REGERINGEN

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KANADA

Sveriges fjärde nationalrapport till konventionen om biologisk mångfald

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Regeringens beslut

Regeringen beslutar att överlämna Sveriges fjärde nationalrapport till konventionen om biologisk mångfald. Rapportens lydelse framgår av *bilagan*.

Ärendet

Som part till konventionen har Sverige förbundit sig att med jämna mellanrum rapportera till konventionens sekretariat om genomförandet. Detta är fjärde tillfället för en sådan nationalrapport. Formerna för rapporten beslutades av konventionens åttonde partsmöte 2008.

Underlaget för rapporten har tagits fram av Naturvårdsverket med hjälp av Centrum för biologiskt mångfald, efter samråd med berörda myndigheter, i enlighet med regleringsbrevet för Naturvårdsverket för 2008.

På regeringens vägnar

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Fourth national report to the Convention on Biological Diversity

Sweden

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Executive summary

Key actions taken

In Sweden, mainstreaming biodiversity issues receives high priority. Therefore, the national strategy for biological diversity and the set of sectorally focused action plans, formulated in 1995 and approved by the Swedish Parliament in 1997, have to a large extent, been replaced by the 15 Environmental Objectives decided upon by Parliament in 1999. These Environmental Objectives form the backbone of Swedish environmental policy. In 2002, Parliament decided on a first set of concrete and measurable interim targets. The system of environmental objectives and interim targets was evaluated for the first time in 2004. This resulted, among other things, in the adoption by Parliament of a sixteenth objective in 2005, called *A rich diversity of plant and animal life*. In 2008 the Swedish Environmental Objectives Council presented its second evaluation of the environmental objectives. Thus Swedish biodiversity policy has been evaluated and revised three times since the adoption of the national biodiversity action plan.

Key actions taken in order to reach the objectives of the Convention include both site protection and the promotion of sustainable use. Establishment of protected areas is a specific measure to achieve 7 of the 16 national environmental quality objectives.

In order to meet the threat posed by invasive alien species and mobilise a cooperative approach at all levels of government for preventing harm to biological diversity, a proposal for a national strategy and action plan for alien species was developed and submitted to the government for approval in 2008 by the Swedish Environmental Protection Agency, the Swedish Board of Fisheries, the Swedish Forest Agency, the Swedish Board of Agriculture, Swedish Customs, the Swedish Maritime Administration and the Swedish Species Information Centre. Other sectoral authorities, regional authorities, stakeholders and scientists participated in the work with the strategy and action plan.

The Swedish parliament has, as a part of the Swedish Policy for Global Development, established the following overarching goal for Swedish development cooperation: *"To contribute to an environment supportive of poor people's own efforts to improve their quality of life."* The Swedish Policy for Global Development is based upon eight guiding principles of which one – s*ustainable use of natural resources and protection of the environment* – is especially relevant to the articles of the CBD. The Swedish International Development Cooperation Agency, Sida, has provided support to projects relating to the objectives of the CBD and worked with integrating the objectives of the CBD into Sida's work since the convention was ratified.

Overall status and trends in biodiversity, and major threats

Sweden is committed to reach the European Union's 2010-target of halting the loss of biodiversity. This target has been incorporated into the structure of the Environmental Objectives decided upon by Parliament that forms the backbone of Swedish environmental policy. An analysis of the results of work with the Environmental Objectives undertaken in 2008, shows that the 2010-target will not be met, despite increasing actions in various parts of the Swedish society. Since then the government has taken several steps to significantly increase the speed of protecting more valuable forest areas. With these actions the government will be at least close to fulfilling Sweden's interim target for formal protection of valuable forest areas. A fair number of the CBD goals and targets are met or within reach, provided that efforts are

increased. Sustainable use of all biological diversity will not be achieved by 2010, but the process of understanding and employing the concept of sustainable use has started.

The 2010 biodiversity targets are very ambitious, probably too ambitious in terms of the time scale, but not in terms of what needs to be done. Their great importance lies in the processes they have started, which should be allowed to grow stronger and eventually lead to achieving the objectives and targets, even if that will take place beyond 2010. Therefore, it is important that the Swedish objectives and the global biodiversity targets be evaluated and renewed .

Agricultural ecosystems

Agriculture is only a minor land use in Sweden, covering about 8 % of the land surface. Some of the most species-rich habitats to be found in the country, the grazed or mown semi-natural grasslands, are part of the agricultural landscape. During the past century,, these grasslands have been reduced to only a fraction of their previous extent. The Swedish goal is that the area of semi-natural grasslands should not decrease and for the most threatened types of grasslands, management should lead to an increase in their area. However, well-studied organisms such as birds still show a decreasing trend in the agricultural landscape.

Almost half of the red-listed species (2020 of 4338) can be found in the agricultural landscape (of course, a species can occur in several habitats). Between 2000 and 2005, more red-listed species in the agricultural landscape showed deteriorations than improvements.

Following the EU Habitats Directive Sweden has an obligation to preserve a large number of species and habitats identified as being of interest to the entire Community. The results of the Swedish assessment were reported to the European Commission in June 2007. Many of the grassland habitats failed to reach a favourable conservation status.

The main threats to biodiversity in agricultural ecosystems are intensification on one hand, and abandonment on the other. That is to say, the variation on a landscape level decreases when elements such as stone walls, hedges and small wetlands are removed in relatively intensive areas, and grasslands and arable land are abandoned in more forest-dominated parts of the country. Intensification may be driven even further by the increasing demand for biofuels.

Since agricultural ecosystems are dependent on management, finding the correct way of managing grasslands is of utmost importance. This also applies to restored grasslands. Also here, variation appears to be a key element. However, it is often difficult to combine the need for variation and adaptive management with the need to control and predict results which is needed in the system of environmental payments to farmers for the purpose of preserving biodiversity.

Forests

Forests cover about 58 % of the Swedish land surface. In spite of a dramatic decline during the 20th century, Sweden still has the largest area of old-growth boreal forests in Western Europe. Large, more or less pristine boreal forest ecosystems remain, especially in and adjacent to the mountain zone. Forestry in this area has previously affected forests at lower altitudes and more productive forests. Protected forests in proximity to the mountain range are normally located at higher altitudes and in westerly located valleys. This is the area in Sweden with the best long term possibilities for naturally functioning ecosystems .

The main focus of Swedish forest biodiversity protection has been on old-growth forest habitats with a low human influence and, especially in the southern part of Sweden, on habitats created as a result of traditional land use such as grazing, mowing and pollarding.

Many of the forest habitats failed to reach a favourable conservation status according to the Swedish report to the European Commission on the implementation of the Habitats Directive in June 2007.

About half of the red-listed species in Sweden can be found in the forest (2221 of 4338; note that species can occur in several habitats). The number of red-listed species with deteriorating status is about equal to the number of red-listed species with improving status between 2000 and 2005.

The four main threats to forest biological diversity are; the logging of high-value core areas, the removal of dead wood and old or damaged trees, drainage, fertilisation and the use of exotic species; and the lack of natural disturbance regimes. The first three of these threats are closely related to an intensification in forestry, which may become even more explicit in the future as demand for biomass and biofuels continues to increase.

Inland waters

Sweden is a country rich in inland waters. Today around 9% of the surface area is covered by lakes and more than 10% is covered by wetlands. Natural running waters comprise some of Sweden's most species-rich habitats. Fluctuations in waterflow and transport of material form a large variety of habitats in and around streams and rivers. There is a gradient of conditions for plants and animals both along and across each river system.

Habitats with a favourable conservation status, as reported according to the EU Habitats Directive in June 2007, include dystrophic lakes and calcareous fens with *Cladium mariscus* . Several other lacustrine, riverine and wetland habitats only reach a favourable conservation status in the Alpine region, where they cover large areas, are widely distributed, and often occur within protected areas. In other parts of Sweden river damming, wetland drainage, sewage effluents and leaking of fertilisers have caused severely disturbed hydrological conditions and eutrophication. As a result, many habitats currently have an unfavourable conservation status. In recent years, strengthened legislation regulating all types of drainage has, however, contributed to an improvement of the situation.

Wetlands and freshwater ecosystems harbour about 15 and 7 %, respectively, of the Swedish red-listed species (622 and 268 of 4338). In both ecosysytems, but especially in freshwater, the status of more red-listed species improved than deteriorated from 2000 to 2005.

As a result of land use, many aquatic environments have decreased in extent, become fragmented or isolated. Still, the increasing demand for timber, pulpwood and, not the least, bioenergy, generates effects on freshwater habitats. The increased need for hydrolelectric power as a capacity reserve during the conversion to renewable energy sources is a threat to river ecosystems and is in conflict with the aim to restore rivers and streams and to promote environmentally sound river regulation. The continued demand for housing near the shoreline creates pressure for increased exploitation of shorelines and water. Water quality has improved in many respects during the last ten years, but emissions and leakage of acidifying and eutrophicating substances and the use of chemicals are still of great significance.

Up to a quarter of Sweden's original area of wetland is estimated to have disappeared due to drainage, lowering of water levels in lakes and straightening of watercourses. The wetland inventory shows that more than 80% of the remaining wetlands are affected to varying degrees by human interventions such as drainage, agriculture and forestry, roads and off-road driving and peat extraction. During the last 15 years restoration and construction of wetlands is in focus but still wetlands, especially small inland waters, disappear through drainage or filling.

Marine and coastal ecosystems

Many of the marine habitats were reported as failed to reach a favourable conservation status in the Swedish report according to the EU Habitats Directives in June 2007.

Marine ecosystems and sea shores harbour about 6 and 8 %, respectively, of the Swedish red-listed species (286 and 329 of 4338). In both categories, more red-listed species has had their status deteriorated rather than improved from 2000 to 2005, especially in marine ecosystems.

Despite considerable efforts over the last 30 years, the environmental status of the Baltic Sea, Kattegat and Skagerrak remains poor. For several fish species and populations, the situation is still very serious: the eel, for example, is now red-listed as critically endangered throughout its range, and bycatch of fish, birds and marine mammals, continues to be a problem.

Threats to marine and coastal biodiversity, as identified by the Swedish Environmental Objectives Council, include expansive fishing, eutrophication, oil transport, boat traffic, heavy development pressure, increased population pressure, for example in conjunction with tourist industry in sensitive areas, and climate change, which may have especially severe consequences in the Baltic where the water may become less salty.

Mountain ecosystems

Habitats currently with a favourable conservation status, as reported according to the EU Habitats Directive in June 2007, are mainly found within the northern mountain range, and in rocky areas throughout the country, where levels of exploitation are low and land use is less intense. However, the status of more red-listed species deteriorated than increased between 2000 and 2005. The total number of red-listed species in mountain ecosystems (180) is relatively low.

The main threats to biological diversity in mountain ecosystems are increased exploitation and increasing effects of climate change.

Areas where national implementation has been most effective or most lacking, and some obstacles

Sectoral integration is one of the main characteristics of Swedish biodiversity policy. Ideally, this should lead to a widely accepted base for nature conservation measures that are deemed necessary. This is the case to a large extent. An example is the Forestry Act that sets two equally important goals for Swedish forestry: a production goal and an environmental goal. Of course, in practice, views can still differ in concrete situations.

The ecosystem approach as such is not very well known in Swedish society or even by nature conservation practitioners. However, many the concepts described in the CBD decisions are widely applied in nature conservation as well as other sectors of society. Transparency in decision making and involvement of all stakeholders have long been the norm in Sweden. Some examples are given in the main text.

Examples of successful implementation are the work on protected areas, which has accelerated during the last decade, and the production and implementation of species action plans, which in some cases have led to species no longer being red-listed. Forest certification schemes have attracted a very large proportion of Swedish forest owners, and voluntary set-asides increase the area of protected forest. These examples show a strong will to contribute towards sustainable use.

However, so far it has proven difficult to arrive at a concrete definition and follow up mechanism of sustainable use of biological resources. Although there is consensus in broad terms on what should be included in sustainable use, operationalisation to a level that would be usable for farmers or foresters, for instance, has not yet been achieved.

A major obstacle to the implementation of measurements is the lack of incentives. Although the number of perverse incentives has been reduced, some still exist. Also, increasing pressure on especially forest and agricultural ecosystems has led existing incentives to become less effective. Difficulties to design incentives that allow the amount of flexibility needed to best preserve ecosystems such as grasslands form another obstacle. Of course, the underlying reason for all these obstacles is people's failure to see the importance of biodiversity as being essential for our survival and well-being.

Future priorities

Sweden's Environmental Quality Objectives are currently being reviewed with a view to enhancing their relevance and efficiency. The government has declared that the international aspects of environemntal work must be better reflected in this system. The system must in the future also draw more efficiently on the engagement of the private sector.

As for protected areas, a key factor for success will be to draw on the involvement and participation of the local communities including land-owners, local citizens and local NGO:s. In particular, the land-owners's engagement and knowledge regarding biological diversity are of strategic importance.

Efforts to conserve and sustainably use biological diversity are important also in the context of mitigation and adaptation to climate change. Methods need to be developed that counteracts the loss of biodiversity while at the same time contributing to reducing greenhouse gas emissions from ecosystems. In order to secure biodiversity and ecosystem services in the face of climate change, green infrastructure need to be developed, with for example corridors that facilitate species dispersal and link protected areas together. We also need to improve the basis for prognosis and planning for effects of climate change, through improved and cost efficient monitoring and analysis.

The value of biodiversity and ecosystem services need to be estimated more accurately, also in economical terms. Sweden look forward to new reports addressing and estimating the value of biodiversity and ecosystems. This will give an important knowledge to base further action to halt the loss of biodiversity. In this perspective, it is important to estimate the costs of inaction. Without this information it is difficult to decide when and how to intervene. Business also needs information about the business case for biodiversity. Improved understanding of the value of ecosystem services will help the sectors formulate and implement policy measures, that can secure a long term sustainability.

1. Overview of biodiversity status, trends and threats

1.1 Introduction

Swedish biodiversity was comprehensively described in a country study (Biological diversity in Sweden: A country study, Swedish Environmental Protection Agency, 1994) produced soon after Sweden acceded to the convention. Threats to biodiversity, as they were known then, were also identified in the country study. Since then, Sweden has established a system of 16 environmental quality objectives, some of which address the issues of conservation and sustainable use of biodiversity (see chapter 2 for more details about this system). A recent assessment of the environmental quality objectives (see Appendix IV) forms the basis for the status report given in this chapter. Among the 16 environmental quality objectives, seven specifically deal with biodiversity. Six objectives focus on different ecosystems, and the seventh is a cross-cutting objective for biodiversity.

The following sections will first give a broad general overview of the status of biodiversity in Sweden, as well as of the main factors threatening it (1.2), and then give more specific data for the different main ecosystems: agricultural ecosystems (1.3), forest ecosystems (1.4), inland waters and wetlands (1.5), marine ecosystems (1.6) and mountain ecosystems (1.7).

1.2 A general overview

1.2.1 Introduction

Sweden is a country in Northern Europe with a total area of 450 295 km^2, of which 39 959 consist of freshwater. Forests cover more than half the land surface of the country (58%). Agricultural land covers approximately 8% of the land surface, slightly less than open wetlands (9,5%) (figures from Statistics Sweden, 2005). On December 31, 2007, Sweden had 9 182 927 inhabitants, which gives a relatively low population density of 20 inhabitants per square kilometre. The majority of people live in the southern part of the country. Sweden is surrounded in the southwest, south and east by the Skagerrak, Kattegat, Baltic Sea proper and the Gulf of Bothnia, seas whose salinity decreases with distance from the North Sea (between 25 and 30‰ for the Skagerrak down to less than 3‰ for the far north of the Bothnian Bay).

With about 50 000 species of plants, fungi and animals, Sweden is relatively species poor, compared to many other countries. This is partly due to the northern location, and partly to the fact that the land was covered with ice until at least 15 000 years ago, when it slowly started receding, starting in the southwest. Because of this, and the continuing rising of the previously submerged land when the mass of the ice had disappeared, species are still spreading. However, for specific species groups, such as bryophytes, lichens and some groups of fungi, Sweden can be considered as rather species rich. Moreover, many species in Sweden occur at the edge of their distribution, often resulting in genetically distinct populations.

The Swedish Environmental Objectives Council has performed a comprehensive assessment of the status of biodiversity in Sweden (see Appendix IV). The assessment reports on progress towards achieving the 16 environmental quality objectives , and the associated 72 interim targets. The texts included here represent abbreviations of the report with relevance for biodiversity.

The assessment of the national objectives and targets shows among other things that the status and trends of biodiversity components is far from satisfactory, although a number of improvements have been recorded.

There are areas of importance for biological diversity that do not fit in the ecosystem classification that has been made for this report. Such environments are for example areas along infrastructure, and in exploited and urban areas. The species that find new habitats in these areas are often species that benefit

from disturbances that no longer commonly occur. Fire dependent species for instance, whose situation today often is critical, may find suitable habitats along rails where sparks from the brakes sometimes cause small fires. Other species may benefit from open sand and gravel habitats in connection to especially railroads. Species in exploited and urban environments are often overlooked but the situation is improving. The awareness about these habitats varies among the counties and the work carried out also differs.

1.2.2 Status and trends

Evaluation of the environmental quality objective A Rich Diversity of Plant and Animal Life

The Environmental Objectives Council judges that the environmental quality objective *A Rich Diversity of Plant and Animal Life* will be very difficult to achieve by 2020. There are ample indications that the loss of biodiversity is continuing, although the rate has decreased somewhat and measures taken to reduce the loss have been stepped up. There are many species whose current populations are not viable in the long term. For these species, it is not enough for the decline to be halted: their populations must then increase before they can be regarded as having long-term viability. Today, however, the trend for threatened species is the opposite, *i.e.,* they are becoming more threatened.

Knowledge of the functions and processes of ecosystems remains, in many cases, inadequate. A one-sided focus on certain ecosystem services may have adverse repercussions on other functions and processes. Future climate change may subject ecosystems to new or more severe strains that cause a loss of ecosystem services.

Biological processes are often prolonged. Even if trends at all levels were pointing in the right direction at present, the objective might not necessarily be achieved by 2020. For species (and habitat types, ecosystems or processes) that are dependent on, for example, old, hollow trees or large areas characterised by long-term continuity, it may take a very long time to regain or re-establish habitats in the quantity considered necessary. In addition, the issue of an 'extinction debt' requires our attention. This means that certain species can remain in the landscape a long time after their habitats have lost what they require, in quantitative or qualitative terms, for long-term survival.

Interim target: Halting the loss of biodiversity

By 2010 loss of biological diversity in Sweden will have been halted.

The Environmental Objectives Council regards this interim target as very difficult to achieve within the time frame envisaged. Nearly three-quarters of the natural habitat types and roughly half the species covered by the EU Habitats and Species Directive do not enjoy favourable conservation status at present. For the habitats, the problem is usually shortcomings in quality (structures and processes) rather than quantity. The trend for species on the Swedish Red List still points in the wrong direction, and several commoner species, too – including birds of the farmed landscape – continue to decline. Work to halt the loss of genetic diversity has recently begun.

Interim target: Fewer species under threat

By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.

The Environmental Objectives Council judges that this interim target is achievable provided further measures are undertaken. Yet, verified, genuine changes in the natural environment indicate that the proportion of species under threat rose between 2000 and 2005. Vascular plants, macrofungi, butterflies and beetles are groups of flora and fauna containing particularly large numbers of threatened species, and the proportions of such species among brachiopods, amphibians, reptiles, anthozoa (sea anemones and corals)

and mammals are especially high. Forest land and the agricultural landscape contain a large share of threatened species. In marine environments, the situation has deteriorated for a particularly high proportion of species. Similarly, in farmland, mountain areas and urban environments, and on seashores, species whose status has deteriorated outnumber the ones whose situation has improved.

Interim target: Sustainable use

By 2007 follow-up methods will have been developed with a view to ensuring that biological diversity and biological resources, both terrestrial and aquatic, are used in a sustainable manner. By 2010 biological diversity and biological resources, both terrestrial and aquatic, will be used in a sustainable manner, so that biodiversity is maintained at the landscape level.

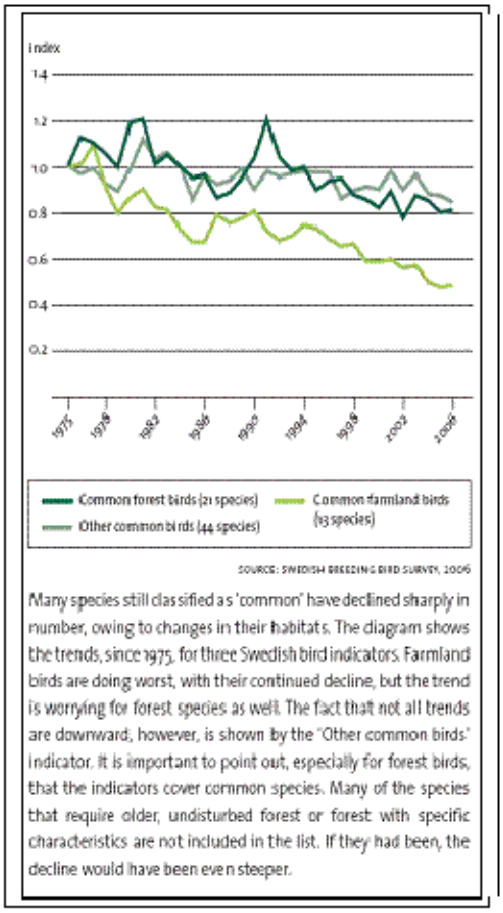

Figure 1.1. Population trends for some common bird species in Sweden, 1975-2006.

This interim target will be very difficult to achieve within the time frame laid down. Several common species, such as farmland birds, are still declining (figure 1.1). The first analysis of the species and natural habitat types covered by the EU Habitats and Species Directive shows that for nearly three-quarters of these habitats and approximately half the species, conservation status is not favourable at present. These are strong indications that the current use of biological resources is not sustainable.

The Swedish assessment of species and habitats of European Community interest

Following the EU Habitats Directive Sweden has an obligation to preserve a large number of species and habitats identified as being of interest to the whole Community. The results of the Swedish assessment were reported to the European Commission in June 2007. The report was compiled by the Swedish Species Information Centre on commission by the Swedish Environmental Protection Agency.

The assessment has revealed large differences in conservation status between species and habitats.

Habitats currently enjoying a favourable conservation status are mainly found within the northern mountain range, and in rocky areas all over the country, where levels of exploitation are low and land use is less intense. This applies to *e.g.* Baltic islands and islets, alpine grasslands and heaths as well as screes and caves. Other habitats with a favourable conservation status include dystrophic lakes and calcareous fens with *Cladium mariscus* . Several other lacustrine, riverine and wetland habitats only reach a favourable conservation status in the Alpine region, where they cover large areas, are widely distributed, and often occur within protected areas. In other parts of Sweden river damming, wetland drainage, sewage effluents and leaking of fertilisers have caused severely disturbed hydrological conditions and eutrophication. As a result, many habitats are currently in an unfavourable conservation status. In recent years, strengthened legislation regulating all kinds of drainage has, however, contributed to an improvement of the situation.

Similar patterns apply also to the species. The differences in conservation status between organism groups are, however, large. The conservation status of species and populations is, in general, more favourable in the northern part of the country. This is also true of species associated with montane and

rocky habitats. The conservation status of vascular plants and freshwater insects is, on average, better than that of other groups, but also some mammal and fish species maintain a favourable status. Enduring work to decrease acidification and to restore natural watersheds, together with construction of new ponds and wetlands, is beginning to yield improved conditions for many aquatic organisms. In addition, all frog and toad species currently in an unfavourable conservation status are subjected to Species Action Plans.

Many species are, however, threatened and fail to reach a favourable conservation status. This is often due to decreasing range and excessive loss of habitat, in conjunction with small population sizes. The situation is especially serious for listed butterflies, woodland insects and marine mammals. Commercial fisheries and chemical pollution are major threats to seals and Harbour porpoises. The seals are, however, gradually recovering. Commercial fisheries on Atlantic salmon, Vendace, and River lamprey affect these species adversely, as does the presence of dams and other obstacles to migration. Butterflies and some other insects that thrive in traditionally managed, semi-natural grasslands suffer from the abandonment of traditional agricultural practises as well as the transformation of grasslands into woodland. Several species of bryophytes, amphibians, and molluscs are at risk. Prescribed burning of woodland in central and northern Sweden has, however, improved the situation for several species associated with fire and burnt wood.

Marine habitats, forests and grassland habitats are generally heavily affected, and as a result neither Range nor Structures and functions reach satisfactory levels. Problems are often associated with unsustainable land use and human exploitation of land and water resources. The situation for several marine habitats is regarded as unfavourable, with negative future prospects, due to excessive nutrient levels and commercial fisheries (mainly bottom trawling). Forest habitats are adversely affected by clear-cutting and other forest practices. Modern forestry management results in severe deficits of coarse woody debris and old trees, and natural disturbances such as fire and flooding are scarce. Valuable grassland habitats suffer from lack of management and are consequently becoming increasingly over-grown with young trees and bushes. Abandonment of agricultural land, fertilisation through deposition of air-borne nitrogen, and an evermore intense use of remaining areas constitute major problems. A small but positive exception concerns calcareous grasslands and alvar on the island of Öland, where a restoration project funded by the EU LIFE instrument has been highly successful.

1.2.3 Threats

According to the Swedish Environmental Objectives Council the biological diversity of genes, species and ecosystems is decreasing at a rapid rate. The most significant factors posing a threat are changes in land use which mean that habitats are declining in quality and quantity, climate change, invasive alien species and overexploitation of biological resources. These are discussed in more detail where applicable in the sections on the different ecosystems below.

Infrastructure, exploited and urban areas

Factors mentioned by county administrative boards as main threats to biodiversity in urban areas are noise, exploitation and felling of old trees with biological values. Also considered to be a threat is the lack of information and knowledge about biological diversity in exploited and urban areas and insufficient treatment of previous quarries, which threatens a number of species largely dependent on these environments.

A large number of species find their habitat along different kinds of infrastructure but for other species the infrastructure is a major problem. Roads, railroads and game fences along them function as barriers, and contribute to the fragmentation of the landscape. These structures cause significant and lasting

effects. This is primarily a problem in the surroundings of larger cities. To reduce the negative effects, tunnels and ecoducts can be built.

Urban sprawl has also been mentioned as a threat to biological diversity. One consequence of urban sprawl could be that green areas are claimed for exploitation especially as these areas often are attractive building sites. Isolation of still unexploited areas increases the risk of losing biodiversity. Therefore, green areas need to be integrated in physical planning at an early stage.

1.3 Agricultural ecosystems

1.3.1 Introduction

The historical agricultural landscape

The species-rich habitats in the agricultural landscape consist of biotopes (*e.g.* grassland, forest pasture, coppice woodland) and landscape elements (*e.g.* old trees, stone walls, ponds) of which a majority are formed by a long history of traditional land use. These habitats provide favourable conditions for large numbers of specialised species and for species-rich organism communities. Some particularly important habitats are grazed or mown unfertilised grassland (in particular on sand, base-rich soil, and in wetlands), semi-open grazed forest, coppice woodland, and shrubs and old-growth sun-exposed trees. Since such habitats are created by man but have been colonised by wild species, they are often referred to as semi-natural.

Historically, land use in the agricultural landscape was based on production without input of artificial fertilisers or fossil fuels. In order to deal with these fundamental constraints a number of traditional land use methods were developed, which include management of large areas of unfertilised land. Although land use has naturally changed over time, these methods persisted for centuries and millennia, which provided long ecological continuity, being a major reason for the habitats' high biodiversity.

Biotopes and elements together built up landscape types that constituted habitats for larger and more mobile species such as birds and pollen/nectar eaters, and for species dependent on multiple habitats. Particularly important elements in such landscapes are flower-rich grassland, non-forested wetlands, sun exposed sandy soils, shrubland, old-growth sun-exposed trees, and manure from grazing animals. In the traditional landscape habitat patches had a high connectivity, either by being spatially connected (structural connectivity) or because of anthropogenic or other dispersal vectors (functional connectivity). The landscapes thus supported a balance between local extinction and re-colonisation, as well as metapopulations of species with particularly high local extinction rates.

The present agricultural landscape

In the present agricultural landscape much of the species-rich traditional habitats have vanished due to production intensification in some areas and abandonment in others, see below. Intensification consists of both transformation of semi-natural habitats (for example of meadows into arable land and of pastures into production forest) and intensification in terms of increased fertilisation, use of biocides, and homogenisation of arable land. With few exceptions the new habitats are species poor and mainly colonised by generalist species. Abandoned semi-natural habitats, on the other hand, can for some period of time remain rich in management-dependent species due to slow succession and delayed population responses to changed environmental conditions. Later in the succession these species disappear but sometimes the forest habitats that eventually are formed are rich in threatened species, as long as such forest habitats are not transformed into production forest.

The loss of biotopes, landscape elements etc. and the general homogenisation of arable fields has in large parts of Sweden caused severe degradation of the ecological functions of landscapes.

The agricultural landscape also contains a number of new habitats being the result of infrastructure and urbanisation, such as road verges, urban habitats, tree rows, sand pits, and corridors for electric power lines. Many such habitats have been colonised by a varied number of species from the old-landscape habitats and thus at least partly function as qualitative replacement habitats for threatened biodiversity.

1.3.2 Status and trends

The Swedish Environmental Objectives Council has reported on the status of biodiversity in agricultural ecosystems, and on progress towards achieving the environmental quality objective, and the associated interim targets.

Environmental quality objective: A Varied Agricultural Landscape

The Swedish Environmental Objectives Council's assessment is that the environmental quality objective can be met by 2020, provided that further measures are taken.

For biodiversity and cultural heritage assets, improvements such as increased areas of high-value land under management are taking place. At the same time, many species of the agricultural landscape are threatened or declining.

Current status and historical trends of biodiversity in agricultural ecosystems

The present conservation status of biodiversity in the agricultural landscape is the result of both historical and currently ongoing changes of landscapes, biotopes, and populations. A large number of species, habitats etc. have already, due to historical decline, reached critically low levels of abundance and are thus mainly threatened by factors related to rarity. Other species are still fairly common but are threatened by current negative trends. Trends can be observed for species/populations and habitats, of which the latter include trends in both abundance (*e.g.* area of biotope) and quality (*e.g.* management status).

A rapid decline of species-rich traditional habitats started in Scandinavia 50-100 years ago when artificial fertilizers began to replace manure, and intense animal husbandry or farming without livestock replaced traditional farming systems. For example, in Sweden the area of mown semi-natural grassland decreased from ca. 1.2 million to 2 400 hectares between 1880 and 1990, and studies have shown that in the province of Blekinge approx. 60% of the wetland area was drained between the late 1800's and today. In both examples the decline is due to both abandonment followed by spontaneous succession, and active transformation into arable fields or production forest. This habitat loss caused drastic decline in abundance of species connected to the semi-natural habitats. The habitat loss also caused decline of species utilising whole landscapes. The stork (*Ciconia ciconia*), depending on landscapes rich in wetlands, occurred with at least 1000 reproducing pairs in the early 1800's in Sweden, but declined due to drainage and was extinct in Sweden around 1950.

In general, abandonment of managed habitat has been very low after 1990 compared to earlier decades, most likely due to compensation programmes for management, first within the NOLA system (a system with agro-environmental payments for nature conservation in the agricultural landscape prior to Sweden's EU-membership), later within the European Common Agricultural Policy (CAP). The introduction of agro-environment measures in the national rural development programme has stopped the successive loss of managed mown semi-natural grassland. In 2007, the acreage under this land-use was 8 500 hectares and a national interim target is set to 10 000 hectares by 2010. A significant proportion of the 460 000 hectares of semi-natural grasslands with high-nature values under grazing comprises land that previously included mowing in the management regime. National area records do not allow analysis of the rate of the still ongoing abandonment since the data only show changes in total area within the agro-environment payments, not the area of semi-natural habitat *per se* and in particular not the qualitative changes of the managed habitat patches. However, the national survey of semi-natural pastures and

meadows carried out by the Swedish Board of Agriculture found that approx. 7.5% of the grassland area having high values around 1990 (according to an earlier survey published by the Swedish Environmental Protection Agency in 1987) had lost their values by 2002-2004.

As mentioned earlier abandonment of a habitat patch will in the long run cause extinction of all management dependent species. Very few data on species richness in abandoned habitats are available and it is thus difficult to estimate the impact of the ongoing cessation of management. A comparison in the county of Västra Götaland of the two consecutive national surveys of pastures and meadows showed that 27% of the populations of nine management dependent plant species were subject to abandonment from early 1990:s to 2004.

For some species, mainly at high trophic levels, biocides caused severe decline during 1940-1960's, but most of these species have since recovered and continued low numbers can usually be attributed to other threats.

The degradation of the agricultural landscape during the last 50-100 years has suppressed a large number of species to low abundances and highly fragmented distributions. The 2005 Red List lists 1783 species entirely or partly belonging to the agricultural landscape, and around 1/3 of these species are mainly threatened by small population size and fragmented distribution. 132 species became extinct from the Swedish agricultural landscape. It should be noted that the national Red List only lists species having a certain risk of going extinct in the country as a whole. In many Swedish provinces provincial red lists have been developed. Such red lists show that a large number of species are rare or decrease rapidly in many biogeographic regions of Sweden but without yet being nationally red-listed.

For some species groups, especially birds, trends for the last decades are known, and the trends show the same negative tendency as the Red List depictures. Of the farmland birds (36 species studied) 22% have lost more than half of their populations during the last 30 years and 58% in total have declined. Of 75 wetland species (many of which are connected to wetlands in the agricultural landscape) 29 have declined. Many of the previously declining species have during the last 10 years stabilised at a lower level.

The 2007 national assessment of conservation status of species and habitats in the EU Habitats Directive found 16 out of 29 habitats directive species in management depending habitats to have unfavourable status in all and another four species in some biogeographic regions. In most cases the unfavourable status is due to deficit of both habitat area and habitat quality.

The assessment concludes that 20 out of 28 management depending listed habitats have unfavourable conservation status in all Swedish biogeographic regions (alpine, continental, and boreal) and another 5 in one or two regions. The assessment further concludes that most of the management-depending habitats need to increase by several magnitudes of their present area, on average 9 times increase in the continental zone, 12 times in the boreal, and 7 times in the alpine zone.

1.3.3 Threats

The Swedish Environmental Objectives Council has identified five elements of concern in the agricultural landscape. Many species in the agricultural landscape are endangered or are in decline. Buildings and built environments are subject to major changes. Cadmium pollution and subsoil compaction may pose a threat in the future. Traditional cultivation is endangered when many farms are abandoned, particularly in areas where the agricultural landscape has already lost land. Intensification of agriculture has an adverse impact on natural and cultural assets.

Abandoned semi-natural habitats

Semi-natural grasslands are the most threatened habitats in the agricultural landscape, especially mown meadows, coastal meadows, marsh-meadows, but also semi-natural pastures. The cause of habitat change

is usually abandonment and succession. The area of species-rich grasslands is now very small, and highly fragmented. Among the species affected negatively are the rattle grasshopper (*Psophus stridulus*), the barbastelle bat (*Barbastella barbastellus*), and the corn crake (*Crex crex*).

In abandoned habitats there is an ongoing loss of biodiversity due to vegetation succession and population decline. Without resumed management all management-depending species in an abandoned semi-natural habitat patch can be assumed to eventually become extinct, and the patch thus to change to another habitat, not dependent on management. Extinction in abandoned habitats is probably the major cause of current biodiversity decline in the agricultural landscape. This threat and the resulting biodiversity decline have, however, been largely overlooked because estimates of biodiversity status often focus solely on abundance trends of currently managed habitats.

Knowledge about the amounts of abandoned habitats still rich in management-depending species is therefore crucial for estimating the current trends as well as for predicting how much biodiversity will be lost in absence of relevant conservation measures. Unfortunately, no systematic surveys of such habitats has been carried out in Sweden, but the available data unambiguously indicate that abandoned species-rich habitats are very common and host a large proportion of the total populations of farmland species. For example, a pilot study in the province of Uppland showed that 20-80% (varying between landscape types) of the populations of management depending vascular plants occur in abandoned grassland. Homogeneous agricultural landscapes in south-central Sweden and small agricultural areas within the forest landscape can be assumed to be closer to the lower end of that interval, and landscapes in topographically heterogeneous and dry regions to have high proportions of abandoned habitats. The extent of abandoned semi-natural habitats indicates a currently ongoing and extensive loss of biodiversity in the agricultural landscape.

The proportion of abandoned habitat, and thus the need for resumed management, can be assumed to also vary between habitats, both due to the extent of abandonment and the rate of succession. Both factors contribute to make habitats on low-productive soils overrepresented among the abandoned, still species-rich habitats. Examples are dry forest pastures and habitats on sand.

Semi-natural habitats under restoration and currently managed semi-natural habitats

Modern conservation work aims at the restoration of semi-natural grasslands, often using methods that should mimic the old traditional ways. When misapplied, such methods may do as much damage as the abandonment, *e.g.* if the mowing is done too early in the season, or to intensely, or if grazing animals of inappropriate species or breeds are used. Knowledge of the traditional methods and their effects on biodiversity are thus essential.

In the semi-natural habitats subject to continuous or resumed management, biodiversity relies on sufficient habitat quality in combination with necessary processes such as pollination and dispersal. A growing body of observations and studies indicates, however, that management not always provides habitat quality sufficient for more demanding species. Some examples of such indications are:

Several management depending species decline despite management, in particular pollen and nectar eaters and phytophagous insects, *e.g.* butterflies. Abandoned grassland habitat patches are often richer in phytophagous insects connected to management depending plants than grazed grassland patches.

Usually the reason is that management is too different from the traditional land use that created the habitats. This may in turn be caused by too large a management focus on vascular plants, lack of knowledge about the links between biodiversity and historical management regimes, *e.g.* timing of grazing or application of too intense grazing as an attempt to decrease shrub cover. Instructions for management that are poorly ecologically justified occur both within the Swedish application of CAP regulations and within the Natura 2000 framework. The main criticism, especially concerning CAP, has been that uniform management regimes (in terms of grazing intensity, scrub clearing etc.) are applied without sufficiently considering different management needs among different habitat types.

On the other hand, the number of grazing animals is a limiting factor for the management in several parts of the country. Neither are the biologically most valuable semi-natural grassland always the preferred grazing areas from an economic point of view, resulting in too low a grazing pressure.

Other threats are eutrophication (mainly air-borne nitrogen) that may contribute to biodiversity decline in managed grassland in some parts of Sweden, and non-natural flooding tables in marshes along shores of water-level regulated lakes and streams.

Insufficient habitat quality has attracted little attention compared to habitat loss, and few quantitative estimates of its impact are available. Quantitative data are provided mainly by long-term scientific field surveys. For example, around 30% of the populations of the grassland herb field gentian (*Gentianella campestris*) have gone extinct during 1990-2004 and another 40% have declined. Around 80% of the decline can be attributed to suboptimal grazing, mainly too intense or too early in the season. Of the mown meadows in the province of Västra Götaland 56% of the polygons (not of the area) were subject to changed management (usually transformed into pasture) between ca. 1990 and 2004. Such a shift in management has been shown to affect biodiversity negatively.

