted as sites that are important on the basis of one or more of the following three criteria: (a) the site hosts a rich suite of orchid species (b) the site hosts an important population of at least one orchid species considered not very common on the national territory (c) the site hosts one or several orchid species considered to be rare, very rare or exceptional on the national territory.	Plants: Mesobromion - Anthyllis vulneraria, Arabis hirsuta, Brachypodium pinnatum, Bromus inermis, Campanula glomerata, Carex caryophyllea, Carlina vulgaris, Centaurea scabiosa, Dianthus carthusianorum, Eryngium campestre, Koeleria pyramidata, Leontodon hispidus, Medicago sativa ssp. falcata, Ophrys apifera, O. insectifera, Orchis mascula, O. militaris, O. morio, O. purpurea, O. ustulata, O. mascula, Polygala comosa, Primula veris, Sanguisorba minor, Scabiosa columbaria, Veronica prostrata, V. teucrium. Xerobromion - Bromus erectus, Fumana procumbens, Globularia elongata, Hippocrepis comosa. Festucetalia valesiacae: Adonis vernalis, Euphorbia seguierana, Festuca valesiaca, Silene otites, Stipa capillata, S. joannis. Animals: Papilio machaon, Iphiclides podalirius (Lepidoptera); Libelloides spp., Mantis religiosa (Neuroptera).
6230	*	Closed, dry or mesophile, perennial Nardus grasslands occupying siliceous soils in Atlantic or sub-Atlantic or boreal lowland, hill and montane regions. Vegetation highly varied, but the variation is characterised by continuity. Nardetalia: 35.1-Violo-Nardion (Nardo-Galion saxatilis, Violion caninae); 36.31- Nardion.Species-rich sites should be intrepreted as sites with are remarkable for a high number of species. In general, the habitats which have become irreversibly degraded through overgrazing should be excluded	Plants: Antennaria dioica, Arnica montana, Campanula barbata, Carex ericetorum, C. pallescens, C. panicea, Festuca ovina, Galium saxatile, Gentiana pneumonanthe, Hypericum maculatum, Hypochoeris maculata, Lathyrus montanus, Leontodon helveticus, Leucorchis albida, Meum athamanticum, Nardus stricta, Pedicularis sylvatica, Platanthera bifolia, Polygala vulgaris, Potentilla aurea, P. erecta, Veronica officinalis, Viola canina. Animals: Miramella alpina.
6410		Molinia meadows of plain to montane levels, on more or less wet nutrient poor soils (nitrogen, phosphorus). They stem from extensive management, sometimes with a mowing late in the year or, they correspond to a deteriorated stage of draining peat bogs. Sub-types : 37.311: on neutro-alkaline to calcareous soils with a fluctuating water table, relatively rich in species (Eu-molinion). The soil is sometimes peaty and becomes dry in summer. 37.312: on more acid soils of the Junco-Molinion (Juncion acutiflori) except species-poor meadows or on degraded peaty soils	Plants: 37.311 - Molinia coerulea, Dianthus superbus, Selinum carvifolia, Cirsium tuberosum, Colchicum autumnale, Inula salicina, Silaum silaus, Sanguisorba officinalis, Serratula tinctoria, Tetragonolobus maritimus; 37.312 - Viola persiciflora, V. palustris, Galium uliginosum, Cirsium dissectum, Crepis paludosa, Luzula multiflora, Juncus conglomeratus, Ophioglossum vulgatum, Inula britannica, Lotus uliginosus, Dianthus deltoides, Potentilla erecta, P. anglica, Carex pallescens.
6430		37.7 - Wet and nitrophilous tall herb edge communities, along water courses and woodland borders belonging to the Glechometalia hederaceae and the Convolvuletalia sepium orders (Senecion fluviatilis, Aegopodion podagrariae, Convolvulion sepium, Filipendulion). 37.8 - Hygrophilous perennial tall herb communities of montane to alpine levels of the Betulo-Adenostyletea class	Plants: 37.7 - Glechoma hederacea, Epilobium hirsutum, Senecio fluviatilis, Filipendula ulmaria, Angelica archangelica, Petasites hybridus, Cirsium oleraceum, Chaerophyllum hirsutum, Aegopodium podagraria, Alliaria petiolata, Geranium robertianum, Silene dioica, Lamium album, Lysimachia punctata, Lythrum salicaria, Crepis paludosa; 37.8 - Aconitum lycoctonum (A. vulparia), A. napellus, Geranium sylvaticum, Trollius europaeus, Adenostyles alliariae, Peucedanum ostruthium, Cicerbita alpina, Digitalis grandiflora, Calamagrostis arundinacea, Cirsium helenioides.
6510		Species-rich hay meadows on lightly to moderately fertilised soils of the plain to submontane levels, belonging to the Arrhenatherion and the Brachypodio-Centaureion nemoralis alliances. These extensive grasslands are rich in flowers and are not cut before the grasses flower and then only one or two times per year	Plants: Arrhenatherum elatius, Trisetum flavescens ssp. flavescens, Pimpinella major, Centaurea jacea, Crepis biennis, Knautia arvensis, Tragopogon pratensis, Daucus carota, Leucanthemum vulgare, Alopecurus pratensis, Sanguisorba officinalis, Campanula patula, Leontodon hispidus, L. nudicaulis, Linum bienne, Oenanthe pimpinelloides, Rhinanthus lanceolatus, Malva moschata, Serapias cordigera

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6520		Species-rich mesophile hay meadows of the montane and sub-alpine levels (mostly above 600 metres) usually dominated by Trisetum flavescens and with Heracleum sphondylium, Viola cornuta, Astrantia major, Carum carvi, Crepis mollis, C. pyrenaica, Bistorta major, (Polygonum bistorta), Silene dioica, S. vulgaris, Campanula glomerata, Salvia pratensis, Centaurea nemoralis, Anthoxanthum odoratum, Crocus albiflorus, Geranium phaeum, G. sylvaticum, Narcissus poeticus, Malva moschata, Valeriana repens, Trollius europaeus, Pimpinella major, Muscari botryoides, Lilium bulbiferum, Thlaspi caerulescens, Viola tricolor ssp. subalpina, Phyteuma halleri, P. orbiculare, Primula elatior, Chaerophyllum hirsutum and many others	Plants: Trisetum flavescens and with Heracleum sphondylium, Viola cornuta, Astrantia major, Carum carvi, Crepis mollis, C. pyrenaica, Bistorta major (Polygonum bistorta), Silene dioica, S. vulgaris, Campanula glomerata, Salvia pratensis, Centaurea nemoralis, Anthoxanthum odoratum, Crocus albiflorus, Geranium phaeum, G. sylvaticum, Narcissus poeticus, Malva moschata, Valeriana repens, Trollius europaeus, Pimpinella major, Muscari botryoides, Lilium bulbiferum, Thlaspi caerulescens, Viola tricolor ssp. subalpina, Phyteuma halleri, P. orbiculare, Primula elatior, Chaerophyllum hirsutum, Alchemilla spp., Cirsium heterophylum.
7110	*	Acid bogs, ombrotrophic, poor in mineral nutrients, sustained mainly by rainwater, with a water level generally higher than the surrounding water table, with perennial vegetation dominated by colourful Sphagna hummocks allowing for the growth of the bog (Erico-Sphagnetalia magellanici, Scheuchzerietalia palustris p., Utricularietalia intermedio-minoris p., Caricetalia fuscae p.). The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active peat formation is temporarily at a standstill, such as after a fire or during a natural climatic cycle e.g., a period of drought, are also included.	Plants: Erico-Sphagnetalia magellanici- Andromeda polifolia, Carex pauciflora, Cladonia spp., Drosera rotundifolia, Eriophorum vaginatum, Odontoschisma sphagni, Sphagnum magellanicum, S. imbricatum, S. fuscum, Vaccinium oxycoccos; in the Boreal region also Betula nana, Chamaedaphne calyculata, Calluna vulgaris, Ledum palustre and Sphagnum angustifolium. Scheuchzerietalia palustris p., Utricularietalia intermedio-minoris p., Caricetalia fuscae p.- Carex fusca, C. limosa, Drosera anglica, D. intermedia, Eriophorum gracile, Rhynchospora alba, R. fusca, Scheuchzeria palustris, Utricularia intermedia, U. minor, U. ochroleuca; in the Boreal region also Sphagnum balticum and S. majus. Animals: Dragonflies- Leucorrhinia dubia, Aeshna subartica, A. caerulea, A. juncea, Somatochlora arctica, S. alpestris; Butterflies- Colias palaeno, Boloria aquilonaris, Coenonympha tullia, Vacciniina optilete, Hypenodes turfosalis, Eugraphe subrosea; Spiders- Pardosa sphagnicola, Glyphesis cottonae; Ants- Formica transkaucassia; Cricket/Grasshopper- Metrioptera brachyptera, Stethophyma grossum
7120		These are raised bogs where there has been disruption (usually anthropogenic) to the natural hydrology of the peat body, leading to surface desiccation and/or species change or loss. Vegetation on these sites usually contains species typical of active raised bog as the main component, but the relative abundance of individual species is different. Sites judged to be still capable of natural regeneration will include those areas where the hydrology can be repaired and where, with appropriate rehabilitation management, there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years. Sites unlikely to qualify as SACs are those that consist largely of bare peat, that are dominated by agricultural grasses or other crops, or where components of bog vegetation have been eradicated by closed canopy woodlands.	
7140		Peat-forming communities developed at the surface of oligotrophic to mesotrophic waters, with characteristics intermediate between soligenous and ombrogenous types. They present a large and diverse range of plant communities. In large peaty systems, the most prominent communities are swaying swards, floating carpets or quaking mires formed by medium-sized or small sedges, associated with sphagnum or brown mosses. They are generally accompanied by aquatic and amphibious communities. In the Boreal region this habitat type includes minerotrophic fens that are not part of a larger mire complex, open swamps and small fens in the transition zone between water (lakes, ponds) and mineral soil. These mires and bogs belong to the Scheuchzerietalia palustris order (oligotrophic floating carpets among others) and to the Caricetalia fuscae order (quaking communities). Oligotrophic water-land interfaces with Carex rostrata are included.	Plants: Eriophorum gracile, Carex chordorrhiza, Carex lasiocarpa, Carex diandra, Carex rostrata, Carex limosa, Scheuchzeria palustris, Hammarbya paludosa, #Liparis loeselii, Rhynchospora alba, R. fusca, Menyanthes trifoliata, Epilobium palustre, Pedicularis palustris, Sphagnum sp. (S. papillosum, S. angustifolium, S. subsecundun, S. fimbriatum, S. riparium, S. cuspidatum, Calliergon giganteum, Drepanocladus revolvens, Scorpidium scorpioides, Campylium stellatum, Aneura pinguis.
7150		Highly constant pioneer communities of humid exposed peat or, sometimes, sand, with Rhynchospora alba, R. fusca, Drosera intermedia, D. rotundifolia, Lycopodiella inundata, forming on stripped areas of blanket bogs or raised bogs, but also on naturally seep- or frost-eroded areas of wet heaths and bogs, in flushes and in the fluctuation zone of oligotrophic pools with sandy, slightly peaty substratum. These communities are similar, and closely related, to those of shallow bog hollows (51.122) and of transition mires (54.57).	Plants: Rhynchospora alba, R. fusca, Drosera intermedia, D. rotundifolia, Lycopodiella inundata.
7210	*	Calcareous or marly screes of the hill and montane levels extending into mountainous regions (subalpine and alpine), often in dry, warm stations in associations with Stipetalia calamagrostis. This habitat type should be clearly distinguished from 8130 - Western Mediterranean and thermophilous scree, a non-priority Annex I habitat type.	Plants: Achnatherum calamagrostis, Dryopteris robertiana (=Gymnocarpium robertianum), Galeopsis angustifolia, Petasites paradoxus, Rumex scutatus
7220	*	Hard water springs with active formation of travertine or tufa. These formations are found in such diverse environments as forests or open countryside. They are generally small (point or linear formations) and dominated by bryophytes (Cratoneurion commutati)	Plants: Arabis soyeri, Cochlearia pyrenaica (in sites with heavy metals), Pinguicula vulgaris, Saxifraga aizoides. Mosses: Catoscopium nigritum, Cratoneuron commutatum, C. commutatum var. falcatum, C. filicinum, Eucladium verticillatum, Gymnostomum recurvirostrum. In the Boreal region also Carex appropinquata, Epilobium davuricum, Juncus triglumis, Drepanocladus vernicosus, Philonotis calcarea, Scorpidium revolvens, S.cossoni, Cratoneuron decipiens, Bryum pseudotriquetum.

