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Progress towards the European 2010 biodiversity target — indicator fact sheets

Compendium to EEA Report No 4/2009

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Sebi

European Environment Agency

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Acknowledgements

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Frederik Schutyser.

The EEA Technical report documenting the SEBI 2010 indicators, published in October 2007, emphasised the importance of the work of all experts and reviewers involved. This network of experts, together with the SEBI 2010 Coordination Team, has been equally valuable for the production and review of the present report. Members of the SEBI 2010 Coordination Team and Working Groups are listed in Annex 1 to this report.

About this report

This Technical report contains individual assessments for each of the 26 SEBI 2010 indicators. These detailed assessments underpin the analysis, synthesis and policy implications contained in EEA Report 04/2009, entitled 'Progress towards the European 2010 biodiversity target' ([1]).

Technical specifications for the indicators used in this report can be found in (EEA, 2007a). For several of the indicators, the assessment in this report builds on work done for the report *Europe's environment — the fourth assessment* (the 'Belgrade Report') (EEA, 2007b).

Photo: © Santiago Urquijo Zamora

([1]) Available online at www.eea.europa.eu/highlights/publications/progress-towards-the-european-2010-biodiversity-target.

Introduction

Following a prolonged worldwide decline of biodiversity, the United Nations Convention on Biodiversity (CBD) was adopted in 1992 with three overall goals: 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources'.

In 1995, a pan-European response to the CBD came when more than 50 countries endorsed the Pan-European Biological and Landscape Diversity Strategy (PEBLDS). The European Community, as contracting party to the CBD, adopted a Biodiversity Strategy in 1998, providing a comprehensive response to the CBD.

Within this policy framework and the wider sustainable development agenda it was agreed at global level in 2002 to significantly reduce the rate of biodiversity decline by 2010; Europe decided to halt the decline by 2010. The EU target 'to halt the decline of biodiversity in the EU by 2010 and to significantly reduce the rate of biodiversity loss globally by 2010' now represents a political beacon, a waypoint in the process towards sustainable use of natural resources and a healthy environment. Indeed, at national level, a growing number of European countries have included the 2010 target as part of their national biodiversity strategies.

SEBI 2010

Having set such a target, however, it becomes necessary to measure progress towards its achievement. For instance, we need to know if international and national policies that govern land use and management are providing the correct response to the biodiversity decline. We must answer questions about the current status of biodiversity and the key pressures that are likely to impact on it now and in the future. Much thought has therefore been given to developing a common set of coherent indicators that, like the instruments on the dashboard of a car, inform us simply and reliably where we are along the journey and how we are doing.

To this end, in 2004 the parties to the CBD adopted a global framework for evaluating progress, including a first set of indicators grouped into focal areas such as 'status and trends' or 'threats'. These were taken up within the European Union later that year and were subsequently adopted at pan-European level in 2005.

Across Europe work has been under way to identify and evaluate indicators which together allow an assessment of progress towards the 2010 target. Building on the conceptual framework provided by the CBD, the European Union and the Pan-European Biological and Landscape Diversity Strategy derived a set of agreed headline indicators within the CBD focal areas.

The CBD focal areas are:

- status and trends of the components of biological diversity (where we are now and where we may be heading);
- threats to biodiversity (the main pressures that need to be countered through policy measures and action);
- ecosystem integrity and ecosystem goods and services (functioning of ecosystems in terms of their ability to provide goods and services);
- sustainable use (specifically in relation to forestry, agriculture and fisheries);
- status of traditional knowledge, innovations and practices (this focal area was not included at the European level);
- status of access and benefit-sharing (the sharing of benefits derived from biodiversity, particularly from genetic resources);
- status of resource transfers (the extent to which society is willing to invest in biodiversity conservation (through the provision of financial resources).

At the European level, public awareness and participation was included as an additional focal area in line with the adoption of the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), which establishes a number of rights of the public (individuals and their associations) with regard to the environment.