Suboptimal management is likely to be the cause of a considerable ongoing decline of certain species groups, in particular insects, and in certain habitats, in particular dry grasslands and habitats that traditionally were subject to late-season disturbance, *e.g.* former hay-meadows. Given the slow response of biodiversity to abandonment in many habitats, suboptimal management may in a shorter time perspective sometimes cause faster rate of decline than abandonment.

The drivers behind the changes

The main drivers and causes behind the problems are economic and technical development in agriculture which facilitates the structural rationalisation towards larger and more intensively farmed units. Inadequate profitability in small-scale agriculture is leading to abandonment. Factors that influence the social situation of farmers, for example social networks and functioning social services, impact on their willingness to engage in agriculture.

Indigenous and local communities inhabiting *e.g.* the agricultural landscape, mountain or coastal areas, and using different biotopes for traditional use of natural resources, have voiced their concern about the loss of transfer of traditions and knowledge to a new generation of tradition holders. It is becoming difficult for local rural people to compete with urban people when it comes to buying farms and lands in attractive regions. This leads to a decrease in traditional land tenure and often to a limited understanding of local practices and traditions concerning the use of biodiversity. The result is a decreasing number of active local small-scale artisanal fishermen or farmers.

The number of agricultural businesses continues to decrease, and former farmland is becoming overgrown in a large part of Sweden, while agriculture is becoming more intensive in the areas that remain. Both these processes lead to continued loss of species habitats and also have an adverse impact on historic monuments and relics.

Landscape trends

Both loss and reduced quality of habitat patches cause fragmentation. When fragmentation crosses a certain threshold the landscape loses its function as habitat for large and mobile species. For example, several bird species, such as the stork, disappeared following drainage of small waters and wetlands. Species that need more than one habitat type are affected in a similar way, for example wild-bee species of which a large proportion are red listed because pollen sources and nesting sites are not any longer occurring together. The process of landscape deterioration for such “landscape-depending species” is difficult to detect through surveys of landscapes and habitats, both because we rarely know when critical fragmentation thresholds are reached, and because habitat patch quality (which is an important component of landscape

quality) of managed and abandoned patches needs fine-scale analyses to be estimated. An ongoing decline of populations of farmland birds however indicates that such loss of landscape function is still a highly significant cause of biodiversity decline.

1.4 Forest ecosystems

1.4.1 Introduction

The main focus in Swedish forest biodiversity protection has been on old-growth forest habitats with a low human influence and, especially in the southern part of Sweden, on habitats created as a result of traditional land use such as grazing, mowing and pollarding. Focus has been on rare and threatened species, especially habitat specialist species connected to the above mentioned habitat types. Structures important for these habitats and species have been highlighted, for example biologically old trees and coarse woody debris. Every kind of species is in principle treated with equal importance, except micro-organisms, it means that concern has been on both the lower and the higher fauna, flora and funga.

In the old-growth forest habitats in Sweden the natural disturbance regimes and the effect they have on the forest landscape and its biodiversity are important. Most important in the boreal and boreo-nemoral forests are natural forest fires. Fire caused by factors such as lightning during thunderstorms occurred naturally with an interval of approximately 50-100 years in dry and mesic forests in northern Europe, including Sweden. They had, before man interrupted, a large-scale influence on the landscape and are important, directly or indirectly, for many Swedish forest species. Fires create a mixture of various succession stages in a patchwork in the forest landscape. Scots Pine is a fire-adapted tree dominating natural forests on drier and less fertile soil. Old pine trees often survive fires and the seeds the surviving trees drop, regenerate in great abundance in the ash formed after fires. The whole ecosystem connected to natural pine forests is fire-adapted and many organisms are fire-dependent. Another important aspect is the establishment of deciduous forest forming the first forest generation after fire on mesic soil. 60-100 years later a colonisation of Norway spruce takes place. The spruce is sensitive to fire meaning that after every fire the succession starts all over again with a regeneration of deciduous forest. Further, fires create a large quantity of valuable structures for the biodiversity, such as sun-exposed trees, damaged trees and sun-exposed coarse woody debris. Fires also affect the soil chemistry and create patches of bare soil.

A factor contributing to the maintenance of a variety of succession stages in the natural forest landscape is storm-felling. The gaps and openings change the light conditions, uprooting of fallen trees causes soil disturbances, and fallen logs provide substrates for a large variety of species dependent on dead and decaying wood in different decomposition stages.

Another important natural disturbance regime is flooding of water-bodies and wet forests. Flooding of lakes and watercourses with an intact water regime creates deciduous forests along the water edges, since Norway spruce is sensitive to flooding. For wet forests an intact hydrology, including regular flooding, creates deciduous rich forests.

A large part of the high conservation natural and cultural values in especially the forests of southern Sweden has been created in a former agricultural landscape through mowing, and sometimes pollarding, in wooded meadows and through grazing in wooded pastures and grazed forests. Important aspects and structures created are for example

- giant sun-exposed or semi-exposed wide-crowned trees of many different tree species;
- hollow trees and trees with damaged and dead parts;
- pollarded trees, which in many ways are different from tall forest trees, they for example become much older due to the constant reduction of the crown;
- thorny bushes;

- berry and nut producing trees and bushes often growing in or along the edge of the fringe and mantle,
- sun-exposed or semi-exposed coarse woody debris, both lying and standing;
- grass sword with a flora and fauna specialised on natural grasslands, as well as
- an exposition of existing archaeological remains and other cultural historical values.

Many species are dependent on a combination of more than one of the above mentioned structures.

Oak- and hazelbush habitats are normally dependent on grazing or mowing to be preserved. However, oak-pine forests on dry soil were probably created and/or favoured by natural fires. Natural southern Swedish wet-forests, preferably with black alder and ash as the dominating tree species, are naturally affected by small-scale gap-phase dynamics and sometimes flooding. Natural southern deciduous forest on steep slopes often consists of elm, ash, lime and maple with gap-phase dynamics as the dominating natural disturbance regime.

The old-growth forests and the high conservation value forests formed in the old agricultural landscape are normally called *High-value cores* in Sweden. A substantial part of the high-value cores have been surveyed by the Forest Agency and the larger forest companies during the last two decades and identified as either so called *Woodland Key Habitats* or if the natural values are somewhat lower as *Other stands with high natural value*.

1.4.2 Status and trends

The Swedish Environmental Objectives Council has reported on the status of biodiversity in forest ecosystems, and on progress towards achieving the environmental quality objective, and the associated interim targets.

Environmental quality objective: Sustainable Forests

The assessment made is that this environmental quality objective will not be achieved by 2020. Regarding the state of the environment, several opposing trends are noted. Biological diversity in forests continues to decline. The felling rate in forests is very high, partly because demand for biofuels is rising. Use of forest resources is intensive. Forests of very high nature conservation value are still being felled, and regeneration felling with a continuing lack of proper attention to conservation is also impairing diversity. Several common forest species are declining. Regeneration felling of near-natural or semi-natural forest stands is the single measure that is judged to threaten the largest number of species. Yet at the same time, some basic preconditions for biodiversity are improving: examples are the quantity of dead wood, the number of large trees, mature forest with a large deciduous element, etc.

Current status of forest biodiversity [Jo, vänligen kolla siffrorna!]

Habitat area

In Sweden there are 23.75 million ha of productive forest land from which 900 000 ha is legally protected; 600 000 ha in the mountain zone and 300 000 ha below the mountain zone. According to the Forestry Act, forest land is land that is suitable for wood production and that is not used for any other purpose to a significant extent. The average annual wood production on such land is 1 cubic meter/ha or more. To that should be added an additional 6.2 million ha of non-productive forest with a lower production. The overall standing volume is around 3 billion cubic meters which means an average of 127 cubic meters/ha. Since the 1920's the standing volume has increased more than 60%. The annual growth is around 100 million cubic meters from which 95.5 million cubic meter were cut 2007.

Today, forests with old-growth forest qualities are very rare in Europe. In spite of a dramatic decline during the 20th century, Sweden is still the country in Western Europe that has the largest area of old-growth boreal forests. Especially in and close to the mountain zone large, more or less untouched, boreal

forest ecosystems can still be seen. The forestry in this area has formerly affected lower altitudes and more productive forests. The protected forests close to the mountain range is normally located on higher altitude and in westerly located valleys. With the limitations this gives in terms of biodiversity protection, this is still the area in Sweden with the best long term possibilities for naturally functioning ecosystems and preservation of biodiversity. This is also the case for quite large areas just below the mountain zone in Norrbotten and Västerbotten where old-growth forests are found to an extent which is not seen in the rest of the country. According to the Swedish Sami Council most of the old-growth boreal forests of northern Sweden are used for reindeer winter grazing, and these remaining areas are of utmost importance for the future of reindeer husbandry.

Broad-leaved woodlands were, for climatic reasons, once much more common in Continental Europe than in Sweden. Today, only around 0.2% of the original area of nemoral deciduous forest in Europe exists in a relatively natural state. In many cases forestry activities, pressure from exploitation and air pollution negatively influences the biodiversity in those woodlands which are left. Sweden is significantly less populated and less exploited. Deciduous forests with more natural features therefore still exist in different parts of Sweden. Equally important however are the biologically significant structures which are conserved within the agricultural landscape in the form of ancient trees and pollarded trees for example. Sweden is one of the countries in Europe with the most valuable oak dominated agricultural landscapes, including oak wooded pastures and ancient oaks.

Around 975 000 hectares of un-protected high conservation value forest (high-value cores) on productive forest land are identified through several extensive surveys; 225 000 ha in the mountain zone and 750 000 ha below the mountain zone. They could be either forests with a certain amount of old-growth forest qualities or have gained similar qualities in the old agricultural landscape, for example wooded pastures with large trees.

The legally protected area, which to a high degree consists of old-growth forests, together with the area of identified un-protected high-value cores makes up 7.9% of the productive forest land, 55% in the mountain zone and 5.7% below the mountain zone.

The forests logged in the 50s to 80s

The forests planted after extensive loggings or on former cultivated land since the 1950s are poor in biodiversity. The amount of dead wood is small, and there are few snags, old deciduous trees, slow-growing trees or other elements worth saving for conservation purposes. Swedish commercial forests have a much shorter production cycle, are denser and contain fewer tree species than old-growth forests. Furthermore, the soil has a thicker layer of humus. Taken together, this leads to few occurrences of habitat qualities essential to specialised forest-living species.

Species

In Sweden 1862 red-listed species occur in forest environment, 831 of which are threatened. 91 species have become extinct in Sweden (*i.e.*, regionally extinct), and 13 are possibly extinct, since the year 1800. Approximately half of the red-listed forest species are dependent on dead wood. There are more species in the forests and more threatened forest species in southern Sweden than in northern. Most threatened forest species are connected to southern broad-leaved forest.

Major trends in forest biodiversity

Decrease in the area of old-growth forest and other high-value cores

Although the priority in the National Strategy for Legal Protection on Forest land is put on preservation of high-value cores and the preservation of woodland key habitats is included in the certification standards, substantial cutting of identified high-value cores is still continuing. Statistics from the Swedish Forest

Agency show that the number of registrations for cutting (parts of) woodland key habitats, handed in to the Forest Agency, has been increasing and is today around 700 – 2000 /year, all together 4700-13000 during the last 10 years period. The area of these woodland key habitats is not known. The large span between the two numbers depends on the difficulties to determine if an application is only touching the border of a woodland key habitat or actually is including a part of it. The correct figure is somewhere between these numbers. There are no figures for the fellings actually carried out in key habitats. Around 1000 biotope protection areas have been established out of the 4700 habitats obviously reported for logging during the last 10 years. This legal protection has thereby hopefully prevented the cutting of 1000 of those areas.

Viability of threatened species in production forests

A key question for evaluating biodiversity trends in the forest landscape is whether demanding (currently declining) species can maintain viable populations in production forest that is managed using today's level of considerations. If species can survive in the production forest, then trends of species can be expected to be much less negative than the trends of area of high-value cores. Also, there would be less need for preserving the remaining high-value cores. If production forest, on the other hand, cannot support viable populations of demanding species, then the trend of area of high-value cores is a good indicator of the trend of forest biodiversity. The key question can be decomposed into three sub-questions:

1. Can threatened species survive on trees, wood and other substrate retained at clear-cutting long enough for the substrate to function as rescue habitat?
2. Can threatened species re-colonise and build viable populations in the new forest stands that are formed after clear-cutting?
3. Can survival on retained substrate (1) plus re-colonisation of new stands (2) together support viable populations of currently threatened species in a production forest landscape?

The production of this national report to the Convention has included a thorough review of scientific studies addressing the three questions. Based on available scientific evidence by November 2008 the following conclusions can be made:

1. Several studies show that red-listed and other species of conservation concern can use structures retained at clear-cutting, either by staying on the retained substrate when their forest stand is logged or by colonising the substrate from nearby unlogged forest stands. There is little evidence for long-term utilisation of the retained structures but for some types of substrate there are strong indications of decreased value for species after ca. 10 years.
2. Several studies show that many species of conservation concern can re-colonise new forest stands, but that after 40-120 years the abundance of species is usually still lower than in the nearby unlogged forest.
3. Only few studies deal with the question of long-term survival of biodiversity in the production forest landscape. The studies represent three approaches. Modelling studies (two) show that retained substrate and even rather long (160 yrs) rotation periods decrease viability of species considerably compared to unlogged forest. Historical studies (two) show decreased biodiversity in landscapes that had low abundance of high-value cores 120-150 years ago, compared to landscapes with more mature forest habitats, thus that reduction of natural forest gives long-term imprints on biodiversity. Comparative landscape studies, finally (two) show that certain substrates were considerably less species rich in a production landscape with fragmented mature forest than in a landscape less affected by forestry.

The answer to the key question is thus that so far there is no evidence for long-term maintenance of forest biodiversity in production forest, but rather indications of the opposite. Possible reasons may be that structures retained at clear-cutting, although frequently utilised by demanding species, are too temporary,

too dispersed, and too few, and that rotation periods in forestry are too short for sufficient re-colonisation before the next clear-cutting. Therefore, based on current evidence negative trends of area of high-value cores are likely to lead to corresponding negative trends of forest biodiversity. Furthermore, the effects on biodiversity of considerations in forestry are not yet substantial enough to justify continued logging of high-value cores.

Less detrimental forestry practises and higher awareness

Current forestry practises, in a wide sense, are less detrimental to the biodiversity than those of a few decades ago: when clear-cutting an area, some trees are left (called eternity trees) and high stumps are created, voluntary set-asides are retained, nature reserves and biotope protection areas are established etc. It must be noted though that the improvements started from a very low level when it comes to nature considerations in forestry practices.

The general awareness of conservation issues in forestry has improved through education and forest certification. The ecological aspects are also promoted to a larger extent by ecological landscape planning and forestry planning. Large-scale education programmes have been targeted at people employed in forestry.

Despite the improvements in the awareness among foresters and forestry methods mentioned above, the overall situation of the red-listed species has not improved since 2000, according to the 2005 Red List. The actual situation for the specialised organisms in the forests is becoming worse. The amount of high-value cores are decreasing due to logging, continuity forests that formerly have only been selectively cut, or/and grazed, are clear-cut and replaced by planted forests, etc. Also many species that have not yet been red-listed, *e.g.* willow tit *Parus montanus*, continue to decrease. Another example of a decreasing species is the formerly common species marsh tit *Parus palustris* which recently has been red-listed. Of Sweden's 121 forest bird species, the populations of 18 have increased and 33 have decreased during the past decade.

Decrease in continuity/ancient woodland and very old forest

According to the Swedish National Forest Inventory, the amount of forest older than 160 years has decreased by half during the past 50 years. Since 1983, the area of forest older than 100 years has decreased by 15%. The annual forest area being logged has increased considerably since 2000. This affects all species that cannot tolerate clear-felling. In the north of Sweden this primarily includes forests that have never been logged, although some selective cutting may have occurred. These continuity forests are termed *Ancient woodland*. Ancient woodland often harbours a large number of red-listed species that find it hard to survive in managed forests, for example the fungus *Tricholoma matsutake*. The area of ancient woodland is likely to decrease by at least 25% in the coming 10 years, should logging continue at the current rate. The number of very old coniferous trees also continues to decrease, particularly in the inland regions of Northern Sweden.

Failures to fulfil nature conservation considerations

Controls carried out by the Swedish Forest Agency show that around 25% of the loggings do not fulfil the minimum requirements of nature conservation consideration, as defined by the Forestry Act. The most common failures are to give insufficient consideration to sensitive biotopes, for example along water courses, and to habitats of red-listed species. A problem which has been discovered in for example the counties of Dalarna and Östergötland, is that in approximately two thirds of the logged areas where trees have been retained for conservation purposes in the logging operation, the trees have later been removed, often by the landowner himself.

Neglected aquatic environments

The effects of insufficient conservation measures in and around aquatic environments in the forest landscape are numerous and severe in relation to the area affected. They may consist in direct physical disturbances in the form of increased exposure to the sun, barriers to migration or hydrological changes. They may also consist in physical or chemical influence in the form of, for example, increased inputs of sediment, nutrients, metals or acid water. Logging all the way down to water courses leads to a lack of shading trees, frequently combined with damages to the ground. This has adverse effects on the fish populations as well as on benthic fauna and flora. Furthermore the loggings often cause sludge sedimentation, which is detrimental to filter feeding species, for example several red-listed caddisflies *Trichoptera* and mussels, *Bivalvia*).

Since 2000, mercury leaching from forest land in connection with forestry operations has attracted attention. Measures that affect turnover of the mor layer of the soil, such as felling, site preparation, driving and drainage, usually also boost the outflow of humus (organic matter) into water. The metals bound to the humus, such as mercury, then enter lakes and watercourses. Retaining a buffer zone, with its vegetation, around lakes and along watercourses exerts favourable effects on the aquatic environment. Forested buffer zones appear to reduce run-off by slowing the water down and through the trees' absorption of water. This also helps to prevent erosion of banks. Buffer zones in the forest landscape have also proved to absorb large quantities of the nutrients released during regeneration felling, including nitrogen and phosphorus.

Lack of dead wood and other key elements

The lack of ecological key elements related to old-growth forests and natural disturbances, such as dead and decaying wood, standing and lying dead trunks and trees (alive or dead) affected by disturbance factors such as fire and storm-felling, has a serious negative impact on the biodiversity on the species and ecosystem levels. This is obvious in the commercial forests but also true in many of the remaining fragments of old-growth forest and other high-value cores.

At least one third of all forest living species are associated with dead wood. For red-listed forest species the figure is around 50%. In commercial forests virtually all trees are harvested and removed in order to produce logs, pulp or bioenergy; wood that otherwise would have been used by the large number of species decomposing dead wood. There is an increasing interest to chip wood debris from loggings, especially in the southern and central parts of Sweden. The amount of dead wood in the forests has decreased continuously throughout the 20th century. It is only in recent years that the total amount of dead wood has started to increase, mainly due to the two large storm-fellings 2005 and 2007. A current estimate is around 7 m3 dead wood/ha. As yet, however, there is no definite increase in the amount of coarse woody debris, and the volume is far too small to ascertain the biodiversity of wood-living species. In untouched old-growth forests the amount of dead wood is usually around ten times as large as in production forests.

Deciduous forest

According to the Swedish National Forest Inventory, the area of deciduous forest has increased by around half a million hectares since the 1950s. This is the result of the expansion of young deciduous forest (<20 years), whereas the area of old deciduous forest (>80 years) has decreased considerably. In particular, the number of deciduous trees older than 125 years has dropped. Throughout the country, the area occupied by old deciduous trees has decreased by 80% over the past 50 years, and by 60% over the past 20 years. The largest decrease has occurred in northern Sweden. More aspen trees are retained during logging now than before, but intense browsing by moose and roe deer hampers the regeneration of aspen (*Populus tremula*), goat willow (*Salix caprea*) and rowan (*Sorbus aucuparia*).

The area of oak and beech forest has decreased drastically during the last century. In the south of Sweden only 20% of the oak forests and 30% of the beech forests present at the beginning of the 20th century still remain. Since the laws about beech forests (1974) and hardwood forests (1984) where passed, the area of forests of medium sized and large beech and oak (over 50 cm diameter) has increased by 40% and 15% respectively, but the proportion of very large trees is still decreasing. An alarming gap in the succession of old deciduous trees, notably in the broad-leaved forests and wooded pastures of southern Sweden, is likely to cause problems for a large number of red-listed species.

Lack of natural disturbance regimes

In Sweden, many of the forest species found on the national Red List are dependent on or strongly benefit from natural disturbance regimes. Several species of beetles are favoured by or entirely dependent on fires for their long-term survival, some bird species are favoured by the early succession stages after a forest fire. Some rare vascular plants are dependent on or favoured by fire. The certification standards demand a certain amount of prescribed burning for the forest companies. This, together with the action plan for fire-dependent threatened species, has had a positive effect on primarily fire-dependent species. In recent years, species such as the beetle *Melanophila acuminata* have increased due to this activity. The amount of living trees included in the burnings, however, varies a great deal, as does the quality of the biotopes created.

A much larger number of species than the primarily fire-dependent species are the ones favoured in the long run by the forest appearing after a forest fire, for example the ones connected to the deciduous rich forests appearing after fire on mesic, medium fertile soil. Thus, the lack of forest fires causes a substantial loss of biodiversity. It remains to be seen how many of the prescriptively burnt areas will develop into the right type of deciduous-dominated stands.

Fragmentation and extinction debt

A spatial problem is the ongoing fragmentation of the forest ecosystem, leaving patches of suitable habitat to far between for species movement to function. A significant part of the current occurrences of red-listed forest species represent small and isolated remnants of formerly large populations with a continuous distribution. This means that when individual populations go extinct for one reason or the other, there is no chance of re-colonisation, and the species as a whole is in danger of gradual extinction. Such species are part of what has been called an extinction debt. This is true of many species associated with dead wood in general and with special wood-qualities in particular.

Although fragmentation is an increasing problem, habitat loss is still the major problem for biodiversity preservation, for example the cutting of old-growth forests or the overgrowing of valuable wooded pastures.

The emergence of a polarised forest landscape

A related problem that has been high-lighted relatively recently is the increasing division of the landscape into two extremes. If forestry and nature conservation continue as today – business as usual – prognoses show that a polarised, black and white forest landscape pattern is emerging. A small proportion of areas with older and older forest with an increasing amount of coarse woody debris will be as islands in clear-cut, planted forest with a short time of rotation. The forests with a nature conservation value in-between high-value cores and planted commercial forest are decreasing and will be principally absent in a few decades time. A medium-value forest, for example a selectively cut continuity/ancient woodland, will be either set aside and transformed into a high-value core or clear-cut and planted. The forests with medium natural value could have an origin as selectively cut forests in the northern part, where only the oldest trees were cut many decades ago, or earlier grazed and extensively managed farmer forests in the south-

ern part of Sweden. One problem with the black and white forest landscape will be that species specialised on high-value cores will face increasing difficulties to move around in the landscape. Another problem is that the set-aside high-value cores will be very dense and dark forests. Species specialised on sun-exposed old trees and sun-exposed coarse woody debris will have large problems.

1.4.3 Threats

The Swedish Environmental Objectives Council is concerned about loss of biodiversity and natural and cultural assets in the forest ecosystems, and points out that climate change and the ensuing increased demand for biomass are putting additional pressure on the forest ecosystem and its resilience. Many of the long-term trends described above (1.4.2) can also be seen as threats.

A large number of interests have to reach a consensus if the Swedish forests are to be able to continue in the long term to be a basis for a strong Swedish export industry, provide a source of rich recreation and maintain the biodiversity that today is under threat. At the same time as the forest ecosystem has to cope with a changed climate, demand for biomass is increasing, which makes it all the more important to take account of environmental concerns in use of the forests so that the forest ecosystem's own living conditions are also respected. The natural functions and processes of the ecosystems have to be protected, all natural species have to be able to continue to survive in long-term viable populations with sufficient genetic variation and dispersed across their natural ranges – otherwise the biological objectives of the forests will be threatened, if they are threatened the economic production objectives will be so too in the longer term.

Forest felling is now at the limit of what is sustainably possible. Sawmills and the paper and pulp industry have faced competition from the energy sector in purchasing forest raw material which means that demand for forest products is increasing. This is hard to combine with the ambition that all forests should be managed with greater concern for the environment, and forests of particular conservation interest should to be managed on the basis of environmental objectives instead of production targets. Commercial forestry methods, although now more considerate than previously, are employed in sensitive areas where extra consideration is needed or where no felling at all should take place. There is inadequate mapping of what needs to be protected for cultural or environmental reasons, and inadequate knowledge of how consideration should be given.

If forests worthy of protection are felled, major natural assets will be lost for a very long time – hundreds of years. Such felling is taking place at present. With regard to biodiversity, the habitats of species may disappear locally.

Main threats to forest biodiversity

The major threats to biodiversity in Swedish forests may be summarised as the simplification of the forest ecosystem in different ways through forestry practices, leading to problems for species specialised in, nowadays rare, structures and circumstances. This is illustrated by an analysis of the number of different ecological niches available in the forest. Typically, a managed coniferous forest in the middle of Sweden provides around 16 different niches (defined as four different life stages - sapling, young, middle-age and cutting age - of four different tree species - Norway spruce, Scots pine, silver birch and white birch - present in the forest), whereas an old-growth forest in the same area would provide over 100 niches from nine different tree species and many more stages of life and decomposition.

Logging of high-value core areas

An obvious threat is the logging of old-growth forests and forests with old-growth forest structures (Swedish Species Information Centre, 2007). Identified high-value cores are not automatically legally protected and the economical resources for establishing legal protection of high-value cores are too small.

The underlying driver for the cutting of old-growth forests is the high demand for timber, pulp and bio-energy from the forest industry and society as a whole.

A potentially serious threat is the cutting of non-registered high-value cores, although the magnitude of the problem is unknown. Newly identified high-value cores/woodland key habitats are rarely reported to the Forest Agency for registration in the woodland key habitat database. Single Forest Agency districts that are active in controlling areas reported for regeneration cutting continuously identify many woodland key habitats; however, most districts rarely identify any new ones at all. It is probably common that high-value cores, for example woodland key habitats, are cut down unnoticed if they are not registered by the Forest Agency. Cutting non-registered high value cores may be caused for several reasons, lack of knowledge on how to identify high-value cores, unwillingness to recognise new areas or lack of time or low priority to fulfil this duty.

Lack of natural disturbance regimes

The lack of natural forest fires and the favouring of spruce in forestry lead to a significant, slow but steady, "sprucification" of the Swedish forest landscape. Open pine forests are replaced by darker spruce dominated forests. Forest fires are effectively kept under control and only rarely they get large enough to have the same impact as in past times (also in protected natural forests). A contributing factor in natural forests is the colonisation of invasive spruce from surrounding commercial spruce forests. The fragmentation of natural forests has affected the frequency and extent of the natural disturbance regimes. Underlying drivers to the "sprucification" are the fact that the forest industry is to a large extent built on the production of spruce pulp; that spruce production is economically favourable, and that uncontrolled forest fires thus are a threat to large economical values.

The lack of natural disturbance factors such as fire, flooding and storm-felling has a large negative impact on the abundance of ecological structures such as dead wood, burnt wood, trees with fire scars, and deciduous trees. In a landscape perspective, disturbance factors such as fire and storm contributed to the creation of a mosaic of different biotopes and succession stages.

Removal of dead wood and old or damaged trees

Fallen or cracked tree trunks after a storm-felling are normally quickly removed, in order to take care of the commercial value of the timber and to reduce the risk of outbreaks of harmful insects. The long history of forestry in Sweden has led to many of the high-value cores being in a state far from that in old-growth forests, especially in southern and the eastern part of northern Sweden. This is most obvious for the amount of dead wood. In high-value cores the proportion of dead wood might often be around 5% of the timber volume while an un-touched old-growth forest naturally contain 20-40% of dead wood. The main underlying driver behind this is the use of dead wood and damaged trees for fire wood. This driver was stronger in the past time but is still a serious threat to the biodiversity connected to dead wood in most parts of Sweden. An up-coming possible threat is the use of dead wood and damaged trees for bio-energy on a larger scale. Also the amount of very old trees is generally much lower in the current high-value cores than in old-growth forests.

Drainage, fertilisation and use of exotic tree species

Drainage has a severe detrimental effect on forest biodiversity. For wet forests and forests along lakes and water-courses, an intact hydrology including regular flooding is an integral part of the dynamics that often is changed due to drainage or regulation of streams and rivers. Negative impacts include overgrowth and competition with spruce, with a decreased proportion of deciduous trees as a consequence. New drainage is not common anymore but the cleansing of old drainage systems prolongs the problem and quite often involves a deepening of the ditch, thereby increasing the drainage effect.

In order to increase productivity of the forests it has been suggested that fertilisation be substantially increased. This, in combination with air-borne nitrogen deposition, may have adverse effects on the flora of for example certain groups of mycorrhizal fungi as well as on the aquatic ecosystems.

A threat that might increase is the use of exotic tree species. Apart from extensive plantations of *Pinus contorta* in the middle of Norrland, exotic tree species have rarely been used in Sweden. An increasing interest is seen though, especially as an alternative to Norway spruce, which in southern Sweden recently has been severely affected by heavy storms and the spruce bark beetle, *Ips typographus*.

Underlying drivers to drainage, fertilisation and the use of exotic tree species is again the demand for pulp, timber and bioenergy from the forest industry and the rest of society.

Browsing

The high browsing pressure from moose and roe deer is a serious threat to the biodiversity connected to especially deciduous trees. Large numbers of deciduous tree saplings are currently killed and pine tree saplings damaged by browsing. This influences the tree species composition in two ways; deciduous trees and pine are disfavoured directly by browsing and the forest sector avoids these tree species in plantations. The biodiversity situation is most serious for aspen, goat willow and rowan, young trees of which rarely occur in large parts of Sweden. The situation for organisms specialised on these tree species will become problematic in the future. Populations of predators like wolf, lynx, brown bear and wolverine are too low to regulate the populations of moose and roe deer, except locally, and extensive even-aged monocultures of pine help the moose populations in the winter. The warmer winters also help the roe deer to survive in higher numbers. The underlying driver behind the extra-ordinarily high stocks of game, compared to a natural forest situation balanced by predators, is that hunting is an increasingly popular and economically beneficial activity and therefore high populations of roe deer and moose are a strong interest for the hunters and the hunting organisations.

Air pollution

Air pollution is to some extent decreasing. It is also to some extent more of a local problem in surroundings of certain industries. The sulphatic acid deposition has decreased sharply since the high levels experienced a few decades ago. Nitrogen deposition is still considerable, however, fertilising naturally nutrient-poor ecosystems, for example *Sphagnum* wetlands, in this case leading to the overgrowing of naturally open wetlands. The downfall of mercury also remains high.

Invasive alien species

Invasive species are a comparatively small problem in Swedish forests, but one locally large problem is the aggressive spread of the Sycamore, *Acer pseudoplatanus,* in some southern broad-leaved forests. The spread of *Pinus contorta* into areas with high value for biodiversity and protected areas is seen as a problem by some authorities. During 2009, the government has ordered the Swedish Forest Agency to look at possibilities to enlarge the area where forest rejuvenation using *Pinus contorta* is allowed. The spread of alien populations of pine and spruce is widespread. The consequences of this for native biodiversity at the gene level are not known.

Climate change

The expected change in climate due to the emissions of green house gases will add to and increase the existing risks, including drought, increased spring and autumn frost risk and insect and pathogen damage. These changes will affect the phenology, growth and distribution of species and the species composition of Swedish forests. Changes in the frequency and degree of extreme climatic events (such as long-term

droughts, floods and storms) may have a larger effect on forest ecosystems than the projected change in average temperature and rainfall.

Diseases and large outbreaks of insects

In some cases, single species have become a threat to the biodiversity connected to certain tree species by killing a large part of the population of that species. The most obvious is the Dutch elm disease, *Ceratocystis ulmi,* which has killed all the elm trees in large areas of southern Sweden. Specialised organisms connected to, especially very old, elm trees, for example some lichen and beetle species, have thus become threatened.

With the beginning in 2003 a new disease, the ash die-back disease, *Chalara fraxinea*, has started to affect a very large proportion of the ashes in infected regions. The disease kills the year shoots on the ashes. If this is repeated for several years the ash trees will die. In 2008 a slight improvement may have occured, but the long-term effects remain to be seen.

A worrying phenomenon the last decades has been the sudden death of apparently healthy oaks. The reasons behind the oak-death are unclear, but the problem seems to have decreased the last years.

In normal situations the spruce bark beetle *Ips typographus* is a key species in boreal forests. It is a valuable creator of important structures in the natural forest, for example natural spruce snags. Large outbreaks may, however, be so severe that all spruce trees are killed in for example a protected area. The risk for large outbreaks of *Ips typographus* increases when applying the forestry methods currently in use in southern Sweden: monocultures of spruce, also on dry soil where pine normally grows, and clear cutting as the main logging method. The spruce bark beetle had a very advantageous period after the large storms in 2005 and 2007.

Implications

The forest has an important role to play for biodiversity, economy and social life. The economically most important products are timber, pulp and paper. Bioenergy is increasingly important. The forest industry and forestry products are the largest Swedish net export branch, representing a value of 13% of the total Swedish export. Around 90 000 people are directly employed in the forestry and forest industry sector. Additionally a large number of people rely on forestry indirectly, in the refinement industry, the transport sector, etc.

Often wooded areas deliver more ecosystem services than we normally consider. As an example could be mentioned some ecosystem services delivered from an oak pasture:

- Beauty
- Prevention of acidification
- Increase of the amount of fish in water bodies
- Habitat for threatened species
- Meat
- Health
- Decrease of global warming
- Resource for eco-tourism

Generally, more intensified forestry that relies on fertilisation, drainage and monotonous monocultures will decrease most values in the forest, apart from timber and pulp production. On the other hand a more varied forestry with well functioning nature conservation considerations will deliver benefits from a variety of ecosystem services.

Lower resilience towards changes in the environment

The forest delivers different ecosystem services such as binding of carbon, soil formation, cleaning of water and air, climate regulation and as a stabilising factor towards external disturbances. More homogenous forests and their lower biodiversity make the forest ecosystems less resilient to meet new situations and deliver valuable ecosystem services. Most obvious now is that more homogenous, low biodiversity forests are less resilient to meet the threat from global warming.

Deteriorated reindeer herding

Reindeer herding is dependent on lichen rich forests to be grazed in the wintertime. When the snow turns to ice due to changing weather there are difficulties for the reindeer to find easily accessible food, except in the form of tree lichens. The transformation of old-growth lichen rich forest to planted young forest with few lichens drastically decreases the suitability of the forest for reindeer herding.

Decreased recreational value

A less varied, more monotonous forest is often less interesting for recreation and other social values. A rich biodiversity and the knowledge that a forest contains certain species make the nature experience richer. Certain activities, like hunting, angling, berry and mushroom picking and other recreational aspects are strongly dependent on how the forest is managed.

One example is that the creation of a buffer zone as a general consideration along a water course will increase the fish populations and thereby the value of the water course for angling. Another example is that a large proportion of deciduous trees, as well as gaps, increases the roe deer and moose populations, benefiting hunting.

The social values of the forest become increasingly important with increasing urbanisation, when the forest is no longer a natural part of daily life.

A measure of the importance of the forest for recreation is that 80% of the Swedish population walk for pleasure several times a year (Statistics Sweden, 2004.). 30% uses the forest for recreation more than 20 times a year. Around half a million people in Sweden are involved in hunting activities. Another large activity in the forest is angling. Around 1 million people are engaged in angling, with an average time spent of 12 days/year.

Decreased value for berry and mushroom picking, hunting and angling,

The amount of berries and mushrooms picked annually is around 36 000 tons. Apart from the recreational value hunting contributes with around 16 800 tons meat annually to a value of 700 million SEK.

Intensive forestry, especially fertilisation and drainage, decreases the amount of mushrooms and berries suitable for picking. If the blue berry coverage is decreasing due to fertilisation and trenching the forest hen populations, for example the capercaillie, *Tetrao urogallus*, will decrease, and thereby the hunting possibilities. Fish populations are strongly favoured by natural deciduous forest shading the water bodies. The common failure to retain buffer zones along water bodies is therefore negative for angling.

1.5 Inland waters

1.5.1 Introduction

Two national environmental quality objectives for inland waters together express the value attached to freshwater biodiversity, and indicate the range of biodiversity components addressed in the implementation of relevant CBD work programmes.

Sweden is a country rich in inland waters. Today around 9% of the surface area is covered by lakes and more than 10% is covered by wetlands.

Generally speaking we find oligotrophic clear-water lakes in mountain areas, poor in nutrients and with a relatively species-poor flora and fauna. In forest areas lakes are still relatively nutrient poor but many of them receive a substancial input of humic substances from the land run-off and the water is stained brown. The lowland lakes in agricultural areas of southern and central Sweden are often nutrient and species rich.

Natural running waters form some of Sweden's most species-rich habitats. Fluctuations in waterflow and transport of material form a large variety of habitats in and around the streams and rivers. There is a gradient of conditions for plants and animals both along and across each river system.

In southern Sweden bogs are the most widespread type of mire but further north fens gradually become more common and mires generally are more diverse. Also the species composition changes and e.g the number of wetland birds increases along the south-north gradient. Most mires in Sweden are naturally fairly poor in nutrients and in species. However, the mineral-rich fens which occur in calcareous terrain may be very rich in species. A large part of the rich fens were formerly used for hay-making but those that are still managed are grazed. Most other wetlands are not used in agriculture anymore. The direct use of biological resources in wetlands is constrained to berry picking, hunting and peatcutting, and of course forestry.

The transition zone between land and water, between forest and wetland or between wetland and water is often more species-rich than the more homogenous part of a habitat. A big problem is that transition zones often are more affected by land use or by water management. The transition zone is often destroyed without consideration of its importance as a buffer zone and biotope for species migration and survival.

The use of inland waters for transport, hydropower and agriculture has strongly affected the waters. Large areas of wetlands, shallow lakes and shores have been drained for agriculture and forestry. Watercourses have been straightened or deepened for transport and drainage and the water quality has been affected by acidification, eutrophication or other pollutants. The most far-reaching human interference with the rivers is the harnessing of waterpower. The habitats are fragmented and the natural transport of nutrients, materials and biological migration interrupted.

Among the main threats to inland waters is the intensive use of land, both in agriculture and in forestry, together with low consideration in terms of bufferzoners and physical disturbance. Moreover, downfall of nutrients, climate change and the spread of alien species have an increasing impact on inland waters. The negative effects of hydropower on rivers and drainage on wetlands remain.