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7230		Wetlands mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous base-rich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum. Peat formation, when it occurs, is infra-aquatic. Calciphile small sedges and other Cyperaceae usually dominate the mire communities, which belong to the Caricion davallianae, characterised by a usually prominent "brown moss" carpet formed by Campylium stellatum, Drepanocladus intermedius, D. revolvens, Cratoneuron commutatum, Acrocladium cuspidatum, Ctenidium molluscum, Fissidens adianthoides, Bryum pseudotriquetrum and others, a grasslike growth of Schoenus nigricans, S. ferrugineus, Eriophorum latifolium, Carex davalliana, C. flava, C. lepidocarpa, C. hostiana, C. panicea, Juncus subnodulosus, Scirpus cespitosus, Eleocharis quinqueflora, and a very rich herbaceous flora including Tofieldia calyculata, Dactylorhiza incarnata, D. traunsteineri, D. traunsteinerioides, D. russowii, D. majalis ssp.brevifolia, D. cruenta, #Liparis loeselii, Herminium monorchis, Epipactis palustris, Pinguicula vulgaris, Pedicularis sceptrum-carolinum, Primula farinosa, Swertia perennis. Wet grasslands (Molinietalia caerulaea, e.g. Juncetum subnodulosi & Cirsietum rivularis, 37), tall sedge beds (Magnocaricion, 53.2), reed formations (Phragmition, 53.1), fen sedge beds (Cladietum mariscae, 53.3), may form part of the fen system, with communities related to transition mires (54.5, 54.6) and amphibious or aquatic vegetation (22.3, 22.4) or spring communities (54.1) developing in depressions. The sub-units below, which can, alone or in combination, and together with codes selected from the categories just mentioned, describe the composition of the fen, are understood to include the mire communities sensu stricto (Caricion davallianae), their transition to the Molinion, and assemblages that, although they may be phytosociologically referable to alkaline Molinion associations, contain a large representation of the Caricion davallianae species listed, in addition to being integrated in the fen system; this somewhat parallels the definition of an integrated class Molinio-Caricetalia davallianae in Rameau *et al.* 1989. Outside of rich fen systems, fen communities can occur as small areas in dune slack systems (16.3), in transition mires (54.5), in wet grasslands (37), on tufa cones (54.121) and in a few other situations. The codes below can be used, in conjunction with the relevant principal code, to signal their presence. Rich fens are exceptionally endowed with spectacular, specialised, strictly restricted species. They are among the habitats that have undergone the most serious decline. They are essentially extinct in several regions and gravely endangered in most	Plants: Schoenus nigricans, S. ferrugineus, Carex spp., Eriophorum latifolium, Cinclidium stygium, Tomentypnum nitens.
8150		Siliceous screes of hills of western and central Europe, with Epilobium collinum, Galeopsis segetum, Senecio viscosus, Anarrhinum bellidifolium, Cryptogramma crispa. Upland siliceous screes, often resulting from quarry activity, and colonised by very impoverished forms of the Alpine communities, usually rich in mosses, lichens and sometimes ferns, notably Cryptogramma crispa, are included, but should not be taken into account.	Plants: Epilobium collinum, Galeopsis segetum, Senecio viscosus, Anarrhinum bellidifolium, Cryptogramma crispa
8160	*	Calcareous or marly screes of the hill and montane levels extending into mountainous regions (subalpine and alpine), often in dry, warm stations in associations with Stipetalia calamagrostis. This habitat type should be clearly distinguished from 8130 - Western Mediterranean and thermophilous scree, a non-priority Annex I habitat type.	Plants: Achnatherum calamagrostis, Dryopteris robertiana (=Gymnocarpium robertianum), Galeopsis angustifolia, Petasites paradoxus, Rumex scutatus
8210		Vegetation of fissures of limestone cliffs, in the mediterranean region and in the euro-siberian plain to alpine levels, belonging essentially to the Potentilletalia caulescentis and Asplenietalia glandulosi orders. Two levels may be identified: a) thermo- and meso-Mediterranean (Onosmetalia frutescentis) with Campanula versicolor, C. rupestris, Inula attica, I. mixta, Odontites luskii; b) montane and oro-Mediterranean (Potentilletalia speciosae, including Silenion aurticulatae, Galion degenii and Ramondion nathaliae). This habitat type presents a great regional diversity, with many endemic plant species (indicated under point 2).	Plants: 62.11 - Western Mediterranean communities (Asplenion petrarchae): Asplenium petrarchae, Asplenium trichomanes ssp. pachyrachis, Cheilanthes acrostica, Melica minuta, Hieracium stelligerum, Erodium petraeum; Mesothermic shady fern groups of the supra-Mediterranean level (Polypodion australis): Polypodium cambricum ssp. australe, Saxifraga corbariensis, #Asplenium jahandiezii, Asplenium sagittatum, Pteris cretica, Asplenium trichomanes ssp. inexpectans. 62.12 - Central Pyrenean communities (Saxifragion mediae): Asperula hirta, +Androsace cylindrica, Asplenium celtibericum, Saxifraga media, S. longifolia, S. aretioides, Potentilla alchimilloides, P. nivalis, Ramonda myconi, Ptilotrichum pyrenaicum. 62.13 - Liguro-Apennine cliffs communities (Saxifragion lingulatae): Saxifraga callosae ssp. lingulata, Primula marginata, P. allionii, Phyteuma cordatum, Ballota frutescens, Potentilla saxifraga, Silene campanula, Phyteuma charmelii. 62.14 - Southern Italian communities (Dianthion rupicolae): #Dianthus rupicola, Antirrhinum siculum, Cymbalaria pubescens, Scabiosa limonifolia. 62.15 and 62.1B - Euro-Siberian communities and Mediterranean communities of the supra to oro-Mediterranean levels (Potentilletalia caulescentis): -shady communities : Cystopteris fragilis, Asplenium trichomanes, Asplenium viride. -xerophilous communities : Ceterach officinarum, Asplenium ruta-muraria, Draba aizoides, Kernera saxatilis, Biscutella laevigata. -alpine level communities : Androsace helvetica, Minuartia rupestris, Draba tomentosa. - Centre and Southern Italian communities (Saxifragion australis): Saxifraga australis, Potentilla