Headline indicators are clustered under each of the focal areas and for each headline indicator one or more specific indicators have been selected on the basis of rigorous criteria. The SEBI 2010 process and indicator set currently provides the best coverage on the basis of available information and resources in Europe but data coverage needs to be improved.

The indicators can be used both individually and in combination to provide a consistent and coherent framework for assessment. They can also be used in association with socio-economic indicators to build up a broader picture of the extent to which sustainable development is being achieved. Several indicators in the SEBI 2010 set are also being used in other policy relevant indicator sets.

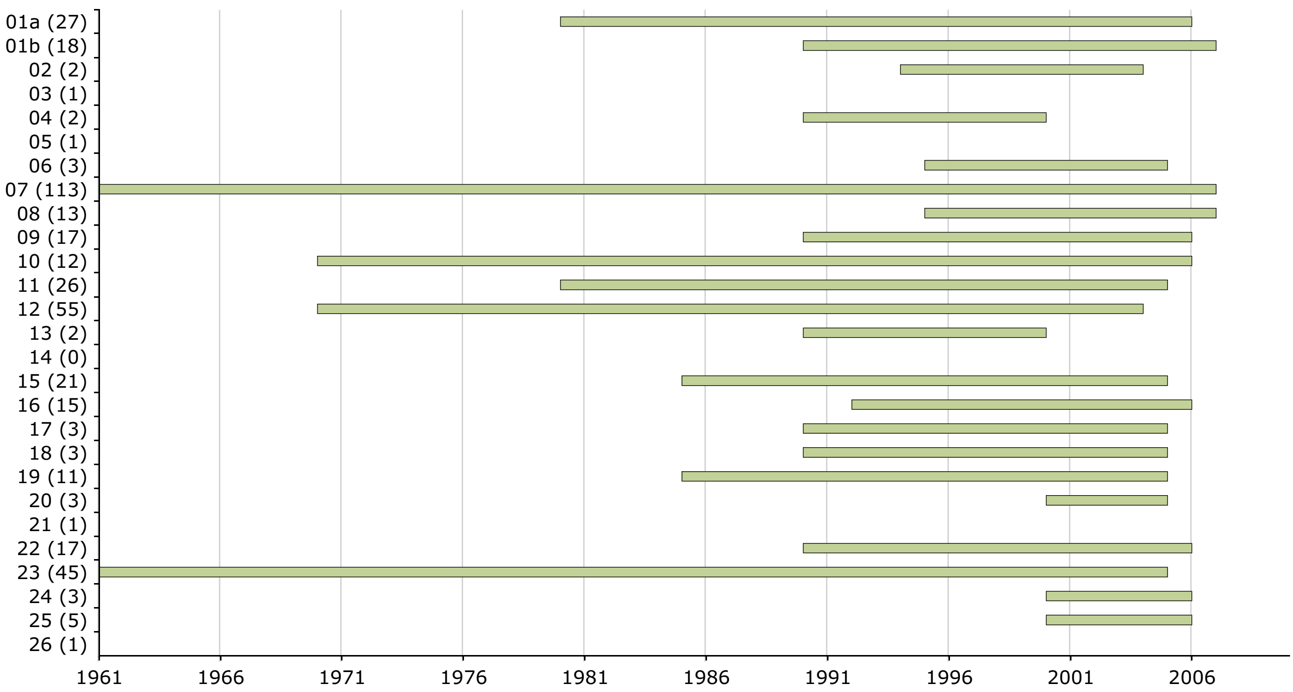
The European Community's 2006 Biodiversity Communication and Action Plan provided a detailed strategic response to accelerate progress towards the 2010 targets at Community and Member State level. The SEBI 2010 indicator set has been used by the European Commission to support its assessment of progress in implementing the Biodiversity Action Plan.

While SEBI 2010 is pan-European in scope, some of the indicators specifically link to the community policy framework that exists for EU Member States.