The environmental objectives focus on protection of the most valuable habitats and areas, restoration of destroyed habitats and re-creation of wetlands in regions where a large portion of wetlands have been drained. Moreover, focus lies on improved consideration of wetlands and streams in agriculture and forestry practices as well as reduced effects of alien species and fish stocks.

1.5.2 Status and trends

The Swedish Environmental Objectives Council has reported on the status of biodiversity in freshwater ecosystems, and on progress towards achieving the two relevant environmental quality objectives, and the associated interim targets.

Environmental quality objective: Flourishing Lakes and Streams

The Environmental Objectives Council's assessment is that the objective Flourishing Lakes and Streams can be attained within the time frame laid down, provided that improved environmental stewardship is achieved in agriculture and forestry, and further action is taken under the interim targets. Since 2006, efforts to protect natural environments and restore rivers and streams have been stepped up. Increased allocations for nature conservation, combined with strategies, an improved knowledge base and future progress towards water management goals, are in the long term expected to enhance biodiversity and ensure

greater consideration for natural and cultural heritage assets. Provided that county administrative boards continue to make the environmental objectives a priority, and in certain respects do more in this area, positive progress is expected to be made.

Environmental quality objective: Thriving wetlands

The Environmental Objectives Council judges that the environmental quality objective Thriving Wetlands can be met by 2020 if further action is taken. The cultural value of wetlands, their biological diversity, ecological functions, and significance for local climate and hydrology must be preserved and strengthened. The exploitation of wetlands should be avoided to the greatest extent possible, while re-establishment of wetlands is necessary in areas where many have disappeared or been subjected to encroachment. Although some interim targets will not be met on time, the situation looks fairly promising in the slightly longer term and there are ample indications that efforts to promote wetlands will gather momentum over the next few years.

Current status of inland water biodiversity

Intensive land use and water management affect the transition zones which are important to inland water biodiversity. The transition zone is often destroyed without consideration of its importance for structure and function of inland waters, e.g input of organic matter, local climate, buffer zone against surface runoff as well as a biotope for migration and species survival.

Downfall and leakage of acid substances have decreased and the number of acidified inland waters is less than ten years ago. A liming programme is running and waters still suffering from acidification are treated. A large effort is made to diminish the effects of eutrophication, but in agricultural areas it is still a problem. The nutrient rich water also has a serious effect on coastal waters. One important measure is to improve the plant nutrient retention rate in the landscape by restoration and re-creation of wetlands.

The biological response on improved water quality is slow and many species also need physical improvements of e.g streams before they are able to recolonise the habitats. For example the fresh water pearl mussel (*Margaritifera margaritifera*) is still absent from 30% of the watercourses where it formerly occurred and only 41% of the existing populations in Sweden are reproducing. Many of the freshwater fish populations, especially in the north, have recovered, due to a combination of improved water quality and restoration mesures and fishery management. However, some of the most important fish species (*e.g*. salmon) are still far from their natural population size, due to fragmentation and reduced availability of habitats.

The status of some threathened species has improved mainly as a result of measures taken within species specific action plans, e.g *Lutra lutra*, *Hyla arborea*, and *Bombina bombina*. For other species the knowledge has improved due to inventory efforts within action plans e.g *Unio crassus*, *Margaritifera margaritifera*, *Lampetra fluvialis*. Still others are in very bad state in spite of species specific action plans, for example the Swedish cray fish (*Astacus astacus*) which is endangered due to crayfish plague *(Aphanomyces astaci)* which is in many cases spread by the alien but common species american signal crayfish *(Pasifastacus leniusculus)*.

A large part of the threatened plant species in wetlands is found in formerly managed wetland types such as rich fens and wet meadows. Discontinued management results in vegetational changes such as colonisation of shrubs and trees, which often has a negative impact on threatened plant species. Overgrowth of open wetlands has increased also due to drainage and nutrient downfall and especially in the south of Sweden even large open bogs become overgrown by trees and schrubs which put many wetland birds at a disadvantage.

Major trends in inland water biodiversity

During 2008 the preliminary ecological status of surface waters in accordance to the EC Water Framwork Directive was classified. In the district "Norra Östersjön", a relatively densely populated area, 84% of the waterbodies were stated at risk of not reaching good status by 2015. The classifications are preliminary and in the rest of the district results are not available yet.

Trends in inland water biodiversity depend at large on landscape management. Unfortunately inland waters have often been seen as a problem in land use. The aim both in forestry and in agriculture was to get rid of the water as soon as possible. Large forest areas were drained 20-50 years ago and nowadays forest-owners argue that there is a need to dredge many of these ditches again. Large scale dredging of forest ditches is a threat to inland water biodiversity as it increases the load of sediment, organic substances, nutrients and pollutants. See also "Neglected aquatic environments" under paragraph 1.2.2 Forest ecosystems.

Among examples of positive trends at the species level is the freshwater pearl mussel where a slight increase in the number of populations and reproducing populations has been shown. However, reproduction is often weak as the number of small mussels (reproduction) is very small in most of the reproducing populations.

Birds connected to lakes and streams have been successful during the last few years. The negative effect of drainage, bad water quality and intensive hunting has decreased. Restoration of bird lakes, improvement of water quality, reduced hunting and milder winters have improved the conditions for this group of birds. The picture for birds connected to wetlands is different. The population trend is positive in the south of Sweden, but slightly negative in the northern part of the country. The positive trend in the south may be explained by the large efforts to restore wetlands.

The conservation status of species and habitats listed in the Habitats Directive was assessed during 2007. Among the inland water habitats dystrophic lakes and calcareous fens with Cladium mariscus was considered to be in a favourable conservation status in the whole country. Several other lacustrine, riverine and wetland habitats only reach a favourable conservation status in the Alpine region, where they cover large areas, are widely distributed, and often occur within protected areas. Enduring work to decrease acidification, and to restore natural watersheds, together with construction of new ponds and wetlands, is beginning to yield improved conditions for many aquatic organisms. Commercial fisheries on Atlantic salmon, trout, vendace, and river lamprey affect these species adversely, as does the presence of dams and other obstacles to migration.

1.5.3 Threats

As a result of land use, many aquatic environments have decreased in extent, been fragmented or become isolated. Still, the rising demand for timber, pulpwood grain and, not least, bioenergy such as stumps and slash are forces that generate effects on freshwater habitats. Forestry and agriculture change shoreline and aquatic environments physically, while also affecting the quality of water. The most serious effect today is that of clearcutting along aquatic habitats leaving no functional bufferzone as well as removal of vegetation and sediment in streams and ditches to promote drainage. These changes mean that many species have decreased in range or number. There are around 100 freshwater-related species in Sweden today which are judged to be threatened by lack of suitable habitats.

The increased need for hydrolelectric power as an interruption and capacity reserve during the conversion to renewable energy sources is a threat to rivers and gets into conflict with the aim to restore rivers and streams and to promote environmentally sound regulation.

The continued demand for housing near the shoreline is a force for a more severe exploitation of shorelines and water. Plans to ease the strong legislation currently in force might result in effects that are not yet completely known.

Human activity also changes the composition of species in lakes and watercourses by moving or introducing plant or animal species or fish populations. Globally the dispersal of alien species is judged to be second greatest threat (after habitat destruction) to biological diversity. In aquatic environments the problem is tangible and can cause changes to ecosystems through changed competition between species, genetic changes or spread of diseases.

Water quality has improved in many respects during the last ten years but still emissions and leakage of acidifying and eutrophicating substances and the use of chemicals are of great significance. Increasing watercolour as a respons to landuse, climate change and changes in soil chemistry show a worrying trend that has increased during the period.

Up to a quarter of Sweden's original area of wetland is estimated to have disappeared due to drainage, lowering of lakes and straightening of watercourses. The wetland inventory shows that more than 80% of the remaining wetlands are affected to varying degrees by human interventions such as drainage, agriculture and forestry, roads and off-road driving and peat extraction. Almost one fifth of wetlands are greatly affected hydrologically, in their entirety or locally, or are judged to have been completely destroyed. This means that the functions of the wetlands in purifying water, equalising water flow rates, sequestering carbon and regulating the local climate are adversely affected. The ecological conditions for various species are also impaired, and more than 200 wetland-related species are considered to be endangered.

During the last 15 years restoration and re-creation of wetlands is in focus but still wetlands, especially small inland waters, disappear through drainage or filling.

1.6 Marine and coastal areas

1.6.1 Introduction

The national environmental quality objective for marine ecosystems expresses the value attached to marine and coastal biodiversity, and indicates the range of biodiversity components addressed in the implementation of relevant CBD work programmes.

1.6.2 Status and trends

The Swedish Environmental Objectives Council has reported on the status of biodiversity in marine ecosystems, and on progress towards achieving the relevant environmental quality objective, and the associated interim targets.

Environmental quality objective: A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos

The Environmental Objectives Council makes the assessment that it will be very difficult to achieve this environmental quality objective by 2020, even if further measures are introduced. The capacity for recovery of marine ecosystems will crucially determine when the objective as a whole can be attained. The basic conditions for a good marine environment, however, could possibly be achieved by 2020.

Despite considerable efforts over the last 30 years, the environmental status of the Baltic Sea, Kattegat and Skagerrak remains poor. For several fish species and populations, the situation is still very serious: the eel, for example, is now red-listed as critically endangered throughout its range, and bycatch of fish, birds and marine mammals, continues to be a problem. Fundamentally, the current overexploitation of fish resources is the result of too large and efficient a fishing fleet. There are some encouraging trends as well, however, such as the progress being made in establishing marine nature reserves and no-fishing areas, and the sustained decrease in illegal discharges of oil into the Baltic. In November 2007 all memberstates of HELCOM adopted an ambitious overarching action plan to drastically reduce pollution to the Baltic Sea and restore its good ecological status by 2021.

1.6.3 Threats

Threats to marine and coastal biodiversity, as identified by the Swedish Environmental Objectives Council, include expansive fishing, eutrophication, oil transport, boat traffic, heavy pressure of development, increased population pressure, for instance in conjunction with tourist industry in sensitive areas, and climate change, which may have especially severe consequences in the Baltic where the water may become less salty.

Coastal zones are important production and nursery environments for many species, including fish. These environments are particularly sensitive to both external impact and exploitation. Many marine ecosystems are particularly sensitive to collapse of stocks, due to their long recovery period. These marine ecosystems fulfil a number of vital functions that are fundamental to the development of society. Despite restrictions on construction and development, the unaffected valuable and sensitive areas that remain continue to be under severe pressure from many interests.

The exploitation of the shoreline for instance for housing is continuing unabated, threatening the prospects of preserving the high recreational assets generated by natural and cultural environments in coastal areas. Oil transport is increasing substantially and the number of alien species in the Baltic is rising. The situation for several commercially important fish stocks has been critical for several years, and the collapse of stocks threatens stocks of cod in the Baltic, Kattegat and North Sea in particular. Because of their long recovery period, marine ecosystems face the risk of complete elimination .

1.7 Mountain ecosystems

1.7.1 Introduction

The national environmental quality objective for mountain ecosystems expresses the value attached to mountain biodiversity, and indicates the range of biodiversity components addressed in the implementation of relevant CBD work programmes.

1.7.2 Status and trends

The Swedish Environmental Objectives Council has reported on the status of biodiversity in mountain ecosystems, and on progress towards achieving the relevant environmental quality objective, and the associated interim targets.

Environmental quality objective: A Magnificent Mountain Landscape

The overall assessment is that the environmental quality objective A Magnificent Mountain Landscape can be met if the sectors concerned, and society as a whole, show the consideration required by the interim targets. However, it is already now essential to heed, and take steps to prevent, the adverse effects of climate change on Sweden’s mountain environment. Regarding the state of the mountain environment, a positive trend is discernible.

New, in-depth knowledge of the vegetation and cultural settings of the Swedish mountains is greatly needed. More knowledge about the extent of noise and soil damage is also required. Together, the programmes of the county administrative boards and the environmental plans of the reindeer-herding districts are essential aids to resolve land-use issues in mountain areas. Preserving a landscape characterised by grazing impact calls for reindeer husbandry that is managed and developed sustainably in environmental terms.

1.7.3 Threats

The Swedish Environmental Objectives Council expresses concern about extensive traces of driving on snow-free ground, a wear that leads to erosion and large-scale changes of vegetation. Climate change also poses a very severe threat to the mountain ecosystems of Sweden. Knowledge and maintenance of the Sami cultural heritage and the cultural environments of the mountains need to be improved.

2. Current status of national biodiversity strategies and action plans

2.1 The Swedish biodiversity strategy

A national strategy for biological diversity, formulated in 1995, was approved by the Parliament of Sweden in 1997 , and a set of sectorally focused action plans was produced. However, since the Parliament's adoption of the over-arching system of environmental objectives in 1999, biodiversity policy has been mainstreamed into these objectives, so that today there is no document called National biodiversity strategy and action plan.

The fifteen environmental objectives adopted in 1999 include six objectives whose main focus is on biological diversity, each for a specific ecosystem/nature type (freshwater, the marine environment, wetlands, forests, the agricultural landscape and the mountains), as well as one objective with biodiversity as one of its main pillars (the built-up environment). The remaining eight objectives focus on environmental threats, including threats to biological diversity. Together, the objectives define an environmentally sustainable development in Sweden, and the goal is to reach this by the year 2020 (2050 for the climate objective). In March 2002 the Parliament decided on a first set of concrete and measurable interim targets.

The system of environmental objectives and interim targets was evaluated for the first time in 2004. This resulted, among other things, in the adoption by Parliament of a sixteenth objective in 2005, called A rich diversity of plant and animal life. This objective was set in order to take into account those aspects of biological diversity that may not easily be dealt with in sectoral approaches. The 2010-target of the CBD is included as one of the interim targets, albeit in its stricter form, as adopted by the EU, of halting biodiversity loss rather than significantly reduce it.

In 2008 the Swedish Environmental Objectives Council presented its second evaluation of the environmental objectives (upon which parts of chapter 1 in this report build), which also includes proposals for amended and new interim targets.. Thus, up to now Swedish biodiversity policy has been evaluated and revised three times since the adoption of the national biodiversity action plan. In 2008 the Government initiated a public inquiry in order to make the system of environmental quality objectives more efficient. One of the main tasks of the inquiry is to improve considerations of the international dimensions of environmental issues.

A cornerstone in the Swedish strategy for biodiversity is sectoral integration. This means that objectives, targets and action plans have been largely produced and carried through within each sector, involving government agencies as well as private actors in each sector (including industry).

Since activities such as transportation, energy consumption, flows of materials, chemicals, products etc. – are responsible for several of today's environmental problems, certain measures introduced may therefore be relevant to more than one environmental objective. Therefore, Parliament has adopted three strategies to guide efforts to implement the objectives:

- A strategy for more efficient energy use and transport – to reduce emissions from the energy and transport sectors.
- A strategy for non-toxic and resource-efficient cyclical systems, including an integrated product policy – to create energy- and material-efficient cyclical systems and reduce diffuse emissions of toxic pollutants.
- A strategy for the management of land, water and the built environment – to meet the need for greater consideration for biological diversity, the cultural environment and human health, wise management of land and water, environmentally sound land use planning and a sustainable built environment.

The national objectives and targets have also been adapted and applied as appropriate by regional authorities (the county administrations) and local governments (municipalities). For instance in the municipality of Stockholm a set of targets with indicators now guides action and monitoring of biological diversity.

A number of other national strategies further contribute to the CBD targets, *e.g.* the Swedish strategy for sustainable development, and the Swedish climate strategy (see section 3.2).

2.2 Targets and indicators

The interim targets and indicators of the environmental objectives are given in annex IV.

2.2.1 Targets

Many of the targets adopted under the Convention have been incorporated into the system of environmental objectives (see details below, in section 2.3), some explicitly, but most with a somewhat differing wording.

The 2010-target of halting the loss of biodiversity appears explicitly as an interim target within A rich diversity of plant and animal life. The conservation of ecosystems, species and genetic diversity has been incorporated into all environmental objectives with a focus on biodiversity, as well as into several interim targets within these objectives. Sustainable use is mentioned explicitly in one of the interim targets of A rich diversity of plant and animal life. Moreover, sustainable use is, without being mentioned explicitly, the focus of various other environmental objectives, most obviously Sustainable forests, A varied agricultural landscape, and A balanced marine environment.

Addressing the threats to biodiversity is incorporated into every environmental objective and many interim targets. Habitat-related pressures are primarily dealt with in the six objectives that focus on specific ecosystems. Most of these objectives also address the threat posed by invasive alien species, which also is included in A rich diversity of plant and animal life. Challenges from climate change and pollution are amply addressed in especially the remaining nine objectives.

Traditional knowledge is mentioned in A rich diversity of plant and animal life.

Since the environmental objectives define an environmentally sustainable development within Sweden, aspects relating to access to genetic resources and the fair and equitable sharing of benefits obtained from these, as well as aspects relating to relations with other countries, have not been incorporated into the systems. These issues are dealt with within other policy frameworks. More details are given below in 2.3.12 and 2.3.13.

2.2.2 Indicators

Sweden has participated actively in the work on biodiversity indicators driven by the European Environmental Agency EEA under the acronym SEBI 2010 (Streamlining European Biodiversity Indicators). This work has resulted in a first set of 26 indicators based upon decision VIII/15 of the Conference of Parties of the Convention. An analysis showed that most of the information conveyed by these indicators is already present within the indicators in the system of environmental objectives. Some remaining indicators will be added to the system shortly.

2.3 Implementation of the Swedish biodiversity strategy

The environmental quality objectives and their interim targets with defined indicators, constitute the main framework for the implementation of the Convention, and all its work programmes and guidelines. The Environmental Code – Sweden's first coordinated body of environmental legislation – is the principal

legal instrument for attaining the objectives, and the objectives themselves provide guidance when it comes to applying the Code. Experience with economic instruments such as incentives in the environmental sphere has been encouraging, the effects of the current energy and carbon dioxide taxes being good examples. Other important instruments include information and voluntary agreements and dialogue between government and trade and industry.

In this section the progress in implementation is reported for each of the ecosystems, and for a range of cross-cutting issues.

There is one cross-cutting environmental quality objective that should complement the sectoral and ecosystem-specific objectives:

Environmental quality objective: A Rich Diversity of Plant and Animal Life

Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being.

The outcome within a generation for this environmental quality objective should include the following:

- Action by central and local government to preserve biological diversity are undertaken from a landscape perspective on ecosystem management.
- The buffering capacity of ecosystems - their ability to cope with change and undergo further development so that they can continue to be productive and deliver goods and services - is maintained.
- The landscape, lakes and seas are constituted so as to secure species habitats and dispersal pathways.
- Habitats exist in sufficient numbers to maintain long-term viable species populations (favourable conservation status).
- Where important habitat types have been damaged, these must be restored, significantly improving conditions for biological diversity. Examples include habitats that have shrunk substantially in area and/or distribution, whose quality as habitats has been generally degraded, or which support large numbers of species or genetically distinctive populations.
- The distribution throughout the country of animal and plant species within their natural ranges ensures sufficient genetic variation within and between populations.
- Non-native species or genetically modified organisms posing a potential danger to human health or threatening to deplete biological diversity in Sweden are not introduced.
- Biological diversity is primarily maintained through a combination of sustainable use of biological resources, conservation of species and their habitats, measures to minimize the pollutant load, and action to limit climate impact.
- Species that are exploited, e.g. through hunting or fishing, are managed in such a way that they can be harvested as a renewable resource in the long term without affecting ecosystem structures or functions.
- People have access to natural and cultural environments with a rich diversity of plant and animal life that helps promote and maintain high standards of public health.
- Sweden's biological cultural heritage is managed in such a way that important natural and cultural assets are preserved.
- Government and citizens alike are widely knowledgeable about and aware of the importance of biological diversity.
- Traditional and local knowledge about biological diversity and its benefits is safeguarded and used appropriately, and
- Sweden takes an active part in international environmental cooperation aimed at preserving biological diversity.

Interim target: Halting the loss of biodiversity
By 2010 loss of biological diversity in Sweden will have been halted.

Interim target: Fewer species under threat
By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.

Interim target: Sustainable use
By 2007 follow-up methods will have been developed with a view to ensuring that biological diversity and biological resources, both terrestrial and aquatic, are used in a sustainable manner. By 2010 biological diversity and biological resources, both terrestrial and aquatic, will be used in a sustainable manner, so that biodiversity is maintained at the landscape level.

A number of national strategies contribute to the CBD objectives, *e.g.* the Swedish strategy for sustainable development, the Swedish policy for global development, and the Swedish climate strategy.

The Swedish Strategy for Sustainable Economic, Social and Environmental Development (2003) is a revised version of the national strategy for sustainable development presented in 2002. The strategy builds on the 2002 World Summit on Sustainable Development held in Johannesburg and the EU strategy for sustainable development, and addresses the three dimensions of sustainable development: economic, social and environmental.

Within the sectors, a large number of strategies and programmes have been initiated to implement the environmental quality objectives. The Environmental Protection Agency and the National Board of Forestry, for instance, have produced a common national strategy for the protection of forests. Meanwhile, corresponding regional strategies are being prepared. Within the forest sector, so called "green" forest management plans include recommended areas for voluntary set-aside, which has proven to be a powerful tool. A strategy for access to genetic resources has been formulated within the framework of the Nordic Council of Ministers ("A Nordic approach to access and rights to genetic resources", 2003). It is focused on the access to genetic resources within the Nordic countries.

2.3.1 Species action plans

The Swedish Environmental Protection Agency embarked on a large-scale set of action programmes for threatened species in 2004 and will have adopted some 200 programmes by 2010. These will serve as guides for action to conserve and promote some 400 species that have been singled out. The measures include restoration of these species' habitats, which will favour considerably more species than those specifically identified in the programmes. For example, the action plan for trees of high conservation value in the cultural and urban landscape is expected to benefit at least 400 species on the Swedish Red List.

The species action plans are part of the environmental objectives. Until 2005, specific interim targets existed for each of the different ecosystem-related environmental objectives (for details see below), specifying that species plans should be initiated for those species in need of specific measures. Except for the marine environment, these targets are judged to have been met. Now the work on species action plans is continued within the framework of the interim target for threatened species, under the environmental objective A Rich Diversity of Plant and Animal Life. This interim target sets the reduction in the proportion of threatened species (*i.e.*, the preferred state of biodiversity) rather than specifying the method.

2.3.2 Agricultural ecosystems

The Environmental quality objectives, and their interim targets with defined indicators, constitute the main framework for the implementation of the programme of work for agricultural ecosystems. However, our assessment of implementation and target achievement is closely linked to the objectives and targets, not to the programme of work itself. The Swedish Environmental Objectives Council has reported on actions and progress towards achieving the environmental quality objectives, and the associated interim targets.

Environmental quality objective: A Varied Agricultural Landscape

The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.

The outcomes within a generation should include the following:

- The nutrient status of arable land is well-balanced, with a good soil structure and humus content, and pollutant levels are so low as not to affect the functioning of ecosystems and human health.
- Agricultural land is cultivated in such a way as to minimize adverse environmental impacts and favour biological diversity.
- The land is cultivated in such a way as to maintain its long-term productive capacity.
- The agricultural landscape is open and varied, with plenty of small habitats and water environments.
- Biological, cultural and historical assets in the agricultural landscape that are the result of long traditional management are preserved or enhanced.
- Endangered species and habitat types, and also cultural environments, are protected and preserved.
- The habitats and dispersal pathways of non-domesticated plant and animal species in agricultural land are protected.
- The genetic variation in domesticated animals and plants is preserved. Cultivated plants are preserved to the extent possible in their historical locations.
- Alien species and genetically modified organisms that may be a threat to biological diversity are not introduced.

Interim target: Meadow and pasture land

By 2010 all meadow and pasture land will be preserved and managed in such a way as to preserve its value. The area of traditionally managed meadow land will increase by at least 5 000 hectares and the area of managed pasture land of the most endangered types will increase by at least 13 000 hectares by 2010.

The assessment is that this interim target can be met on time if further measures are taken Since 2000, the area of meadow and pasture land included in the agri-environment scheme has increased at a good rate. Some 458 000 hectares (ha) of pasture land and approximately 8 500 ha of hay meadows were covered by the payment scheme in 2007 (the figures for 2007 are preliminary). For meadow land, the target is for at least 10 000 ha to be managed by 2010. In 2007, the area of pasture land qualifying for agri-environment payments decreased, while there was no further increase in the meadow area. This trend is explained by changes in support for agriculture and by the expiry of a programme period. The area target for the threatened types of pasture land appears to be attainable. Yet, there are no definitive figures concerning the total area of meadow and pasture land in Sweden irrespective of inclusion in the payment scheme.

Resumed management of species-rich abandoned semi-natural habitats is considered a priority conservation measure. The national aim, however, focuses only on area of habitat subject to environmental

management schemes under the European Common Agricultural Policy (CAP), not the actual areas in the landscape. The area of semi-natural grassland within the CAP-system increased from 390 800 to 471 028 hectares between 2001 and 2006, which is satisfactory according to the national aims.

Although the rate of resumed management cannot be estimated from these figures, it is likely that the trends for area subject to environmental management schemes indicate a real trend in area. Thus, there are probably positive trends in area of mown meadows (increase in area subject to environmental management schemes from 6000 to 8086 hectares 2000-2006), forest pasture (from 9 300 to 13 852 hectares), and number of coppiced trees (from 13 481 to 14 086 trees during 2003-2006).

Judging from the financial support to resumed management during 2001-2006, the area of semi-natural grassland subject to resumed management comprised only ca. 0.8% of the area of already managed grassland with high conservation value (3 550 hectares resumed management, 471 028 hectares managed grassland). Some additional area is being restored without financial support but yet the rate of management resumption (*i.e.,* most likely less than 0.5%/year) is very far from the total amount of abandoned grassland that still harbours management-dependent species. This implies that (1) the current rate of management resumption will rescue only a fraction of the species-rich abandoned habitats before they are lost due to succession; (2) there will continue to be a strong biodiversity decline in agricultural ecosystems; (3) the abundance of management depending species will decrease by 20-80% and eventually stabilise at a considerably lower level.

Interim target: Small-scale habitats

Small-scale habitats on farmland will be preserved to at least the same extent as today throughout the country. By 2005 a strategy will have been adopted to increase the number of such habitats on the agricultural plains of Sweden.

With the strategy for the agricultural plains of southern and central Sweden adopted by the Swedish Board of Agriculture in 2004, the target for 2005 calling for a strategy to increase the number of small-scale farmland habitats has been achieved. The target of preserving the number of small farmland features and habitats on at least the same scale as in the year 2000 can, in the Council's view, be met with further measures. However, this assessment is highly uncertain because of insufficient data on the numbers of habitats disappearing and coming into existence. The quality of small-scale farmland habitats, or their capacity to serve as habitats of valuable species, is another matter that needs to be clarified.

The primary intention of the interim target is to reverse the negative trend for species associated with the farmed landscape. Small farmland features and habitats are important to biodiversity on and around arable land, but variation in crops and forms of management also has a major bearing on prospects of reversing the adverse trend for farmland species.

Interim target: Plant genetic resources and indigenous breeds

By 2010 the national programme for plant genetic resources will be fully developed and there will be sufficient numbers of individuals to ensure the long-term conservation of indigenous breeds of domestic animals in Sweden.

In the Environmental Objectives Council's view, the interim target relating to the national programme for plant genetic resources can be met within the time frame. Results to date of the ongoing inventories of Sweden's plant genetic resources show that the prospects of a well-functioning programme are good. Seed material is stored at the Nordic Gene Bank, and work is under way to resolve the question of how to conserve vegetatively propagated material.

There are not, as yet, enough individuals of indigenous livestock breeds to ensure their conservation. This applies particularly to breeds of poultry. To achieve the target, further action is needed to foster and increase interest in breeding and husbandry of endangered breeds.

Interim target : Action programmes for threatened species

By 2006 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target was achieved in 2006: 68 action programmes had been introduced, with measures affecting more than 150 species in the farmed landscape, including species associated with trees of high conservation value.

Review of successes and obstacles

European Common Agricultural Policies (CAP)

The main tool for reaching the aims is the CAP system for restoration of habitat, resumed management, and continued management. Land-owners voluntarily apply for economic compensation (environmental payment) for restoring, managing etc. certain habitats identified in the system. During 2002-2006 ca. 4.4 billion SEK was paid for such activities. The payment is accompanied by certain directives for the management, intended to guarantee the quality of the activity. Some of the directives are developed in Sweden, whereas others are based on EU directives. The directives and the applications are dealt with and the activities are controlled by the county administration boards.

Also a number of CAP single farm payments are important for the number of active farms and the economic stability of farming. Both factors are essential for the possibility (the number of active farms) to apply environmental payment directly aiming at improving biodiversity.

The environmental payments and single farm payments together have strongly contributed to halt the decrease in number of active farms. The payments for management, restoration etc. has, similarly, had a profound positive effect on the amount of species-rich habitat managed by the remaining farms. The environmental payments have, in other words, made farmers allocating labour and grazing animals to species-rich but low-productive areas. Both single farm payments and environmental payments have changed several times since the beginning of the Swedish EU membership, both in terms of type, economic level, and directions for use. Some single farm payments may have counteracted the aims of environmental payments during some periods, but such effects are probably weak.

The environmental payments *per se* has thus been strongly positive for biodiversity, compared to a scenario without compensations. There have, however, been considerable problems with the practical application of the payment, in particular regarding directives for management, restoration and resumed management. Ecologically irrelevant directives have no doubt affected biodiversity negatively in terms of unnecessarily low habitat quality and habitat amount, compared to a scenario with ecologically relevant directives. It has repeatedly been stated that quality according to the directives for management is not equal to ecological quality. Monitoring of biodiversity responses are largely lacking. Some particularly important problems during the last 10-year period have been:

- A general rule that grasslands need to be grazed or mown “intensively enough to counteract deleterious litter accumulation”, earlier accompanied by recommendations for certain vegetation heights. Since both these quality measures are difficult to define unambiguously, quality of the farmers’ activities has been rather subjectively estimated, generating an unpredictable risk for a farmer of being rejected at a quality field control. This has further increased the uncertainty and forced the farmers to a management intensity that is often ecologically and economically too intense – “better safe than sorry”.
- The amount of trees and shrubs that are allowed in pastures has varied over time, but has during some periods been low, leading to considerable bush clearing and negative effects on biodiversity.

- Environmental payment for management of small-size habitats, for example stone walls, and ditches, has required that *all* elements on a farm be managed, sometimes using ecologically negative management methods. This has caused many farmers to refrain from applying for the compensation.
- An obligate rule for annual management, without possibilities of applying ecologically necessary variation.
- The need for resumed management of abandoned, still species-rich semi-natural habitats has been overlooked.

Management of protected areas

The Swedish Environmental Protection Agency distributes governmental resources for management of protected areas that are established by the county administrations. Local authorities are responsible for their own nature reserves. The need for measures for management dependent biodiversity is stated in a management plan accompanying each nature reserve. When management is applied this is financed by national resources or, if relevant, within the CAP system. Most of the protected areas consist of forest. In Sweden 4% of the total forest land is preserved within protected areas. 75% of this forest is situated in the mountainous region and consist of old growth forests with no or restricted needs for active nature conservation management. However active nature conservation management needs to be reinforced in protected areas where the values are dependent upon traditional disturbance regimes such as grazing. The oak landscape is an example of international recognition.

Natura 2000

Several of the habitats and species in the EU Habitats Directive are management dependent and the necessary status and measures are stated in habitat-wise definitions, guidelines and monitoring schemes and in site-wise protection plans. The aim of the measures is to reach favourable conservation status. Measures can be assembled in LIFE projects aiming at certain geographic areas or certain habitats or species.

In general, the implementation of Natura 2000 in terms of practical measures for improving conservation status of habitats and species has only started and it is therefore too early to evaluate the outcome of the system. Some conclusions can be drawn based on definitions, guidelines, conservation plans etc. The habitat definitions are mostly ecologically relevant although clear description of links between management and biodiversity are sometimes missing. The guidelines and indicators for monitoring sometimes contain habitat variables and measures that may be negative for biodiversity, for example obligatory demands for annual grazing in grassland habitats. Scanning of ca. 30 protection plans in the administrative province of Uppsala indicates that general ideas for habitat development at certain Natura 2000-sites properly reflect the necessary environmental conditions and measures to reach the conditions. The detailed suggestions for restoration and management however refer to the guidelines and may thus contain measures that are negative for biodiversity.

LIFE projects rapidly increase the amount of managed habitat, although there has been criticism concerning the quality and ecological justification of some of the measures taken. Usually, the problems concerning habitat quality that are discussed under CAP, above, are applicable also on LIFE projects for resumption and management.

Action plans for threatened species

As one of the interim targets recovery plans for ca. 400 species in 210 action plans are presently being developed. Several of these plans concern management dependent semi-natural habitats. Even though many plans focus on only one or a few species, sufficient conservation status for those species can be considered to reflect environmental conditions that benefit many other species in the habitat in question.

The action plans have not yet been evaluated but several programmes that have been implemented in practice have yielded positive trends for species. The plans furthermore point out shortcomings of other systems affecting the species and their habitats, in particular CAP.

NGO and voluntary programmes for management, resumption, and restoration
A few NGOs and voluntary groups are or have been involved in programmes for increasing the amount of managed semi-natural habitat in certain areas. Examples are WWF and regional and local conservation foundations, for example the Uppland Foundation. In addition to practical measures the projects usually include building of cooperation networks among farmers, food industry and authorities, and sometimes also branding and marketing of meat from semi-natural grasslands. The projects are often combined with LIFE projects, and the habitats are managed according to existing directives, mainly within CAP.

The projects are almost always very successful in terms of increase of habitat amount, management sustainability, and attitudes to biodiversity conservation among farmers and the public. Since products from semi-natural land are often included in the projects, also economic stability of farming (in particular semi-natural farming) is improved. Quality of management and habitats can sometimes be questioned in the same way as discussed for CAP and Natura 2000.

2.3.3 Forest ecosystems

The Environmental quality objectives, and their interim targets with defined indicators, constitute the main framework for the implementation of the forest programme of work. The Swedish Environmental Objectives Council has reported on actions and progress towards achieving the environmental quality objectives, and the associated interim targets.

Environmental quality objective: Sustainable Forests
The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded.
The outcomes within a generation should include the following:

- The natural production capacity of forestland is preserved.
- The natural functions and processes of forest ecosystems are maintained.
- Natural regeneration is practised wherever the land is suitable for this method.
- The forests' natural hydrology is protected.
- No remedial measures are taken against the effects of forest fires.
- Care-demanding forests with valuable natural and cultural assets are managed in such a way as to preserve and enhance these assets.
- Forests where there is great variation in the age of the trees and the composition of tree species are protected.
- Cultural monuments and environments are protected.
- Importance is attached to forests as sources of nature experiences and recreation are taken into account.
- Endangered species and habitat types are protected.
- There are viable populations of indigenous plant and animal species living in natural conditions.
- Endangered species can spread to new habitats in their natural areas of distribution, thus ensuring viable populations.
- Alien species and genetically modified organisms that may be a threat to biological diversity are not introduced.

Interim target: Long-term protection of forest land

A further 900 000 hectares of forest land of high conservation value will be excluded from forest production by the year 2010.

The interim target relates to forest land outside the montane forest zone. Of the total area excluded from forest production, nature reserves are to account for 320 000 ha and habitat protection areas for 30 000 ha of productive forest land, while nature conservation agreements are to cover 50 000 ha. Forest owners are expected to set aside at least a further 500 000 ha on a voluntary basis, making a total of at least 730 000 ha of productive forest land subject to voluntary protection by 2010.

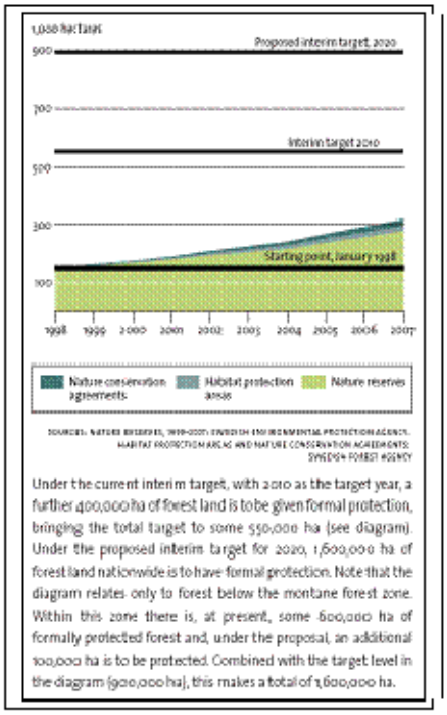

Figure 2.1. Total area of formally protected forest outside montane forest zone, 1998-2007.

The Environmental Objectives Council has estimated that this interim target will not be met by the target year 2010 (figure 2.1). In response to this situation, the Government has taken several steps and is to propose additional measures during 2009. The state-owned forest company Sveaskog has committed to set aside an additional 60 000 hectares of productive forest of high conservation value. This constitutes a major leap towards reaching the target. By developing methods and instruments further, and in the case of similar commitments by land owners, the Government have good hope to reach significantly closer to the target.

The voluntary set-asides were investigated during 2007. Outside the mountainous zone altogether 936 000 ha of set-asides have a documentation in a green forestry plan or likewise. On private properties 72% of the set-asides are of high conservation value. On state owned land the figure is 80% while the figure is unknown on land owned by the large forest companies since the forest companies did not allow the Forest Agency to investigate their set-asides. 50% of the private forest owners declared in an inquiry that they intended to preserve their set-asides in 30 years or more. The intentions by the forest companies have not been investigated. 15% of the areas that were set-aside 1997, were logged or partly damaged by drainage, cuttings etc. in 2001.

Interim target: Enhanced biological diversity

By 2010 the amount of dead wood, the area of mature forest with a large deciduous element and the area of old forest will be maintained and increased by:

- *increasing the quantity of hard dead wood by at least 40% throughout the country and considerably more in areas where biological diversity is particularly at risk;*
- *increasing the area of mature forest with a large deciduous element by at least 10%;*
- *increasing the area of old forest by at least 5%;*
- *increasing the area regenerated with deciduous forest.*

With the current trend, these targets will be met with a very ample margin. The volume of hard dead wood and the areas of old forest and mature forest with a large deciduous contribution are increasing sharply, in all cases more in the south than in the north of the country, where progress is very slow. Up to and including 2005, the volume of hard dead wood rose by some 60%, the area of old forest by more than

30% and the area of mature forest with a large deciduous contribution by some 15%. The area regenerated with deciduous forest appears to have become larger as well.

Interim target: Action programmes for threatened species

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target is judged to have been met. By the end of 2005, a total of 23 action programmes for threatened species had been drawn up. These contained action proposals concerning 52 threatened species. The programmes are expected, in the long term, to benefit a large number of other species as well.