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			nebrodensis, Campanula tanfanii, Trisetum bertolonii. 62.16, 62.17, 62.18, 62.19 and 62.1A - Greek and Southern Italian calcareous cliff communities (Campanulion versicoloris, Cirsietalia chamaepeucis, Silenion auriculatae, Ramondion nathaliae). 62.1C - Boreal communities with Asplenium viride, Woodsia glabella.
8220		Vegetation of fissures of siliceous inland cliffs, which presents many regional sub-types, described under point 2.	Plants: 62.21 - Alpine siliceous cliff vegetation (Pyrenees and Alps) and of Hercynian system and its periphery (Androsacion vandellii): Androsace vandellii, Saxifraga retusa ssp. retusa, S. aspera, Phyteuma scheuchzeri, Primula hirsuta, Eritrichium nanum; Communities of montane level of Pyrenees and Cevennes (Asarinion procumbentis: includes 62.26): Asarina procumbens, Dianthus graniticus, Saxifraga continentalis, S. prostii, Anarrhinum bellidifolium; Saxicolous communities of the plain to hill levels under Middle European climate (Asplenion septentrionalis) and communities of the plain level under oceanic climate (Asplenion billotii-Umbilicarion rupestre: 62.29 is included): Asplenium septentrionale, A. adiantum-nigrum, A. billotii, A. foreziense, A. onopteris. - Hercynian serpentine cliffs (Asplenion cuneifolii): Asplenium cuneifolium, A. alternifolium, A. adulterinum. 62.22 - high altitude siliceous cliff vegetation of Iberian mountains: - Central Iberian mountains (Saxifragion willkommianae): Saxifraga willkommiana, S. orogredensis, Murbeckiella boryi; - Sierra Nevada (Saxifragion nevadensis): Saxifraga nevadensis. 62.23 - South-western Alpine siliceous cliff vegetation (Saxifragion pedemontanae): Saxifraga pedemontana, #S. florulenta, Galium tendae, Sempervivum montanum ssp. burnatii, Jovibarba allionii. 62.24 - Cyrno-Sardian siliceous montane cliff vegetation (Potentillion crassinerviae): Potentilla crassinervia, Armeria leucocephala, Silene requientii, Saxifraga pedemontana ssp. cervicornis. 62.25 - Northern Greek siliceous cliff vegetation (Silenion lerchenfeldianae): Silene lerchenfeldiana. 62.26 - see 62.21 62.27 - Western Iberian siliceous cliff vegetation of the submontane level (Cheilanthion hispanicae): Cheilanthes hispanica, C. tinaei. 62.28 - Provençо-Iberian siliceous cliff vegetation on rock faces rich in basic silicates (basalts and peridots), of the thermo to meso-Mediterranean levels (Phagnalo saxatilis-Cheilanthion maderensis): Cheilanthes maderensis, C. marantae, C. vellaea, Asplenium balearicum. 62.29 : see 62.21. 62.2A - Boreal siliceous cliffs (rapakivi cliffs)
8230		Pioneer communities of the Sedo-Scleranthion or the Sedo albi-Veronicion dillenii alliances, colonising superficial soils of siliceous rock surfaces. As a consequence of drought, this open vegetation is characterised by mosses, lichens and Crassulacea.	Plants: Sedo-Scleranthion: Sempervivum arachnoideum, Sempervivum montanum, Sedum annuum, Silene rupestris, Veronica fruticans; Sedo albi-Veronicion dillenii: Veronica verna, Veronica dillenii, Gagea bohemica, Gagea saxatiles, Riccia ciliifera; Plant species belonging to the two syntaxa: Allium montanum, Sedum acre, Sedum album, Sedum reflexum, Sedum sexangulare, Scleranthus perennis, Rumex acetosella. Mosses- Polytrichum piliferum, Ceratodon purpureus.
8310		Caves not open to the public, including their water bodies and streams, hosting specialised or high endemic species, or that are of paramount importance for the conservation of Annex II species (e.g. bats, amphibians).	Plants: mosses only (e.g. Schistostega pennata) and algal carpets at the entry of caves. Animals: Very specialised and highly endemic cavernicolous fauna. It includes underground relic forms of a fauna which has been diversified outside. This fauna is mainly composed of invertebrates which exclusively live in caves and underground waters. The cavernicolous terrestrial invertebrates are mainly coleoptera, belonging to the Bathysciinae and Trechinae families in particular, which are carnivorous and have a very limited distribution. Cavernicolous aquatic invertebrates constitute a highly endemic fauna, dominated by crustaceans (Isopoda, Amphipoda, Syncarida, Copepoda) and include many living fossils. Aquatic molluscs, belonging to the Hydrobiidae family are also found. With regard to vertebrates, caves constitute hibernation sites for most European bat species, among which many are threatened (see Annex II). Several species can live together in the same cave. Caves also shelter some very rare amphibious species like #Proteus anguinus and several species of the #Speleomantes genus

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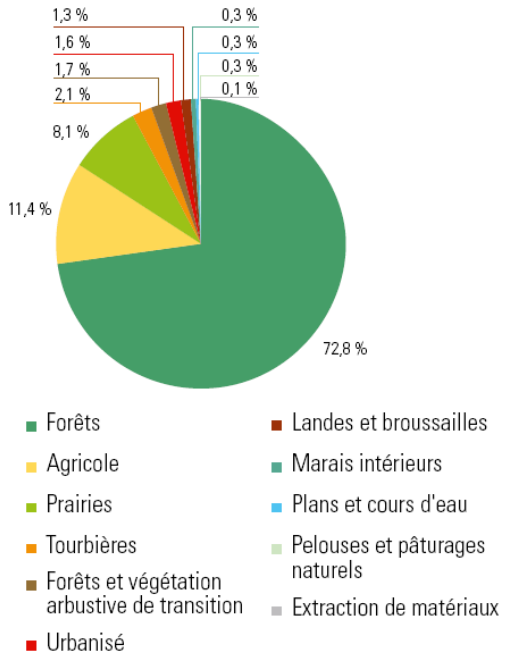
9110		Fagus sylvatica and, in higher mountains, Fagus sylvatica-Abies alba or Fagus sylvatica-Abies alba-Picea abies forests developed on acid soils of the medio-European domain of central and northern Central Europe, with Luzula luzuloides, Polytrichum formosum and often Deschampsia flexuosa, Calamagrostis villosa, Vaccinium myrtillus, Pteridium aquilinum. The following sub-types are included: 41.111 Medio-European collinar woodrush beech forests Acidophilous Fagus sylvatica forests of the lesser Hercynian ranges and Lorraine, of the collinar level of the greater Hercynian ranges, the Jura and the Alpine periphery, of the western sub-Pannonic and the intra-Pannonic hills, not or little accompanied by self sown conifers, and generally with an admixture of Quercus petraea, or in some cases Quercus robur, in the canopy. 41.112 Medio-European montane woodrush beech forests Acidophilous forests of Fagus sylvatica, Fagus sylvatica and Abies alba or Fagus sylvatica, Abies alba and Picea abies of the montane and high-montane levels of the greater Hercynian ranges, from the Vosges and the Black Forest to the Bohemian Quadrangle, the Jura, the Alps, the Carpathians and the Bavarian Plateau.	Plants: Fagus sylvatica, Abies alba, Picea abies, Luzula luzuloides, Polytrichum formosum and often Deschampsia flexuosa, Calamagrostis villosa, Vaccinium myrtillus, Pteridium aquilinum.
9120		Beech forests with Ilex, growing on acid soils, of the plain to montane levels under humid Atlantic climate. The acid substrate corresponds to alterations of acid rocks or to silt with flints more or less degraded or, to old alluvial deposits. The soils are of acid brown type, leaching or with an evolution towards podsol type. The humus is of moder to dysmoder type. These beech forests present different varieties: a) subatlantic beech-oak forests of the plains and hill levels with Ilex aquifolium b) hyper-Atlantic beech-oak forests of the plains and hill levels with Ilex and Taxus, rich in epiphytes c) pure beech forests or acidophilous beech-fir forests of the montane level, with Ilex aquifolium in the field layer.	Plants: Ilex aquifolium, Taxus baccata, Ruscus aculeatus, Deschampsia flexuosa, Hieracium sabaudum, H. umbellatum, Pteridium aquilinum, Vaccinium myrtillus, Lonicera periclymenum, Melampyrum pratense, Teucrium scorodonia, Holcus mollis.
9130		Fagus sylvatica and, in higher mountains, Fagus sylvatica-Abies alba or Fagus sylvatica-Abies alba-Picea abies forests developed on neutral or near-neutral soils, with mild humus (mull), of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, characterised by a strong representation of species belonging to the ecological groups of Anemone nemorosa, of Lamiastrum (Lamium) galeobdolon, of Galium odoratum and Melica uniflora and, in mountains, various Dentaria spp., forming a richer and more abundant herb layer than in the forests of 9110 and 9120. Sub-types : 41.131 - Medio-European collinar neutrophilous beech forests Neutrocline or basicline Fagus sylvatica and Fagus sylvatica-Quercus petraea-Quercus robur forests of hills, low mountains and plateaux of the Hercynian arc and its peripheral regions, of the Jura, Lorraine, the Paris basin, Burgundy, the Alpine piedmont, the Carpathians and a few localities of the North Sea-Baltic plain. 41.132 - Atlantic neutrophile beech forests Atlantic beech and beech-oak forests with Hyacinthoides non-scripta, of southern England, the Boulonnais, Picardy, the Oise, Lys and Schelde basins. 41.133 - Medio-European montane neutrophilous beech forests Neutrophile forests of Fagus sylvatica, Fagus sylvatica and Abies alba, Fagus sylvatica and Picea abies, or Fagus sylvatica, Abies alba and Picea abies of the montane and high-montane levels of the Jura, the northern and eastern Alps, the western Carpathians and the great Hercynian ranges. 41.134 - Bohemian lime-beech forests Fagus sylvatica or Fagus sylvatica-Abies alba forests rich in Tilia spp., of the Bohemian basin. 41.135 - Pannonic neutrophilme beech forests Neutrophilous beech forests of medio-European affinities of the hills of the Pannonic plain and its western periphery.	Plants: Fagus sylvatica, Abies alba, Picea abies, Anemone nemorosa, Lamiastrum (Lamium) galeobdolon, Galium odoratum, Melica uniflora, Dentaria spp.