An urgent priority, also in the context of discussions on biodiversity targets beyond 2010, is research into target values for several of the indicators. For example, indicators show quantities of deadwood in forests but do not tell what quantity would be good for biodiversity. Similarly, concentrations of pollutants in coastal waters may be known but it is also necessary to investigate the concentration at which impacts on biodiversity are significant. Within the framework of SEBI 2010, a study is ongoing to compile information on target values for the indicators where possible.

Finally, given the SEBI 2010 mandate, this report mainly provides a European picture, which may hide some regional or national nuance. Finer detail can be provided by indicators at the national level and many countries have indicator sets similar to the SEBI 2010 set (EEA, 2009). Also, Europe's impact on global biodiversity, represented in the present set by the Ecological Footprint, will be further investigated within the global Biodiversity Indicator Partnership

Figure 1 Time series for each SEBI 2010 indicator, January 2009



Note: Figures in brackets indicate the total number of data points covered by each indicator.

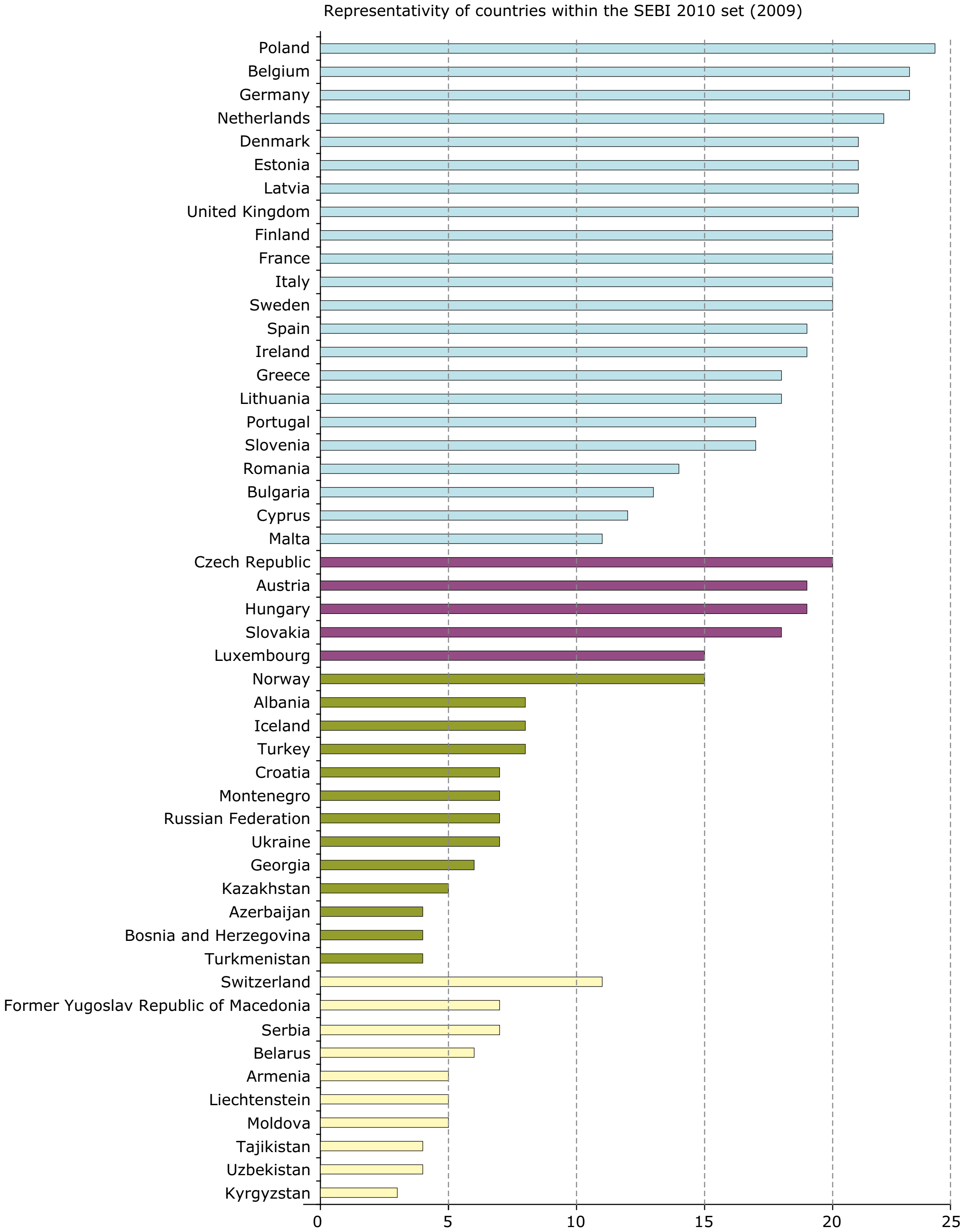
Source: European Topic Centre on Biological Diversity (ETC/BD), 2009.