Review of successes and obstacles

The Forestry Act and certification

More than half the forestry sector is now operating within the framework of the forest certification systems (those of the Forest Stewardship Council, FSC, and the Programme for the Endorsement of Forest Certification, PEFC), a proportion which is increasing. This improves the chances of meeting several of the interim targets. The Forestry Act of 1994 is a deregulated legislation in which production goals and conservation goals are given equal importance. The Forest Agency has been given the mandate of breaking down the two overall forest policy goals into more detailed sub-goals, or so called forest sector goals. Its success in application depends partly on how well forest owners conduct their business, *i.e.,* forest owners have great responsibility for achieving these goals. Currently some forest companies are decreasing their nature considerations since their own audits have shown that they were exceeding the minimum level for nature considerations in the certification standard. Unfortunately, the standards have lower minimum levels than what is thought to be needed from a scientific point of view. Another problematic aspect with the certification systems is that the controlling companies are paid by the certified companies and are hence economically dependent on the companies they are controlling. One nature conservation NGO has for that reasons left the board of FSC in order to protest and to mark its own integrity.

Voluntary set-asides

An investigation of the voluntary set-asides carried out by the Swedish Forest Agency in 2008 estimated that the voluntary set-asides below the mountain zone in total constitute somewhat less than 1 million ha with an economic value of around 30-40 billion SEK. This makes the set-asides one of the largest contributions to the environmental objectives. From an environmental objective point of view the voluntary set-asides have several advantages:

- The establishment can be and has been very fast.
- When the forest owner finds forests with higher natural or cultural value than the existing set-asides it is possible to switch to the more valuable set-aside.
- Some natural values move around in the landscape, which can be considered in the voluntary set-asides.
- From a state budget point of view voluntary set-asides are a low cost compared to legal protection.
- The forest owners can manifest their involvement in a sustainable use of forests.
- Large forest companies can draw up, and have done so , ecological landscape plans, thereby including landscape ecological aspects in the selection of set-asides.

Voluntary set-asides also have weak points:

- It is difficult to guarantee that the voluntary set-asides will be preserved for such a lon time that they will be ecologically relevant, that is often more than 50-100 years.

- The sustainability in the obligations in the certification standards and the standards themselves are sometimes questionable.
- The location and the quality of the voluntary set-asides have so far, with a few exceptions, not been open to the public, other stakeholders or the authorities. The possibilities for others to study the set-asides have been small. This has led people to question the credibility of the system.
- The point above also makes it problematic to integrate set-asides and legal protection into a functioning system in a landscape perspective.

The Forest Agency has stated that the voluntary set-asides are an important part of the environmental objective Sustainable Forests, and that the low transparency is a large problem that needs to be solved.

Recent success-stories

The Swedish state-owned forest company Sveaskog has in the last years made a strong commitment to biodiversity protection by launching a programme with the aim that 20% of the company's land should be used for biodiversity protection, including the establishment of 36 so-called eco-parks, constituting altogether around 175 000 ha.

Several other initiatives have started from a grassroot level with co-operation in whole landscapes with the aim to achieve sustainable development and biodiversity protection, especially in rural areas. Examples of initiatives are:

- The Eastern Slopes of Lake Vättern
- The Vilhelmina Model Forest which was established in 2004 as part of an international network of model forests with the aim to develop partnership and arenas for sustainable forestry in a landscape perspective
- The Bråbygden area with grassroot co-operation for rural development, including the management of a small-scale old agricultural landscape with wooded pastures, grazed forests and a large number of pollarded trees
- The Oak-landscape in Östergötland County were the aim is to get a living oak-landscape through multi-purpose management, primarily grazing and sustainable forestry. The method used is cross-sectoral co-operation between authorities and land-owners.

Box 1. Sveaskog – a company with high ambitions

Sveaskog is owned by the Swedish state and with a holding of 15% of the country's productive forest land (3 300 000 hectares), Sveaskog is the largest forest owner in Sweden. The vision of Sveaskog is that the company will lead the way in the development of all kind of forest values. Nature conservation and consideration are, of course, such values.

Sveaskog's environmental policy includes using 20% of productive forest land for environmental consideration and nature conservation. According to the policy, the 20% will be accomplished in the four national forest regions below the montane forest region. The level of ambition for individual landscapes in each region, however, may vary considerably depending on the starting point and resident values. The montane forest forms a separate region in which approximately 60% of the forests are used for nature conservation.

The company uses three different strategic tools in order to implement and accomplish the policy and thereby reach their environmental objectives. The three tools operate in different scales which reinforce and complement each other.

Ecoparks

An ecopark is a large, contiguous landscape with high biological and ecological values, for which Sveaskog has high nature conservation ambitions. At least half of the productive forest land is used for nature conservation. Furthermore, ecological values always take precedence over financial values in an ecopark. Sveaskog is in the process of establishing 36 ecoparks throughout Sweden. Mean size is about 5 000 hectares with a range from 1 000 to 20 000 hectares. In total, the ecoparks make up for five% of the land holding, which corresponds to 175 000 hectares.

Forests set-aside for nature conservation

300 000 hectares of the land holdings are used for nature conservation only. In the process of selecting the forests to be a part of this, high conservation values have been guidelines. Apart from this, forests without conservation values today but with a high ecological potential to recover values in a near future were included. Factors as international responsibility for and national under representation of specific forest types as well as several landscape ecology criteria have been used in selecting forests with high ecological potential. Individual nature conservation forests are much smaller than ecoparks.

Consideration in production forests

All Sveaskog's forest holdings are certified in accordance with FSC standards in Sweden. Nature consideration is the third strategic tool in Sveaskog's toolbox and is in use in all forests making up the land hold. The consideration ranges from individual trees, groups of trees to minor areas of the forest that are preserved during a felling. On average, 9% of every commercial forest stand will constitute general consideration, which sums up to 250 000 hectares.

Transparency and co-operation

Environmental measures carried out and their effect on the environment are followed up and reported in a transparent way. Sveaskog is a natural partner for research and development on forestry and nature conservation issues and has developed a dialogue with environmental organisations and other stakeholders. As a part of the transparency, all the company's ecoparks and nature conservation forests can be found on the web at www.sveaskog.se.

Analysis of effectiveness

Preservation of high-value core areas

The most effective measure to preserve biodiversity connected to old-growth forests and old-growth forest structures is to preserve existing high-value ecological cores. Various studies suggest that 10 to 30% of the original amount of habitat is needed to protect specialised species from disappearing due to fragmentation. A gap-analysis undertaken for the in-depth evaluation of the environmental objective Sustainable Forests shows that the existing identified area of high-value cores, for example woodland key habitats, is smaller than what is needed to preserve all forest biodiversity in the long run.

Box 2. The initiative *Eastern Slopes of Lake Vättern*

The Eastern Slopes of Lake Vättern is a 93 000 hectare large landscape situated in the middle of southern Sweden. It has been recognised for its diversity and attractiveness – very much depending on an extreme topography and diverse land-use. The forests are dominated by spruce and pine, but there is also a relatively big share of other tree spices, like birch, aspen, alder, oak, elm, ash and lime. The most ecologically valuable areas are the almost untouched broadleaved covered slopes and the wooded pastures (former meadows) with giant oaks and broad-leaved trees used for pollarding. The mosaic character of the landscape has, together with long and diverse use of its natural resources, resulted in a very high biodiversity. WWF nominated in 2001 the Eastern Slopes of Lake Vättern as one of a hundred hotspots in Europe for ecological valuable woodland. More than 230 redlisted species have been found in the area.

The work within the area started in 1998 when there were deep conflicts between different interest groups concerning the woodland key-habitat survey and production versus conservation. The confrontation led to the creation of a platform – with nine stakeholders representing land and forest owners associations, authorities and green NGOs – for discussions, mutual learning and conflict solution. The work within the area has from the start aimed at creating an integrated landscape perspective and tried to find a good balance between conservation and sustainable use, *i.e.,* an ecosystem approach. The intensive cooperation has resulted in a more resilient socio-ecological system, with a better possibility to meet future changes in societies and ecosystems.

A key factor for this transformation (from conflict to cooperation) was to make all information about the values in the landscape visible for everyone, by thorough inventories and discussions of the results. Important for the development of a sustainable governance system on landscape level was also to agree on and work for a vision of the area. All stakeholders have together formulated the following vision for the future: "Through an active collaboration

we create a vigorous countryside, a sustainable ecosystem, and an attractive landscape for the users, the residents, and the visitors of the land."

Since the land is owned by over one thousand small land-owners and the land-use is a mixture between forestry and farming, there has been a big need of trying to cross many of the geographical, sectoral and administrative borders within the landscape. One of the most problematic borders is that between the forest and the more open landscape. An integration within and between authorities has been important for building trust and a broader understanding among different stakeholders. This has also led to that land-owners get better information on how to act, when for example an employee at the Swedish Forest Agency also can inform about those rules surrounding environmental aids normally handled by the County Administrative Board. Moreover, it has led to increased understanding for the land-owners situation within the authorities

The often made bisection between cultural and natural values, as well as between science and traditional knowledge, could be seen as obstacles for creating an effective management of the values in the landscape. Under the concept of "bio-cultural heritage" and a special focus upon trees that have been used for pollarding, the initiative Eastern slopes of Lake Vättern has managed to bring together knowledge and practices of local communities and scientists and bridge the gaps within and between different interest groups. This unfortunately rather unusual approach has proved very helpful in promoting and reaching different environmental goals. It also has encouraged the application of knowledge, innovations and practices in management at different levels.

It takes a long time for most types of forest high-value cores, with their accumulations of old trees and large deadwood, to be formed. New high-value cores of most types, and of today's quality and species composition, can not be formed soon enough to ensure the survival of many specialised plant and animal species. For such species, preservation of existing high-value cores is more effective than if they were to be logged and then restored in a process that is costly, time-consuming and uncertain as to outcome. In the current situation it is therefore imperative to prioritise conservation efforts targeted at the remaining high-value cores. Both the National Strategy for the Legal Protection of Forest Land (Swedish Environmental Protection Agency & Swedish Forest Agency, 2005) and the In-depth evaluation of Sustainable Forests (Swedish Forest Agency, 2008) emphasise the need to preserve the remaining high-value cores. It is equally important that high-value cores which cannot be legally protected be assigned priority for establishment as voluntary set aside areas.

Restoration of half a million hectares

The in-depth evaluation additionally states that there is a long-term need for restoration of at least 500 000 ha forests with lower natural value in order to re-establish ecological functionality in and between the high-value cores. This calculation is taking as an assumption that all high-value cores are functional, both that the stand is functional in itself regarding key structures, size, etc. and that it has connectivity with similar habitat types in the landscape. It is obvious that this is not the case so the calculated needed area for restoration should be seen as an absolute minimum figure that could need to be increased if the short- or long-term functionality shows not to be adequate.

Enhancing the quality of the set-aside areas

The National Strategy for the Legal Protection of Forest Land has led to an improved selection of areas suitable for legal protection, considering the stand level values, landscape characteristics and forest types especially important for Sweden to protect. If the principles in the strategy were used for the selection of voluntary set-asides, that would lead to an improved quality also of voluntary set-asides, from a nature conservation point of view. That would especially be the case if the process with voluntary set-asides would be transparent and the selection of areas that should be used for nature conservation, whether it is on a legal or a voluntary basis, would be chosen in good co-operation between the authorities working with legal protection and the forestry sector selecting the voluntary set-asides.

It is equally important to manage set-aside areas, including legally protected, in the most favourable way for biodiversity, which in many cases could mean no management at all. Strategies for the management of protected areas are currently under development in the responsible authorities. The need for management in the voluntary set-asides is unknown, but estimated to be equally large.

Improving general conservation considerations

An important measure in the Swedish model for nature conservation in forests are the general conservation considerations in everyday forestry. They are important in order to make the areas between the legally protected areas and voluntary set-asides as suitable as possible for specialised species living in those areas so that they can move between the cores. But they are also important for the everyday biodiversity and to create structures that are not common in the protected areas and set-asides, for example sun-exposed biologically old trees and sun-exposed coarse woody debris.

There is a large variation in how well the general conservation considerations are handled. Audits of the actual outcome show that there is a large potential to improve both the quality and the quantity of the considerations. Most obvious is that the quantity of retained so-called eternity trees and dead wood in forestry operations in many cases need to be much larger. If all forestry operations where done according to the suggested level by the Forest Agency a large improvement of the situation for the biodiversity in the commercial stands would be seen. It is also important to improve the considerations towards water-bodies and wet forests. Most important in that respect is to retain and create functional buffer zones around wet forests, wetlands and water-bodies and to avoid damages on the ground and soil caused by forestry machines. Currently these are probably the most problematic general conservation considerations so here is a large potential to improve the situation.

Developing the Swedish model

The different parts in the Swedish model – legal protection, voluntary set-asides, general conservation considerations and adapted management methods – are interdependent. It means that if the general conservation methods and the voluntary set-asides are very appropriately taken care of, the need for legal protection would be decreased and vice versa. It is important to point out that the calculations of the needed area for legal protection and voluntary set-asides in the in-depth evaluation are based on well functioning general conservation considerations. If the general conservation considerations will not be improved it would mean that a larger area of legal protection is needed. Also, intensified forestry as a means to meet the increasing need for bioenergy might result in a much higher need of protected areas.

Preservation of natural disturbance regimes

Because of the human-induced decrease in the frequency of some of the natural disturbance regimes, especially forest fire and flooding, it is important to preserve, restore or mimic these natural disturbance regimes. For example the restoration of natural water regimes and prescribed burning are important measures. This could be done both through nature conservation management in legally protected areas and in voluntary set-asides as well as a part of an adapted forestry on commercial forest land.

Reintroduction of grazing and pollarding

Traditional agricultural management methods are important to preserve the biodiversity connected to woodland, for example solitary grown trees and bushes, with an origin in the old agricultural landscape. Grazing or mowing are needed to maintain the biodiversity connected to, earlier or still, grazed forest, wooded pastures and wooded meadows. The practising of pollarding is important to maintain the biodiversity connected to pollarded trees. In cases where grazing, mowing or pollarding is not possible alterna-

tive management methods mimicking the original ones need to be used. For further discussion on the forests arising from the old agricultural landscape, see the chapter on agricultural ecosystems.

Consideration of the whole landscape

Another aspect to bear in mind when dealing with the general conservation considerations are the characteristics of the broader landscape. Interdisciplinary ecological landscape strategies and/or plans could increase the possibilities for the creation of functional and cost-effective green infrastructures in the forestry landscape.

Adaptations towards climate change

The effects of climate change have to be approached through adaptation measures such as ensuring connectivity between for example high-value cores in order to facilitate migration of species. The commercial forests also have to be more varied and resilient towards the different effects of climate change that might appear. Increased extension activities and environmnetal payments to promote a larger content of indigenous deciduous forests in especially southern Sweden would be a pro-active way to achieve this. A large biodiversity in itself, ensured through all the other suggestions in this document, increases the resilience of the forest landscape.

2.3.4 Inland waters

The Environmental quality objectives, and their interim targets with defined indicators, constitute the main framework for the implementation of the inland waters programme of work. However, our assessment of implementation and target achievement is closely linked to the objectives and targets, not to the programme of work itself. The Swedish Environmental Objectives Council has reported on actions and progress towards achieving the environmental quality objectives, and the associated interim targets.

It is unclear whether *Flourishing Lakes and Streams* and *Thriving Wetlands* will be achieved by 2020. For lakes and streams the targets put forward extend only to 2015, and many decisive factors are beyond the scope of the work being done to implement this environmental quality objective. The interim targets, policy instruments and measures now proposed are not entirely sufficient for the environmental quality objective to be met. It is essential for the Habitats and Species Directive to be implemented and for progress to be made in national efforts to bring about sectoral responsibility and sustainable use. Both goals focus on the physical condition of the inland waters and use of land/water in and around them. Wetlands are affected by climate change and emissions of nitrogen, in particular, to air and water. The interim targets now proposed are milestone targets focusing on particularly urgent issues where specific actions are needed, but they will probably not cover the entire need in terms of biodiversity. The starting point now is wetland birds' requirements, while in lakes and streams the focus is on a broader part of the biodiversity. There is also a need for restoration of watercourses, lakes, mires, wetland forests and small lakes and ponds in the forest landscape.

Environmental quality objective: Flourishing Lakes and Streams

Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded.

The outcomes within a generation should include the following:

- Structures using water that are valuable from a cultural and historical point of view (such as watermills) continue to be used. The natural flows and water levels in today's unexploited and

virtually unspoiled streams are maintained, and the flows in streams affected by regulation are adjusted wherever possible to the needs of biological diversity.

- A good preservation status is maintained for valuable habitats for endangered, rare or care-demanding species and for natural habitats.
- There are viable populations of fish and other aquatic species that are directly dependent on lakes and streams.
- Endangered species can spread to new habitats in their natural areas of distribution, thus ensuring viable populations.
- Lakes and streams have a good surface water status with respect to the composition of species and chemical and physical conditions in accordance with the Water Framework Directive.
- Biological diversity is restored and maintained in lakes and streams.
- Genetically modified fish are not released.
- Alien species and genetically modified organisms that may be a threat to biological diversity are not introduced.

The most important factors affecting the prospects of achieving *Flourishing Lakes and Streams* are:

- Carry out protection and restoration according to interim targets and adopted national strategies.
- Improved stewardship and management of aquatic environments, especially in agriculture and forestry.
- A reduced level of construction near lake shores and river banks, as development in such areas restricts public outdoor recreation and adversely affects animal and plant life.
- Measures to lessen the impacts of hydroelectric schemes on biodiversity.
- Due consideration for valuable cultural environments in the planning and implementation of ecological restoration projects.
- Implementation of the Ordinance on Water Quality Management (Water Framework Directive), to ensure that water bodies achieve good ecological status.
- Implementation of measures proposed under other environmental quality objectives that have implications for this objective.
- Limitation of the impacts of climate change.
- Reinforce actions against illegal releases

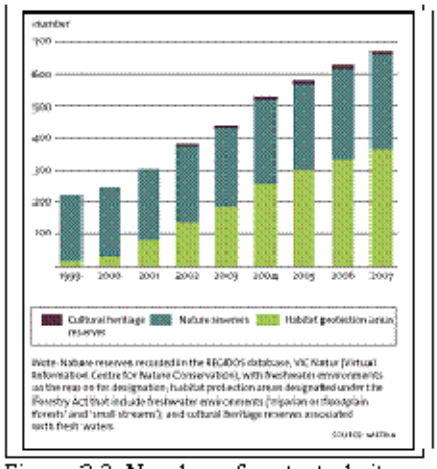

Figure 2.2. Number of protected sites with freshwater interest features as a priority, 1999-2007.

Interim target: Protection of natural and cultural environments

By 2005 the competent authorities will have identified and drawn up action programmes for natural and cultural environments, in or in the vicinity of lakes or streams, that are of particularly high conservation value and require long-term protection. By 2010 long-term protection will be provided for at least half of these environments, which must be evenly distributed among the five water districts. There must be at least 15 no-fishing areas in every water district.

This interim target is judged to be very difficult to meet within the time frame laid down for it. The basic conditions for protection efforts have to some extent improved, however, partly thanks to increased funding for nature conservation and a national strategy for work in this area. Enhanced allocations are also needed to secure the protection of valuable cultural environments.

Of 537 sites of particular value for nature conservation, 90%, or some 480, were judged by county administrative boards in 2005 to require long-term protection (figure 2.2). The interim target calls for half, *i.e.,* 240, of these sites to be protected by 2010. Around 130 such sites have still to be protected. With the current definition of 'long-term protection', moreover, it will be difficult to bring about the necessary measures on the basis of the policy instruments available in the fisheries and cultural heritage sectors.

The interim target's goal of 15 no-fishing areas in each water district is not considered achievable.

Interim target: Restoration of rivers and streams

By 2005 the competent authorities will have identified and drawn up action programmes for the restoration of Swedish rivers and streams of high conservation value or with the potential to acquire high conservation value following remediation.

By 2010 at least 25% of valuable and potentially valuable rivers and streams will have been restored.

It is uncertain whether this target can be met by 2010. A large number of watercourses are in need of restoration, and in some cases the measures required are complex and costly. Around 680 rivers and streams are judged to need restoring. The 25% target means that some 170 of them should be dealt with by 2010. However, conditions for achieving the interim target 2 have improved. The action programme for restoration (national strategy) has been drawn up by the Swedish Environmental Protection Agency, the Fisheries Board and the National Heritage Board. Financial resources for restoration have increased and the strategy and handbook for ecological restoration of rivers and streams, published in the autumn of 2007 and 2008, respectively, will facilitate the actual carrying out of measures. Moreover, a database for the documentation of completed measures will make evaluation and coordination easier.

Interim target: Releases of animals and plants

By 2005 releases of aquatic animals and plants will be undertaken in ways which do not adversely affect biological diversity.

This interim target is judged to have been met as a better system for legal realeases has been developed. However, illegal and unintentional releases continue, affecting the prospects of achieving the objective Flourishing Lakes and Streams.

Interim target: Action programmes for threatened species

By 2005 action programmes will have been prepared and introduced for threatened species and fish stocks that are in need of targeted measures.

This target is judged to have been achieved.

Environmental quality objective: Thriving Wetlands

The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.

The outcomes within a generation should include the following:

- There are wetlands of various kinds all over the country with preserved biological diversity and cultural and historical assets.
- Endangered species can spread to new habitats in their natural areas of distribution, thus ensuring viable populations.
- Alien species and genetically modified organisms that may be a threat to biological diversity are not introduced.
- Peat extraction is carried on in sites that are suitable with regard to the natural and cultural environment and biological diversity.

- As far as possible, wetlands are protected against drainage, peat extraction, road construction and other development operations.

The key factors affecting the scope for achieving *Thriving Wetlands* are:

- Compliance, and supervision of compliance, with existing legislation and guidelines. In particular, environmental stewardship in forestry must be improved.
- Combined effects of human wetland use and climate change, such as old ditch systems and changed precipitation patterns.
- Implementation of measures in forestry and agriculture.
- Policy decisions on resources for land purchase, compensation payments and nature conservation agreements, and for management and restoration of protected areas.
- Policy decisions on resources for administrative staffing at the county administrative boards.
- Knowledge accumulation and surveys of the cultural heritage assets of wetlands.
- Policy decisions on government and EU-funded payments for restoration and management of wetlands after 2013, when the current RDP comes to an end.
- Landowners' interest in wetlands, which may decrease if growing cereals or energy crops, is regarded as a more attractive option.

Interim target: Strategy for protection and management

A national strategy for the protection and management of wetlands and wet woodlands will be drawn up by 2005.

This target was met in December 2005, when the Swedish Environmental Protection Agency, the Forest Agency, the Board of Agriculture and the National Heritage Board jointly adopted a National Strategy for Thriving Wetlands.

Interim target: Mire protection plan

By 2010 long-term protection will be provided for all the wetland areas listed in the Mire Protection Plan for Sweden.

The 'Mire Protection Plan for Sweden' was adopted in 1994 for the purpose of identifying the wetland areas most worthy of protection (in terms of nature conservation value) and to pave the way for systematic protection. On 1 October 2006 a total of 276 sites remained to be protected by 2010. During the period 1995–2006, 92 of the mires listed in the Plan – an average of just fewer than eight a year – became subject to protection. For the interim target to be achieved on time, the pace at which new sites are protected needs to be increased almost tenfold. This target will thus not be met within the defined period.

Interim target: Forest roads

By 2006 forest roads will not be built over wetlands with significant natural or cultural assets or in such a way as to adversely affect such wetlands.

The interim target defines a zero vision: that no forest roads are to be laid across wetlands and wetland forest areas of high natural or cultural value. Forest roads near wetlands of high value must not cause damage. For the monitoring of progress towards this target, the term 'wetlands with significant natural assets' has been restricted to wetlands and wetland forest in nature conservation value categories 1 and 2. Which wetlands of high cultural value are covered has not been defined, since the knowledge base is inadequate.

The target on forest roads was not met by the target year 2006. The Swedish Forest Agency's analysis, which excludes cultural heritage assets, shows that forest roads have been built across 89 of the 7 600 wetlands surveyed. Since the mid-1990s, long-term planning of the road network has deteriorated. It is rare for forest owners to engage in cooperation. The high felling rates of the present day exert continued

pressure to build forest roads across wetlands. During this century to date, some 1 700 km of roads have been laid annually. The need is most marked in northern Sweden. In the south, the road network is already extensive, but maintenance of existing roads is expected to increase. This may exacerbate the impact on wetlands. Climate change and mild winters may make it more difficult to use temporary winter roads and further increase the need for forest roads.

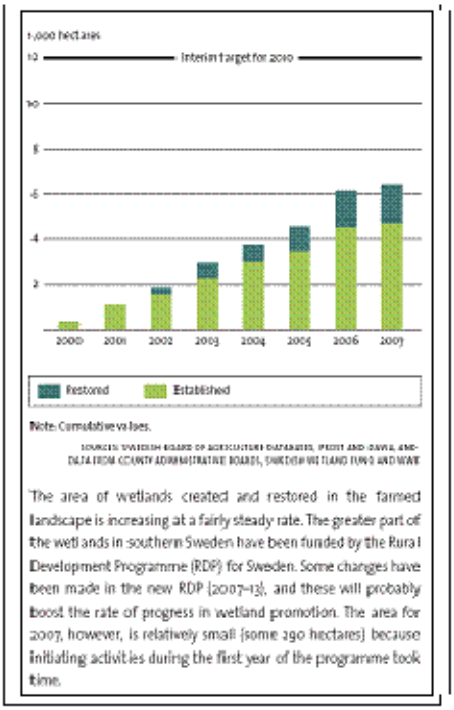

Figure 2.3. Wetlands established and restored on agricultural land, 2000-2007.

Interim target: Wetlands on agricultural land

At least 12 000 hectares of wetlands and ponds will be established or restored on agricultural land by 2010.

Over the period 2000– 2006, 4 505 ha of wetlands were created (6 510 ha from 1995-2006) and 1 641 ha restored (figure 2.3). Accordingly, at the present rate, some 95 00 ha will have been established or restored by 2010. This is far short of the national area target. The indicator of established and restored wetlands shows that the rate has been fairly steady, averaging 878 ha a year.

Uniform methods of evaluating the effect of manmade wetlands on biodiversity are lacking. However, a number of studies including inventories of various groups of organisms show that such wetlands often serve as the habitat for a highly varied array of species, and that species on the Swedish Red List are found in a high proportion of them.

Interim target: Action programmes for threatened species

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

The list of species in need of action programmes is revised regularly. Action programmes now exist for 19 species associated with wetlands and for one habitat, rich fens; and more programmes are to be developed. The interim target has thereby been attained.

2.3.5 Marine and coastal areas

The Environmental quality objectives, and their interim targets with defined indicators, constitute the main framework for the implementation of the programme of work for marine and coastal areas. However, our assessment of implementation and target achievement is closely linked to the objectives and targets, not to the programme of work itself. The Swedish Environmental Objectives Council has reported on actions and progress towards achieving the environmental quality objectives, and the associated interim targets.

Environmental quality objective: A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos

The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance.

The outcomes within a generation should include the following:

- Endangered species and stocks can spread to new habitats in their natural areas of distribution, thus ensuring viable populations.
- A good conservation status is maintained for habitats for endangered, rare and care-demanding species and for natural biotopes that are worth preserving.
- The natural beauty and natural and cultural assets of coastal and archipelago landscapes, biological diversity and variation are maintained by continuing prudent use.
- Consideration is given, in connection with fishing, shipping and other uses of seas and water areas, as well as construction and other development in coastal and archipelago areas, to the productive capacity, biological diversity, natural and cultural assets and outdoor recreation assets of the water areas.
- All Sweden's coastal waters have a good surface water status in terms of the composition of species and physical and chemical characteristics, as defined by the Water Framework Directive (Directive 2000 / 60 / EC).
- Buildings and built environments in coastal and archipelago landscapes that are particularly valuable are preserved and improved.

The recently adopted EU Marine Strategy Framework Directive reinforces the EU's commitment to the CBD work programme on marine and coastal biodiversity, but the organisation Greenpeace is concerned about continued extraction of fish in designated Natura 2000 areas: "As long as extractive activities that have a direct impact on biodiversity continue to be allowed within Natura 2000 sites, this network in its current modus operandi, will never be able to deliver on the commitments Sweden, and the EU as a whole has made under the CBD to protect and, where necessary, restore biodiversity. It will only be through establishing a network of marine reserves within their own waters, as well as much more concerted action regionally and internationally to extend a network to high seas areas, that EU countries (Sweden) will effectively be able to fulfil their obligations under the CBD, including the application of the ecosystem approach and the precautionary principle".

The time scale of recovery in the marine environment is very long, and the objective therefore may not be met until several decades beyond 2020. Both positive and negative trends can be observed in the state of Sweden's seas. As far as commitment to action is concerned, the trend is positive, especially at a national level.

Key factors affecting the prospects of achieving *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* are:

- Climate change – higher temperatures could, for example, result in a dilution of salinity, reduced ice cover, changes in the species composition of ecosystems, and increased leaching of nutrients.
- Eutrophication – high nutrient levels promote algal blooms and exacerbate benthic oxygen depletion.
- Fisheries – if certain fish species disappear as a result of overfishing, the balance of ecosystems could be affected.
- Toxic pollutants – heavy metals and persistent organic pollutants either end up buried in sediments or become concentrated as they move up through food chains.
- Use of coasts and archipelagos – in attractive coastal regions development pressures are growing.
- Developments in neighbouring countries – Sweden has little chance of influencing the state of its seas by its own efforts alone.

Interim target : Protection of environments

By 2010 long-term protection will be provided for at least 50% of marine environments of high conservation value and at least 70% of coastal and archipelago areas with significant natural and cultural assets.

By 2005 another five marine areas, plus a further 14 by 2010, will be protected as nature reserves. Together, these will form a representative network of marine natural habitats.
In addition, an area in which fishing is permanently banned will be established by 2006 for evaluation by 2010. A further three coastal and open sea areas with permanent bans will be established in the Baltic Sea and the North Sea respectively by 2010 for evaluation by 2015.
The Environmental Objectives Council judges that the goal of long-term protection for 70% of identified coastal and archipelago areas can be met within the time frame laid down, provided that additional action is taken to protect cultural heritage.

The target of another 14 marine nature reserves by 2010 is also likely to be achieved. These reserves will probably be spread across all counties and marine geographical regions within Swedish territorial waters. In some respects, though, the geographical distribution of protection is very uneven, with a large share of protected sites in coastal areas of the Quark (Kvarken) Straits, the Sound (Öresund) and the Skagerrak, while in the Gulf of Bothnia and the southern Baltic, for example, less than 3% of the total area is protected. Both the current distribution of protected areas and that projected for 2010 fall short of the goal of a representative network of different marine habitats. In addition to the marine reserves there are more than 250 Natura 2000 sites with marine habitats designated. These sites cover more than 6% of the marine territorial water and approximatly 3.5% of Sweden's Exlusive Economic Zone.

The goal of establishing a no-fishing zone by 2006 was met when the Swedish Board of Fisheries banned all fishing from an area within four nautical miles of Gotska Sandön. Preparations are in hand for the designation of another six no-fishing areas by 2010.

Interim target: Action programmes for threatened marine species
By 2005 action programmes will have been prepared and introduced for threatened marine species and fish stocks that are in need of targeted measures.
This interim target was not met by the target year 2005, or during 2006. In its Red List for 2000, the Swedish Species Information Centre identified 17 species associated with marine environments as being in need of special measures. Action programmes currently exist for 14 of these. In 2006, the Board of Fisheries proposed measures for 26 threatened fish species, for which fishing could be one of the threat factors. Since then, fishing has been prohibited on 18 of these. For the remaining ones, international co-operation is deemed to be necessary.

Interim target: Bycatch
By 2010 total annual bycatches of marine mammals will not exceed 1% of each population. Bycatches of seabirds and non-target fish species will have a negligible impact on the populations concerned and on the ecosystem.
This target will not be met by 2010 for all marine mammal populations. In particular, there is still a long way to go as regards grey and harbour seals. To achieve the 1% target for grey seals, a large proportion of inshore fisheries would have to be closed. For the common porpoise, bycatch should not be a significant problem in the Kattegat and Skagerrak, chiefly thanks to a dramatic decrease in the scale of gill-net fishing. As for the Baltic, there is a lack of data on both the population and the bycatch of this species. More reliable estimates of populations of non-target species and bycatch levels are necessary, along with efforts to win the trust of and improve cooperation with commercial fishermen.

Interim target: Catches and recruitment of fish
By 2008 catches of fish, including bycatches of juveniles, will not exceed levels commensurate with maintaining fish stocks of a size and composition sufficient to ensure that the ecosystem's basic structure and functions are preserved. Populations will have been restored to levels well above biologically safe limits.

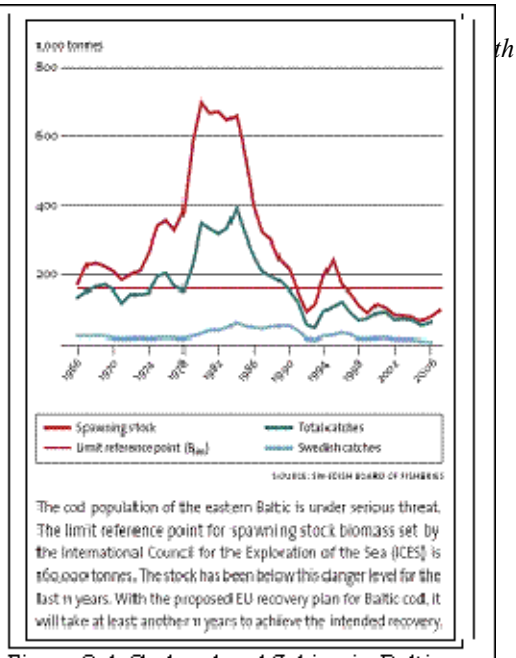

Figure 2.4. Cod and cod fishing in Baltic Sea (eastern stock), 1966-2007.

The interim target has not been met. For several fish stocks the situation remains very critical, and in some cases it has worsened (figure 2.4). The proposed EU recovery plan for Baltic cod can serve to illustrate the difficulties. Under it, the current fishing mortality (F) of 1.1 for the eastern cod stock is to be brought down to 0.3 by means of annual reductions of, at most, 10% of F. It will thus take at least 11 years, *i.e.,* until 2018, to reach the target.

Interim target: Noise and other disturbance

By 2010 noise and other disturbance from boat traffic will be negligible in particularly sensitive and designated archipelago and coastal areas.

The county administrative boards of Sweden's coastal counties have drawn up an action plan to establish 'special consideration' zones in archipelago areas. Under the plan, at least three such zones with respect to noise, geographically distributed across the country, are to be designated on a trial basis by the summer of 2008. An evaluation of these zones is to be completed by autumn 2009, and measures to reduce disturbance are to be adjusted, where necessary, by 2010.

Interim target: Discharges of oil and chemicals

By 2010 discharges of oil and chemicals from ships will be minimised and reduced to a negligible level by stricter legislation and increased monitoring.

This target is judged to be achievable within the time frame laid down. The number of discharges of oil in Sweden's zone of responsibility/response region has fallen in recent years, indicating that aerial surveillance by the Swedish Coast Guard, targeted air–sea operations and international cooperation are continuing to produce results.

2.3.6 Mountain ecosystems

The Environmental quality objectives, and their interim targets with defined indicators, constitute the main framework for the implementation of the programme of work for mountain ecosystems. However, our assessment of implementation and target achievement is closely linked to the objectives and targets, not to the programme of work itself. The Swedish Environmental Objectives Council has reported on actions and progress towards achieving the environmental quality objectives, and the associated interim targets.

Environmental quality objective: A Magnificent Mountain Landscape

The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.

The outcomes within a generation should include the following:

- Alien species and genetically modified organisms that may be a threat to biological diversity are not introduced.
- Cultural heritage assets, in particular the Sami cultural heritage, are preserved and enhanced.

- Reindeer husbandry, tourism, hunting, fishing and other use of the mountains, as well as construction and other development, are carried on with regard for the areas' long-term productive capacity, biological diversity and natural, cultural and recreational assets.
- Less damage is caused to mountain vegetation and the extent and thickness of the lichen cover is increasing.
- Endangered species that have suffered a significant decline can spread to new habitats in their natural area of distribution, thus ensuring viable populations.
- The majestic mountain scenery with its pastures and extensive continuous open spaces is intact.
- Biological diversity in mountainous areas is preserved.
- Local stocks of fish and other aquatic species in mountain lakes and streams are maintained.

Ájtte , the Swedish Sámi and Mountain museum, stresses that the Swedish mountainous region is at large a cultural landscape with a cultural heritage consisting of both material and biological remains. The reindeer husbandry connected to milk economy as it was performed until the 1950s is still leaving biological traces in the region with plant populations dependent on heavy grazing. Ájtte, the Sámi parliament, NAPTEK (National Programme for Traditional Ecological Knowledge) at Swedish Biodiversity Centre as well as other Sámi organisations are involved in several projects focusing on the documentation of traditional Sámi land tenure and ecological knowledge.

The Environmental Objectives Council judges that this environmental quality objective can be met by 2020 if further measures are taken, with a reservation for adverse effects of climate change on the mountain environment. Knowledge is insufficient to assess how much remains to be done before the objective is met.

Key factors affecting the prospects of achieving *A Magnificent Mountain Landscape* are:

- Mineral exploration and test quarrying, since applications are on the rise.
- Wind power, because interest in expanding the use of this energy source is growing.
- Disturbance from off-road vehicles, given that vehicle use is expected to increase as a result of growing tourism and other factors.

Interim target: Damage to soil and vegetation

By 2010 damage to soil and vegetation caused by human activities will be negligible.

Meeting this interim target is judged to be feasible if measures are taken to channel off-road driving, and other activities that damage the terrain, away from sensitive areas. Regional efforts to fulfil environmental objectives play a large part in enabling the target to be achieved. Failing better documentation, risks of damage to soil and vegetation have been assessed indirectly to date, on the basis of numbers of reindeer and off-road vehicles. The reindeer population has fallen by 1.4% since 2005, while these vehicles (snowmobiles and all-terrain vehicles, ATVs) have shown an insignificant increase in the past few years.

Various surveys were conducted as part of the National Inventory of Landscapes in Sweden (NILS) during 2003–4. In the field inventory work, individual vehicle tracks were found in or near eight of the 28 grid squares surveyed. From aerial photographs of two areas surveyed, numerous linear elements (*i.e.,* tracks) were identified. A questionnaire survey revealed no clear pattern in the scale of these tracks, other than finding that they traverse most of the mountain region. In many cases, drainage ditches were found to have formed in the tracks on slopes, and in numerous places this damage was perceived as severe. The questionnaire survey also suggested that there are large areas with vehicle-track damage that fall outside the NILS grid squares.