N°	Prioritary?	Definition - general description of the vegetation, syntaxa, abiotic features, origin	Characteristic species animal and plant key species including details of their occurrence on Annexes II and IV (* = priority; # = non-priority from Annex II and IV; + = Annex IV only)
9150		Xero-thermophile Fagus sylvatica forests developed on calcareous, often superficial, soils, usually of steep slopes, of the medio-European and Atlantic domaines of Western Europe and of central and northern Central Europe, with a generally abundant herb and shrub undergrowth, characterized by sedges (Carex digitata, Carex flacca, Carex montana, Carex alba), grasses (Sesleria albicans, Brachypodium pinnatum), orchids (Cephalanthera spp., Neottia nidus-avis, Epipactis leptochila, Epipactis microphylla) and thermophile species, transgressive of the Quercetalia pubescenti-petraeae. The bush-layer includes several calcicolous species (Ligustrum vulgare, Berberis vulgaris) and Buxus sempervirens can dominate. Sub-types : 41.161 - Middle European dry-slope limestone beech forests Middle European sedge and orchid beech woods of slopes with reduced water availability. 41.162 - North-western Iberian xerophile beech woods Fagus sylvatica forests of relatively low precipitation zones of the southern ranges of the Pais Vasco and of superficially dry calcareous soils of the Cordillera Cantabrica, with Brachypodium pinnatum ssp. rupestre, Sesleria argentea ssp. hispanica, Carex brevicollis, Carex ornithopoda, Carex sempervirens, Carex caudata, Cephalanthera damasonium, C. longifolia, Epipactis helleborine, Epipactis microphylla, Neottia nidus-avis	Plants: Fagus sylvatica, Carex digitata, C. flacca, C. montana, C. alba, Sesleria albicans, Brachypodium pinnatum, Cephalanthera spp., Neottia nidus-avis, Epipactis leptochila, Epipactis microphylla, Buxus sempervirens
9160		Forests of Quercus robur (or Quercus robur and Quercus petraea) on hydromorphic soils or soils with high water table (bottoms of valleys, depressions or in the vicinity of riparian forests). The substrate corresponds to silts, clayey and silt-laden colluvions, as well as to silt-laden alterations or to siliceous rocks with a high degree of saturation. Forests of Quercus robur or natural mixed forests composed of Quercus robur, Quercus petraea, Carpinus betulus and Tilia cordata. Endymion non-scriptus is absent or rare.	Plants: Quercus robur, Carpinus betulus, Acer campestre, Tilia cordata, Stellaria holostea, Carex brizoides, Poa chaixii, Potentilla sterilis, Dactylis polygama, Ranunculus nemorosus, Galium sylvaticum.
9180	*	Mixed forests of secondary species (Acer pseudoplatanus, Fraxinus excelsior, Ulmus glabra, Tilia cordata) of coarse scree, abrupt rocky slopes or coarse colluvions of slopes, particularly on calcareous, but also on siliceous, substrates (Tilio-Acerion Klika 55). A distinction can be made between one grouping which is typical of cool and humid environments (hygroscopic and shade tolerant forests), generally dominated by the sycamore maple (Acer pseudoplatanus) - sub-alliance Lunario-Acerenion, and another which is typical of dry, warm screes (xerothermophile forests), generally dominated by limes (Tilia cordata, T. platyphyllos) - sub-alliance Tilio-Acerenion. The habitat types belonging to the Carpinion should not be included here.	Plants: Lunario-Acerenion - Acer pseudoplatanus, Actaea spicata, Fraxinus excelsior, Helleborus viridis, Lunaria rediviva, Taxus baccata, Ulmus glabra. Tilio-Acerenion - Carpinus betulus, Corylus avellana, Quercus sp., Sesleria varia, Tilia cordata, T. platyphyllos
9190		41.51 - Acidophilous forests of the Baltic-North Sea plain, composed of Quercus robur, Betula pendula and Betula pubescens, often mixed with Sorbus aucuparia and Populus tremula, on very oligotrophic, often sandy (or moraine) and podsolized or hydromorphic soils; the bush layer, poorly developed, includes Frangula alnus; the herb layer is formed by Deschampsia flexuosa and other grasses and herbs of acid soils (sometimes includes Molinia caerulea), and is often invaded by bracken. Forests of this type often prevail in the northern European plain and occupy more limited edaphic enclaves. Syntaxa: Querco-Betuletum, Molino-Quercetum, Trientalo-Quercetim roboris. 41.54 - Forests of Quercus robur and, sporadically Quercus pyrenaica or hybrids, on podzols, with a herb layer formed by the group of Deschampsia flexuosa, with Molinia caerulea and Peucedanum gallicum. Syntaxa: Peucedano-Quercetum roboris.	Plants: Quercus robur, Betula pendula, B. pubescens, Sorbus aucuparia, Populus tremula.
91D0	*	Coniferous and broad-leaved forests on a humid to wet peaty substrate, with the water level permanently high and even higher than the surrounding water table. The water is always very poor in nutrients (raised bogs and acid fens). These communities are generally dominated by Betula pubescens, Frangula alnus, Pinus sylvestris, Pinus rotundata and Picea abies, with species specific to bogland or, more generally, to oligotrophic environments, such as Vaccinium spp., Sphagnum spp., Carex spp. [Vaccinio-Piceetea: Piceo-Vaccinienion uliginosi (Betulion pubescentis, Ledo-Pinion) i.a.]. In the Boreal region, also spruce swamp woods, which are minerotrophic mire sites along margins of different mire complexes, as well as in separate strips in valleys and along brooks. Sub-types : 44.A1 - Sphagnum birch woods 44.A2 - Scots pine mire woods 44.A3 - Mountain pine bog woods 44.A4 - Mire spruce woods	Plants: Agrostis canina, Betula pubescens, B. carpatica, Carex canescens, C. echinata, C. nigra, C. rostrata, Frangula alnus, Juncus acutiflorus, Molinia caerulea, Trientalis europaea, Picea abies, Pinus rotundata, P. sylvestris, Sphagnum spp., Vaccinium oxycoccus, V. uliginosum, Viola palustris; in spruce swamp woods also: Carex disperma, C. tenuiflora, Diplazium sibiricum, Hylocomium umbratum and Rhytidiadelphus triquetrus

N°	Prioritary?	Definition - general description of the vegetation, syntaxa, abiotic features, origin	Characteristic species animal and plant key species including details of their occurrence on Annexes II and IV (* = priority; # = non-priority from Annex II and IV; + = Annex IV only)
91E0	*	Riparian forests of Fraxinus excelsior and Alnus glutinosa, of temperate and Boreal Europe lowland and hill watercourses (44.3: Alno-Padion); riparian woods of Alnus incanae of montane and sub-montane rivers of the Alps and the northern Apennines (44.2: Alnion incanae); arborescent galleries of tall Salix alba, S. fragilis and Populus nigra, along medio-European lowland, hill or sub-montane rivers (44.13: Salicion albae). All types occur on heavy soils (generally rich in alluvial deposits) periodically inundated by the annual rise of the river (or brook) level, but otherwise well-drained and aerated during low-water. The herbaceous layer invariably includes many large species (Filipendula ulmaria, Angelica sylvestris, Cardamine spp., Rumex sanguineus, Carex spp., Cirsium oleraceum) and various vernal geophytes can occur, such as Ranunculus ficaria, Anemone nemorosa, A. ranunculoides, Corydalis solida. This habitat includes several sub-types: ash-alder woods of springs and their rivers (44.31 - Carici remotae-Fraxinetum); ash-alder woods of fast-flowing rivers (44.32 - Stellario-Alnetum glutinosae); ash-alder woods of slow-flowing rivers (44.33 - Pruno-Fraxinetum, Ulmo-Fraxinetum); montane grey alder galleries (44.21 - Calamagrosti variae-Alnetum incanae Moor 58); sub-montane grey alder galleries (44.22 - Equiseto hyemalis-Alnetum incanae Moor 58); white willow gallery forests (44.13 - Salicion albae). The Spanish types belong to the alliance Osmundo-Alnion (Cantabric atlantic and southeast Iberia peninsula)	Plants: Tree layer - Alnus glutinosa, Alnus incanae, Fraxinus excelsior; Populus nigra, Salix alba, S. fragilis; Betula pubescens, Ulmus glabra; Herb layer - Angelica sylvestris, Cardamine amara, C. pratensis, Carex acutiformis, C. pendula, C. remota, C. strigosa, C. sylvatica, Cirsium oleraceum, Equisetum telmateia, Equisetum spp., Filipendula ulmaria, Geranium sylvaticum, Geum rivale, Lycopus europaeus, Lysimachia nemorum, Rumex sanguineus, Stellaria nemorum, Urtica dioica.
91F0		Forests of hardwood trees of the major part of the river bed, liable to flooding during regular rising of water level or, of low areas liable to flooding following the raising of the water table. These forests develop on recent alluvial deposits. The soil may be well drained between inondations or remain wet. Following the hydric regime, the woody dominated species belong to Fraxinus, Ulmus or Quercus genus. The undergrowth is well developed	Plants: Quercus robur, Ulmus laevis, U. minor, U.glabra, Fraxinus excelsior, Fraxinus angustifolia, Populus nigra, P. canescens, P. tremula, Alnus glutinosa, Prunus padus, Humulus lupulus, Vitis vinifera ssp. sylvestris, Tamus communis, Hedera helix, Phalaris arundinacea, Corydalis solida, Gagea lutea, Ribes rubrum.