Table 1 SEBI 2010 indicators within CBD focal areas and headline indicators

CBD focal area	Headline indicator	SEBI 2010 specific indicator
Status and trends of the components of biological diversity	Trends in the abundance and distribution of selected species	1. Abundance and distribution of selected species a. birds b. butterflies
	Change in status of threatened and/or protected species	2. Red List Index for European species
		3. Species of European interest
	Trends in extent of selected biomes, ecosystems and habitats	4. Ecosystem coverage
		5. Habitats of European interest
	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance	6. Livestock genetic diversity
	Coverage of protected areas	7. Nationally designated protected areas
		8. Sites designated under the EU Habitats and Birds Directives
Threats to biodiversity	Nitrogen deposition	9. Critical load exceedance for nitrogen
	Trends in invasive alien species (numbers and costs of invasive alien species)	10. Invasive alien species in Europe
	Impact of climate change on biodiversity	11. Impact of climatic change on bird populations
Ecosystem integrity and ecosystem goods and services	Marine Trophic Index	12. Marine Trophic Index of European seas
	Connectivity/fragmentation of ecosystems	13. Fragmentation of natural and semi-natural areas
		14. Fragmentation of river systems
	Water quality in aquatic ecosystems	15. Nutrients in transitional, coastal and marine waters
		16. Freshwater quality
Sustainable use	Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable management	17. Forest: growing stock, increment and fellings
		18. Forest: deadwood
		19. Agriculture: nitrogen balance
		20. Agriculture: area under management practices potentially supporting biodiversity
		21. Fisheries: European commercial fish stocks
		22. Aquaculture: effluent water quality from finfish farms
	Ecological Footprint of European countries	23. Ecological Footprint of European countries
Status of access and benefits sharing	Percentage of European patent applications for inventions based on genetic resources	24. Patent applications based on genetic resources
Status of resource transfers	Funding to biodiversity	25. Financing biodiversity management
Public opinion (additional EU focal Area)	Public awareness and participation	26. Public awareness

Source: EEA, 2007a.