Altogether, throughout the mountain region, a study carried out in summer 2007 found approximately 1 km of paths, tracks or trails broader than 20 cm, *i.e.,* made by trampling or vehicles, per square kilometre. One in eight of these paths, tracks or trails had been caused by four-wheel ATVs. The results of the earlier questionnaire survey suggest that there are larger areas affected by damage from off-road vehicles

than the 2007 survey revealed. The smaller number of observations in 2007 may reflect relatively limited damage from off-road driving and overestimation of its impact by the questionnaire survey. Alternatively, it may suggest that a larger number of NILS areas in the mountains need to be surveyed for the field inventories to detect off-road driving to a larger extent.

Interim target: Noise

Noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced to meet the following requirements:

• by 2015 at least 60% of light off-road vehicles will meet stringent noise standards (below 73 dBA);

• by 2010 the noise from aircraft will be negligible both in class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the national park area.

This interim target is judged to be achievable within the time frame if further measures are taken. To meet the target for light off-road vehicles, however, one requirement is for noise limits for new vehicles of this kind to be inserted in Directive 2000/14/EC, in line with the proposal submitted to the European Commission by the Swedish Environmental Protection Agency in 2005. For progress towards this interim target to be monitorable, the Swedish vehicle register must contain particulars of noise levels for the types of vehicles concerned. This registration issue is being investigated by the Swedish Road Administration.

Interim target: Natural and cultural assets

By 2010 long-term protection, including where necessary management and restoration measures, will have been provided for the majority of mountain areas with representative and significant natural and cultural assets.

The Environmental Objectives Council judges that achieving this interim target within the time frame is not feasible. Regional environmental work relating to the Sami cultural heritage and improved knowledge of mountain cultural environments are crucial factors. Resources are required to enhance knowledge, both regarding the nature reserves and national parks that have already been set up and to enable long-term protection to be provided for new sites in the future.

Interim target: Action programmes for threatened species

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target is judged to have been met by the target year 2005. Originally, five action programmes were envisaged, covering species to be found in both mountain and forest areas. The target is considered to be met when a proposed action programme has been adopted or circulated for comment. For the mountain region, action programmes for Arctic fox, wolverine and great snipe have now been adopted. Three programmes of relevance to the region have also been completed: for rich fens, wolf and brown bear. In all, there are thus six action programmes. A total of nine species and an equal number of action programmes have been identified for the mountain landscape.

2.3.7 Identification and monitoring

Sweden has made a considerable effort to identify and monitor its biodiversity. National surveys of biological resources, combining basic taxonomic work with assessments of sustainable use were carried out already during the 18th century, when the young naturalist Carl Linnaeus was commissioned by the government to survey less well known parts of Sweden. Nowadays, Swedish authorities, museums, universities and organisations contribute to a large-scale long-term monitoring of a multitude of biodiversity

components, and of a large number of abiotic factors that affect biodiversity. As a whole, it is a very valuable system, but there are still gaps to fill.

Many components of biodiversity are not well covered, especially among those less well known taxonomically. There is a focus on the biotope level, and the quality of substrates that support many species, but less information on the species themselves, and even less on the genetic level. Some basic tools are still missing, *e.g.* a comprehensive and detailed vegetation and land use classification, and there is no national digital vegetation map. There is an enormous amount of data and information in storage, distributed among a large number of hosts. Much of this information is not readily available for potential users, for technical and ownership reasons.

Identification of the Swedish wild fauna and flora

The Swedish Taxonomy Initiative (STI) is an All Taxon Biodiversity Inventory (ATBI) of Sweden coordinated by the Swedish Species Information Centre and carried out in collaboration with Swedish universities and natural history museums. Started in 2002 and fully funded from 2005, the project aims to completely chart the flora and fauna of Sweden within 20 years.

The Encyclopaedia of the Swedish Flora and Fauna will constitute a series of identification handbooks in Swedish, which will be published in both paper and electronic editions. The 20 000 species which can be identified without highly advanced equipment will be described in detail, including information on distribution and biology. For most of them, distribution maps as well as illustrations such as watercolours will also be provided. The groups containing the remaining 30 000 species will be presented down to a suitable taxonomic level (*e.g.* families), with the species presented as checklists. All texts are written in Swedish, but each species has a short English summary. In total, the Encyclopaedia will include more than 100 volumes; the first two appeared in 2005, covering butterflies and millipedes. Like many forthcoming volumes, the book on millipedes represents the first Swedish text describing all species in this category occurring in the country.

The taxonomy initiative has identified the need to perform large-scale basic inventories aimed at taxonomic groups that are poorly known in Sweden. A marine collection effort is running 2006-2008 and a three-year Malaise trapping programme targeting poorly known insect groups has already been completed, resulting in 40 million new specimens. Preliminary estimates from the Malaise trapping programme indicates that it will add more than 5 000 species to the Swedish list of 50 000 multicellular organisms; at least 1 000 of these are expected to be new to science.

Amateur naturalists are being encouraged to collect information about the species presented in the Encyclopaedia through the Species Gateway, an observational database originally developed by Swedish bird watchers and now being extended to cover most organism groups. Amateur naturalists currently represent the most important information source concerning the distribution and abundance of Swedish species. An important goal of the STI is to enable and encourage this group to study a broader range of organisms, significantly improving Swedish biodiversity monitoring in the process.

The STI represents an important step forward in implementing the Convention on Biological Diversity; without a completely inventoried flora and fauna, measuring progress towards goals such as the 2010 target becomes guesswork. Hopefully, experiences gained during the STI will be valuable in conducting similar studies both in neighbouring countries in Northern Europe as well as in more biodiversity-rich countries across the globe.

Monitoring of Swedish biodiversity

Extensive monitoring of Swedish biodiversity is carried out or commissioned by the Swedish Environmental Protection Agency as well as by sectoral agencies, such as the National Board of Fisheries, the Swedish Forest Agency, and the Swedish Board of Agriculture.

Traditionally the ecosystem level has received most attention in Swedish monitoring systems. There is a wide range of initiatives and programmes. Terrestrial ecosystems are covered by two sample-based programmes, using systematic sampling (different percentage of area covered for different ecosystems and variables). Sweden has a long-standing monitoring system for forestry data, and is increasingly adding variables to describe a wider range of biodiversity measurements. A research programme (HEUREKA) investigates the efficient use of such data for active planning and management of forestry in a GIS-based tool. The Swedish national forest inventory covers not only forests, but also other non-tilled and non-urban areas outside the mountain range.

A relatively new programme, NILS (National Inventory of Landscapes in Sweden) where landscape squares are censused every fifth year by field visits and air photo interpretation, covers all terrestrial ecosystems. The first round of this programme was completed in 2007. From 2008 the same squares will be censused for the second time, thus allowing to see changes in the landscape. Within the NILS framework, the Swedish Board of Agriculture monitors change in the habitat quality of meadows and pastures.

For fresh-water ecosystems, a sample-based inventory (PPS sampling, once every 5th yr) exists, and also yearly monitoring at selected sites (non-randomly selected). There is monitoring of fish communities in coastal areas with multi-mesh nets, trawls and fyke-nets, covering 50 species of a total of 200 naturally occurring fish species. Additional information is provided by test fishings within the environmental monitoring of 34 inland lakes and an additional 20 limed lakes. Environmental monitoring in lakes covers, in addition to fish, also plankton and benthic fauna. Basically, most of the around 40 freshwater fish species are covered in the survey test fishing.

Monitoring of pollution and eutrophication and its effects is one of the major aims of our freshwater and marine monitoring programmes, and relevant variables are also included in air monitoring (deposition monitoring), forest monitoring (soil monitoring, forest health, vascular plants with indicator value, even some high-intensity catchment studies), and monitoring of nutrient leakage from agricultural sites.

A number of top predators are more or less comprehensively censused yearly (wolf, bear, wolverine, lynx, arctic fox, seals, eagles). There is a breeding bird survey (partly based on systematic sampling), and also some other monitoring and inventory activities that together give fairly good yearly population data for many, but not all, bird species. Selected lists of vascular plants, mosses and lichens are monitored in the terrestrial sample-based programmes mentioned above.

The government has commissioned the Swedish University of Agricultural Sciences (SLU) to conduct environmental monitoring and assessment for the conservation and sustainable use of biological resources affected by agriculture, forestry, game management, aquaculture and fisheries. This means that SLU monitors the country's forests, agricultural landscapes, lakes, watercourses and species in order to analyse environmental trends. The results from this monitoring and assessment are used to track progress towards Sweden's environmental objectives and its commitments under international agreements. The university has chosen to organise environmental monitoring and assessment into programmes related to the Swedish environmental objectives.

Data gathered in monitoring activities are currently stored in databases administrated by different authorities (*e.g.*, National Board of Fisheries, Swedish Meteorological and Hydrological Institute, Swedish University of Agricultural Sciences), acting as Data Hosts.

Red-listed species

The Swedish Species Information Centre is the focal point for information on Swedish red-listed species and biodiversity, and functions as a link within and between the scientific community and the practical and administrative sectors. The most important tool in this work is to prepare and update Red Lists and Red Data Books for plants and animals in Sweden. Data sheets with the most important information about each red-listed species are gradually being made and continuously up-dated. The aim is to provide data

sheets for all red-listed taxa, and this is completed for vertebrates and vascular plants. Reports on findings of red-listed plants and animals are continually put into the databases. These reports are given by some thousand people, a majority being competent amateurs.

National expert committees have a major role in co-ordinating activities for different taxonomic groups. Today such committees exist for the following plant and animal groups in Sweden: vascular plants, bryophytes, lichens, fungi, algae, vertebrates (excl. fishes), fishes, and invertebrates. The committees consist of some of the leading specialists in Sweden. They suggest changes in the Red Lists, which are revised every five years.

Natura 2000 monitoring and monitoring of species and habitats in the European Habitats directive
Basic inventories have been performed in about 4000 Swedish protected areas that form part of the European network Natura 2000, with the aim to assess the status of species and habitats listed by European Union directives on conservation. For species that show a non-favourable conservation status long-term action plans have been adopted.

The national report on the status of threatened species and habitats of European interest was coordinated by the Swedish Species Information Centre. The report from 2007 was the first in which the conservation status of species and habitats was evaluated. Based on experiences from the preparation of this report, the Swedish Environmental Protection Agency is currently completing and revising parts of its nature monitoring programmes in order to get statistically better information for the next report, due in 2013.

2.3.8 Ex-situ conservation

For wild fauna and flora ex situ measures are considered a lower priority, as in situ conservation and sustainable use is the preferred management strategy. Most ex situ measures concern domesticated animals and crop plants.

Domesticated plants
A national programme for plant genetic resources (POM) is being implemented. POM is actively inventorying plants in traditional use, collecting samples, and documenting associated local knowledge. The programme covers agricultural or horticultural plant species, but not wild plants. The Nordic Genetic Resource Center (NordGen) has been charged with the ex situ conservation of the seed producing species identified as priorities by POM. The organisation of long-term preservation of vegetatively reproducing species is still in the planning phase.

The Nordic Genetic Resource Center (NordGen) is a joint agency for Sweden and the other Nordic countries. NordGen is mandated to manage ex situ measures for cultivated plants that are adapted to the Nordic climate as well as their wild relatives, for Sweden and the Nordic region. NordGen performs ex situ conservation of seed producing species and co-ordinates the preservation of clonally propagated species. NordGen also coordinates the management of farm animal genetic resources.

The general public and a range of non-governmental organisations make large contributions towards the continued use and preservation of indigenous domesticated plants. One example is the organisation Sesam (The Society for Seed Plants and the Preservation of Cultivated Plants). About 450 members dedicate their time and gardens to old indigenous cultivars, and to the search for new varieties that are well adapted to the local environment. The organisation has developed a system for the collection and distribution of seed material. Competent members assume responsibility to keep, describe and propagate each group of cultivars. A wide range of traditional Swedish food crops are covered, as well as the traditional use of such plants in the kitchen.

A database for cultural plants and the variety names (SKUD) is hosted by the Swedish Biodiversity Centre and Gothenburg Botanical Gardens.

Domesticated animals

Regarding livestock a national programme for animal genetic recourses is under development by the Swedish Board of Agriculture. Most of the practical work of keeping and managing populations of threatened domestic breeds is performed by volunteers and their non-governmental organisations. Successful management of threatened breeds can only be achieved through cooperation between relevant government agencies, academic research institutions, and the animal keepers. So far, cooperative action has not been sufficient.

There is an EU programme for agro-environmental payments for keeping traditional domestic breeds that are threatened with extinction, for instance through support to environmental capacity building for farmers and to the ex situ breeding activities.

Research on the identification and characterisation of domesticated plant and animal genetic resources is performed by Swedish universities, principally the Swedish University of Agricultural Sciences, and other organisations.

Wild fauna and flora

The botanical gardens of Sweden have generally not taken active measures to conserve indigenous plants ex situ, but contribute to the conservation of globally endangered plant species.

Nordens Ark, a private non-profit foundation dedicated to the conservation of endangered animals, promotes ex situ breeding and reintroduction programmes, research and information. Furthermore, there are several zoological gardens that contribute to national and European breeding programmes for threatened animal species. The national programmes are coordinated through the Swedish Association of Zoological Parks and Aquaria (SAZA), and the European programmes by the European Association of Zoos and Aquaria (EAZA).

For a very limited number of species there have been adequate measures taken when species have been reintroduced in their natural habitat. This especially applies to threatened species for which detailed action plans have been developed. However, Sweden lacks an agency or organisation that promotes such activities.

2.3.9 Incentive measures

Sweden has introduced a number of incentive measures aimed at the conservation and sustainable use of biodiversity, and a few perverse incentives have been identified and eliminated. New incentives need to be developed, and remaining perverse incentives should be eliminated, especially to help the sectors to achieve sustainable use. For example, in the agricultural sector positive economic incentive measures have been applied to non-market values of biological diversity, through direct agro-environmental payments. In the forestry sector, however, there are insufficient incentive measures directed at the private sector.

Among the harmful incentives that have been removed, most concerned payments to commercial activities that threaten biodiversity, *e.g.* for afforestation of grazing pastures, construction of forest roads (for transportation of timber), cutting down sparsely wooded forests, and for drainage of wet forests.

The national programme for local investments for sustainable development (Lokala investeringsprogram LIP) has acted as a strong incentive for local authorities. A total of 195 conservation and sustainable use projects were awarded 400 million SEK in government grants. The projects were based in *e.g.* marine and freshwater environments (35%), urban areas (20%), the agricultural landscape (6%), forests (3%),

wetlands (22%). The conservation of biodiversity has benefited from this programme, especially so in the wetland projects. Several Swedish municipalities report on highly successful projects.

Sweden's Rural Development Programme within the EU Common Agricultural Policy framework includes agro-environmental payments and extension work that encourage the conservation and sustainable use of biodiversity in agriculture. Payment for agro-environmental measures have stimulated environmentally sound practices in ley production, the use of natural grazing pastures, and ecological farming. The programme has been instrumental in creating opportunities for farmers to keep grazing livestock on traditionally managed semi-natural grasslands.

Today 460 000 hectares with semi-natural grasslands of high conservation value are being managed, as a result of the rural development programme. Without such incentives the estimated acreage still in active management would would have been less than 50 000 hectares. A large number of nationally threatened species benefit from the preservation of such traditional meadow management.

2.3.10 Research and training

Sweden has a range of universities providing scientific and technical education and training, covering most aspects of the identification, conservation and sustainable use of biological diversity. Graduate programmes are available in all disciplines. Scientific education and training is also carried out by various natural history museums.

Most funds available to research on biological diversity and related disciplines are distributed by a few major governmental organisations, including the Swedish Research Council (Vetenskapsrådet), the Foundation for Strategic Environmental Research (Mistra) and Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas). Within the implementing agencies, such as the Swedish Environmental Protection Agency, research results are employed through different channels. The agency, as a stakeholder, participates in many research projects and programmes, especially those to whose funding it contributes.

The Foundation for Strategic Environmental Research

Mistra, the Foundation for Strategic Environmental Research, is a foundation whose board and chairman are appointed by the government. Its aim is to support research of strategic importance for a good living environment and to promote the development of robust research environments of the highest international class that will have a positive impact on Sweden's future competitiveness. The research shall play a significant role in solving major environmental problems and contribute to the development of a sustainable society. Mistra distributes about 200 million SEK per year. Among the biodiversity-relevant programmes that Mistra has funded, are SUFOR - Sustainable Forestry in Southern Sweden (1996-2004, 108 million SEK), SUCOZOMA - Sustainable Coastal Zone Management (1997-2004, 80 million SEK), FjällMistra - Sustainable management in the mountain region (1998-2006, 84 million SEK), HagmarksMistra - Management of semi-natural grasslands - economics and ecology (2001-2008, 47 million SEK) and TransportMistra (2006-2008, 30 million SEK). Mistra also funds the Stockholm Resilience Centre (2007-2013, 105 million SEK) where complex socio-ecological systems are studied.

Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning

Formas, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, is a governmental research-funding agency related to several ministries. Formas has the task of promoting and supporting basic research in common calls, as well as need-driven research in specified calls. The funded research is related to sustainable development within the areas of the environment, agricultural sciences, including forestry and fisheries, and spatial planning.

The research topics funded by Formas fall within the area of basic research, as well as applied research on agriculture, forestry, fishing, sustainable development and spatial planning. Between the years 2005 – 2007, Formas funded 107 projects with different topics of biological diversity, and the sum of the granted funds was more than 203 million SEK. Some of these projects were funded in co-operation with other international financing agencies, for instance Sida/SAREC. Five international projects were granted a total sum of more than 3.9 million SEK. The projects themes were "sustainable use of mussels in South Africa", "evaluation of biological diversity-recommendations for forestry in South-East Asia", "the biological diversity and nutrient status of different agricultural systems in Kenya", "biological monitoring of pesticides in Central America" and "monitoring and sustainable use of wildlife resources". Funding has also been granted to Swedish researchers for planning studies within the EU 7th framework within biodiversity research.

In a special call for research on sustainable management of biological diversity in 2006, 11 projects were granted a total sum of more than 23.6 million SEK. The project topics were, for instance, if sown wild flower strips were an effective measure to enhance biological diversity in the agricultural landscape, the consequences of ocean acidification for the capacity of adaptive responses in marine invertebrates, the role of biodiversity for management of suburban forests, and evaluation of strategies to maintain lichen populations.

In the marine call in 2005, two biodiversity projects were granted – (1) Biodiversity and ecosystem function: exploring bi-directional interactions between species diversity, community production and consumer mediated trophic cascades and (2) Unicellular cyanoplankton in the Baltic Sea: linkages between diversity and biogeochemical function. These two projects received 1.7 million SEK and 1.04 million SEK, respectively.

Four projects with biological diversity as a theme were granted in the trans-disciplinary calls in 2005, 2006 and 2007. These projects grasp over a variety of disciplines – from "the genetic diversity and phylogenetic relationship among cultivated Swedish hops (*Humulus lupulus*)", via "Biodiversity and economy - balance between protected areas and management of matrix" and "Combining sustainable biodiversity and human activities in the Swedish archipelago", to "Transgenic trees: a multidisciplinary approach to problems related to public attitudes, social acceptance and ecological risks". The projects were granted a total sum of 13.8 million SEK.

The Swedish University for Agricultural Sciences (SLU) received 25 million SEK from Formas in 2005. This was a grant for strong research environment for the biodiversity project "Microbiomics for Agriculture, Forestry and Freshwater Management".

Formas was also part of the Swedish government special call on biological diversity that started in 2002. In this call, Formas was responsible for distributing money to research projects within the areas of basic and applied research, and to support ecological and sustainable development.

Formas is participating in European networks of research funding agencies and institutions, so-called ERA-nets, which are promoting *e.g.* joint research strategies and joint research funding. BiodivERsA is specifically working the biodiversity issues and besides Formas, the Swedish Research Council and the Swedish Environmental Protection Agency are also participating. BiodivERsA is just about to start 12 projects on biodiversity. Each project involves researchers from at least three EU-countries and addresses one or more of the following themes: global change and biodiversity dynamics, ecosystem functioning, and ecosystem services.

Formas regularly produces and distributes different kinds of information on current research issues and sustainable development, *e.g.* in a series of popular science books. In 2006 Formas published a report on the present knowledge of biodiversity in Sweden. In the report it is stated that there is a general lack of research on measures within the work on environmental quality. Further, it is stated that researchers

should assume a more prominent role in the work on environmental objectives, and that the output of measures within this work must be critically evaluated.

Further research needs

Swedish scientific research covers a wide range of topics concerning biodiversity. A number of specialised research areas still need further attention, *e.g.* on ways to value biological resources, as alternatives to the purely economical valuation, and on methods for implementing and monitoring sustainable use.

In 2008, the Government initiated an effort to enhance research on climate related issues. Among the areas covered, funding for research on the effects of climate change on natural resources, ecosystem services and biological diversity was increased by earmarked funding amounting to SEK 75 Millions.

There is a need for interdisciplinary research, which has proven difficult to achieve. There is a growing concern that purely biological research will not be sufficient to provide the answers to conservation and sustainable use issues. Interdisciplinary research combining natural and social sciences may be better placed to produce results relevant to many stakeholders and implementing agencies. There are several challenges in this. First, the funding agencies need to revise their application and evaluation procedures to allow for more interdisciplinary and collaborative projects. Then there is the challenge to merge the academic cultures in terms of approaches, methods and terminology. A third challenge is the low status given to interdisciplinary and applied research in the academic society, leading to fewer funding and employment opportunities for researchers engaging in such activities.

Concerns have been expressed regarding the status of taxonomic and systematic research and education. Today, expert knowledge in several fields is concentrated in only a few individuals, with limited possibilities of transferring it to a new generation of specialists.

2.3.11 Communication, education, and public awareness

There are ongoing measures and activities to implement article 13 but there is no comprehensive national CEPA strategy as such. For the continued conservation work a number of issues have been highlighted, including a strengthened dialogue with citizens, the importance of local community participation, and of nature in urban areas, as well as the importance of research, education and information. In school biology teaching aims at making knowledge and experiences usable, to promote concern and respect for nature and one's fellow humans. Fundamental starting points are theories about the ecosystem and evolution, as well as knowledge of different species and knowledge of the living conditions and relations between plants and animals.

Many species find their substrate or habitat in abandoned formerly exploited areas such as previous airports, harbours and gravel-pits as well as in the city environment. Urban green areas are held to be important to increase the public knowledge and appreciation of biological diversity. It is also believed to be important for schools to have access to a nearby forest area for pedagogic purposes and for people to have access to a nearby green area, especially for people without opportunity to visit nature in the countryside.

The National Board of Housing, Building and Planning is responsible for issues concerning city planning including urban green structures. The Board has developed several documents on how the municipalities can work with these issues. The goal is to increase awareness about the importance of accessible green areas and how these areas can be saved for the future. The Board has investigated which values people find most important in their surrounding landscape. The qualities most appreciated are quiet natural areas suitable for walking and relaxing.

A number of the municipalities are very aware of biological diversity and nature values in urban areas and are working actively to conserve and enhance these values. More densely populated municipalities appear to work with a greater focus on urban nature. During a number of years the Swedish Environ-

mental Protection Agency granted funds to help the municipalities carry out projects that are intended to promote biological diversity. One third of these projects were aimed at increasing information and education about biological diversity and a large number where carried out in urban areas. In general the results from these projects are regarded to be successful. Many of the projects focused on school children and construction of self-guiding nature paths and information points. Other examples were the restoration of ponds that purify waste water and function as a recreational area at the same time, inventories of lichens and bats as well as finding different ways to promote biological diversity in urban areas.

Communication between the municipalities and the residents mainly takes place at the municipality Internet website, and mostly in the form of information to the residents. Some municipalities have databases and systems for public reporting on biological diversity. Other methods employed for communication are public lectures, printed information, educational material for schools, and self-guiding nature paths**.** In general knowledge about the level of public awareness is restricted, but it is assumed to be quite poor.

Today information about biological diversity is becoming more accessible as many authorities have made information available on the Internet and the number of searchable databases increases. Another important activity to increase knowledge about biological diversity is the Swedish Flora and Fauna Encyclopaedia (see above) which aims to give the public access to information on the majority of the species occurring in Sweden, and in many cases in all Nordic countries. The Swedish Species Information Centre is also making information about species available through other books, websites, seminars etc.

Another important actor is the Swedish Museum of Natural History that works in several areas concerning biological diversity. One of the most important tasks is to communicate and disseminate knowledge to the public. The museum does this through exhibitions, lectures, publications, excursions and through information and communication at the Internet and in databases. Several of the museum's departments are cooperating with amateur specialists in numerous fields especially regarding the collections, inventories and monitoring of species. The museum also has a biologist on duty to which the public can turn to in any question about biology. People visiting the museum still represents a minority that already has obtained an interest in nature and biological diversity. The Swedish Museum of Natural History stresses the necessity to reach the wider public which has not developed such an interest, and tell them about the status of biological diversity in their vicinity, and what they can do to improve the situation.

The Swedish node of GBIF, the Global Biodiversity Information Facility, is located within the Swedish Museum of Natural History. Through it, Sweden is one of the main contributors to this international network of biodiversity data.

The Swedish Board of Agriculture also is an important source of information about biological diversity and its management in agricultural environments. It distributes information to the media, to professional farmers and to the general public.

There are also several non-governmental organisations that spread significant information about biological diversity.

2.3.12 Access to genetic resources

Sweden has facilitated access to its genetic resources according to a decision made by the government in 2003. By recommendation of the Nordic Council of Ministers the government decided that access to all plant genetic material of Swedish origin in NordGen is free, and that the administration of them should be shared by all the Nordic countries. This material shall also be included in any multilateral system for access and benefit-sharing (*e.g.* in ITPGRFA). There are no restrictions covering the access to wild genetic resources. Private collections are however private property.

Sweden has so far not taken any initiatives to regulate the access to its genetic resources. The Swedish position is that plant and other genetic resources should be available with a minimum of bureaucracy and restrictions. Sweden has implemented the European Union Directive 98/44/EG on legal protection of biotechnological inventions. Sweden is party to the UPOV 1991 Convention, the European Patent Convention, and member of WIPO. Sweden holds the position that intellectual property rights are important incentives for research and development of innovations. Sweden has thus ratified the International Treaty on Plant Genetic Resources for Food and Agriculture.

During 2004 Sweden actively participated in the EU discussions on disclosure of origin of genetic resources and associated traditional knowledge in patent applications. An EU proposal on a mandatory disclosure requirement in patent applications (as a formal condition) was adopted by EU and submitted to WIPO in December 2004. The current Swedish Patent legislation (Patentkungörelse 1967:838) requires that the origin of the genetic resources used in an invention shall be disclosed in patent applications. If the origin is unknown it should be indicated. The failure to provide this information does not affect the handling of the patent application by the authorities or the rights conferred by a patent. The requirement does nothave any material effects on *e.g.* the validity of granted patents.

Sweden has, in cooperation with the other Nordic countries within the Nordic Council of Ministers, adopted a number of strategies regarding ABS, *e.g.* a Nordic approach to Access and Rights to Genetic resources, the Nordic Ministerial Declaration on Access and Rights to Genetic Resources 2003, and a strategy for genetic resources for fisheries, agriculture, forestry and food 2005-2008.

The Swedish international development cooperation agency (Sida) has adopted a policy that requires the establishment of a material transfer agreement (MTA) for financing research cooperation activities involving genetic material.

The Swedish international development cooperation agency (Sida) prioritises support work relating to fair and equitable sharing of benefits arising from the use of genetic resources and traditional knowledge (see section 2.3.13). This includes support to the development of mechanisms that ensure compensation to those who have developed and preserved genetic resources and traditional knowledge, which now is used commercially. Sida works to increase the participation of governments, NGOs etc in developing countries in the international policy work related to genetic resources and ABS. The main objectives generally are to increase knowledge and understanding of the international processes and issues, to build capacity to develop national frameworks and legislations, allow for increased civil society participation, and ensure a broad variety of positions and opinions to be heard in the international discussions.

The Swedish Sámi parliament has not yet taken any decision regarding if there is a need for any restrictions concerning access restriction to biodiversity-related traditional knowledge, innovations and practices. However, within the Sámi community there are at present people arguing for both sides, *i.e.,* either an ethnic restriction to the access of Sámi knowledge or an open attitude to sharing.

2.3.13 Swedish international development cooperation

Biodiversity is a crucial resource for the worlds' poorest, and a fundamental Global Public Good. Rights to and sustainable management of biodiversity are often critical for local livelihoods, and are intimately linked to fundamental development aspects such as poverty, food security, equity, economic growth, health, and trade. Sustainable management of biodiversity and ecosystem services is thus a prerequisite for sustainable development and poverty alleviation in both local and global perspectives.

The Swedish parliament has, as a part of the Swedish Policy for Global Development, established the following overarching goal for Swedish development cooperation:

"To contribute to an environment supportive of poor people's own efforts to improve their quality of life."

The Swedish Policy for Global Development is based upon eight guiding principles of which one – s*ustainable use of natural resources and protection of the environment* – is especially relevant to the articles of the CBD.

The Swedish International Development Cooperation Agency, Sida, has provided support to projects relating to the objectives of the CBD and worked with integrating the objectives of the CBD into Sida's work since the convention was ratified.

Points of departure for Sida's biodiversity related work:

- Sida strives to make strong linkages to the Millennium Development Goals, incl. poverty alleviation, food security and local livelihoods, and health, etc.
- Ensure synergies with climate change and biodiversity.
- Focus on equity aspects (as linked to livelihoods and poverty alleviation of poor and local communities) and the role of local communities and indigenous peoples in managing biological resources. Sida finds it important to ensure involvement of stakeholders such as poor people, indigenous and local communities and involvement of key sectoral agencies in biodiversity strategies and plans.
- Sida strives to work proactively through integration/mainstreaming of biodiversity within bilateral and regional programmes focused on natural resource management (agriculture, rural development, marine/coastal, forestry etc). Sida consequently gives strong focus to sustainable use within managed landscapes and acknowledges the importance of the ecosystem approach and the role of ecosystem services for human well-being and poverty alleviation.
- Sida works towards that strategies such as National Biodiversity Strategies and Action Plans (NBSAP) and instruments such as Poverty Reduction Strategy Papers (PRSPs) and strategies to attain the UN Millennium Development Goals (MDGs) should be mutually reinforcing. It is important that NBSAPs are considered in national budget processes, PRSPs, sector support etc, to be fully considered.
- Sida sees the need for increased capacity building and consideration regarding the link between ecosystem services and economic development. Using more of an MA (Millennium Ecosystem Assessment) approach, *i.e.,* building on the MA framework and focusing more on ecosystem services, could potentially lead to better joint planning and implementation of *e.g.* PRSPs and NBSAPs since the term ecosystem services makes the concept of biodiversity easier to grasp for stakeholders in a society that is not familiar with why biodiversity is important for human well-being.
- Sida focuses on "up-streaming" planning through including biodiversity aspects in policies and strategies. Special attention is given to addressing biological resources and their importance for poverty alleviation in development of Country Strategies.
- EIAs/SEAs are a mandatory tool for all Sida supported development initiatives (EIA/SEA guidelines include biodiversity assessments).
- Sida through *e.g.* SwedBio[1] supports development and dissemination of tools and methods for mainstreaming sector integration such as policy analysis, valuation of ecosystem services, biodi-

[1] Amongst other initiatives and contributions Sida started Swedish International Biodiversity Programme, SwedBio, in 2003 as a joint initiative by the Swedish International Development Cooperation Agency (Sida) and the Swedish Biodiversity Centre (CBM), focusing on biodiversity and ecosystem services for local livelihoods and poverty alleviation. SwedBio's work is organised into three main components: 1) Integration of biodiversity aspects in Swedish development cooperation: Primary focus is on capacity building at Sida through supporting integration of biodiversity aspects in Sida's policies, programmes and projects. SwedBio also works with other actors involved in Swedish international development cooperation (*e.g.* NGOs, consultancy com-

versity within Environmental Impact Assessment (EIAs) and Strategic Environmental Assessments (SEAs), and biodiversity indicators for different sectors and related to the 2010-target and CBD's strategic plan.

- Support is also provided to projects/programmes with biodiversity objectives and/or components, *e.g.* through NGOs like IUCN and WWF, to research (*e.g.* CGIAR and others) and to strategic smaller initiatives focused on methods- and policy development for equitable and sustainable management of natural resources. Sida also supports civil society participation (NGOs, Indigenous Peoples, etc) in key international meetings and events.
- Support is very seldom directly geared to direct implementation of a certain CBD work programme and/or guideline – but may often be in line with them. Most projects andprogrammes address a number of relevant aspects.

In-situ conservation

Through international development cooperation Sweden supports several developing countries in various aspects of article 8, especially d, e, i and j.

Local communities and indigenous peoples are in many cases ultimately heavily affected by decisions taken in the major policy arenas. Despite this, they have often small possibilities and resources to make their voices heard and influence on these processes and decisions.

Sida therefore supports increased involvement and engagement of local actors in international policy processes related to biodiversity management, through many collaborative partners *e.g.* SwedBio. Some specific examples:

- Tebtebba Foundation: Indigenous peoples capacity building and advocacy project on CBD implementation. The over-all objective is to deepen indigenous peoples' local-global understanding of CBD with a focus on enabling indigenous peoples' participation in national implementation.
- Indigenous Forum on Biodiversity (IIFB): Indigenous participation at the 7th, 8th and 9th Conference of the Parties to the CBD (2004, 2006, 2008 respectively), was supported via the indigenous "platform" International Indigenous Forum on Biodiversity (IIFB).

Through support to civil society networks methods for the co-management between governments and local groups of protected areas have been developed. The methods development has included both protected areas and zones around the protected areas.

Through international NGO networks Sida-support has been given to several countries for analysis of sustainable traditional management systems especially by indigenous groups but also other local groups.

Support to analysis of benefit sharing regarding protected areas and other biodiversity rich areas has been granted through studies of different methods for payments for ecosystems services (PES)

Substantial support to activities aiming at including local traditional and indigenous knowledge into decisions taken in the various work programmes to the convention and to the convention itself has been granted.

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panies, Swedish Government, research institutions etc).; 2) Collaborative programme: Direct support to capacity building and information dissemination on maintaining ecosystem services in the South through collaboration with and financial support to strategic initiatives and organizations (primarily NGOs and independent institutions) focusing on different aspects of "biodiversity for local livelihoods and poverty alleviation".; 3) International dialogue and policy development: Direct involvement by SwedBio staff in relevant international policy and methods development processes where SwedBio staff experiences and information from collaboration with relevant stakeholders in the South on sustainable use of biological diversity are made available to public officials and negotiators.

Efforts aiming at widening protection and sustainable use of biodiversity to encompass also areas outside protected areas have been supported through studies of biodiversity rich areas under management of local groups.

Ex-situ conservation

SADC Plan Genetic Resources Centre (SPGRC)

Since 1989, Sweden, through Sida has supported the SADC Plan Genetic Resources Centre (SPGRC) based in Lusaka, Zambia. SPGRC is involved in maintaining gene-banking facilities in all SADC Member States, training of personnel on conservation and utilisation of Plant Genetic Resources (PGRs) and coordination of technology development and transfer in germplasm conservation. It plays a key role in maintaining the Regional Central Accession Data Base for the PGRs. It maintains crop diversity with increased production and utilisation, thus bringing on board promotion of indigenous knowledge on farming practices and utilisation of conserved material at farmer level. It also works closely with the SADC Seed Security Network (SSSN) in contributing to the development of a harmonised Plant Breeders Rights legislation, which takes into account 'Farmers Rights' as reflected in the ITPGRFA.

The Eastern African Plant Genetic Resources Network (EAPGREN)

EAPGREN is a regional joint project established and supported by Sida since 1997, of National Agricultural Research Systems (NARS) of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) of Burundi, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan and Uganda. EAPGREN tasks include development of operational and effective national programmes, support for countries to develop minimal conservation facilities and equipment, assistance in conservation of ex situ collections and development of human resources. Research activities mainly focus on objectives that address national or regional plant genetic resources constraints including adding value to germplasm to make it more useful for enhancement and breeding programmes, and advancing the science of PGR conservation and utilisation and development of methodologies.

South East European Development Network on Plant Genetic Resources (SEEDNet)

SEEDNet is a regional programme including Albania, Bosnia Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Moldova, Romania, Serbia and Slovenia. SeedNet is supporting the countries in their efforts to establish and strengthen national and regional programmes on PGR with special focus on conservation, utilisation, collaboration and networking among stakeholders at both national and regional levels. Sida has supported SEEDNet since 2004 when the programme was established.

Global Crop Diversity Trust

The Global Crop Biodiversity Trust is an independent international fund, established by the decision of the FAO Commission on Genetic Resources for Food and Agriculture in 2002. The objective of the Trust is to providing a permanent source of funds to support the long-term conservation of the *ex situ* germplasm, including characterisation, documentation, evaluation and exchange of related information, knowledge and technologies. Sida has offered substantial support to the Trust Fund.

In addition, Sida has made strong efforts of securing long term conservation strategies of genetic resources and of strengthening of capacity building and networking in Central Asia states. These efforts will not continue, due to new geographical priorities for Swedish development cooperation.

Sustainable use of components of biological diversity

Sustainable use and the sector approach is a key aspect and entry-point within Sweden's development cooperation (providing useful linkages to the Millennium Development Goals and poverty alleviation ob-

jectives), especially in natural resource management programmes as forestry, agriculture, fishery and marine environment. In contributions to *e.g.* sector programmes, sustainable biodiversity and ecosystem services aspects are also handled to some extent in the planning process through SEAs and EIAs, and can also be part of the objectives of the programmes.

Research and training

Several education and training programmes are supported through Swedish international development cooperation, including:

- Two-year international M.Sc. programme on biodiversity management (at the Swedish Biodiversity Centre at the Swedish University of Agricultural Sciences)
- Regional training and research programme (MSc level) on dryland biodiversity in East Africa, executed in Ethiopia, Swedish funds ended 2006.
- International Foundation for Science, IFS, where support is given to MSc and PhD training in developing countries where biodiversity is an issue.

Research supported through international development cooperation funds includes *e.g.* action research through international and Southern-based research institutes, and in bilateral programmes where biodiversity (within biology/forestry) higher training (PhD level) is supported at Universities in *e.g.* Bolivia and Burkina Faso. Biodiversity management and local livelihoods are focal disciplines that are open for applications from Swedish researchers to the research department of Sweden's international development cooperation agency, SAREC.

Several bilateral and regional research programmes are supported which include strong aspects of conservation and sustainable use of biodiversity – not least in the marine sector.

Public education and awareness

The Swedish Governments contributes 20 million SEK (which is not development cooperation funds) as core funding, which is disbursed according to voluntary indicative scale of contributions. In addition, earmarked contributions are made by the Ministry of Foreign Affairs, Ministry of Environment, Swedish Environmental Protection Agency and Sida. The latest years Sweden has been one of the ten largest donors to UNEP. An important component in Sweden's support is UNEP's dissemination of awareness of the Millennium Ecosystem Assessment (MA) and its conceptual framework.