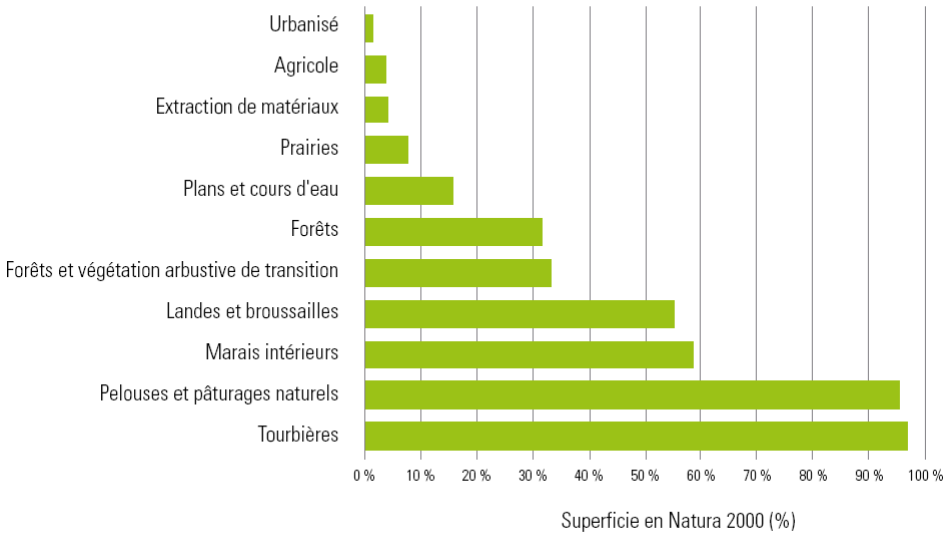
Appendix 13: Natura 2000 network composition in Wallonia

FIG FFH 6-5 *Répartition par catégorie d'habitats des sites Natura 2000 en Région wallonne(mars 2005)*



Sources : *MRW – DGRNE – CRNFB ; Corine Land Cover 2000*

FIG FFH 6-6 *Proportion de la superficie de chaque catégorie d'habitats sous statut Natura 2000 en Région wallonne (mars 2005)*



Sources : *MRW – DGRNE – CRNFB ; Corine Land Cover 2000*

Appendix 14: Delineation of the Natura 2000 network in the Brussels Capital Region

Delineation of Special Protection Areas or SPAs

The BD was implemented into the Brussels legislation on 29/08/91 and this ordonance was later revised (14/01/2000). However, the BD has no additional effect since all birds are protected in Brussels. Moreover, the Brussels Capital Region does not contain sites suitable for proposal as SPAs (Gryseels 2006).

Delineation of Special Areas for Conservation or SACs

The HD was implemented in the Brussels legislation on 26/10/2000. However, it is in the form of a Decision instead of an ordonance. This Decision has been revised twice since then: on 28/11/2002 and on 24/11/2005. Up to date, however, the HD is still not implemented correctly (in the form of an Ordonnance). The key elements are the bad interpretation of Art. 6 and the lack of procedure for the Designation Decisions and the management. A juridical consulting office is currently studying how to revise this Decision. The goal is now to revise it before 01/01/2008 (pers. comm. M. Gryseels & B. Van Der Wijden, *Brussels Instituut voor Milieubeheer – BIM* or *Institut Bruxelloix pour la Gestion de l'Environnement – IBGE*).

Based on: Gryseels (2005, 2006).

A. First stage of delineation of SCIs

* 1995:

A technical dossier with a proposition for the delination of **three pSCIs** (**1.900 ha** or almost 12% of the Brussels surface) was made up by the Brussels Institute for Environmental Management (*Brussels Instituut voor Milieubeheer – BIM* or *Institut Bruxelloix pour la Gestion de l'Environnement – IBGE*). This was based on an inventory of the natural sites by the *IBGE-BIM* (in Brussels, there is a very detailed *BWK*). This delineation was thus made internally, based on existing, scientific knowledge and at this stage, there was no political pressure (pers. comm. M. Gryseels). Furthermore, all proposed sites had a green destination on the spatial zoning plan for the Brussels Capital Region.

* 29/05/1996

The complete files were sent by the Belgian permanent representative to the appropriate services within the European Commission, together with the data concerning 40 Flemish, 58 Walloon and 1 federal site(s).

* May 1998

Formal approval of the EC regarding the reference list of habitats and species for both the Atlantic and Continental Biogeographic regions of Belgium (Anselin & Dufrêne 1998).

* 1999

Scientific evaluation by the ETC-NC in Paris during the seminar for the Atlantic biogeographic region.

* 23/07/1999 and 06/11/2000:

'proofs of default' by the European Commission directed upon the Belgian Government (ref. 20.1299/XI/016513 – DG ENV.D.2) because of insufficient submission. However, **the Brussels Capital Region received no remarks** from the EC.

B. Second stage of delineation of SACs

* 1998-2002:

A LIFE-NATURA project '*Aménagement des Zones Spéciales de Conservation en Région de Bruxelles-Capitale 1998-2001*' (LIFE/NAT/B/5167) was carried out in cooperation with the WWF, resulting in a detailed knowledge of the presence of bats in Brussels.

* 2002:

Based on this new and recent information, a second, updated technical file was prepared in cooperation with the WWF: several additions were made to the **three** earlier proposed **pSCIs**. Although at this stage, the administration got the 'hint' to only include sites with green destination on the spatial zoning plan (pers. comm. M. Gryseels), this was not a real problem as all new proposed sites had meanwhile obtained the essential protection as "green area" on the regional zoning plan. There was only one exception: "plateau de la Foresterie", a site which destination has been kept "open" ('*zone de reserve*'), so a green destination is still possible. Further, a problem exists with one private site, part of the site "Charles Albert" without green destination, but this is due to misinterpretation of the not very detailed maps.

- The total area of the pSCIs increased up to **2.375 ha** or 14% of the Brussels surface.
- For the delineation of the sites, there has not been a real consultation of the Flemish Region, except for the transboundering site "Sonian Forest". This would however, have been interesting for the Linkebeek-valley and the Woluwe-valley (pers. comm. M. Gryseels).

* 21/12/2002:

The second, updated file was sent to the EC (Gryseels 2002).

* 27/03/2003:

Publication of the '*Vaststellingsbesluit*' in the Belgian State journal, without management plans.

* **07/12/2004**

Evaluation of the proposed sites by the EC and **approval of these sites as SCIs** (Eur-Lex Publication L382 of 28/12/2004 and L387 of 29/12/2004).

As it is the case in the other Belgian Regions, the sites, approved by the EC as sites of community importance (SCIs) do not yet have the status of special areas of conservation (SACs) in the Brussels Capital Region. There is still no decision of the Brussels Government to definitively assign these sites as SACs ('*Arrêté de désignation*').). This should be done as soon as the Natura 2000 directives will be correctly transposed in the Brussels law (cfr. currently juridic revision of existing law). Three '*Arrêtés de désignation*' should be prepared (one for each SCI) and these should include management plans, measures, prohibitory clauses, etc. (Gryseels 2006). Because of this legal vacuum, the administration (*IBGE-BIM*) has currently relatively power (pers. comm. B. Van Der Wijden).

Appendix 15: Delineation of the Natura 2000 network at the Federal level

Based on: Cliquet *et al.* (2007) and Decleer (2007).

The North Sea policy of Belgium is scattered over several institutional levels:

The federal government: a.o. environmental policy and protection of the marine environment, wind farms at sea, shipping, military activities, aggregate extraction, cables and pipelines.

The Flemish Region: nature policy on the beach and the hinterland, recreation, ports, fishing, dredging, piloting and coastal defense.

The Belgian federal government is thus responsible for the implementation of the BD and the HD in the North Sea.

However, since the establishment of the BD and the HD, not much progress has been made in protecting marine sites in the EU. For what concerns the HD, the European Member States have focussed on terrestrial areas, while the marine areas were largely neglected. For this, several mutually influencing reasons can be listed (pers. comm. G. Raeymaekers, federal environmental secretary of state: *FOD Veiligheid van de Voedselketen, Volksgezondheid en Leefmilieu*): (i) there was (and is) a lack of scientific knowledge on the marine level, (ii) the experts consulted during the formulation of the HD were more specialized in the terrestrial domain and (iii) it was impossible to draw a European overview of marine habitat types. As a result, very few marine Natura 2000 sites were proposed to the EC and therefore, the EC postponed the evaluation of marine sites.

The EU Biodiversity Action Plan has then set the objectives for marine sites to:

- complete a network of SPAs by 2008,
- adopt lists of SCIs by 2008,
- designate SACs and establish management priorities and necessary conservation measures for SACs by 2012,
- establish similar management and conservation measures for SPAs by 2012.

In accordance with the compliance to several international obligations, the BD and HD were only implementated in the Belgian Federal marine protection law in 1999: '*Law on the protection of the marine environment in marine areas under Belgian jurisdiction on the marine environment*' of 20/01/1999 (Publication in the State journal on 12/03/1999) and changed on 17 September 2005 (State journal 13/10/2005). This law foresees the possibility to demimitate five types of marine protected areas, among which the SPAs and SACs.

* 1996

A proposition for the demarcation of **one pSCI** (Trapegeer-Stroombank, **18.100 ha**) was made by the environmental secretary of law. This delineation was based on existing, scientific knowledge and at this stage, there was no public consultation. No formal delineation of the site by the Belgian Government was made.

* 29/05/1996

The files were sent by the Belgian permanent representative to the appropriate services within the European Commission, together with the data concerning 40 Flemish, 58 Walloon and 3 Brussels sites.

* 1999-2003

Several attempts were made by the federal government to delimitate marine reserves. Cliquet *et al.* (2007), state that in this scientific knowledge was paramount and that they were characterized by a lack of participation opportunities for sectors and local governments while these groups also showed not any goodwill towards the process.

* 2003-2005

In the context of the North Sea Master Plan, the minister with now a specific competence for the North Sea confidentially consulted several departments (mobility and transport, sea fisheries, environment), scientists, actors (e.g. fishermen, coastal mayors, water sport clubs) and NGOs. The discussions concerning the measurements were held parallel to the delimitation procedure. The delimitation of the marine protected areas was still based on scientific knowledge and criteria, but because of the consultation, this demarcation was in the end accepted by stakeholders (Cliquet *et al.* 2007).