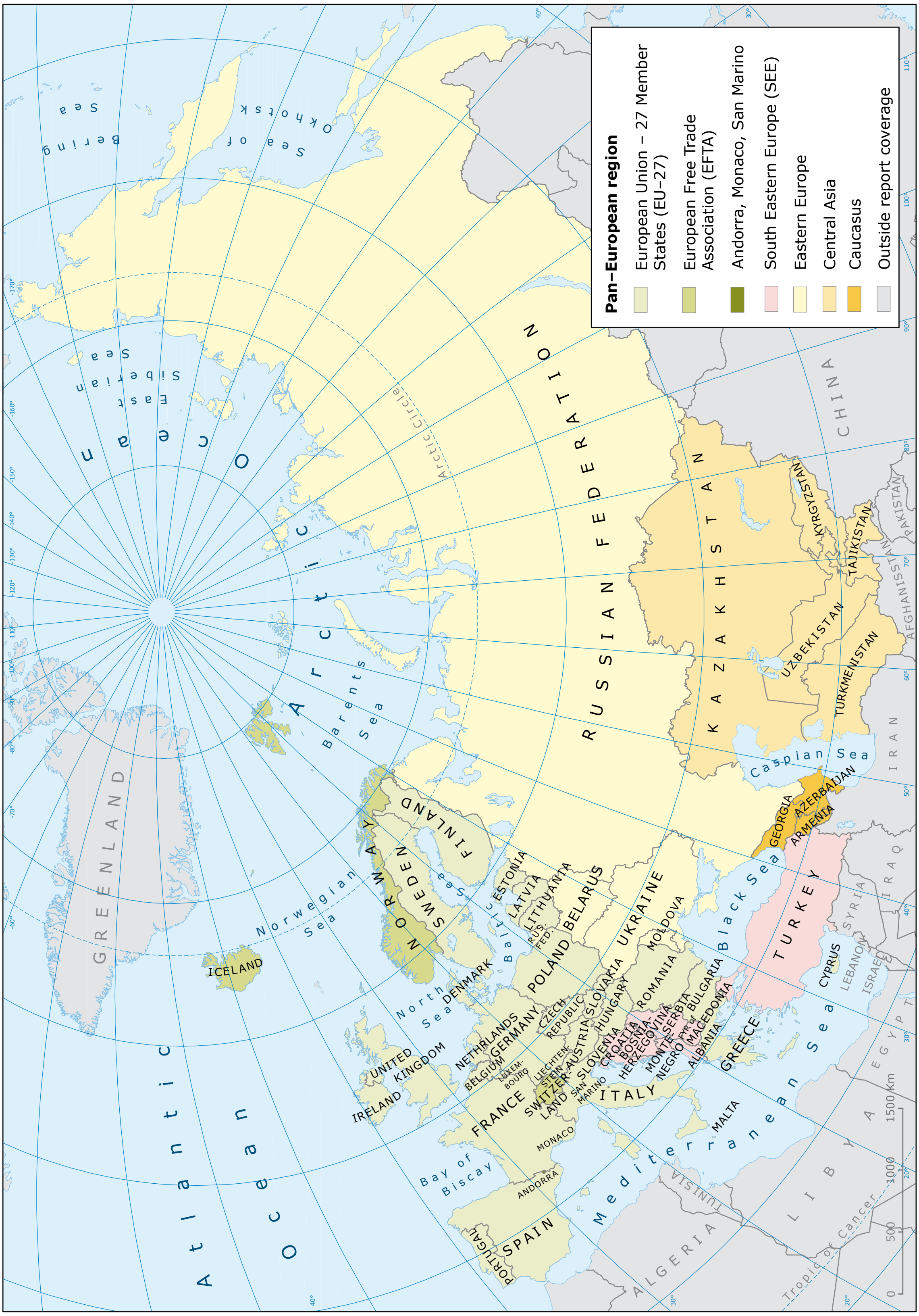
Figure 2 Representation of countries within the SEBI 2010 set, January 2009



Note: How to read the graph: for 24 of the SEBI 2010 indicators data are included for Poland, and for 15 indicators, data are included for Luxembourg.
Data for indicator 14 are not yet available; this indicator was therefore not considered for this figure. Data used for SEBI 2010 indicators are collected through EU, pan-European or international processes. National datasets relevant for the SEBI 2010 set but not collected by EEA or by any other European processes are not taken into consideration here.
Blue indicates EU Member States. Purple indicates non-coastal EU Member States (for whom only 23 indicators are relevant).
Green indicates non-EU countries (for whom only 21 indicators are relevant because EU policies cannot be considered there).
Yellow indicates non-EU and non-coastal countries (for whom only 18 indicators are relevant).

Source: ETC/BD, 2009.