As an important part of Swedish international development cooperation, government grants are made available through Sida for national NGOs to promote co-operation and joint campaigning with NGOs in the South working on protection of biodiversity and ecosystem services. The two most important Swedish environmental NGOs – the Swedish Society for Nature Conservation, SSNC, and WWF Sweden – both run Sida-funded programmes in the South focusing on sustainable agriculture, forestry and Integrated Water Resource Management in close collaboration with grassroot, research and policymaking organisations in developing countries. Apart from using them in the developing countries, outcomes, lessons learnt and experiences from these programmes are also brought to the Swedish public by SSNC and WWF with the help of seminars, websites, booklets, member magazines and other educational tools. The main message of this communication is the importance of protecting biodiversity in the South in order to secure access to and use of ecosystem services for successful poverty alleviation.

"The Global School" is a Sida-funded programme whose mission is to promote education on sustainable development from a global perspective in pre-school education, schools and adult education as well as provide information on the countries included in Sweden's development co-operation programme. The main components of the "The Global School" curriculum are teacher training, developing educational tools and school exchange programmes on global sustainable development

The Swedish International Centre of Education for Sustainable Development (SWEDESD) is a department of Gotland University. The Centre is financed by Sida. SWEDESD started in January 2008. Its purpose is to facilitate and support education and learning in the field of sustainable development. The Centre supports education for sustainable development (ESD) as a part of Sweden's development cooperation. The Centre has a broad scope including formal and informal educational organisations and the promotion of capacity development in ESD. SWEDESD intends to work with policy makers, officials, leaders and planners in pre-primary, secondary, higher and non-formal education, with governmental and civil society organisations (CSOs).

Access to Genetic Resources

Sida has adopted a policy that requires the establishment of a material transfer agreement (MTA) for financing research cooperation activities involving genetic material.

Sida prioritises support relating to fair and equitable sharing of benefits arising from the use of genetic resources and traditional knowledge. This includes support to the development of mechanisms that ensure compensation to those who have developed and preserved genetic resources and traditional knowledge, which now is used commercially. Sida works to increase the participation of governments, NGOs etc in developing countries in the international policy work related to genetic resources and ABS. The main objectives generally are to increase knowledge and understanding of the international processes and issues, to build capacity to develop national frameworks and legislations, allow for increased civil society participation, and ensure a broad variety of positions and opinions to be heard in the international discussions.

Sida has supported a number of capacity-building initiatives linked to ABS, for example:

- Advanced International Training Programme "Genetic Resources and Intellectual Property Rights- Pathways for development", Svalöf, Sweden, each year since 2003. The Programme is arranged by the Stockholm Environment Institute, the Swedish Biodiversity Centre and Svalöf Weibull AB Two-week international training course on IPR and genetic resources (in Sweden)
- Addressed within regional gene bank initiatives (see Article 9) (SADC, East Africa, Balkans) and bio-technology initiative (BioEarn in Africa, see Article 19)
- Support to a number of NGOs and farmers' organisations working on seed supply systems, IPR-issues and genetic policy through *e.g.* the Swedish Society for Nature Conservation International Collaborative Programme (SSNC), and SwedBio
- Direct Sida support to international non-governmental organisations such as the World Conservation Union (IUCN), World Resources Institute (WRI), International Institute for Environment and Development (IIED) etc.
- Support to international agricultural research through the Consultative Group on International Agricultural Research (CGIAR).

The Sida-funded programme SwedBio supports ABS-related work in many organisations, *e.g.* GRAIN, CBDC, Third World Network, ETC-group, African Biodiversity Network and Tebtebba Foundation. Additionally, SwedBio provides specific support to civil society to develop their positions from local to global level and to participate in international processes related to CBD, including ABS.

Access to and transfer of technology

No specific targets have been formulated for technology transfer to developing countries (such as number of individuals to be trained, type of technology to be transferred etc). However, the broader - and more common - concept of capacity building is a corner stone of Swedish development cooperation, and all support – including supported biodiversity-related initiatives – strongly addresses the issues of capacity building. If technology transfer is interpreted in a more narrow sense – *i.e.,* as transfer of technologies

regarding genetic engineering and biotechnology – examples of Swedish support include (but are not limited to) *e.g.* the BioEarn programme in Eastern Africa, see below.

The Sida-funded East African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development (BioEarn) is strengthening research capacity in several fields related to biotechnology and in issues related to biopolicy and biosafety.

The build-up of regional research capacity and joint policy discussions related to biotechnology are of crucial importance when decision-makers and civil society are confronted with the growing importance of biological resource management.

Capacity building in a "sandwich" model is a joint effort between Swedish universities and their African counterparts. It means that PhD-students from Africa study their own countries' problems but divide their time between their home university and a Swedish institution.

The Master programme is implemented at the Swedish Biodiversity Centre, supported by Sida, and takes an interdisciplinary approach to conservation and sustainable use of biological diversity and the relationship between biological diversity and human societies. The course schedule includes basic elements of capacity building related to the Cartagena protocol on biosafety.

Sida has since 2003 supported the course "Genetic Resources and Intellectual Property Rights", implemented by Swedish Biodiversity Centre, Svalöf Consulting AB and Stockholm Environmental Institute. The aim with the course is to train senior national actors from developing countries implementing obligations in different international treaties and conventions related to biological matter, such as WTO/TRIPS, UPOV-91, FAO ITPGRFA, and CBD including the Cartagena Biosafety Protocol. The main focus of the course is the understanding of the interconnections between the treaties related to genetic resources and IPRs, and the importance of a comprehensive strategy when the countries are implementing them. So far during the six years the course has been implemented, almost 200 people from the Andean Community, Southern and East Africa, Southeast Asia, China and Central Asia have benefited from the course.

The Sida-funded SwedBio programme supports biosafety capacity building integrated in other activities related to biodiversity and genetic resources. SwedBio has during the period given priority to supporting involvement and participation of NGOs, indigenous groups and local communities in for example COP8 of CBD and MOP3 of Cartagena Protocol on Biosafety in Curitiba, March 2006.

Swedish biological museums by means of numerous loans from the collections and by means of reception of visiting scientists and other international scientific cooperation contribute to the transfer of technology and technology cooperation.

Exchange of information

Sida contributes to Article 17 in various ways. Amongst other initiatives Sida contributes to organisations like IUCN, World Resources Institute, Swedish Society for Nature Conservation, SwedBio etc. and to programmes on country frame budgets that disseminate information on ecosystem services to decision-makers, contribute to development of ideas, methods and policies regarding biodiversity and local livelihoods. Sidaalso provides financial support to a number of strategic initiatives that directly contribute to exchange of information, development of ideas, methods and policies regarding biodiversity and local livelihoods. These initiatives support capacity building, intended to both encourage development of enabling institutional frameworks, and more hands-on biodiversity-based production and marketing practices. This is done through supporting policy development, development of tools and methods, and net-working (including exchange, learning, and communication) in these areas.

Technical and scientific cooperation

The main part of the Swedish support to research in developing countries is provided through Sida-SAREC. This includes (but is not limited) support to:

- The Consultative Group on International Agricultural Research (CGIAR) which consists of 16 research institutes with diverse mandates related to research on agriculture, forestry and fisheries.
- Victoria lake multidisciplinary research including use and function within the lake system
- MEKARN; Research Cooperation For Livestock-Based Sustainable Farming Systems In The Lower Mekong Basin
- A large number of initiative focusing on marine and coastal research, including *e.g.* CORDIO in East Africa, WIOMSA and other marine initiatives.
- Research on sustainable forest management, *e.g.* AFORNET in Africa (phasing out after 2008).
- AfriMab research collaboration initiated between Stockholm Resilience Centre, and selected Man and the Biosphere Programme (MAB) reserves in Africa.
- International and regional action and policy research institutes, like African Centre for Technology Studies (ACTS), where biodiversity and natural resource management is one focus area.
- SwedBio's financial support to methods development in southern NGO networks (like African Biodiversity Network and others) in supporting sound ecosystem management, local knowledge and biodiversity conservation.

Handling of biotechnology and distribution of its benefits

Sweden is a party of the Cartagena Protocol on Biosafety. Development cooperation related to Biotechnology and distribution of its benefits thus has been reported in the First National report to the Biosafety Protocol. Sida contributes to various activities related to biotechnology:

Sida has since 1999 supported the East African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development. (BIO-EARN). The BIO-EARN Programme was developed by Stockholm Environment Institute (SEI) in close collaboration with the East African Network partners. The mission of the BIO-EARN Programme is to build capacity in biotechnology in Ethiopia, Kenya, Tanzania and Uganda and to promote appropriate research and related policies. The programme aims to use biotechnology in a sustainable manner in order to help improve livelihoods, ensure food security and safeguard the environment. Overall programme objectives are to enable the countries in the region to develop biotechnologies and policies according to their own needs, abilities and opportunities; to promote collaboration in biotechnology, biosafety and biotechnology development to address key challenges and opportunities in the region; and to foster communication between scientists, policymakers, biosafety regulatory officials and private sector nationally and regionally.

In addition, Sida sees as one of its roles to increase the capacity of partners to make their own decisions – based on informed assessments of potentials and risks with different forms of biotechnology. Sida thus supports a critical and vibrant debate on biotechnologies including GMOs with involvement by *e.g.* civil society and others representing poor and small scale farmers.

The support to civil society involvement is canalised though Sida support to Civil Society in Sweden, *e.g.* the Swedish Society for Nature Conservation (SSNC) International Programme.

Likewise, the Sida-funded SwedBio supports international and regional networks engaged in policy and advocacy work related to biodiversity, biosafety and biotechnology, *e.g.* Third World Network, ETC Group, GRAIN and the CBDC Network.

The 2010 biodiversity targets

Sida has contributed to the achievement of the 2010 biodiversity targets by providing support to projects and programmes that contribute to the possibility to reach the targets, and by mainstreaming biodiversity issues in Swedish development cooperation, as described above.

Sida has also through *e.g.* SwedBio supported indicator work related to the 2010 targets and the strategic plan:

- Tebtebba Foundation/International Indigenous Forum on Biodiversity (IIFB) has been supported for the project "International Expert Seminar on Indicators Relevant to Indigenous Peoples, the Convention on Biological Diversity and the Millennium Development Goals (MDGs)". The primary objective of the project has been met, that is to carry forward a structured technical process under the auspices of the International Indigenous Forum on Biodiversity (IIFB) Working Group on Indicators to identify a limited number of meaningful indicators relevant for Indigenous Peoples, the CBD Strategic Plan and 2010 Biodiversity Target and the Millennium Development Goals.
- The World Resources Institute (WRI) project "Mainstreaming Ecosystem Services in Socioeconomic Decisions" includes a component on assessment of the state of indicators for ecosystem services. WRI has assessed how effectively each indicator conveys information for each regulating, provisioning and cultural service to support policy-making, as well as the relevance of ecosystem services indicators for understanding the links between ecosystem services and poverty.
- Global Invasive species programme (GISP) has developed a tentative indicator for trends in Invasive Alien Species (IAS).
- United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC) has been supported for the project "Indicators, Capacity Building and Connecting to the MDGs" with the objective to contribute to the 2010 targets by furthering the development and implementation of a set of approved biodiversity headline indicators. Indicator linking biodiversity and health & well-being is under development. The indicator for the 2010 biodiversity target developed by UNEP-WCMC has been included into the final list of Millennium Development Goal (MDG) indicators.

Financial Resources

Sida contributes annually to a large number of organisations, programmes and projects that work with biodiversity and ecosystem services as their primary objective or have clear biodiversity relevance, but today Sida does not have any statistics on the exact amount. The amount within regional and national projects and programmes regarding sustainable management of natural resources (where biodiversity in most cases is an important dimension) is significant but has not been measured – and would be very difficult to quantify. Direct and indirect support to biodiversity-related activities is thus substantial but hard to quantify. Funds are also channelled through the Ministry of Foreign Affairs (such as Sweden's contribution to the Global Environment Facility). Support – e g for developing country participation in CBD-meetings – is provided through the Ministry for Sustainable Development.

The overall targets for Swedish development cooperation disbursements are presently 1% of GNI. It is also clear that the attention to environmental issues (including biodiversity) during the last 20 years has led to a substantial general increase in disbursements to environment and sustainable natural resource management (including biodiversity) during this period.

There is no financial target for the amount of support to biodiversity initiatives. Environmental sustainability is a key aspect overall within Swedish development Cooperation. Aid modalities developed in the wake of the Paris Declaration on Aid Effectiveness mean that aid flows to an increasing extent are channelled as sector and/or budget support (with decreasing funds available as dedicated or earmarked funds.) There is an increased focus on donor agencies' responsibilities in assisting developing countries to ensure integration of biodiversity concerns in their development and planning framework and budgeting.

2.3.14 Biodiversity and tourism

There is no specific programme on the impact of tourism, but the effects of transportation, infrastructure development (accommodation) etc. on biodiversity are being monitored, indirectly giving an assessment of tourism development. The private tourist sector has developed a number of methods to assess its environmental effects. An eco-labelling system has been implemented by the Ecotourism Association (Ekoturismföreningen), with financial support from the Swedish Business Development Agency (NUTEK) and the Swedish Tourist Authority.

There are a number of tourism development projects run by local authorities that will result in the development of environmentally friendly tourism, with the participation of the local communities. There is also ongoing development of small-scale Sami-based tourism.

There still remain contentious issues that affect biodiversity values. One such issue is whether tourist companies may use carrion baits to attract large predators for easy viewing.

By tradition, all Swedish forests, mountains, shorelines and much of the farmland are accessible for anyone. People may jog, hike, pick flowers, berries and mushrooms, enjoy bird-watching or collect insects, and even spend a night camping. This tradition is of tremendous value for recreational activities, for access to biodiversity and for learning. Naturally, tourists are also welcome to enjoy the right to visit the Swedish nature. Problems may however appear when the scale of tourism increases, and land-owners feel that their resources are being used, or abused, without any compensation.

2.3.15 Invasive alien species

The number of introductions of invasive alien species continues to increase in all environments in Sweden, but especially in the marine and brackish water environment. More than 2000 alien species have been reported in Sweden. In order to meet this threat and mobilise a cooperative approach at all levels of government for preventing harm to biological diversity, a proposal for a national strategy and action plan for alien species was developed and submitted to the government for approval in 2008 by the Swedish Environmental Protection Agency, the Swedish Board of Fisheries, the Swedish Forest Agency, the Swedish Board of Agriculture, Swedish Customs, the Swedish Maritime Administration and the Swedish Species Information Centre. Other sectoral authorities, regional authorities, stakeholders and scientists participated in the work with the strategy and action plan.

Prevention, eradication and control efforts for invasive alien species have been hampered by the lack of coordination between the many responsible sectoral and regional authorities and unclear areas of responsibility and jurisdiction, The national strategy and action plan addresses these difficulties and proposes the formation of a national joint cooperative group to coordinate work with invasive alien species between the central sectoral, regional and local authorities. Eleven sectoral authorites have responsibility for work with invasive alien species, which has lead to gaps and inconsistencies in this work. Cooperation between the sectors is presently achieved through building networks and cross-sectoral working groups for various projects. An example of the cooperation between the sectors is the work with implementing the International Maritime Organization's (IMO) Convention on management of ballast water and sediment which involves the National Maritime Administration, the Environmental Protection Agency, the Swedish Coast Guard, regional environmental authorities, harbour authorities and the shipping sector.

The national strategy and action plan also proposes that the CBD's three-stage hierarchal approach and precautionary principle should be the basis for implementing decisions and developing measures to deal with invasive alien species.

The issue of invasive alien species has been addressed through a wide range of regulatory measures. Existing national, European Union and global regulatory systems pertaining to invasive alien species are focused on the protection of human health, the health of livestock and crops and other economic interests. There is comparably less attention on the effects of invasive aliens species on wild plants and animals and

natural ecosystems. The strengths of the existing framework lie in the control of intentional introductions, whereas there is a clear weakness when it comes to unintentional introductions. Pathways of introduction need more attention. Reviews of the Swedish legal framework pertaining to invasive alien species were carried out in 2005 and in the work with the national strategy and action plan. Recommendations for improvement of Swedish legislature pertaining to invasive alien species have been made.

Sweden's environmental quality objectives address the intentional introduction of alien species into natural habitats and specify targets for achieving these objectives. The unintentional introduction of such organisms, and the pathways involved, are not addressed explicitly. Policies for introduction and spread of invasive alien species have been adopted by the Swedish Environmental Protection Agency and the Swedish Board of Fisheries.

Measures for the prevention of introduction of invasive plant species and pathogens or pests on plants are being further developed in cooperation with the European Plant Protection Organization (EPPO). Within EPPO, guidelines for enforcing regulations on import of plants and plant materials are being developed to also include negative effects of invasive alien plants, pathogens and pests on wild plants and biological diversity.

Eradication programs are already in place locally in certain Swedish County Administrative Boards for the raccoon dog *Nyctereutes procyonoides*, the American mink *Mustela vison,* the Japanese rose *Rosa rugosa,* the Japanese knotweed *Fallopia japonica* and the giant hogweed *Heracleum mantegazzianum*. At the national level, the Swedish Board of Agriculture, the Swedish Environmental Protection Agency, the Swedish Board of Fisheries and other governmental agencies have jurisdiction to issue regulations for control and eradication of invasive alien species. This has however been done only for a very restricted number of species, mainly plant pests and animals which can be hunted.

Sweden has, together with Denmark, coordinated the cooperative programme *North European and Baltic Network on Invasive Alien Species* (NOBANIS) which was funded by the Nordic Council of Ministers. NOBANIS is an Internet based gateway for exchange of information on alien species and enables regional cooperation between the 16 countries. Sweden has also participated in the EU Sixth Framework STREP project *Delivering Alien Invasive Species Inventories for Europe* (DAISIE), which has developed Internet based gateway for information on invasive alien species in Europe.

Research on the ecological effects of invasive alien species has been a priority in Swedish work with invasive alien species. Assessment of the risks posed to ecosystems or species by the introduction of alien species have been published by the Swedish Environmental Protection Agency in 1994, 1997 & 1999, by the Nordic Council of Ministers in 2000 and in numerous scientific articles. Scientific reports on the consequences for biodiversity at the gene level of the intentional spread of alien populations of forest trees, birds for hunting and fish have been published in 2005, 2007 and 2008.

Within the recently concluded *AquAliens* research program, methods have been developed for risk analysis of alien species in aquatic environments. Research within *AquAliens* was also aimed at studying the ecological effects of alien species on biological diversity in aquatic environments. The *AquAliens* research project was financed by the Environmental Protection Agency and involved this agency, the National Board of Fisheries and researchers from universities throughout Sweden. Researchers from the *AquAliens* program made valuable contributions to the work with the national strategy and action plan on invasive alien species. There is a need for similar research programs focusing on other ecosystems and pathways of introduction.

Continuing problems with the implementation of the CBD guidelines concern the placement of burden of proof, and the application of risk analysis. The CBD's Guiding Principles state that the burden of proof, that there is no significant risk involved with an introduction, should rest with the person or company that applies for an import permit for an alien species, or is engaged in activities that may cause inva-

sive alien species to be accidentally introduced. This is not reflected in the Swedish regulatory framework nor policies.

The process for Sweden to accede to the International Maritime Organization's proposed ballast water convention is in progress. A recommendation for joining the convention as soon as possible has been submitted by a government remit from the National Maritime Agency and the Environmental Protection Agency. Due to the shallowness of the Baltic and North Seas, the convention's requirement that ships must exchange ballast water en route is not possible to apply for shipping within the Baltic and North Seas. Sweden is exploring the possibility to accede to the convention with an exemption for shipping within the Baltic and North Seas, so that they are not required to exchange ballast water until that time ships have onboard treatment systems for ballast water. Until the ballast water convention enters into force, OSPAR (Convention for the Protection of the Marine Environment of the North-East Atlantic) and HELCOM (the Helsinki Convention) have adopted voluntary guidelines for the exchange of ballast water en route which follow IMO's guidelines for managing ballast water and sediments. Since 1 April 2008 these guidelines are recommended to be applied by all vessels that enter the North-East Atlantic.

2.3.16 Traditional knowledge

In the central and northern parts of Sweden, where the Sami people traditionally manage their reindeer herds, forest management is undertaken with consideration taken to the reindeer management through local participation in a multi-stakeholder approach. The indigenous Sami people have customary rights to herd their animals over vast areas in central and northern Sweden, although they have no ownership rights directly linked to the customary rights. On the one hand forestry often negatively affects grazing conditions, while on the other hand the reindeer may damage young forest stands. There are also conflicts associated with traditional land-use on hunting, fishing, agriculture and erosion of the sensitive high mountain vegetation.

In Sweden's implementation of article 8(j) the term "indigenous and local communities" has been interpreted to include the Sami people, traditional farmers in mountain and coastal areas, artisanal fishermen and other people with a lifestyle based on traditional knowledge systems.

As a government assignment, the Swedish Biodiversity Centre, in wide consultation with representatives of indigenous peoples and local communities, has carried out a general assessment of the Swedish implementation of Article 8(j). The assessment report suggests a comprehensive new national network organisation to deal with the documentation, preservation and use of traditional knowledge. This suggests a focus on "indigenous and local *knowledge* communities" rather than "geographic local communities", since there is a fragmentation of tradition holders in today's society. Holders of a certain traditional knowledge system for instance artisanal fishermen are today scattered over the entire coastline of the country and not necessarily gathered in a local community. Therefore, when it comes to the maintained knowledge system geographical distance between the homes of two tradition holders is of less importance than the closeness of the working activities.

The government has, on the basis of the report, assigned the Swedish Biodiversity Centre to launch a National Programme on Local and Traditional Knowledge related to Conservation and Sustainable Use of Biological Diversity (NAPTEK). NAPTEK has the mission to in close collaboration with relevant stakeholders work with issues regarding; 1) *documentation*, 2) *maintaining*, 3) *spreading*, and 4) *initiate research* on local and traditional knowledge. This work is planned for the period 2006–2011. When it comes to issues related to the Sami culture and traditional knowledge NAPTEK works in total agreement with the Sami parliament. During 2007 the Sami initiative was jointly launched. It is an initiative working with documentation and maintaining of traditional ecological knowledge from a non-academic, Sami perspective. Two sets of Sami 'grassroot' pilot projects on community-based documentation on traditional Sami land tenure and use of biological resources have been initiated. The purpose is to initiate work fo-

cusing on documentation and maintaining of local Sami knowledge relevant to conservation and sustainable use, a knowledge that can play an important role in decision making in the areas traditionally occupied and used by the Sami people.

During 2007 the Akwé:Kon voluntary guidelines were used by the Sami parliament to prevent a university field course with the objective to study old Sami burial sites and other religious settings in the area of a local Sami village. None from the university had been in prior contact with the local Sami village. NAPTEK and the Swedish EIA Centre are initiating an in-depth analysis of the role of local and traditional knowledge in EIA and other impact assessments as well as a possible inclusion of the Akwé:Kon guidelines in a Swedish context. The Sami Parliament stresses the importance of a Swedish acceptance and actual implementation of the Akwé:Kon guidelines in Sweden. The Swedish Sami Council stresses that lately there has been an increased awareness of the importance of Sami traditional knowledge. However, the inclusion of this knowledge in actual decision making could be extensively improved.

The involvement of local communities in policy making and implementation of conservation activities is an important goal for the Swedish Environmental Conservation Agency, and the guidance on the establishment of nature reserves provided by the agency to local authorities includes considerations of the participation of local stakeholders. The Sámi Parliament requests a full and effective use of local and traditional knowledge in the actual management processes of conservation and use of biological resources.

To solve the land use problems in the mountain areas the government has asked the County Administration Boards to develop, in cooperation and with participation of all relevant stakeholders, a Regional Environment and Management Plan for the mountain region.

A number of activities have been initiated. The reindeer herders among the Sami people, for instance, have voluntarily decided to provide Environmental Plans for each local Sami community. These plans constitute part of the work to implement the Environmental quality objectives, especially the one for the mountain region.

The Swedish Biodiversity Centre, with support from the Environmental Protection Agency, has compiled a three volume encyclopaedia on the traditional use of biological resources in Sweden. These books have been edited as an anthology with well over 130 scholars from different disciplines and the purpose has been to make the public aware of the close linkage between nature and culture, the diversity of local cultural and species traditionally used, and the necessity of a preserved biodiversity for sustainable development reasons. Apart from the encyclopaedia the project also involved the initiation of a national network of museums and other organisations with interests in ethnobiology, traditional ecological knowledge, and conservation and sustainable development. This process is now continued by NAPTEK.

There is a growing interest among the public of issues regarding the connection between traditional knowledge, traditional land tenure and sustainable development as well as participation of local knowledge in decision making. However, many non-governmental organisations would like to see a more rapid development in this direction. Non-governmental organisations representing local communities that base their activities on traditional use of biological resources have pointed out that there are still many customary rights and practices that are not recognised and protected in Swedish law. They feel that existing regulations often are incompatible with traditional use, and there should be a mechanism in place for granting exemptions to recognised traditional practices. These organisations also point to their inability to take part in policy work on equal terms with government agencies and larger companies. Therefore, the trend for these traditional knowledge communities and their traditional land (and water) tenure is showing a slow, but steady, decline. It is in the current situation difficult to interest younger generation in many of these kinds of land tenures so the rejuvenation of tradition holders is almost non-existing. However, the increasing awareness of climate change and peak-oil is slowly beginning to make the public more and more interested in traditional knowledge and traditional methods to create production systems with a lesser dependence on fossil fuel and a better energy balance.

2.3.17 Protected areas

In 2007, the Swedish Environment Protection Agency issued a report on site protection from an international perspective (report 5742). The report was commissioned by the Swedish government and should cover "Further measures that should be taken within the protection of areas as a consequence of the Convention on Biological Diversity (CBD) Programme of Work and OECD recommendations on the Protection of Areas".

Attention was drawn to Programme Element 2 of the CBD Programme of Work, not only in certain proposed measures to take but also through an overview of some ongoing work that concerned participation and site protection. Opportunities for Sweden to carry out relevant activities according to the schedule of the programme were elucidated in connection with earlier reports concerning Notification 2006-080, presented to the CBD secretariat (see Appendix III, which includes an updated version). The government is preparing a bill on protected areas to be presented during 2009.

2.4 Financial resources

Since biodiversity issues have been mainstreamed into environmental and sector policies, it is not possible to give exact figures on the expenditures for biodiversity, be they at the national or sub-national level. Although there exist environmental payments and even entire posts on the national budget that have biodiversity as their main focus, a lot of other expenditures benefit both biodiversity and other issues. Indeed, not seldom have they been formulated in such a way as to give the highest possible synergistic effects. In these cases, it is impossible to divide the expenditure into a biodiversity-related part and some other part.

Aware of this difficulty, the Swedish Environmental Objectives Council makes the assessment that the economic benefits of taking action to achieve all environmental quality objectives, not only the ones relating to biodiversity, as proposed in its report, willoutweigh the costs. The benefits are often difficult to quantify, but the estimates that have been made suggest that implementing the proposed measures will be economically efficient. A number of studies show that the costs associated with failing to act, on the other hand, will be very high.

2.4.1 Costs of environmental policy to the state in 2004–2006

Attaining the environmental quality objectives is costly. On the other hand, other costs are avoided as we get closer to achieving them. The exact costs incurred, and who must bear them, depend on the nature of environmental policy. Besides the state, local authorities, businesses and households also spend money on improving the environment for themselves or others.

During 2004–6, the lead agencies for the environmental objectives incurred costs directly connected with their work for the objectives averaging just over SEK 8bn a year. This emerges from the summaries drawn up by the lead agencies of their costs connected with the objectives (Appendix IV). This is almost double the figure for 2001–3. The primary factors underlying this increase are government budget appropriations for protection of biodiversity, agricultural management measures and purchase of forest land.

Implementing management measures in farming, purchasing forest land of high conservation value or compensating forest owners for enhanced environmental stewardship has a bearing on several environmental quality objectives. The payments made to the farm sector also, in practice, affect other policy objectives. Some of the costs that involve increases in state assets, such as purchases of forest land, might also be envisaged as a redistribution of the state’s asset portfolio. Other cost items that boost real capital assets, too, may be seen as investments – if that distinction is made in the environmental budget. Examples of items that can be regarded in this way are soil remediation and other measures that bring about lasting improvements, thereby increasing the value of land, and local municipal investment programmes.

Environmental appropriations in the state budget have doubled in the past few years as a result of government stepping up its efforts to pursue the environmental objectives. At the current level of appropriations, not even half the environmental objectives are deemed possible to achieve within the set time frame. On the other hand, in many cases this is due not only to insufficient funding but also to the fact that the time scale of nature's recovery is so prolonged that it is not possible for environmental quality to be restored by 2020, even if preconditions can be created for subsequent attainment of the desired quality of the environment. It should be noted that the costs of remedying emissions of ozone-depleting substances have halved. This suggests that when policies succeed and environmental objectives are attained, costs also decrease.

State expenditure on meeting the environmental quality objectives is thus estimated at just over SEK 8bn a year. The Statistics Sweden report commissioned by the Environmental Objectives Council, *Environmental economic indicators in the Swedish state budget 1995–2006*, shows that the budget appropriations that promote the environment are larger than the figures reported by the lead agencies for the environmental objectives. These appropriations rose from just over SEK 4bn to just under SEK 13bn annually during the years studied. They have a wider purpose than just fulfilling the environmental objectives, including, for example, environmental development cooperation (see section 2.3.13).

2.5 Information requested in COP8 decisions

2.5.1 Article 8(j): Participation of indigenous and local communities

The Swedish government has a policy to involve representatives of the indigenous Sami people in international negotiations that concern article 8(j), *e.g.* in CBD and WIPO, and has also supported participation in the ministerial meeting of the Arctic Council (2004). Through the National Programme for Traditional Ecological Knowledge (NAPTEK) the Sami Parliament and other relevant local community organisations are also invited into the national process of preparing responses to CBD notifications regarding article 8(j) and related provisions. NAPTEK also works as a national thematic focal point when it comes to issues concerning article 8(j). However, several non-governmental organisations stress that the possibility for a full and effective participation in the process is relatively small.

The situation for the Sami community is relatively good compared to other representatives of local communities representing traditional lifestyles according to article 8(j). NAPTEK is currently working on highlighting these issues.

There are a number of local initiatives employing participatory processes, *e.g.* the Swedish Environmental Protection Agency has supported projects on traditional reindeer herding, but clearly there is a need for a more comprehensive approach.

There is however a widely felt concern that not enough is made to strengthen the participation of local communities. A researcher within the research programme "The Conservation Chain", funded by the Environmental Protection Agency thus stated: "Nature conservation does have a dominating top-down structure in Sweden. Little effort has thus far been made to enable local people to get involved in conservation and sustainable use of biodiversity. By environmental measures in CAP and other programmes, locals are invited to work with conservation in practice. Means to involve farmers and other locals in planning and decision making have not been developed. Furthermore, means and arenas for communication between locals and executives and experts have not been much considered."

The Swedish Sami Council points out that the Sami people in reality today is absent in most of the processes of decision making dealing with biological diversity or management of biological resources. They furthermore stresses that Sweden is taking lightly on the issues concerning participation of representatives from indigenous and local communities within the context of the CBD.

2.5.2 Genetic resources in the deep seabed

Sweden has not identified any activities or processes under its jurisdiction or control which may have significant adverse impacts on deep seabed ecosystems or species.

2.5.3 Integrated marine and coastal area management

See section 2.3.5 regarding further measures to implement Integrated Marine and Coastal Area Management.

2.5.4 Protected areas: Financial support to developing countries

Sweden has, within its international development cooperation, substantially supported the progress of especially programme element 2 on the Programme of Work on Protected Areas through *e.g.*:

- Regional workshops for indigenous and other forest dependent groups for capacity building and information prior to the second Ad Hoc meeting of Working Group on Protected Areas (WGPA).
- Capacity building and support to the same groups in connection with the two WGPA meetings.
- Support to Civil Society networks with aims to including voices from civil society in CBD processes related to Programme of Work on Protected Areas.

Sweden has also supported activities to integrate protected areas into broader land- and seascapes through supporting studies aiming at validating biodiversity values in areas managed sustainably by local communities. Sweden has supported method development in relation to co-management (government and local groups) of protected areas aiming at improving site-based protected area planning and management.

2.5.5 Implementation of guidelines on impact assessment

See section 3.4 for a discussion on the implementation of CBD guidelines on impact assessment.

3. Sectoral and cross-sectoral integration or mainstreaming of biodiversity considerations

3.1 Integration of biodiversity into sectoral strategies and plans

Sectoral integration is fundamental to the Swedish implementation of the Convention. Through national policy and laws a clear responsibility is given to each sector to achieve conservation and sustainable use. The public nature conservation sector is still a crucial actor, and it complements the work of the other sectors, but for the larger part of the landscape the sectoral responsibility must be assumed. Therefore, it is often difficult to distinguish between mainstreaming biodiversity issues and the direct implementation of the national biodiversity strategy and action plan, as contained a.o. in the environmental objectives. Much of the information about the implementation of the CBD given in chapter 2 could also be considered as sectoral integration.

The Swedish sectors, such as forestry, agriculture, fishery, tourism, transport and infrastructure have all taken steps to assume their responsibility, both in their public and private spheres. Sectoral policy documents, strategies, plans and programmes usually contain biodiversity issues, and actual implementation is also widespread. There are, and will always be, discussions about how far the responsibility reaches, *e.g.* how costs should be distributed among the public and the private spheres.

The collective work of the nature conservation sector, and all the other sectors, has not so far affected measurable trends in the status of biodiversity. We cannot state that we have achieved sustainable use, or the conservation of biodiversity across the landscape. There may be a number of reasons for this, apart from the obvious explanation that such trends are hard to detect statistically over a short period of time.

The sectoral integration is not perfect. Some sectors are much less clearly involved than others, integration within each sector is not always efficient, and the horizontal integration between sectors is usually the least developed. The sectors that utilise biodiversity resources, such as the forestry, agriculture and fishery sectors, have generally integrated biodiversity issues widely, both in policy documents and in real implementation. Other sectors are clearly working towards this goal, such as housing and building, transport infrastructure, tourism, and international development cooperation.

Integration and coordination within each sector means that the private and public spheres must work together, and processes that link the European, national, regional and local level must be developed. Several sectors have achieved this to a certain degree, but further development is needed. Examples of horizontal integration that needs attention are the agriculture/forestry, and the cultural heritage/nature conservation interfaces. Agriculture and forestry are governed by quite different rules, *e.g.* in terms of the incentive measures applied, and the present sectoral division ignores historical land tenure patterns. Better horizontal integration between sectors could also facilitate the application of a coherent approach in different international processes.

The main purpose of sectoral integration is to achieve sustainable use, which is not an easy task. Biodiversity cannot be used without being affected, which means that sustainable use must be based on a compromise, a balance between an accepted change in biodiversity components and the value of the benefits gained from the resources. Often this is seen as a balance between the cost of conservation and the profit of commercial use, which is an oversimplification. There is also a cost of using the resources in an unsustainable way, and a value in ecosystem services other than the resource being utilised. Such costs and values must be considered in the balance between use and the degree of accepted change. Incentive measures may be used to make such costs and values apparent. There is a need for better methods to value

ecosystem services, and to design incentive measures that facilitate sustainable use. There is also a much more basic need to understand how the use of resources affects biodiversity. Such knowledge may permitt better use of resources with less negative effects on biodiversity.

According to the CBD definition, sustainable use means "the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations". This is not an operational definition for Swedish forestry, or any other sector. An operational definition should clearly state a spatial and temporal dimension, specify which biodiversity is concerned, and how much change is acceptable. Work has been initiated in the government agencies for forestry, agriculture and fishery to formulate a working definition, but more remains to be done before the definitions are fully operational.

3.1.1 Agriculture

Integration in plans and strategies

Biodiversity can be said to be highly integrated into all strategies and plans affecting the agricultural landscape.

The main problem, which strongly impedes successful biodiversity preservation, is that knowledge about relationships between land use and biodiversity is not applied properly in strategies and plans. Several systems, even those entirely aiming at biodiversity preservation, are based on preset structures rather than being based on the biological needs. One example is the inclusion in the EC Habitats directive of some habitats without any nature conservation value or historical value in the Swedish landscape (see above).

Sectoral integration

Maintenance of biodiversity in the agricultural landscape is almost entirely performed by voluntary action (based on environmental payment) by farmers on private land. There is thus a pronounced sectoral integration from the highest European and Swedish national level to single farms.

However, the long "distance" from the EU Commission to the farmer also causes a number of severe conflicts with considerable adverse effects on biodiversity (see 2.3.1). It is clear that some definitions and directives at the EU level are not entirely suitable for Swedish biodiversity, land use traditions, or economic structure. Similarly, it is clear that some directives for environmental payment developed at the Swedish national level (by the Board of Agriculture) are not totally suited for local conditions regarding biodiversity, land use traditions, or economic structure.

Horizontal integration

The agricultural landscape was created largely through traditional land use in the traditional landscape. This land use comprised not only arable land and open grasslands, but also more or less forested areas, wetlands, shore areas etc, and today such areas thus contain management dependent biodiversity. In the Swedish sectoral administration, however, many of these areas are not assigned to the agricultural sector, for example wooded areas and wetlands in forest. The dependence of biodiversity on management is usually overlooked in non-agricultural sectors, which affects biodiversity negatively.

Also the integration between the cultural heritage sector and the biodiversity conservation sectors has been poor in terms of aims and measures necessary for preservation of biodiversity. Recently, however, the Swedish National Heritage Board has started a work on biocultural heritage that will possibly improve this integration.

3.1.2 Forestry

The Swedish Forest Agency is the authority responsible for the environmental quality objective *Sustainable Forests*. The sector, including authorities, organisations and companies, has been given a clear sectoral responsibility to fulfil the objective.

In the Swedish Forestry Act of 1994, the production goal and the conservation goal are given equal importance. The utilisation of the forests and the forest land should be efficient and responsible so that high and sustainable yield is achieved. The forestry methods used should give freedom in how the forestry products are used. At the same time the natural production capacity of the soil should be preserved. Biodiversity and genetic variability should be safe-guarded. The forest should be managed so that naturally occurring plant- and animal species could prevail under natural circumstances and in viable populations. Threatened species and ecosystems should be protected. The cultural heritage in the forest as well as the aesthetic and social values should be safe-guarded. There is a legal demand to regenerate a forest-stand after cutting. The site conditions should decide which tree species that can give a satisfying production and a high economic outcome. It means that regeneration currently mainly is done with Scots Pine, Norway Spruce and Birch. The large storms in 2005 and 2007 have highlighted the issues of regeneration and selection of tree species.