* 31/10/2005

Publication of a Royal Decision in the State journal, indicating three SPAs and two pSCIs:

- SBZ-V1 Nieuwpoort, SBZ-V2 Oostende and SBZ-V3 Zeebrugge: announced for several Tern species, Grebe and Little Gull. The scientific background for this was a study by the Institute of Natural Sciences and the *INBO* (based on bird counts along the coastline) and coordinated by the BMM.
- SBZ-H1 Trapegeer Stroombank and SBZ-H2 Vlakte van de Raan: announced for two habitat types, while there occur a number of mobile sea mammels and fish species (Annex II of HD). For this delineation, Annex III of the HD was not strictly followed (pers. comm. G. Raeymaekers).

* 27/03/2006

Publication of a Royal Decision in the State journal, changing the coordinates of one of the SPAs.

- total area of SPAs: **30.576 ha**.
- total area of SACs: **20.017 ha**.
- total area of marine Natura 2000 sites: ca. 12% of the Belgian part of the North Sea (which is 3.600 km² large).
- Belgium has decided to not demarcate sites outside of the territorial waters (12 miles zone).

The Belgian marine sites under the HD are thus still not evaluated by the EC. These marine workshops will take place in 2008 at the earliest, after the announcement of sites by alle EU member states.

Appendix 16: The Natura 2000 network in our neighbouring countries

Neven *et al.* (2005) conducted a comparative study (literature review and document analysis) into the implementation process of Natura 2000, with regard to relevant issues for the Netherlands. Among other aspects, the delineation of the Natura 2000 network was investigated:

- In most of the EU-countries, the ministry responsible for the implementation had the task to nominate sites as national SPA or pSCI, but in some countries (e.g. UK, Sweden) this task was dedicated to a public agency.
- In most countries scientists or expert bodies (museums, scientific institutes) and NGOs were involved in collecting data and the selection of preliminary Natura 2000 sites. Sometimes only scientists were involved (Estonia, Cyprus). In most, if not all member states, insufficient habitat and species data caused problems in the site selection process, particularly when sites were not already protected under other schemes.
- The interference of other ministries during the selection process can also be mentioned as a factor influencing the list of national nominated sites.
- In some member states definite lists of SPA and pSCI were discussed during public consultation with landowners and other stakeholder groups (e.g.The Netherlands). During this stage, strong opposition originated from private landowners in for instance France, The Netherlands and Germany. Moreover, in Lithuania and Slovenia, some groups of stakeholders must even agree with the nominated sites, as a result of which in Lithuania some nominated sites were removed from the national list. Overall, the involvement of stakeholders during the implementation process varies strongly.
- In many countries the number of selected sites was thus higher than the number of national nominated sites sent to Brussels. Many national lists involved in the beginning mainly already protected sites (e.g. The Netherlands). Later on, a considerable number of new sites have been proposed, as well buffer and transition zones to increase coherence and connectivity between sites.

Only two EU Member States (the Czech Republic and Luxembourg) are reported to have integrated the connectivity aspect among the Natura 2000 sites within the site designation process, either at the regional, national or international level. In most Member States, site designation has only been seen as national obligation, so that international cooperation within this context has been secondary (WWF 2006).

Neven *et al.* (2005) also analyzed the establishment of appropriate Management Plans (MP), which can be one of the “necessary conservation measures” (HD Art. 6 (1)), to which the member states are not obliged. Although there exist MPs for protected sites under existing protection regimes, Natura 2000 sites specific MPs are still scarce. Therefore, they concluded that an ecological evaluation of the effectiveness of these MPs and their measures was impossible.

In what follows, we shortly describe the situation in our neighbouring countries. Table 4 gives an overview of the delineation of the Natura 2000 network in our neighbouring countries: The Netherlands, Germany, Luxembourg and France.

Table A - 2. Excerpt of the Natura 2000 Barometer, which monitors the progress of implementing the HD and the BD of the 25 Member States to December 2006. Source: Natura 2000 Newsletter, June 2007 (European Commission 2007). a) Special Protection Areas (SPAs) and b) Sites of Community Interest (SCIs). Legend: + = largely complete; 0 = incomplete; - = notably insufficient; ↑ = recent significant progress.

a)

Member state	SPAs					
	Number of sites	Total area sites (km²)	Terrestrial area (%)	Number of marine sites	Marine area (km²)	Progress
Belgium	229	2964	9.7	0	0	+
Germany	568	48102	8.9	14	16216	0 ↑

France	369	45500	7.7	62	3260	0 ↑
Luxembourg	12	139	5.4	-	-	+
The Netherlands	77	10109	12.5	7	4913	+

b)

Member state	SCIs					
	Number of sites	Total area sites (km²)	Terrestrial area (%)	Number of marine sites	Marine area (km²)	Progress
Belgium	278	3221	10.0	1	181	0
Germany	4617	53294	9.9	48	18086	0 ↑
France	1305	48942	7.9	90	5603	0 ↑
Luxembourg	47	383	14.8	-	-	0
The Netherlands	141	7510	8.4	9	4025	+

The Netherlands

In comparison to other European countries, the Netherlands have delineated a large proportion of its territory as SPA (Table 4).

In the past, The Netherlands have several times been urged by the European Commission or condemned by the European Court of Justice because of the insufficient delineation of pSCIs (see an overview in Geertsema *et al.* 2003). However, The Netherlands was the first member state which designated all SCIs as SACs (WWF 2006).

In the beginning of July 2003, the EC has approved the Dutch list of pSCIs as SCIs (Table 4), comprising eight border-crossing sites with Germany and eight with Belgium (Geertsema *et al.* 2003, Milieu en Natuurplanbureau 2007). Due to it's location in the Delta, The Netherlands have a large importance for species and habitats of coast, dunes, rivers and marshes (also shifting sands and heathland). Forests of community importance are, in contrast, underrepresented (Natuurbalans 2006, Milieu en Natuurplanbureau 2007). Moreover, The Netherlands have great international importance for migratory waterbirds and have therefore assigned a large surface as SPA (Milieu en Natuurplanbureau 2007). Ca. 50% of the total surface of Natura 2000 on land is owned by terrain-managing organizations (Staatsbosbeheer, Monumenten en Landschappen), while ca. 30% is managed by private persons, farmers, foundations and enterprises (Milieu en Natuurplanbureau 2007).

To increase the carrying capacity for the delineation of SACs, a public consultation has been performed in an early stage (Feb-March 2003). Many reactions came from the agricultural sector, but also from the provinces, municipalities and nature protection organizations. These reactions varied from legal uncertainty (e.g. in the context of business expansions), demands for clarity about the adopted procedure, questions for changes in the delineation and proposals for new sites. As a result, the borders of a number of sites were adapted and a number of new sites were added to the list (Geertsema *et al.* 2003). However, the implementation procedure of Natura 2000 is regarded by others (Gerritsen 2006) as a process in which only the European Union, LNV, scientists and environmental and nature organizations were involved until end 2005. The latter organizations have had a large influence on the delineation and goals and this process was therefore dominated by discussions about the nature values defined in species and habitats (Gerritsen 2006). In December 2005, parties with other backgrounds and interests had the chance to react.

The Dutch Ministry of Agriculture, Nature and Food quality (*Landbouw, Natuur en Voedselkwaliteit* or *LNV*) is currently working on the publication of the designation decisions (*Aanwijzingsbesluiten*), which will contain the conservation goals per Natura 2000 site (Natuurbalans 2006). The public consultation of the first part of these designation decisions has taken place in January-February 2007. Furthermore, the Dutch Parliament has decided that management plans are obliged and these should be finished by 2010 (Roels & Thissen 2007). A study of the possible role and content of this instrument was carried out by the University of Wageningen (Beunen & van Ark 2005), which demonstrated that the expectations on the effect of MPs may be often too positive.

In the Dutch Natura 2000 sites, the current state of conservation of a great number of species and habitats is still unfavorable, so more policy effort is necessary (Natuurbalans 2006, LNV 2006, Milieu en Natuurplanbureau 2007).

Germany

In Germany, as in Belgium, the 16 'regions' ('*Bundesländer*') are responsible for nature protection. The federal government is however, from the perspective of the EC responsible for submitting the national list. The selection of pSCIs was thus made by the ministers of environment of the *Länder* and their related technical agencies. The national ministry of environment and the Federal Agency of Nature Conservation (Bfn) then coordinated and integrated the 16 individual lists.

As a result, the procedures of site selection may differ significantly among the *Länder*. While in some cases, there had been extensive consultation with several minisitries and with the public, in other cases the selection was treated merely 'technically' (Leibenath 2004).

The announcement of sites to the EC was quite a few times postponed in Germany: the submission of its list of pSCIs to the EC was performed in several "tranches" (SRU 2004).

As a result of the different selection criteria among the *Länder*, not even the national coherence of sites across the internal boundaries of the Federal State was ensured, e.g. in the case of rivers (Leibenath 2004). Moreover, the German Natura 2000 network consists of relatively small, fragmented sites.

The Bundesländer are also responsible for the management of the Natura 2000 sites, which may thus differ among the regions. The Länder may also already dispose of an other type of ecological network.

Efforts undertaken fora n ecological network

France

The network of French Natura 2000 sites took a long time to be set up, often because of the polemic and the bad acceptance because that was perceived like a confiscation of the grounds.

In France, 1706 Natura 2000 sites have been selected (mai 2007). That is distributed between 1334 pSCIs and 371 SPAs. The total area of sites is 6,82 million hectares, that is to say, ca. 12% of the total area of France (Anonymous, 2007a). France is the only European country to have 4 of the 6 biogeographic regions on its metropolitan territory. It covers, in Europe, 34 % of the Atlantic biogeographic region and 28 % of the Continental biogeographic region. It shelters 70 % of the habitats of Community interest (133, including 43 priority) present in Europe (Anonymous, 2007b). 274 birds species from the BD, 95 animal species and 62 vegetal species from the HD are present in France (MEDA, 2007).

The major soil occupations of the N2000 network are agricultural land (including grasslands) (41%), forests (39%), heathlands and other open environments (13%), wetlands (6%) and artificial territories (1,1%) (Anonymous, 2007a).

The selection of sites has been made on a scientific basis. SPA's are based on the inventory of the *Zones Importantes pour la Conservation des Oiseaux* (ZICO) which were carried out by the *Ligue pour la Protection des Oiseaux* (LPO) and the *Service du Patrimoine Naturel* du *Museum National d'Histoire Naturelle* (MNHN). pSCIs are based on the inventory of the *Zones Naturelles d'Intérêt Ecologique, Faunistique et Floristique* (ZNIEFF) which was launched in 1982 by the *Ministère de l'Environnement* to have reliable and homogeneous information about areas of high biological interest (Anonymous, 2007a)

Within the framework of the HD, an inventory, validated by the MNHN in 1996, determined 1316 sites covering approximately 13% of the territory. This inventory was carried out, with few means and very often voluntarily, by the *Comités Scientifiques Régionaux du Patrimoine Naturel* (CSRPN), starting from the data in their possession (in particular inventory ZNIEFF 1st generation), bibliographical data and/or fields visits. The HD knew oppositions, in particular from the "Group of Nines" (= federation of associations of rural actors: hunters, fishermen, foresters, land-owners,…), which contributed to delay the procedure. A circular of the *Ministère de l'Ecologie et du Développement Durable* (MEDD) of November 21, 2001 identified an additional list of sites intended to fill the insufficiencies identified by the 1st series of biogeographic

seminars. France was sentenced by the European Court of Justice for insufficiency of transmission, on September 11, 2001, within the framework of to the HD, and on November 26, 2002, within the framework of the BD, and passes for the "worse pupil" of Europe for the implementation of Natura 2000. Another circular of November 23, 2004 identified, after political agreement between EC and France, a 2nd additional list of sites intended to fill, for the end April 2006, the insufficiencies identified at the time of the 2nd series of biogeographic seminars. The MEDD should prepare an additional list of sites, intended to fill the insufficiencies not yet filled by the circular of November 23, 2004 (Anonymous, 2006). The European Commission validated the list of the French sites on March 21, 2007 (Anonymous, 2007c)

The equivalent of the designation decree in France is the *Document d'Objectif* (DOCOB).

Its contents are as follows:

- A description and an analysis of the existing state;
- Objectives of durable development of the site, intended to ensure the conservation and/or the restoration of the habitats and species as well as the safeguard of the socio-economic and cultural activities being exerted on the site;
- Proposals for contractual and lawful measurements allowing to achieve these goals;
- Projects of standard schedules of conditions for the contractual measures suggested;
- The indication of the financial devices;
- The description of the procedures of accompaniment, follow-up and evaluation of the measures suggested and the state of conservation of the natural habitats and the species.

The different types of habitats and species of Community interest present in the site are listed in appendix (Anonymous, 2007b).

Each Natura 2000 site is managed by a manager appointed at the time of the creation of the site. This manager must be a local collectivity or a grouping of local collectivities concerned with the site. For each Natura 2000 site, a *Comité de Pilotage* (COPIL) leads the elaboration of the DOCOB and organizes then the management of the site and the follow-up of the implementation of the actions decided in the DOCOB. This DOCOB is a place of exchanges and debates and is composed of the various actors involved by Natura 2000 in the site (Anonymous, 2007a).

France made the choice of a contractual and voluntary management of the sites, by making it possible to the users to invest itself in their management by the signing of *Contrats de gestion* and of the *Charte Natura 2000*. The *Contrat de gestion* comprises a whole of engagements, in conformity with the orientations laid down by the DOCOB, on the conservation and, if necessary, the re-establishment of the natural habitats and the species which justified the creation of the Natura 2000 site. The contract defines the nature and the methods of the State aid and the services required in the other hand by the recipient. The *Charte Natura 2000* of a site contains engagements of general use and durable management of the grounds and spaces and returns to sporting practices or leisures respectful of the natural habitats and species. Adhesion with the *Charte Natura 2000* of the site does not imply the payment of a financial counterpart. However, it opens right for the benefit of the exemption of the land tax on the unbuilt properties and also makes it possible to reach certain government aid. (Anonymous, 2007a).