The Forestry Act is a deregulated legislation with a clear expectation that the forest owners and the forestry sector have large responsibility for achieving these goals. In addition to the Forestry Act, the Swedish Forest Agency is also responsible for enforcing the Environmental Code. In the environmental policy the responsibility for the environment is stated. A major part of the Swedish forest is voluntarily certified within The Forest Stewardship Council (FSC, 10.4 million hectares), and the Programme for the Endorsement of Forest Certification schemes (PEFC, 7.5 million hectares). The total amount of certified forest land in Sweden is currently unclear since some certified forest owners are certified within both FSC and PEFC and no comprehensive statistic is accessible for the total amount of certified forest. The forestry certification systems in Sweden could be said to be an example of corporate social responsibility. In Sweden there is close to consensus that the certification systems should be driven by the market and not by state policies.

Swedish environmental and forestry policy has for a long time been built on a combination of voluntary and legal measures. The Swedish model is based on the assumption that the forest sector takes larger responsibility than what is strictly said in the legislation. The Swedish model for preserving biodiversity in forests includes several components:

A land-owner's perspective

The Swedish Federation of Forest Owners has submitted the following text, in which they express their views on family forestry, the responsibilities of the sector, and the prospects for sustainable use:

"About 50% of the forest areas in Sweden are family forests. The mean estate is about 45 ha. There are about 350 000 forest owners. Of course, it is not possible to tell a single story about how the family forester tenders his or her estate. There are as many stories as there are forest owners. But it is possible to review some trends and general issues.

Most family foresters really *tender* their forests. They have an emotional relationship to the forest, and they are proud of their forest, including its biodiversity and occurrences of rare species, if they are aware of them. Today's Swedish forest owner not necessarily depends on the income from the forest. As most of these forests have been managed, often by a rather intense forestry, for generations, the family forester cannot understand that their forestry practices harm biodiversity. Rather they believe that management is needed to preserve the present state of the forest, including its biodiversity. And this is often the start of a conflict.

When the government, often through the county administration, wants to create a nature reserve, the forest owner believes the area will be destroyed. The family forester feels that his or her tender is really needed to maintain the state of the forest, and at the least rumour of authorities taking over, the forests are just left there, without tender. For many forest owners, it is also difficult to understand that even a gentle forestry is regarded as having a negative impact on biodiversity. These conflicting views are really harmful to Swedish biodiversity. As family foresters do not want authorities to "take over" their forests, many forest owners do things to their forests that they really would not want to do, to make the forest less attractive as a protected area.

The solution is simple. Dialogue, and sustainable use. If the forest owner was approached differently, starting with authorities really listening to the family forester, many areas could probably be continuously tendered by its owner with conservation of biodiversity as an integrated aspect of forestry practices. Perhaps some compensation will be needed due to for example the need to use more costly harvesting methods, but altogether it would be a win-win situation, cheaper both in terms of compensation and labour for authorities, better relations between authorities and family foresters, and a good situation for biodiversity.

It is important to take into account in biodiversity conservation that we will need most of the good soils globally to produce raw materials and food needed for the growing human population. Biodiversity must be conserved within these same areas. Thus sustainable use must be the main way forward, and sustainable use of forests must include timber and other wood products. There is a need to try new approaches to sustainable use, not looking backwards on past landscapes, but forward on new approaches and ideas to sustainable forestry.

Family forestry is an important resource in that work, as many different owners potentially can do different things. For example the present Focus on Forests (Kraftsamling Skog) tries to encourage family foresters to a more profitable forestry through sustainable methods. Different people will apply different measures, and we could end up in a choice of approaches, that would need to be evaluated.

A way forward in integrating family forestry in new ways of sustainable use is to give many options, and choices of options. That would put the family forester in charge of his or her estate, while we would get a diversity of forestry practices that, hopefully – at least over larger areas – would promote biodiversity conservation."

General conservation considerations require modifications of logging practices and other forestry operations, on the part of landowners. They should be applied on all forest land. Examples include the retention of snags and trees on clear-cut areas and the establishment of buffer zones along watercourses.

Adapted management methods, which include for example regeneration without clear-cutting. This aspect is more developed in several other European countries.

Voluntary set-aside areas are established when land-owners remove areas from forestry production to establish conservation sites. The concept of voluntary set-asides has been developed during the last decades in co-operation between the certification-systems, the acting of the state and international move-

ments. There are similarities and dissimilarities between the certification standards and the environmental objectives. The voluntary set-asides are mostly a result of the obligations in the certification standards and made from the point of view of the interests of the forestry sector and market demands.

Legal protection is intended to preserve areas with exceptional high natural value. Legal protection refers to national parks, nature reserves, habitat protection areas and nature conservation agreements. It is the intent of the current National Strategy for the Legal Protection of Forest Land that legal protection and voluntary conservation measures shall complement each other, so that as valuable forest as possible is protected within Interim Target 1 of the environmental quality objective Sustainable Forests.

The less developed horizontal integration between the forestry and agricultural sectors is due to the fact that different authorities and legislations are dealing with their own sectors. A contributing factor is that the biodiversity situation in the agricultural landscape is strongly dependent on the agro-environmental payments from the EU, while this is not the case in the forestry sector. Another reason is that historical land tenure patterns often are not considered. The separation of the landscape into agricultural land and production forests is opposed to the traditional practices to graze animals in the forest and have timber and fuel wood production on meadow land. Forest grazing has been and is still in some areas also combined with many other related traditional practices that influence the biodiversity. This kind of traditionally tenured areas is today extremely scarce and subject to a negative trend.

3.1.3 Fisheries

The Swedish Board of Fisheries is the authority responsible for conservation and exploitation of Sweden's fish resources, and as such is represented in the Swedish Environmental Objectives Council. It was given a government assignment to operationalise the concept of sustainable use so that it can be used in the fisheries sector, thereby improving the integration of biodiversity issues in this sector. The board presented its report to the government in December 2007. It is based on an analysis of how to apply the ecosystem approach and its 12 Addis Ababa principles, which lead to the following targets for sustainable use:

- Management should not be focused on single species, but take into account the effects of fishing on the entire ecosystem;
- The extraction of resources should take place at an economically and biologically sustainable level and the methods of fishing should be chosen in such a way as to minimise damage to the environment;
- All new fisheries should be subject to environmental impact analysis so as to minimise the risk of effects on other ecosystems.

Tools to reach these targets include:

- Adaptive management, which in a structured manner records changes, analyses these and adapts management in a conscious and learning process;
- Spatial planning and zoning to regulate the impacts of fisheries on entire ecosystems;
- Adaptation of management measures to the temporal and spatial scale of the ecosystem;
- Inclusion of local stakeholders in freshwater fisheries and coastal fisheries management, analogous to the Regional Advisory Councils established under the EU Common Fisheries Policy;
- Increased cooperation and exchange of information between fishermen and scientists;
- Inclusion of externalities in economic analyses in fisheries management.

In order to allow fish stocks to reach sustainable levels, the Swedish Board of Fisheries has proposed a number of measures in order to reach the environmental interim target on adapting the extraction of fish. These can be summarised as follows:

- The overcapacity in the concerned fisheries shall be phased out according to an adaptation plan;
- Alternative ways of management shall in the longer term replace the existing quoting system;

- Co-management shall ensure increased local influence;
- All Swedish water shall be zoned in regard to allowed fisheries activities;
- The legal framework for access to resources shall be reformed in order to regulate fisheries in a clearer way;
- Selective fishing methods and tools shall be developed and realised in fisheries;
- Better control shall be achieved by more effective routines and technical monitoring of fisheries;
- Knowledge on fisheries and ecosystem-based management shall increase;
- Active participation within the EU system shall lead to higher acceptance for Swedish vews.

Co-management for the lake Vättern

Co-management means, somewhat simplified, that local fishermen, NGOs and authorities share responsibility for fisheries management in a certain area. The Swedish Board of Fisheries has started six pilot projects, commissioned by the government, in which co-management was to be developed. One of them concerns fishing in the lake Vättern, the second largest lake in Sweden. The aim of the project is to reach long-term sustainable fishing in the lake.

Stakeholders should be able to table questions, from different points of view, on how to manage fisheries in the lake and what to do to improve the situation for the declining populations of Arctic char (*Salvenius alpinus*) and common whitefish (*Coregonus laveratus*).

The co-management project is carried out under the auspicies of the Lake Vättern Society of Water Conservation, in which participate municipalities, companies, county administration boards etc. around the lake. The work includes an analysis and possible adaptation of fishing guidelines for the lake, the production of information brochures for use by visitors to the area, and the evaluation of no-fishing zones in the lake, among other things.

3.1.4 Physical planning

The National Board on Housing, Building and Planning has the main responsibility for city planning, building and sustainable use of land and water, which includes biological diversity in urban areas. According to the strategies for urban environments, areas with natural and cultural values should be managed with the aim to preserve and improve their values. The Board is now working to integrate green areas in city planning and to promote planning at the landscape level. Similar work is ongoing for marine environments ("seascape planning"). A handbook on how to perform impact assessments of city plans has been completed and distributed.

The county administrative boards suggest that the situation for biodiversity in urban areas can be improved if it is considered at an early stage of planning and exploitation. Urban biodiversity should also be included in environmental impact assessments to a higher degree (see section 3.4).

3.1.5 Other sectors

The National Food Administration works towards the fulfilment of the Swedish Environmental Objectives within the food sector. This specific responsibility involves a unifying, supporting and inspirational role in the work towards sustainable development. The environmental responsibility for the food sector has led the National Food Administration, among other things, to review its dietary recommendations in the new light of their potential environmental impact. The final product of this activity is dietary recommendations to the consumers that also include environmentally-based advice, or "environmentally-smart food choices". The work is still ongoing to draft these information texts on food choice, and when finalised they will be communicated to the consumers, directly and via various media. The goal with this pro-

ject is to support the consumers in their ambition to choose more environmentally-smart food, which will result in positive effects for our environment.

The Swedish Rail Administration has begun to map the biological diversity along railroads. Most likely there are numerous interesting habitats and species along the tracks but the knowledge is so far insufficient. In the future the Swedish Rail Administration can facilitate the development and conservation of these areas but today such work is done only to a small extent. Most of the work done so far has been measures taken to compensate for negative effects during exploitation. New tracks and constructions are to some extent adjusted to reduce their negative effect on biological diversity. From the perspective of the Swedish Rail Administration the work in this area has just begun, but there are plans to make adjustments to already existing tracks. There is no strategy within the Swedish Rail Administration for how to assess biological diversity and the measures taken are usually on demand from the county administrative board.

For many species of butterflies and dragonflies habitats alongside forest roads and power distribution networks are of great importance since their natural habitat is declining in both quantity and quality. Correct maintenance of areas around these infrastructures is hence important to these species. This means that for example ditching and clearing has to be done in the correct way and in the right time of year. Regarding road building, one county administrative board points out that the Swedish Road Administration should assist in the construction of passages for migrating mammals and other species and that greater concern should be made in general during road construction. It has also been mentioned that there is a need for more education and information about these environment and the species depending on them.

The Swedish International Development Cooperation Agency (Sida) has worked with integrating the objectives of the CBD into its work since the convention was ratified (see section 2.3.13). Sida supports, through SwedBio, the United Nations University Institute of Advanced Studies (UNU-IAS) for the project “Assessing implementation of CBD National Biodiversity Strategies and Action Plans”. This project aims to provide a comprehensive assessment of the preparation, content, adequacy and effectiveness of existing NBSAPs and will attempt to analyse why some countries seem to have developed successful and well-implemented NBSAPs, while others appear to have been unable to do so. It will also assess to what extent the NBSAPs integrate biodiversity concerns into sectoral and cross-sectoral policies including sustainable development strategies, poverty reduction strategy papers (PRSPS) and national processes, to meet the MDGs.

3.2 The ecosystem approach

Although most people active in Swedish nature conservation probably don't know the phrase “ecosystem approach”, nature conservation has been working according to many of the concepts detailed within the approach for a long time.

The ecosystem approach is a corner stone in Swedish environmental policy, as expressed *e.g.* in the 2002 government communication to Parliament: ”A Comprehensive Policy for Nature Conservation”, it is highlighted in the Strategy for management of land, water and built environment, adopted by Parliament, and the definition of the environmental quality objective *A Rich Diversity of Plant and Animal Life* is clearly based on the ecosystem approach.

The Swedish implementation of the CBD principles for the ecosystem approach

Principle 1: The objectives of management of land, water and living resources are a matter of societal choice.

The goals of all management and conservation are essentially political decisions, which need a democratic underpinning. As a point in case, all environmental objectives as well as the interim targets have

been adopted by Parliament. To gain support, all political ideas need good arguments. No argument can be taken as granted, as being more objective than any other argument.

Principle 2: Management should be decentralised to the lowest appropriate level.
This principle is applied to the responsibility for land use planning, as that is given to the local municipality. Many of the policies that set objectives, principles and values have been formulated at the national level, or even at EU-level, and often guidelines are issued on how the policies could be implemented at a sub-national or local level. County administrations and municipalities also set their own environmental objectives, interpreting and completing the national ones. Increasingly, responsibility is being decentralised. For instance are proposals being formulated on how to increase sub-national influence on the management of big predators.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
The environmental quality objective is interpreted to mean that action by central and local government to preserve biological diversity should be undertaken from a landscape perspective on ecosystem management. As shown below, this notion does exist at the central and local level, but the tools needed are still far from well developed.

Principle 4: Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:
(a) Reduce those market distortions that adversely affect biological diversity;
(b) Align incentives to promote biodiversity conservation and sustainable use;
(c) Internalise costs and benefits in the given ecosystem to the extent feasible.
Again, this principle is supported by Swedish policy, and the number of market distortions that affect biodiversity negatively has been reduced both in Sweden and the EU(see section 2.3.9), even though others still exist. We still have a long way to go before all incentives are aligned, and especially before we find ways to internalise costs. Much of this work has to be done at the EU level.

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
The environmental quality objectives related to biodiversity are formulated to mean that the buffering capacity of ecosystems - their ability to cope with change and undergo further development so that they can continue to be productive and deliver goods and services - is maintained. Conceptually, this is something much more complicated than the preservation of the odd threatened species. There is in many cases a need for improved knowledge on the actual relationship between biodiversity components and the functioning of ecosystems.

Principle 6: Ecosystems must be managed within the limits of their functioning.
Again, the environmental quality objectives demand that species and ecosystems that are exploited, *e.g.* through hunting or fishing, are managed in such a way that they can be harvested as a renewable resource in the long term without affecting ecosystem structures or functions. To achieve this, we need to understand where the limits are, *e.g.* in terms of number of species in an ecosystem, or degree of genetic variation in a population.

Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Principle 8: Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term
Principle 9: Management must recognise that change is inevitable.
Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
The environmental quality objective A rich variety of plant and animal life specifies that biological diversity should primarily be maintained through a combination of sustainable use of biological resources, conservation of species and their habitats, measures to minimise the pollutant load, and action to limit climate impact, which reflects principle 10.

Principles 6-10 essentially specify different aspects of sustainable use. The concept of sustainable use is widely employed withiou a clear definition. Sustainable use is mentioned explicitly in one of the interim targets of A rich diversity of plant and animal life. Moreover, sustainable use is, without being mentioned explicitly, the focus of various other environmental objectives, most obviously Sustainable forests, A varied agricultural landscape, and A balanced marine environment. Sweden has made attempts to formulate a working definition of the concept, to be applied in forestry, agriculture and fisheries, but so far with limited success. The definition must include aspects of spatial and temporal scale, specifying *e.g.* how large the landscape is within which sustainability must be achieved. Another aspect is the degree of change to the biodiversity that can be accepted and still be reconciled with the general definition formulated by CBD, that there must be no long term loss of biodiversity. In accordance with principle 1, a political process must also decide which components of biodiversity should be included in the working definition, as it is practically impossible to measure all components. Sweden cannot safely maintain that its use of biological resources is sustainable, neither in forestry, agriculture nor fisheries.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
The environmental quality objective A rich variety of plant and animal life demands that traditional and local knowledge about biological diversity and its benefits should be safeguarded and used appropriately. Sweden has indeed initiated a national programme for traditional knowledge (see section 2.3.16). It is however far from certain how such knowledge will be safeguarded and applied to achieve sustainable use. Many indigenous and local communities using traditional methods complain that their knowledge is not wanted, and that their voices are not heard (see section 2.5.1).

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.
Swedish policy is very clear on this point: there is a sectoral responsibility for the conservation and sustainable use of biodiversity. In actual practice very much has indeed been achieved. There is a widespread willingness to assume that responsibility, and some very promising results have been shown (see section 3.1). There is however still much more to be done. The ecosystem approach must be based on efficient horizontal integration between sectors, and between different scales in the societal organisation. We still need to develop better tools for the integration of the conservation sector, the cultural heritage sector, forestry, agriculture and so on, as well as between the national, regional and local level.

Competing sectoral interests
The ecosystem approach means that the interests of all stakeholders, and activities within a range of sectors, must be considered within a common framework, and that a balance must be found where different ways to use the resources compete with each other.

In northern Sweden, where the Sami people use forests for winter reindeer grazing, forest management is expected to be undertaken with consideration taken to the reindeer management through local participation in a multi-stakeholder approach. The indigenous Sami people have the traditional right to herd their animals over vast areas in northern Sweden, although they have no ownership rights. Forestry often negatively affects grazing conditions, while on the other hand the reindeer may damage young forest stands. In actual practice, the two stakeholder categories often do not agree on how to share the landscape.

The right to hunt game belongs to the owner of the land. When game populations are too abundant relative to the amount of fodder on the land serious game damage to trees and vegetation may occur. Despite constant or even declining moose populations in the 1990s, the damage to young pine stands has increased, indicating a need for further reductions in abundance. The hunters are normally unwilling to accept lower moose abundances. In both cases conflicts of interest easily emerge, in this case between land-owners with different ways to gain profit from their land.

The traditional rights of the Sami people and the rights of the hunters may be seen as impeding factors for commercial forest management. Considering the broad scope of the sustainable forest management concept they should not; balancing the interests of the different users of the forests is actually part of the forest policy process, as well as of national policy processes on reindeer herding and hunting. The challenge is to shape and employ tools that can achieve such a balance.

Landscape strategies

The ecosystem approach has been adopted in the concept of Landscape Strategies which has been tried in seven pilot studies at the county level (Sweden has 21 county administration boards that implement government policy at the regional level), by commission of the national government. The idea has been to integrate conservation and sustainable use of natural resources in a landscape perspective, with a good balance between conservation and use, and with the involvement of all relevant stakeholders on local and regional level.

The outcome of the pilot studies is promising, especially when it comes to the horizontal co-operation and sectoral integration. Landscape strategies proved to be a valuable tool for more efficient sectoral work, in order to achieve sustainable use and conservation on the landscape level, with a large involvement from different stakeholders. As a consequence of this, the government has obliged all county administration boards to initiate this kind of activities during 2009.

The ecosystem approach in the municipal planning processes

Sweden consists of 290 local municipalities, ranging in size from 9 to almost 20 000 square kilometres. Each municipality performs comprehensive plans for the use of all land within the municipality, as well as detailed development plans, covering smaller sections. The comprehensive plans should, according to national policy, follow the ecosystem approach, although the strict legal requirements are rather limited. In practice, the actual achievement of an ecosystem approach varies considerably between different municipalities. Most municipalities have adopted a strategy for the inclusion of biodiversity issues, or at least a nature conservation plan, that employs several of the CBD principles, but there is very little awareness about the basis in CBD COP decisions.

The planning processes at the local municipal level, and the landscape strategies proposed to be erected by the regional county administrative boards, are actually concerned with the same landscape, but at different scales. This fact has been perceived as a problem.

Some municipalities have dedicated officers for ecological matters, with a clear mandate to integrate biodiversity issues in all municipal activities. In other municipalities there may be an ecologist employed, but without the mandate to work outside the conservation sector. A number of municipalities do not even employ an ecologist. The result is that some municipalities are satisfied to follow the letter of the law,

which means that they perform EIAs and hold public enquiries, whereas other municipalities have established comprehensive strategies and action plans, perform systematic inventories, collect data in public databases, employ GIS-tools for biodiversity mapping and consequence analyses, and have developed fora for interaction with the general public.

An officer employed by a municipality in Southern Sweden expresses his/her views on the ecosystem approach: ”The term ’ecosystem approach’ is not applied to the work done by the municipality. I did not even know about the existence of the concept, until prompted to describe how we have implemented it. I do however employ the landscape perspective when I argue for the need to consider each conservation object as part of a larger system. There is at present no municipal nature conservation plan, and no explicit strategies for biodiversity issues. The national environmental quality objectives do however offer guidance. The municipal ecologist cooperates widely with the municipal offices for recreation, health, tourism and cultural heritage. This makes it easier for the politicians to make decisions, as they are more likely to see the connections between the different interests and sectors, and the value of biodiversity.”

Another view expressed by an employee of a municipality further north similarly shows little familiarity with the concept of ecosystem approach, but nevertheless describes ambitions to apply several of the CBD principles: ”The term ’ecosystem approach’ as such is not used in our planning work, probably because of its rather cryptic nature. It is difficult for the uninitiated to immediately see that the term actually stands for a method to conserve and use natural resources sustainably with a landscape perspective. The term widely used, perhaps too often, is ’sustainable development’, with its ecological, social and economic dimensions. Perhaps this is in fact an application of the ecosystem approach. It is however not evident that the resulting planning work actually follows the ecosystem approach.

The municipality attempts to apply a landscape ecology perspective to the planning of urban green structures, through a network of interconnected conservation areas. Core areas of high nature conservation value have been identified, and the surrounding landscape will be managed to minimise the risk of isolation. There is however no strategical decision to underpin this work and the municipality does not always succeed in its landscape ecology ambitions.”

The ecosystem approach in Swedish international development cooperation

The Addis Ababa principles and guidelines correspond well the criteria and strategy for work with biodiversity formulated by the Swedish International Development Cooperation Agency (Sida) and Sida-supported SwedBio. Both support to biodiversity-focused projects as well as broader work on integration of biodiversity aspects within NRM-programmes fits well with the Addis Ababa principles. However, the aim has not been to support implementation of the guidelines per se, rather they are now being used as an additional point of reference when programmes and projects are designed.

Millennium Ecosystem Assessment

Sida has provided funding for the initial MA process and has very actively responded to the MA. Sida has noted the strategic importance of both the MA conceptual framework and the specific findings and conclusions of the MA. Sida has primarily focused on the huge potential of MA to integrate environmental concerns in development, and hence focuses on encouraging and promoting use of MA in decision-making and planning and programming frameworks, both within its own operations and in partner countries.

Sida has actively contributed to encouraging and catalysing global policy dialogue on MA follow-up. For example, in close cooperation with the Swedish Ministry of Environment, Sida (both directly and through its helpdesk on biodiversity, SwedBio) engaged in dialogue and consultation with UNEP and other key stakeholders on launching a global strategy for MA follow-up with UNEP as anchor institution. The financial support to MA follow-up is closely interrelated with the policy dialogue. Sida has increas-

ingly been using the MA conceptual framework in its internal operational tools, such as poverty-environment briefs developed as part of the process to develop national/regional cooperation strategies.

3.4 Biodiversity in environmental impact assessment

There is Swedish legislation in place regulating projects that are likely to have a significant effect on biological diversity. For activities and measures that may have a significant effect on biological diversity within protected areas of the Natura 2000 network there is an explicit demand for EIAs to be performed. This also applies to all environmentally hazardous projects, water regulating activities, and to gravel extraction and similar activities. In such cases the EIA shall contain assessment of possible risks to the environment and biological diversity.

Swedish legislation addresses the effect of plans and policies on biological diversity. Whenever there is reason to believe that a new plan or programme to be established by an authority may cause a significant effect on the environment, an EIA is mandatory. In municipality plans, *e.g.* comprehensive plans, programmes and detailed development plans, attention must be paid to areas of national interest and formally projected areas such as Natura 2000 areas, national parks, nature reserves, bank protection etc. Concepts becoming more common, especially in comprehensive plans, are large undisturbed areas, ecological sensitive areas and, sometimes, biosphere areas.

The Swedish Biodiversity Centre has, as a government assignment, performed an analysis of the Swedish implementation of the CBD guidelines for EIAs (see www.cbm.slu.se). The analysis showed that most of the guidelines have been implemented in relevant legislation. However, EIAs are mandatory only for projects causing significant impact, and requirements on monitoring and auditing are missing. The guidelines have been applied in a small proportion of EIAs actually performed (about 15%). For an effective consideration of biodiversity issues in EIAs there is a need for a larger-scale strategy, for example a landscape ecological analysis, showing important connections in the landscape, and setting threshold levels for the amount of critical habitats. Without such a tool each EIA case is considered at much too small a spatial scale. At present no such large-scale strategies exist, and the biodiversity issues are hence not fully considered in the general EIA and SEA applications.

Most EIAs are performed by consultant companies, which follow the specifications given by the clients, which in turn are guided by the criteria employed by the competent authority that will receive the assessment and make a decision. The analysis of the Swedish implementation of CBD guidelines suggested that the competent authorities, as well as the clients, should issue more specific criteria for the assessment of effects on biodiversity per se.

The Swedish EIA Centre has received the focal responsibility for article 14, *Impact Assessment and Minimising Adverse Impacts*. In order to deal with this task the Centre has among other things translated the document *Biodiversity in EIA & SEA Background Document to CBD Decision VIII/28: Voluntary Guidelines on Biodiversity-inclusive Impact Assessment* (Commission for Environmental Assessment, 2006) into Swedish (Swedish EIA Centre, 2007). The main purposes for the translation are (1) to improve focus on the obligations the CBD implies according to article 14; (2) to facilitate the incorporation of biological diversity in impact assessments; (3) to create a framework of concepts in Swedish.

On the basis of the translated document two workshops were held in autumn 2007 with invited representatives from several Swedish agencies, viz. the Swedish Road Administration, the Swedish Rail Administration, the Swedish Environmental Protection Agency and the Swedish International Development Cooperation Agency, three county administration boards, and in addition, a number of consultants. Among the participants there was consensus on the need for guidance on how to deal with biodiversity in EIA and SEA. Guidance in form of an operative guideline will not only improve the assessment process but also help for example the county administration boards to guide stakeholders in a more uniform way

independently of where situated in Sweden. An operative guideline would also help consultants in their work with EIA or SEA. The workshops resulted in several suggestions on how to improve the impact assessment processes with respect to biodiversity in projects as well as in municipality planning. One interesting example was to combine the levels of biodiversity, *i.e.,* landscape, ecosystem, species and genotypes, with composition, structure and key processes in a matrix. This would improve the incorporation of biodiversity values in impact assessments considerably. The matrix could also continuously be used in an EIA-process, for example in the scoping stage.

In order to facilitate the inclusion of biodiversity issues in EIAs and SEAs, the National Board of Housing, Building and Planning has issued a guide to the application of the current national and European legislation, describing *e.g.* how comprehensive plans and detailed development plans at the municipal level must employ the EIA tools.

Sweden is party to the Esbo Convention (Convention of Environmental Impact Assessment in a transboundary context), and to the Helsinki Convention (Convention on the protection of the marine environment of the Baltic Sea). These conventions stipulate the establishment of mechanisms for notification on projects that may have transboundary effects, and for the neighbouring countries right to participate in the EIA process.

Sweden cooperates with the other European Union members in the development and implementation of relevant legislation, *e.g.* the Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. Within Sweden’s international development cooperation elaborate guidelines, including biodiversity aspects, have been developed by Sida, including a mandatory process for carrying out EIAs of all projects/programmes and SEAs of strategies/polices.

3.5 Other convention processes

Sweden has signed and ratified a large number of international conventions and treaties relevant to the conservation and sustainable use of biodiversity. The following list is a compilation of the most important ones:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Convention on Migratory Species (CMS)
Convention on Wetlands (Ramsar Convention)
World Heritage Convention
United Nations Framework Convention on Climate Change (UNFCCC)
United Nations Convention to Combat Desertification (UNCCD)
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)
Helsinki Convention (governing body: HELCOM, Helsinki Commission)
OSPAR Convention (governing body: OSPARCOM, OSPAR Commission)
Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)
International Convention for the Regulation of Whaling
International Convention for the Control and Management of Ships' Ballast Water and Sediments (pending)
International Convention on the Control of Harmful Anti-Fouling systems on Ships
International Plant Protection Convention (IPPC)
International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

Note that the Convention for the Control and Management of Ships' Ballast Water and Sediments has still not entered into force. Sweden intends to ratify the convention in the near future (see section 2.3.15).

In addition Sweden holds membership in a range of international organisations that also significantly affect our work with biodiversity, *e.g.* the World Trade Organization (WTO), the World Organisation for Animal Health (OIE), the World Conservation Union (IUCN), and the International Maritime Organization (IMO).

Sweden strives to achieve mutual supportiveness of international agreements. The challenges of balancing conflicting interests and enhancing communication between sectors are, however, apparent both in the negotiation and implementation phases. Sweden's Environmental Quality Objectives is an attempt to facilitate coherence and mainstreaming of environmental issues into the relevant sectors of society. In order to make the system more efficient the government initiated a public inquiry in 2008. One of the main tasks of the inquiry is to improve considerations of the international dimensions of environmental issues.

4. Conclusions: Progress towards the 2010 target and implementation of the Strategic plan

4.1 Progress towards the 2010 targets

Sweden will not meet the 2010 biodiversity targets. An analysis shows that most of the goals and targets cannot be met by 2010, even though Sweden has made a significant effort to achieve every single one. To be fair, even if our policies and actions turn out to be appropriate and sufficient to achieve conservation and sustainable use of all our biodiversity components, it is hardly possible to detect any change in trends by 2010. One reason is that the response of ecosystems can be expected to be slow, and degraded habitats may take long time to recover. Another reason is the simple fact that it is hard to show statistically significant trends over short time periods.

A short account of Swedish progress made towards the 2010 biodiversity targets is included in table 4.1 below, for each of the goals and targets. Examples of the most relevant Swedish objectives and targets within the Environmental Quality Objectives framework are listed in Annex IV.

Most Swedish objectives and interim targets are well integrated into relevant sectoral and cross-sectoral strategies, plans and programmes. A range of different indicators are used to monitor progress towards the objectives and targets.

Table 4.1. Provisional framework of goals, targets and indicators to assess progress towards the 2010 Biodiversity Target, with the Swedish objectives and targets, progress towards the 2010 targets, and obstacles identified.

Goals and targets	**Sweden**
Protect the components of biodiversity	
Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes	
Target 1.1: At least 10% of each of the world's ecological regions effectively conserved. Target 1.2: Areas of particular importance to biodiversity protected	The Swedish objectives do not express the target to conserve 10% of of each ecological region, at least not in the form of protected areas. In most cases less than 10% will be formally protected, but the expectation is that the majority of ecosystems and habitats will be conserved through sustainable use. Sweden has made significant progress towards the protection of a wide range of particularly important habitats, such as old-growth forest, species-rich meadows and pastures on semi-natural grasslands, wetlands, mountains, lakes and rivers and marine habitats. As indicated by the red and yellow colour above, more work remains before the national objectives are met. The main obstacles to the formal protection of habitats are a shortage of funding for land procurement and shortage of conservation staff. There is also a need to further develop the working methods in order to increase efficiency and increase the involvement of stakeholders.. Other important obstacles arecompeting land and water utilisation demands (see section 2.3). The goal will not be met by 2010.
Goal 2. Promote the conservation of species diversity	
Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.	A large proportion of the Swedish fauna and flora has been assessed and and national red-list based on interna-

Target 2.2: Status of threatened species improved.	tionally accepted criteria is available. More than 3600 species are included (18% of all assessed). There has been no improvement in the proportion of species that are red-listed, and a large number of common species show negative trends. A significant number of species have recovered thanks to active efforts, but they are outnumbered by the declining ones. Action plans are being launched for all species that may benefit from specific measures, whereas the needs of the majority of species are addressed through general habitat management measures. The main threat to species is insufficient areas of high quality habitats. This goal is hence dependent on the achievement of goal 1, conservation of habitats, and the same obstacles apply here (see section 2.3). In addition, there is a need to establish and apply appropriate habitat management regimes for protected areas, and in the sustainable use of non-protected areas, to increase the quality of habitats. Very few species are threatened through direct persecution or overharvesting, but there are notable exceptions, especially in the marine environment. The goal will not be met by 2010.
Goal 3. Promote the conservation of genetic diversity	
Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.	The genetic diversity of crops, including the associated indigenous knowledge, is addressed through a national programme (see section 2.3.8) that will meet the target. For livestock a similar programme is planned, but not as well advanced yet. In both cases progress is mainly a question of allocation of funds and organisational matters. The genetic diversity of wild fauna and flora is a completely different matter. Plans are made for an assessment and monitoring programme, but it will not be operational by 2010. The knowledge about genetic diversity in most taxonomic groups is limited, including baseline levels of variation, spatial patterns, and effects of harvesting or habitat changes. The most important obstacles are a low level of recognition of this goal among decision-makers, lack of funding and limited knowledge (see section 2.3.8). The goal will only partially be met by 2010.
Promote sustainable use	
Goal 4. Promote sustainable use and consumption.	
Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity. Target 4.2. Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced.	Sustainable use is a cornerstone in the Swedish biodiversity strategy. Policy documents, objectives and targets express that protected areas will not be sufficient; a well managed landscape that is also used for commercial gain is expected to support a large proportion of the biodiversity. The objectives and targets have been well integrated into sectoral plans and processes, including in the private sector. The sectors have put significant resources into the implementation of sustainable use, *e.g.* through the certification of forestry activities. Sweden has however not achieved sustainable use in any single sector, and will not do so in time to meet the 2010 targets.

	A particular obstacle is that the concept has not been given an operational definition within the sectors. It is still not clear what action is needed to achieve sustainability, nor how it is measured and monitored. For now, the Swedish environmental objectives are only concerned with environmental impact within Sweden. However, it is stated explicitly that environmental objectives may not be reached by exporting the environmental impacts. Yet, no assessment has been made of whether Swedish consumption of imported goods meets target 4.1. The goal will not be met by 2010.
Target 4.3: No species of wild flora or fauna endangered by international trade.	This goal is already met, regarding indigenous species. Importation into Sweden of species that are threatened elsewhere is strictly regulated.
Address threats to biodiversity	
Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.	
Target 5.1. Rate of loss and degradation of natural habitats decreased.	Acidification of lakes, streams and forest soil has decreased significantly during the last 20 years. The amounts of dead wood and deciduous trees in forest have increased. Wetlands and rivers have been restored. These are all examples of very valuable improvements to Swedish ecosystems. The rate of restoration is however not high enough for the objectives to be met by 2010 (nor by 2020). Valuable natural habitats are still being degraded, *e.g.* old-growth forests, and the seabed of the Baltic Sea, through clear-felling and eutrophication, respectively. The main obstacles are shortage of funding for restoration measures, shortage of agency manpower, insufficient knowledge about appropriate habitat management practices, unclear criteria for the achievement of sustainable use at the ecosystem level, and competing exploitation interests (see section 2.3). In several cases international cooperation is necessary, *e.g.* to improve habitat status in the Baltic Sea. Sweden has certainly reduced the rate of habitat loss and degradation in many habitats, but more remains to be done.
Goal 6. Control threats from invasive alien species	
Target 6.1. Pathways for major potential alien invasive species controlled. Target 6.2. Management plans in place for major alien species that threaten ecosystems, habitats or species.	Sweden has achieved a high level of protection against invasive alien species that could threaten crops, livestock and human health. Most intentional releases of such species are strictly regulated, and risk analysis and permit systems are in place (see section 2.3.15). Alien species that could threaten wild fauna and flora or ecosystem functioning are much less well regulated. Many pathways of unintentional introductions are still not controlled, *e.g.* ballast water transportation. There is no comprehensive organisation to monitor or control invasive species outside the agricultural and forestry sectors. The goal will not be met by 2010.
Goal 7. Address challenges to biodiversity from climate change, and pollution	
Target 7.1. Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	Sweden has made progress in the reduction of greenhouse gas emissions. Our ability to maintain and en-

	hance resilience of the components of biodiversity is very much dependent on the achievement of other goals. Another obstacle is the lack of knowledge of the relationship between biodiversity and climate change, and about measures to increase resilience. The target will not be met by 2010.
Target 7.2. Reduce pollution and its impacts on biodiversity.	Sweden has put much effort into meeting this target, and much progress has been made, *e.g.* in the reduction of emissions of sulphur dioxide, gases that threaten the ozone layer, and in many toxic compounds. The situation in natural habitats is however still far from satisfying, with toxic compounds stored in sediments or still accumulating in trophic chains. Sweden has certainly reduced pollution loads and emissions, but more remains to be done.
MAINTAIN GOODS AND SERVICES FROM BIODIVERSITY TO SUPPORT HUMAN WELL-BEING	
Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods	
Target 8.1. Capacity of ecosystems to deliver goods and services maintained. Target 8.2. Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.	The maintenance of ecosystem services is clearly formulated at the policy level, and most of the environmental quality objectives are designed to make it possible to achieve this goal. We have very little knowledge about the actual relationship between biodiversity components and the functioning of ecosystems, and their capacity to deliver services. This is an active field of research, but we are not now in a position to say that we have secured services for long-term use. In addition to lack of knowledge, important obstacles include the failure to internalise the cost of loss of services, and to put market values on services. We cannot safely state that this target will be met by 2010.
Protect traditional knowledge, innovations and practices	
Goal 9 Maintain socio-cultural diversity of indigenous and local communities	
Target 9.1. Protect traditional knowledge, innovations and practices. Target 9.2. Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit-sharing.	Sweden has initiated a national programme to achieve target 9.1 (see section 2.3.16). The programme will inventory, safe-guard and explore traditional knowledge, and make it available to the extent allowed by the owners of the knowledge. This work will however not be completed by 2010. It is likely that this goal will be met, but not by 2010.
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Target 10.1. All access to genetic resources is in line with the Convention on Biological Diversity and its relevant provisions. Target 10.2. Benefits arising from the commercial and other utilisation of genetic resources shared in a fair and equitable way with the countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions	There are no restrictions on access to genetic resources in Sweden, apart from those imposed by laws governing immaterial rights (see section 2.3.12). Sweden encourages users of genetic resources sourced in other countries to enter into formal agreements on access and benefit-sharing, in accordance with CBD provisions. The fulfilment of Target 10.2 will be greatly facilitated by an agreement in 2010 on an international regime for access and benefit sharing.

Ensure provision of adequate resources	
Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention	
Target 11.1. New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20. Target 11.2. Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.	Sweden has developed a clear policy for its international development cooperation that includes biodiversity issues (see section 2.3.13). A wide range of cooperative programmes and projects constitute Sweden's contribution to this goal. Financial resources as well as technology and knowledge are routinely transferred to developing countries. Sweden is also gaining insights and knowledge from this cooperation. In this respect, it is fair to consider the goal to be met.

4.2 Progress towards the goals and objectives of the Strategic plan of the convention

Sweden is making good progress towards the goals and objectives of the Strategic Plan of the Convention. The analysis presented in table 4.2 shows that most goals and objectives have been addressed, and in several cases the goals have been achieved. Meeting the goals of the Strategic Plan means that the real work to achieve the goals of the Convention has been initiated, but not necessarily that we have succeeded in reaching effective conservation, sustainable use and benefit-sharing.