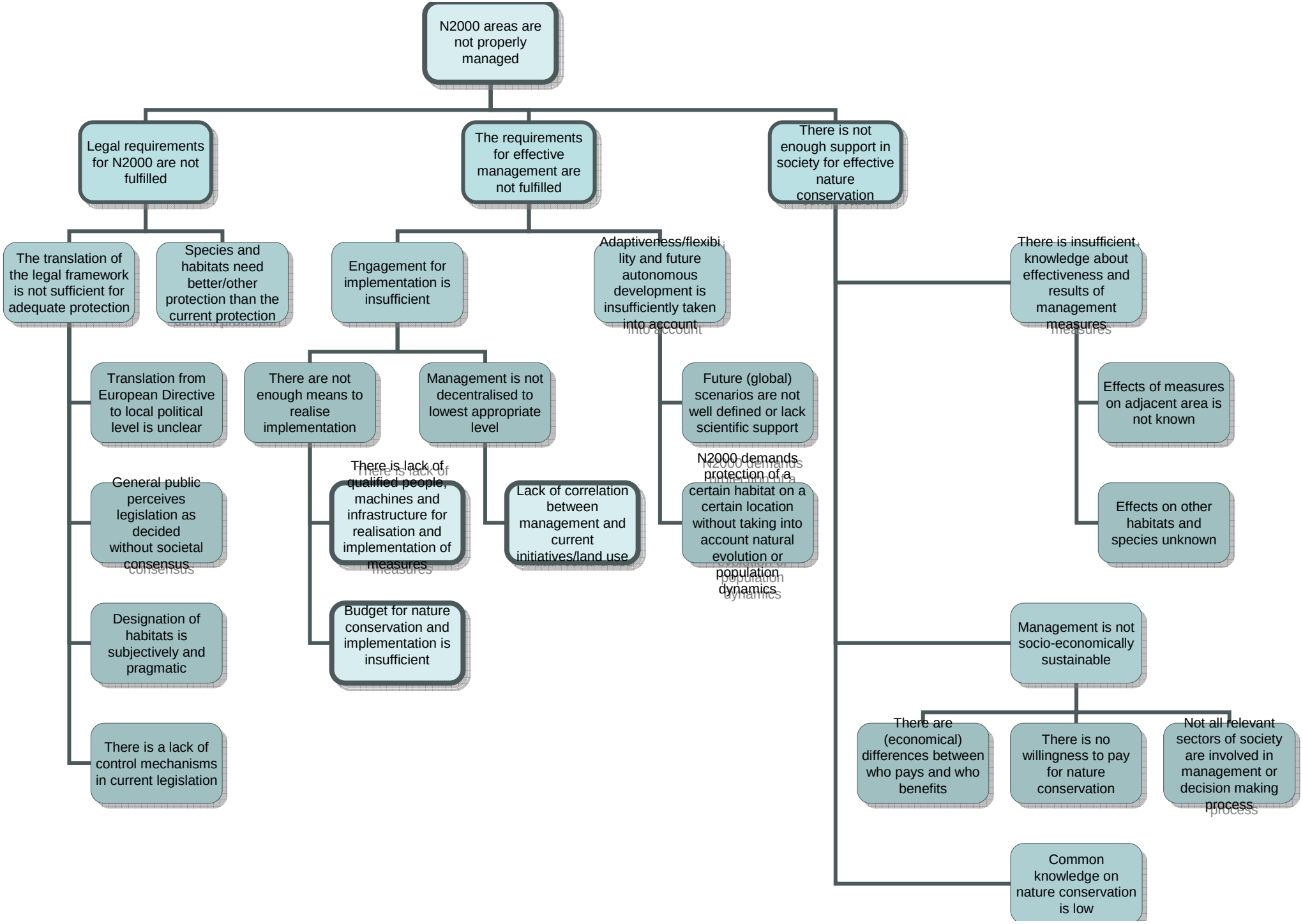
Natura 2000 network in Belgium

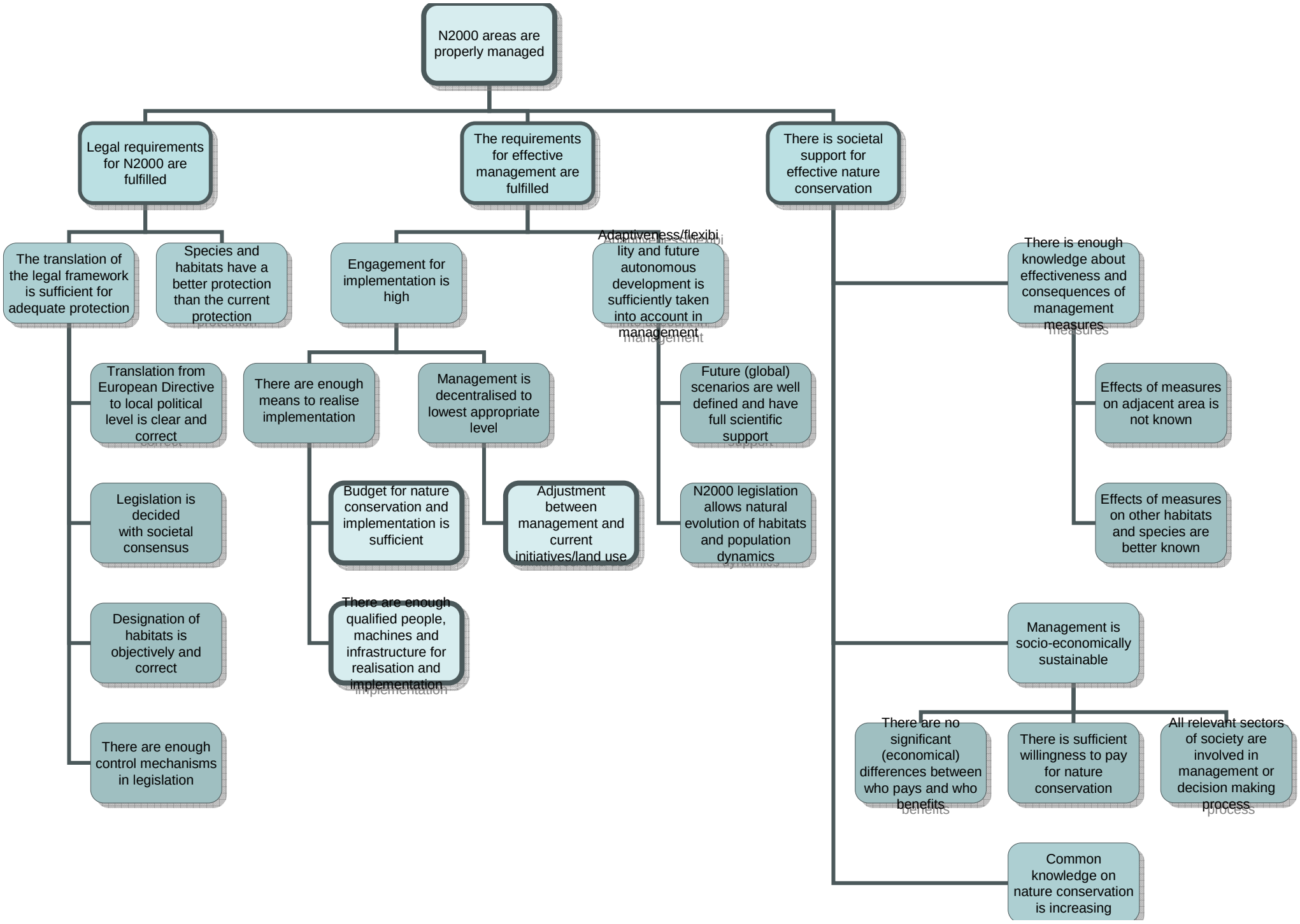
Natura2000 sites in Brussels Region
Regional limits
SPA Flemish
SPA Walloon
SAC Flemish
SAC Walloon

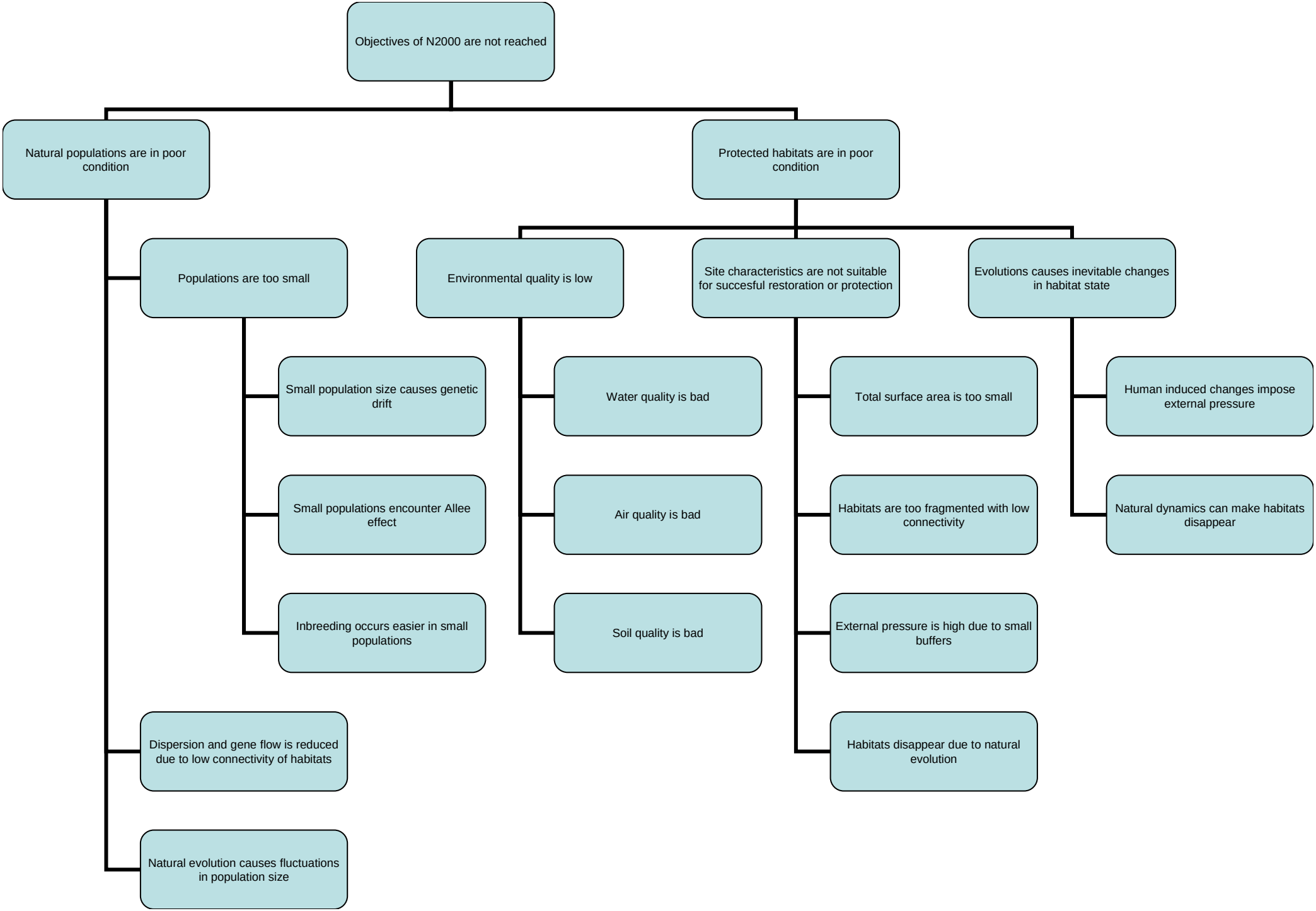
0 60 120 Kilometers

N
W E
S

APPENDIX 1.3 Bottlenecks tree


N2000 areas are not properly managed
Legal requirements for N2000 are not fulfilled
The requirements for effective management are not fulfilled
There is not enough support in society for effective nature conservation
The translation of the legal framework is not sufficient for adequate protection
Species and habitats need better/other protection than the current protection
Engagement for implementation is insufficient
Adaptiveness/flexibility and future autonomous development is insufficiently taken into account
There is insufficient knowledge about effectiveness and results of management measures
Translation from European Directive to local political level is unclear
General public perceives legislation as decided without societal consensus
Designation of habitats is subjectively and pragmatic
There is a lack of control mechanisms in current legislation
There are not enough means to realise implementation
Management is not decentralised to lowest appropriate level
There is lack of qualified people, machines and infrastructure for realisation and implementation of measures
Budget for nature conservation and implementation is insufficient
Lack of correlation between management and current initiatives/land use
Future (global) scenarios are not well defined or lack scientific support
N2000 demands protection of a certain habitat on a certain location without taking into account natural evolution or population dynamics
Effects of measures on adjacent area is not known
Effects on other habitats and species unknown
Management is not socio-economically sustainable
There are (economical) differences between who pays and who benefits
There is no willingness to pay for nature conservation
Not all relevant sectors of society are involved in management or decision making process
Common knowledge on nature conservation is low


N2000 areas are properly managed
Legal requirements for N2000 are fulfilled
The requirements for effective management are fulfilled
There is societal support for effective nature conservation
The translation of the legal framework is sufficient for adequate protection
Species and habitats have a better protection than the current protection
Engagement for implementation is high
Adaptiveness/flexibility and future autonomous development is sufficiently taken into account in management
There is enough knowledge about effectiveness and consequences of management measures
Translation from European Directive to local political level is clear and correct
There are enough means to realise implementation
Management is decentralised to lowest appropriate level
Future (global) scenarios are well defined and have full scientific support
Effects of measures on adjacent area is not known
Legislation is decided with societal consensus
Budget for nature conservation and implementation is sufficient
Adjustment between management and current initiatives/land use
N2000 legislation allows natural evolution of habitats and population dynamics
Effects of measures on other habitats and species are better known
Designation of habitats is objectively and correct
There are enough qualified people, machines and infrastructure for realisation and implementation
Management is socio-economically sustainable
There are no significant (economical) differences between who pays and who benefits
There is sufficient willingness to pay for nature conservation
All relevant sectors of society are involved in management or decision making process
There are enough control mechanisms in legislation
Common knowledge on nature conservation is increasing


Objectives of N2000 are not reached
Natural populations are in poor condition
Protected habitats are in poor condition
Populations are too small
Environmental quality is low
Site characteristics are not suitable for succesful restoration or protection
Evolutions causes inevitable changes in habitat state
Small population size causes genetic drift
Small populations encounter Allee effect
Inbreeding occurs easier in small populations
Water quality is bad
Air quality is bad
Soil quality is bad
Total surface area is too small
Habitats are too fragmented with low connectivity
External pressure is high due to small buffers
Habitats disappear due to natural evolution
Human induced changes impose external pressure
Natural dynamics can make habitats disappear
Dispersion and gene flow is reduced due to low connectivity of habitats
Natural evolution causes fluctuations in population size