Table 4.2. Goals and objectives of the Strategic Plan and provisional indicators for assessing progress, with the Swedish progress towards the goals and objectives of the Strategic plan indicated.

STRATEGIC GOALS AND OBJECTIVES	*SWEDEN*
Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.	
1.1 The Convention is setting the global biodiversity agenda.	Sweden actively promotes the Convention in its international work.
1.2 The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.	
1.3 Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.	
1.4 The Cartagena Protocol on Biosafety is widely implemented.	Sweden has implemented the Cartagena protocol
1.5 Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programmes and policies at the regional and global levels.	Not applicable
1.6 Parties are collaborating at the regional and subregional levels to implement the Convention.	Sweden collaborates widely within its region, *e.g.* in the context of the European Union, the Baltic Sea region, the Nordic countries, and the North-East Atlantic region.
Goal 2: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.	

2.1 All Parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.	Sweden as a country has adequate funding for implementation of priority actions. This does not mean that all measures called for in national strategies and action plans are fully funded, and the government is not necessarily the source of all funding. The sectoral responsibility implies that the private sector will contribute to the implementation.
2.2 Developing country Parties, in particular the least developed and the small island developing States amongst them, and other Parties with economies in transition, have sufficient resources available to implement the three objectives of the Convention.	Sweden makes a significant contribution to developing country Parties, both directly and through international organisations such as UNEP and IUCN.
2.3 Developing country Parties, in particular the least developed and the small island developing States amongst them, and other Parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol on Biosafety.	Sweden makes a significant contribution to developing country Parties, both directly and through international organisations such as UNEP and IUCN.
2.4 All Parties have adequate capacity to implement the Cartagena Protocol on Biosafety.	Sweden has adequate capacity to implement the Cartagena protocol.
2.5 Technical and scientific cooperation is making a significant contribution to building capacity.	Technical and scientific cooperation is well developed, and strongly benefits our strivings to achieve conservation and sustainable use.
Goal 3: National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.	
3.1 Every Party has effective national strategies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.	Sweden has effective national strategies, plans and programmes in place.
3.2 Every Party to the Cartagena Protocol on Biosafety has a regulatory framework in place and functioning to implement the Protocol.	Sweden has a regulatory framework in place and functioning to implement the Cartagena protocol.
3.3 Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.	Biodiversity concerns are integrated in Swedish sectoral law, policies, strategies and programmes.
3.4 The priorities in national biodiversity strategies and action plans are being actively implemented, as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.	The national biodiversity strategy and action plans are being implemented. Based on the assessment of our chances to meet the national objectives by 2020, the implementation is not yet sufficient.
Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.	
4.1 All Parties are implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention.	Sweden is promoting public participation in support of the implementation of the national environmental objectives and targets. There is no comprehensive CEPA strategy, but the subject appears in other strategies and programmes (see section 2.3.11).

4.2 Every Party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness, education and participation in support of the Protocol.	There is a continuing debate on biosafety issues among the general public and non-governmental organisations. The Swedish authorities have a common website covering all legal aspects of biosafety. The Swedish Gene Technology Board and the Swedish Board of Agriculture have especially contributed to public awareness and education in the biosafety field.
4.3 Indigenous and local communities are effectively involved in implementation and in the processes of the Convention, at national, regional and international levels.	Indigenous and local communities are involved in implementation and in the processes of the Convention, but not necessarily to the extent they would prefer (see section 2.5.1).
4.4 Key actors and stakeholders, including the private sector, are engaged in partnership to implement the Convention and are integrating biodiversity concerns into their relevant sectoral and cross-sectoral plans, programmes and policies.	The private sector, non-governmental organisations, and the general public are engaged in partnerships to implement the Convention. There are many cases of successful integration of biodiversity issues into their plans, programmes and policies. There are however large variations in the amount of engagement, and in the degree of integration. Sweden has not yet achieved sustainable use of its biodiversity resources, and in many cases a more explicit asssumption of the sectoral responsibility seems necessary. The integration within sectors, between the private and public actors, and between the national, regional and local scales, also need improvement.

4.3 Conclusions

Impact of CBD implementation

The Convention has been in force for 15 years. During this time, it has proven to be of utmost importance in negotiations and practical work on biodiversity at the national and international level. Still, however, we cannot detect the major change in trends we were hoping for. The reason for this is probably twofold: implementation is not yet sufficient, and natural processes often take a longer time to show changes – for better or worse.

The implementation of CBD in Sweden has improved nature conservation and the attempts at achieving sustainable use. The CBD process has developed or promoted the use of concepts such as sectoral integration, sustainable use, precautionary principle, ecosystem approach, and ecosystem services, and it has significantly broadened the concept of biological diversity. These concepts have opened up new ways to deal with our environmental issues. The CBD provides a framework for a holistic approach to all biological resources.

Sweden will not meet the 2010 biodiversity target in its stricter form, as adopted by the European Union. However, a fair number of the goals and targets are met or within reach, provided that efforts are increased. Sustainable use of all biological diversity will not be achieved by 2010, but the process of understanding and employing the concept of sustainable use has started.

The 2010 biodiversity targets are very ambitious, probably too ambitious in terms of the timescale, but not in terms of what needs to be done. Their great importance lies in the processes they have started, which should be allowed to grow stronger and eventually lead to achieving the objectives and targets, even if that will take place beyond 2010. Therefore, it is important that the Swedish objectives and the global biodiversity targets be evaluated and renewed .

Lessons learned

Successful implementation of CBD, *e.g.* through the ecosystem approach, is based on networks of communicating people, companies and authorities that very often have opposing agendas. Conflicts of interest need to be addressed in a constructive way. Traditional administrative processes often work top-down, whereas CBD implementation often must be based on bottom-up approaches to be successful. Neglect to involve local people and companies is often detrimental to the implementation process (see section 2.5.1). Therefore, an ambitious programme has been initiated by the Swedish Environmental Protection Agency in order to make nature conservation professionals aware on how to involve stakeholders.

Another example of the inefficiency that may result if different sectors are not integrated when they face similar problems is the case of management of invasive alien species (2.3.14). Lack of coordination and a clear distribution of mandate to act among the large number of authorities involved, have often given the invasive species a head-start.

Another simple lesson is that short-term economical interests often prove to be a tough opponent to conservation or sustainable use. Strong and well coordinated incentive measures, and ways to internalise costs in terms of loss of ecosystems services, and to value biodiversity in economic terms can probably constitute arguments for longer-term strategies.

Finally, the lack of a working definition of sustainable use in the various sectors is one important reason why we cannot state that we have achieved sustainable use. Without a definition that clearly states which biodiversity is concerned, how much change in it that is acceptable, over how long time, and over how large area, it is not possible to set up criteria for monitoring of sustainability, or to optimise the use of biodiversity resources.

Turning to cases of successful implementation of the Convention in Sweden, it is easy to list a large number of very good lessons. Two factors describe many of these successful cases. First, they engage local people, and second, they involve private companies that assume their sectoral responsibility.

The account on the implementation in forests (section 2.3.3) describes how forest certification schemes have attracted a very large proportion of Swedish forest owners, how voluntary set-asides increase the area of protected forest, without being formally protected, and how the ecosystem approach has been employed to solve local conflicts of interest (Box 2 in section 2.3.3). It is true that both the certified forestry activities, and the long-term viability of voluntary set-asides must be evaluated and monitored, but the examples show a strong will to contribute towards sustainable use.

In the agricultural sector, farmers have also shown a will to contribute, through their ongoing management of threatened biotopes such as semi-natural grassland (see section 2.3.2). Much of these activities are supported by a detailed economical incentive programme, and a rural development programme, both supported by the European Union. This example shows that biodiversity can be efficiently conserved through well-designed incentive programmes.

Another successful incentive programme concerns local municipalities that have received government support to initiate 195 local projects for sustainable development and conservation of biodiversity (see sections 2.3.9 and 2.3.11).

The general public has much to offer, in terms of knowledge about biodiversity, both recent and traditional. The Species Gateway is an Internet-based database to which the public is invited to submit their observations of fauna and flora (see section 2.3.7). The project started in 2000, and now hosts information on 16 million observations of birds, fish, other vertebrates, invertebrates, plants and fungi. The input increases steadily and now approaches 5 million records per year. The national programme for cultivated plants (POM, section 2.3.8), has engaged several hundred amateurs interested in gardening, and given them a crash-course in inventory techniques for old Swedish plant material. Large-scale inventories have since produced thousands of plant specimens that will enter the national gene bank. In addition to the

specimens, each plant also is accompanied by a story, giving detailed information on the traditional way to grow and use the plant.

Capacity-building needs and future priorities

Based on the account of threats and results of the implementation process, a range of capacity-building needs can be discerned. The following list includes some of the more obvious ones, but is not exhaustive.

Capacity-building needs:

- Construction of incentive measures that will facilitate sustainable use
- Methods for economic valuation of biodiversity and ecosystem services
- Working definitions and follow up methods for sustainable use
- Improved knowledge base for prognoses and planning with regard to effects of climate change on habitat types, species and ecosystem services.
- Knowledge about the genetic diversity of wild fauna and flora, and a monitoring system
- Methods to assess and control pathways for invasive alien species, *e.g.* ballast water treatment
- Improved capacity of sub-national autorities on involvement of stakeholders in plans and decisions about conservation and sustainable on landscape level.
- Capacity for entering partnerships between official and private actors.
- Improved consideration of the international aspects of environmental work within Sweden's system of national Environmental Quality Objectives.

Appendix I. Information concerning reporting Party and preparation of national report

A. Reporting Party

Contracting Party	
NATIONAL FOCAL POINT	
Full name of the institution	***Ministry of the Environment***
Name and title of contact officer	***Lars Berg, Desk Officer***
Mailing address	***SE-103 33 Stockholm***
Telephone	***+46-8405 1000***
Fax	***+46-8 21 91 70***
E-mail	***Lars.Berg@environment.ministry.se***
CONTACT OFFICER FOR NATIONAL REPORT (IF DIFFERENT FROM ABOVE)	
Full name of the institution	
Name and title of contact officer	
Mailing address	
Telephone	
Fax	
E-mail	
SUBMISSION	
Signature of officer responsible for submitting national report	
Date of submission	

B. Process of preparation of national report

The first draft of this report was prepared by the Swedish Biodiversity Centre, at the Swedish University of Agricultural Sciences, based on published sources, texts commissioned from Tommy Lennartsson and Tommy Ek, and on replies from organisations, agencies, companies and private persons that responded to a questionnaire. In total more than 500 such questionnaires were distributed, but unfortunately only a 57 were returned, 15 of which indicated that they unfortunately could not contribute. The first draft did not yet include extensive texts on inland waters, marine areas, fisheries and protected areas.

The Swedish Environmental Protection Agency sent this first draft for comments to the Swedish Forest Agency, the Swedish Board of Agriculture, the Swedish Board of Fisheries and all other organisations that had sent a reply to the Swedish Biodiversity Centre, 57 in total. Nineteen replies were received, seven of which did not contain any new position or information, and one of which agreed completely with the presented text as far as it concerned the focus of the organisation. The remaining 11 comments were considered and the vast majority of them included when preparing and restructuring the final draft. The text was approved by the Director General.

The Swedish Ministry of the Environment coordinated a review of the draft report, involving the relevant ministries. The Swedish Government approved the final report on 2 April 2009.

Anne-Louise Månsson

Dep.Director
Ministry of the Environment
Division för Natural Resources

Appendix II. Further sources of information

The Swedish Environmental Objectives Council has published a comprehensive assessment of the Swedish national environmental quality objectives, which has been extensively employed as a source for this report. The full assessment is available in English at
www.naturvardsverket.se/Documents/bokhandeln/978-91-620-1266-3.htm
The Environmental Objectives Portal: www.miljomal.nu
The Swedish government: www.regeringen.se
The Swedish parliament: www.riksdagen.se
The Swedish Environmental Protection Agency: www.naturvardsverket.se
The Swedish Board of Agriculture: www.sjv.se
The Swedish Forest Agency: www.skogsstyrelsen.se
The Swedish Board of Fisheries: www.fiskeriverket.se
The National Board of Housing, Building and Planning: www.boverket.se
The Swedish Meteorological and Hydrological Institute SMHI: www.smhi.se
The Swedish International Development Cooperation Agency Sida: www.sida.se
The Swedish National Heritage Board: www.raa.se
Statistics Sweden: www.scb.se
The county administration boards: www.lansstyrelsen.se
The Swedish Biodiversity Centre: www.cbm.slu.se
The Swedish Species Information Centre: www.artdatabanken.se
The Swedish Museum of Natural History: www.nrm.se
GBIF-Sweden: www.gbif.se
The Swedish clearing house mechanism for the CBD: www.biodiv.se

Appendix III. Progress towards Targets of the Global Strategy for Plant Conservation and the Programme of Work on Protected Areas

A. Progress towards Targets of the Global Strategy for Plant Conservation

Target 1: A widely accessible working list of known plant species, as a step towards a complete world flora

The Swedish Species Information Centre has been commissioned by the government to run the "Swedish Taxonomy Initiative". This project contains the development of identification keys for all Swedish multicellular organisms. The project is designed to run for 20 years and will result in the production of "The Encyclopaedia of Swedish Flora and Fauna"- a series of identification handbooks with keys to the Swedish plants, fungi and animal species. To run this project the SSIC has made a web based taxonomic database including most of Swedish multicellular taxa (Dynamic taxa). This database will contribute to the complete world flora species list.

The Swedish Research Council has assigned the task to the Swedish Museum of Natural History to act as the Swedish node to the International GBIF, and thereby being a focal point for Swedish information on the world's biodiversity. The Swedish secretariat began its work in January 2003, to make an inventory of the collections of plants and animals, as well as to coordinate and assist with the catalogue and digitising work of the collections within Sweden. GBIF will contain complete authority files on species names, and hence make such a working list widely accessible.

A massive global taxonomic effort to produce a global list of plant (and animal) species names needs to be undertaken. Preferably this should be done in close cooperation with Catalogue of Life and GBIF.

Target 2: A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels

The Environmental Protection Agency has commissioned the Swedish Species Information Center to produce and keep a national red-list of threatened species. A national red-list, elaborated according to the IUCN system, is published every fifth year, the latest was launched in May 2005, and the next will be in April 2010. This is based upon a large database on the occurrence and ecology of species, combined with information on status and trends for forests, grasslands etc. The assessments are performed by a network of more than 100 experts on the different evaluated organism groups. All Swedish vascular plants have been assessed. Sweden is also a part in the work with a Pan European red-list.

In order to fulfil the obligation in EC Habitats Directive all species listed in the Directive are evaluated in terms of Conservation Status. Last evaluation was in June 2007 and the next will be in 2013.

Target 3: Development of models with protocols for plant conservation and sustainable use, based on research and practical experience

Vascular plants are monitored by a network of volunteers around the country, visiting more than 3 500 sites on a yearly basis. The information is coordinated by the Swedish Species Information Center and the Swedish Botanical Society. The work is including monitoring, practical guidelines in conservation for landowners and specific help in how to preserve each site.

In order to see trends within the landscape, several more common species of vascular plants are monitored in the National Inventory of Landscapes in Sweden, NILS.

Target 4: At least 10% of each of the world's ecological regions effectively conserved
The Swedish part of this target is fulfilled except for the Swedish part of the boreal forest ecoregion.

Target 5: Protection of 50% of the most important areas for plant diversity assured
There is significant progress towards the Swedish targets on protected areas, and a large number of sites, corresponding to very large areas of land, now have effective legal protection. There has however been no assessment of whether this achievement corresponds to the GSPC Target 5, in terms of 50% of important areas protected.

Target 6: At least 30% of production lands managed consistent with the conservation of plant diversity
Landscape planning in forestry is used in some parts of Sweden. Several of the national environmental goals are also directly working to fulfil this target.

Target 7: 60% of the world's threatened species conserved in situ.
Action plans has been or are being developed for many of the threatened plant species. This is a part of the assignment by the government to the Swedish Environmental Protection Agency to produce action programmes for threatened species of fungi, plants and animals in collaboration with the Swedish Species Information Center. Together with the conservation work done by the Flora Guardians, Site protection and common awareness of red listed species, a great proportion of the threatened species are under conservation.

The implementation of the EC Habitats Directive, especially provisions on Natura 2000, is relevant in this context. About 4000 sites have been designated to the ecological network Natura 2000. Several of these sites have been selected due to plant species listed in annex 2 to that Directive.

Target 8: 60% of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and 10% of them included in recovery and restoration programmes
No such target is established regarding Swedish indigenous wild plants, as the main strategy to use in situ approaches is deemed sufficient for the great majority of species. There are a few examples of ex situ projects concerning plant species. There is no target regarding threatened species from other countries, but action is being taken by botanic gardens. Domesticated plants in need of ex situ care have been addressed in one specific interim target.

The botanic gardens in Sweden have declared their ambition to take part in the GSPC target 8, where they can be considered to be important actors. As a start, an inventory of all globally red-listed taxa in cultivation in Uppsala is undertaken. Generally, the botanic gardens have not taken any active measures to conserve ex situ or assess status in cultivation for species that are only nationally red-listed. Several species on the national red-list are in cultivation, mainly for educational purposes.

Sweden through its development cooperation supports several large gene bank programmes (South Africa, Eastern Africa, Balkans etc). For globally red-listed species, Uppsala university botanic garden takes responsibility for the genus *Saintpaulia*, of which the collection is probably the most important in the world, together with Helsinki. The conservation programme SAVES, saving African violets ex situ, has recently been started, centered in Helsinki.

A major obstacle in assessing what threatened species are in cultivation is that there is no updated IUCN list for most plant genera, and the 1997 version has an accuracy of less than 20%, *i.e.,* those that are listed are not threatened, and those that are threatened are not listed.

Target 9: 70% of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained

The genetic diversity and conservation of crops are handled by Nordic Genetic Resource Centre and information a local knowledge is maintained at a high level by Swedish Biodiversity Centre.

Target 10: Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems

Eradication programs are already in place locally in certain Swedish County Administrative Boards for the Japanese rose *Rosa rugosa,* the Japanese knotweed *Fallopia japonica* and the giant hogweed *Heracleum mantegazzianum*. At the national level, the Swedish Board of Agriculture, the Swedish Environmental Protection Agency, the Swedish Board of Fisheries and other governmental agencies have jurisdiction to issue regulations for control and eradication of invasive alien species. This has however been done only for a very restricted number of species, mainly plant pests and animals which can be hunted. Recently a national strategy and action plan for invasive species and genotypes was proposed, see section 2.3.15.

Target 11: No species of wild flora endangered by international trade

No Swedish plant species are endangered by international trade and the Swedish legislation on international trade of endangered species is rather strong

Target 12: 30% of plant-based products derived from sources that are sustainably managed

Target 13: The decline of plant resources, and associated indigenous and local knowledge innovations and practices, that support sustainable livelihoods, local food security and health care, halted.

These targets are only to a small extent relevant within Sweden, but Sweden takes part in several international actions concerning this target.

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes.

There is a long tradition in Sweden in awareness of needs for plant conservation at all level of the society. The botanic gardens in Sweden have declared their ambition to take part in the GSPC target 14, where they can be considered to be important actors.

Target 15: The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy.

The number of people working with conservation of plants is estimated to be five times as high as ten years ago in Sweden.

Target 16: Networks for plant conservation activities established or strengthened at national, regional and international levels

Both formal and informal well working networks for plant conservation exist in Sweden. The Swedish Species Information Centre has established a national network of experts on threatened species. Swedish Species Information Centre and Swedish Botanical Society are members of the European network for the protection of vascular plants, the Planta Europa.

B. Progress towards Targets of the Programme of Work on Protected Areas

Table III.1. Goals and Targets of the Programme of Work on Protected Areas

Implementation of the CBD Programme of Work on Protected Areas in reply to the CBD Secretariat notification 2006-080 (Protected areas) has been compiled by Swedish Environmental Protection Agency and submitted by the Ministry for Sustainable Development, in November 2006. The following table is a preliminary updated version of the appendix in the report Site protection from an international perspective - proposed measures for Sweden (Swedish Environmental Protection Agency, rapport 5742, 2007).

Goals	Targets
1.1. To establish and strengthen national and regional systems of protected areas integrated into a global network as a contribution to globally agreed goals.	By 2010, terrestrially / and 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area system is established as a contribution to (i) the goal of the Strategic Plan of the Convention and the World Summit on Sustainable Development of achieving a significant reduction in the rate of biodiversity loss by 2010; (ii) the Millennium Development Goals – particularly goal 7 on ensuring environmental sustainability; and (iii) the Global Strategy for Plant Conservation

1.1 Description of progress and main obstacles 2007-2008

Establishment of protected areas is a specific measure to achieve 7 of the 16 national environmental quality objectives. The target 1.1 may be achieved provided that further actions is taken. The progress report for 2008 shows that further measures will be required and must be intensified. There are to a certain extent administrative problems such as limited funding and insufficiently strong incentive measures in- and outside protected areas.

In December 2008 the Swedish Environmental Protection Agency laid down a revised plan for national parks including a proposal of 13 new national parks. There will also be 7 extensions of existing national parks. Altogether the implementation of the plan will establish site protection in landscapes of intrinsic values and increase the representativeness in the protected area network.

Lakes and streams

In 2007 the government decided on a new category of small habitat protection areas in water habitat. Specific guidelines for the implementation are under development. Also the implementation of the strategy for the protection of lakes and streams of high conservation value is in progress. During the time-period several high conservation value lakes and streams have been protected but the progress in safeguarding freshwater
sites remains slow, and the interim target for protection of valuable natural and cultural environments will not be achieved in time.

The purpose of existing shore protection rules is to safeguard outdoor recreation and maintain favourable conditions for animal and plant life. These interests should be balanced againts the interest of regional development. In a government proposal for new shore protection rules, more of the decisions will be made by local authorities to promote regional development. The level of construction activity close to some lake shores and river banks is high.

Marine environment

In accordance with the environmental quality objective 28 marina protected areas shall be established by 2010. Within the period 2007 to 2008 nine new marine nature reserves have been established and the total is by the end of 2008 21 sites. The marine nature reserves covers approximately 2% of the territorial waters.

The Natura 2000 network extends the network of marine protected areas covering approximately 6% of the territorial waters. In June 2008 the Swedish government proposed four new offshore areas to the European Commission, improving the protection in the Exclusive Economic Zone from 1 to 3.5 percent.

According to the environmental quality objective Sweden shall establish 6 no-fishing areas by 2010. In November 2008 the Swedish and Danish ministries of fisheries agreed upon the closure of the most important spawning habitat for cod in the Kattegatt area.

Wetlands

Protection of mires and re-establishment of wetlands in the farmed landscape are progressing, though not quickly enough. The Environmental Protection Agency and county administrative boards have revised the Mire Protection Plan for Sweden. The revision of the plan primarily involved adjustments to the boundaries of existing areas and additional descriptions of features of cultural heritage interest. In the course of the review, it was noted that 238 of the mires listed in the plan enjoyed long-term protection, leaving another 259 sites to be protected by 2010. In addition, 119 new mire areas were included in the plan, 62 of them in Norrbotten, in the far North. Of these, 105 have still to be safeguarded, although these sites are not currently covered by the target. Greater attention needs to be paid to wetlands, especially in

forestry. Compliance, and supervision of compliance, with existing legislation is crucial, particularly as regards environmental consideration in forestry.

Agriculture landscape

Besides from the implementation of Natura 2000-network, protection of high value core areas in the agriculture landscape has not been a prioritised measure. The environmental payments are applicable to management of core areas. However, the payments are not designed and implemented in a way that ensures habitat quality. Consequently there is a negative trend for some habitat of special value for biodiversity, *e.g.* high conservation value trees. Insufficient numbers of grazing animals is a problem in nature conservation management. A municipality or county administrative board may protect valuable cultural landscape areas by designating them as culture reserves under the Environmental Code. There are 28 culture reserves in Sweden.

Forest

In accordance with the environmental quality objective Sustainable forests, 400 000 hectares will be protected during 1999-2010. When the target is met about 2.6% of the productive forest land will be protected. In the end of 2008 about 70% of the target has been met. In May 2008 the Swedish Environmental Protection Agency and the state owned company Sveaskog signed an agreement on the protection of 60 000 hectares of productive forest of high conservation values. The strategy for protection of forest including regional area targets has been implemented and progress has been made. However, forests of very high conservation value are to a certain extent still being felled.

A key factor for protection of forest include sufficient government funds to compensate landowners for site protection.

Mountainous region

The region is to a large extent protected as nature reserves or as national park. The largest nature reserve in Europe, Vindelfjällen, is proposed as a national park. In 2004, surveys of forest of high conservation value on state owned land verified that there are about 100 000 hectares unprotected nearly pristine forests on the land owned by the National Property Board. These forests are still unprotected.

1.2. To integrate protected areas into broader land- and seascapes and sectors so as to maintain ecological structure and function.	By 2015, all protected areas and protected area systems are integrated into the wider land- and seascape, and relevant sectors, by applying the ecosystem approach and taking into account ecological connectivity / and the concept, where appropriate, of ecological networks.

1.2 Description of progress and main obstacles 2007-2008

The Swedish Environmental Protection Agency, the Swedish Forest Agency and the county administration boards have pointed out high value tracts in forest and other wooded land. These tracts are characterised by a high density of high value core areas for fauna and flora. Protection of natural habitats in these tracts is prioritised. Also landscape strategies for conservation and management have been developed in 7 regions. The oak landscape strategy in the county of Östergötland can serve as an example of best practise in this context.

During 2007 the Kinnekulle project was completed by the county board of Västra Götaland. The project included an in-depth management dialogue with stakeholders together with measures for restoration and site protection. It has been granted funding from LIFE-Nature and the total project budget was 5.7 million Euro, making it one of the largest nature conservation projects in Europe. The project has been very successful and can serve as an example of best practise in the context of target 1.2.

Further measures are described in reply to the CBD Secretariat notification 2006-080 (Protected areas).

The target 1.2 may be achieved provided that further actions is taken.

1.3. To establish and strengthen regional networks, transboundary protected areas (TBPAs) and collaboration between neighbouring protected areas across national boundaries.	Establish and strengthen by 2010/2012 / transboundary protected areas, other forms of collaboration between neighbouring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation

1.3 Description of progress and main obstacles 2007-2008

Sweden has put forward the suggestion on six Marine Protected Areas to be integrated in OSPAR:s marine network of protected areas. New sites were proposed to HELCOM in June 2007 and Sweden's total contribution to the HELCOM network is 21 sites By November 2008 approximately 6.5% of Sweden's territorial waters are protected in transboundary networks.

Kosterfjordens marine national park will connect to Yttre Hvaler marine national park in Norway.

Furher measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas).

The target 1.3 may be achieved provided that further actions is taken.

1.4. To substantially improve site-based protected area planning and management.	All protected areas to have effective management in existence by 2012, using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a

	long-term management plan with active stakeholder involvement
1.4 Description of progress and main obstacles 2007-2008 The Swedish Environmental Protection Agency has laid down a programme for a better administration and management of protected areas. Also a special project for survey and evaluation of PA status has been carried out. However, the results and the evaluation have not yet been finalised. Further measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas). The target 1.4 will be difficult to achieve.	
1.5. To prevent and mitigate the negative impacts of key threats to protected areas.	By 2008, effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of key threats to protected areas are in place.
1.5 Description of progress and main obstacles 2007-2008 Supervision, monitoring and analysis of key threats to protected areas and other high value core areas are insufficient. However, on a site level, detailed information of exploitation activities can be available but both the frequency of occurrence of negative activities and the overall impact on a landscape level and regional level are unclear. The mining industry has intensified its interests in protected areas. There are conflicts of interests in the world heritage area of Lapponia. Also in the Storblaiken oldgrowth forests (one of the largest planned nature reserves in Europe) there are conflicts of interests. In 2008 the Legal, Financial and Administrative Services Agency decided to permit prospecting in the high value core area and nature reserve of Billingen. The demands for an expansion of windpower and waterpower create increasing conflicts of interests in protected areas and other high value core areas. During 2007-2008 about 20% of large scale windpower plants were proposed within protected areas or planned protected areas. For small to middle scale power plants data is not available. The information from regional county boards indicates that Natura 2000 sites are damaged by forest activities in the surroundings. The Forest Agency has developed a system, based on Remote Sensing, to identify non-legal cuttings. Data shows that 20-25% of the clearfelled areas does not fulfil the demands within the Forestry act. The target 1.5 has not been achieved.	
2.1. To promote equity and benefit-sharing.	Establish by 2008 mechanisms for the equitable sharing of both costs and benefits arising from the establishment and management of protected areas
2.1 Description of progress and main obstacles 2007-2008 Sweden's constitution grants all citizens the same influence over policy development and over the physical planning of local municipalities. Thus, traditionally, Sweden regards all its citizens as ultimate stakeholders. A recent shift in policy focus, summarised in the former Government's Communication to Parliament on Nature Conservation from 2002, emphasises the importance of more active involvement from local stakeholders in conservation activities. Measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas).	
2.2. To enhance and secure involvement of indigenous and local communities and relevant stakeholders.	Full and effective participation by 2008, of indigenous and local communities, in full respect of their rights and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders, in the management of existing, and the establishment and management of new, protected areas
2.2 Description of progress and main obstacles 2007-2008 Addressing issues related to local communities is an important part of ongoing processes for protected areas. The Swedish Environmental Protection Agency and the county administration boards give high priority to local participation and agreements with landowners. The agency has carried out capacity building programmes in local participation for authorities during 2007-2008 and strategies for local participation in the administration of nature resources have been further developed. The number of decisions on nature reserves taken by municipalities has increased during the last years. Ten years ago, only 3% of the reserves were established by a municipality and today the figure is about 7%. Furher measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas).	
3.1. To provide an enabling policy, institutional and socio-economic environment for protected areas.	By 2008 review and revise policies as appropriate, including use of social and economic valuation and incentives, to provide a supportive enabling environment for more effective establishment and management of protected areas and protected areas systems.
a. Description of progress and main obstacles 2007-2008 The target 3.1 is considered to have been achieved.	
3.2. To build capacity for the planning, establishment and management of protected areas .	By 2010, comprehensive capacity-building programmes and initiatives are implemented to develop knowledge and skills at individual, community and institutional levels, and raise professional standards
3.2 Description of progress and main obstacles 2007-2008 In the majority of the county administration boards progress towards the targets with due involvement and cooperation	

with relevant stakeholders is restricted by The target 3.2 may be achieved provided that further actions is taken.	
3.3. To develop, apply and transfer appropriate technologies for protected areas.	By 2010 the development, validation, and transfer of appropriate technologies and innovative approaches for the effective management of protected areas is substantially improved, taking into account decisions of the Conference of the Parties on technology transfer and cooperation.
3.3 Description of progress and main obstacles 2007-2008 Measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas).	
3.4. To ensure financial sustainability of protected areas and national and regional systems of protected areas.	By 2008, sufficient financial, technical and other resources to meet the costs to effectively implement and manage national and regional systems of protected areas are secured, including both from national and international sources, particularly to support the needs of developing countries and countries with economies in transition and small island developing States.
3.4 Description of progress and main obstacles 2007-2008 There are to a certain extent administrative problems such as limited funding and insufficiently strong incentive measures in- and outside protected areas. Key factors for protection of forest include sufficient government funds to compensate landowners for site protection. In the majority of the county administration boards there is a shortage of staff for the establishing of protected areas. To be able to achieve the targets and secure involvement and cooperation with relevant stakeholders there is an urgent need for reinforcement of staff and organisation.	
3.5. To strengthen communication, education and public awareness.	By 2008 public awareness, understanding and appreciation of the importance and benefits of protected areas is significantly increased
3.5 Description of progress and main obstacles 2007-2008 The Swedish Environmental Protection Agency has developed the national data base for protected areas and websites for geographical information on protected areas for public purpose. In 2009 Sweden will celebrate 100 year of nature conservation (in 1909 the parliament enacted a National Parks Act and nine parks were established, the first in Europe). The celebration "Naturens år/Year of nature" includes several CEPA activities and was prepared by different stakeholders during 2008. The target is considered to be achieved during 2009.	
4.1. To develop and adopt minimum standards and best practices for national and regional protected area systems.	By 2008, standards, criteria, and best practices for planning, selecting, establishing, managing and governance of national and regional systems of protected areas are developed and adopted.
4.2. To evaluate and improve the effectiveness of protected areas management.	By 2010, frameworks for monitoring, evaluating and reporting protected areas management effectiveness at sites, national and regional systems, and transboundary protected area levels adopted and implemented by Parties
4.3. To assess and monitor protected area status and trends.	By 2010, national and regional systems are established to enable effective monitoring of protected-area coverage, status and trends at national, regional and global scales, and to assist in evaluating progress in meeting global biodiversity targets
4.4 To ensure that scientific knowledge contributes to the establishment and effectiveness of protected areas and protected area systems.	Scientific knowledge relevant to protected areas is further developed as a contribution to their establishment, effectiveness, and management
4.1 – 4.4 Description of progress and main obstacles 2007-2008 Measures were described in reply to the CBD Secretariat notification 2006-080 (Protected areas). The target 4.1 is considered to be achieved in the context of planning, selecting and establishing of PA.	

Appendix IV. Objectives, interim targets and indicators in the Swedish system of environmental objectives in relation to the CBD goals and targets

Each objective and target is colour-marked, to indicate the probability that they are met by 2010, based on the assessment made by the Swedish Environmental Objectives Council. The Swedish assessment employed a slightly different time scale, as all objectives were assessed against a 2020 timeframe. Most interim targets were however assessed for achievement by 2010 or 2015. Red colour indicates that the objective or target will most likely not be met, yellow colour indicates a chance to meet the objective or target, given that further action is taken, and green colour indicates a high probability to reach the objectives and targets with present measures. Annual costs are given in the table below.

Environmental objective	Interim target (only biodiversity-relevant targets are given here)	Indicators currently in use (for objectives 1 – 7, 9 and 15, only indicators of direct relevance to the CBD-set are given)
1: Reduced Climate Impact 7	Greenhouse gas emissions 7	Arctic fox litters
2: Clean Air 7		Nitrogen dioxide in air NOx emissions
3: Natural Acidification Only 5, 7	Acidification of lakes and streams 5 Acidification of forest soils 5 Sulphur dioxide emissions 7 Nitrogen oxide emissions 7	
4: A Non-toxic Environment 7		
5: A Protective Ozone Layer 7		
6: A Safe Radiation Environment 7		
7: Zero Eutrophication 5		Nitrogen in the sea
8: Flourishing Lakes and Streams 1, 2, 4, 5, 6, 8	Protection of natural and cultural environments 1 Restoration of rivers and streams 5 Water supply plans 8 Releases of animals and plants 6 Action programmes for threatened species 2	Limited nutrient leaching - catch crops Limited nutrient leaching - protection zones Energy use Reproduction of freshwater pearl mussel Nitrogen deposition Sulphur deposition Breeding birds near water Protected lakes and watercourses New buildings near lake shores and river banks Plant protection products
9: Good Quality Groundwater		Nitrogen deposition Sulphur deposition
10: A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos 1, 2, 4, 5, 7, 8	Protection of environments 1 Action programmes for threatened marine species 2 Bycatches 2 Catches and recruitment of fish 4 Discharges of oil and chemicals 7	Limited nutrient leaching - catch crops Limited nutrient leaching - protection zones Fishery vessels Phosphorus in the sea Nitrogen in the sea Spawning cod biomass

		Oil discharges in marine areas New buildings near the sea shore Phosphorus entering coastal areas Nitrogen entering coastal areas Fisheries
11: Thriving Wetlands 1, 2, 5, 6, 8	Strategy for protection and management 1 Mire protection plan 1 Forest roads 5 Wetlands on agricultural land 5 Action programmes for threatened species 2	Artificial wetlands Number of protected wetlands included in the Mire Protection Plan Wetland protection Breeding birds in wetlands
12: Sustainable Forests 1, 2, 4, 5, 6, 8	Long-term protection of forest land 1 Enhanced biological diversity 5 Action programmes for threatened species 2	Acidified forest soils Old forests Hard dead wood Breeding forest birds Nitrogen deposition Sulphur deposition Protected forest land - habitat protection Protected forest land - nature reserves Protected forest land - nature conservation agreements Old forest, rich in broad-leaved trees
13: A Varied Agricultural Landscape 1, 2, 3, 4, 5, 6, 8	Meadow and pasture land 1 Small-scale habitats 5 Plant genetic resources and indigenous breeds 3 Action programmes for threatened species 2	Semi-natural grazing land Organic livestock production Land under organic cultivation Breeding birds on agricultural land Culturally significant features on arable land Mown meadows Plant protection products Arable land
14: A Magnificent Mountain Landscape 1, 2, 4, 5, 6, 8	Damage to soil and vegetation 5 Natural and cultural assets 1 Action programmes for threatened species 2	Number of wolverines in mountain areas Number of reindeer in mountain areas Noise-free mountain zones Exploitation of mountain areas Arctic fox litters Mountain breeding birds Nitrogen deposition Sulphur deposition Protected mountain environments Light all-terrain vehicles meeting noise standards
15: A Good Built Environment 1, 7	Programmes and strategies for planning 1 Waste 7	Planning for ecological structures and water
16: A Rich Diversity of Plant and Animal Life 1, 2, 3, 4, 6, 8	Halting the loss of biodiversity 1, 2, 3 Fewer species under threat 2 Sustainable use 4	Reproduction of freshwater pearl mussel Mountain breeding birds Breeding birds on agricultural land Hard dead wood

Annual costs to the state of each environmental quality objective, averages for 2004-2006. Source: Lead agencies' cost summaries reported to the Environmental Objectives Council.

Environmental quality objective	SEK million*	Largest cost item
Reduced Climate Impact	435	Climate Investment Programme (Klimp), Local Investment Programmes (LIPs)
Clean Air	145	Klimp, LIPs
Natural Acidification Only	255	Liming
A Non-Toxic Environment	1,000	Soil remediation
A Protective Ozone Layer	15	Environmental research
A Safe Radiation Environment	255	Monitoring of radiation environment
Zero Eutrophication	460	Payments for measures
Flourishing Lakes and Streams	185	Payments for measures
Good-Quality Groundwater	55	Water protection
A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos	200	Payments for measures
Thriving Wetlands	200	Management and protection
Sustainable Forests	1,300	Purchases and measures
A Varied Agricultural Landscape	3,200	Payments for measures
A Magnificent Mountain Landscape	25	Minor items
A Good Built Environment	400	Many different items
A Rich Diversity of Plant and Animal Life	165	Payments for measures
Total	**8,295**	

* These costs are estimates, subject to several sources of uncertainty. Some costs of research and development with a bearing on the environmental objectives, for example, are not included.