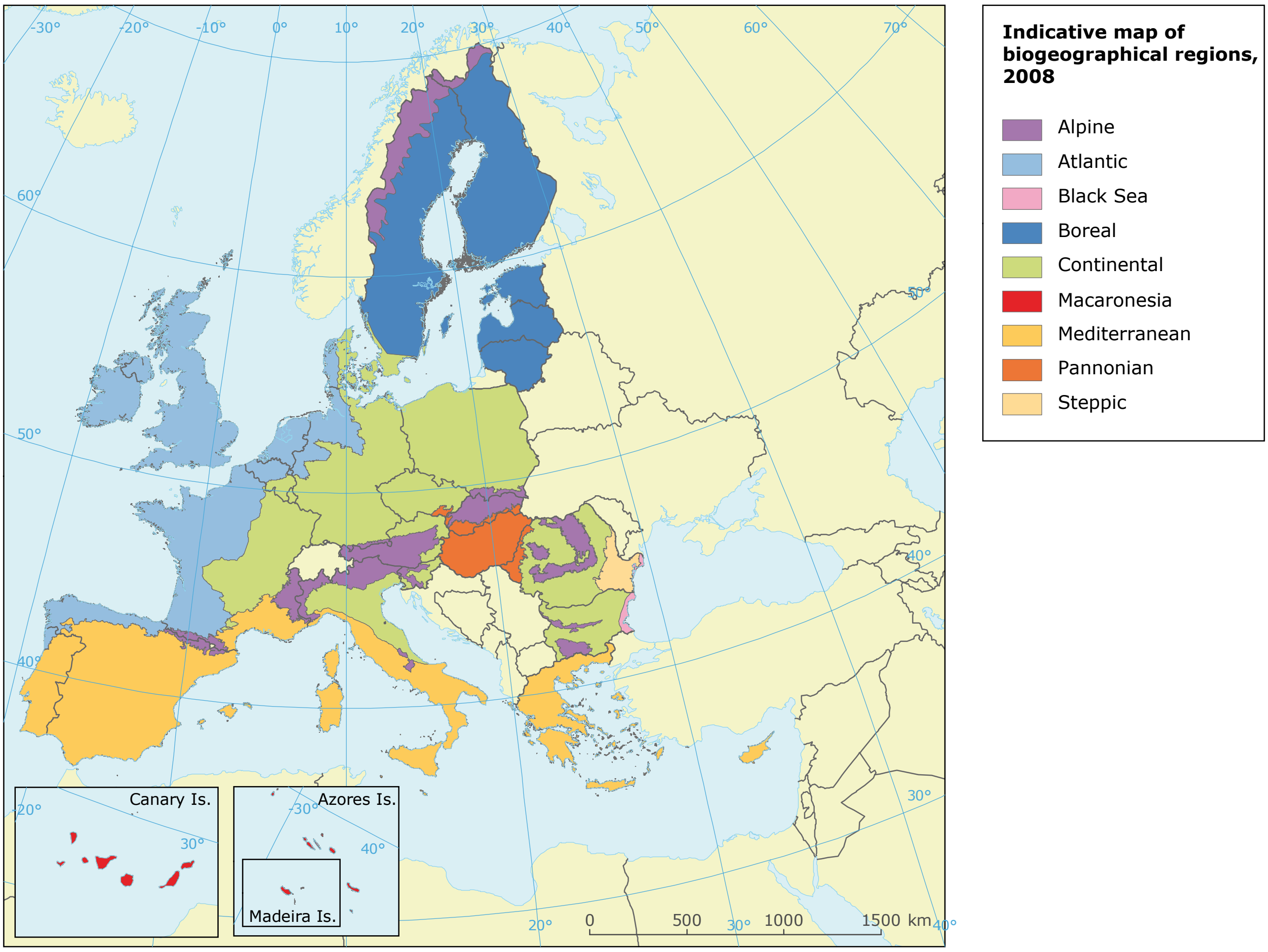
Map 1 European country groupings used in this report ([2])



Source: EEA, 2009.

([2]) Some of the indicators in the present report show data for country groupings. It has not always been possible to combine countries into groups that are meaningful from a geo-political and biogeographical point of view. For transparency, where country groupings are used the composition of the groups is spelled out.

Map 2 Biogeographical zones in Europe



Source: EEA, 2008.

(BIP) and Global Biodiversity Outlook (GBO3) currently being developed by the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC).

Focal area: status and trends of the components of biological diversity

Headline indicator: trends in abundance and distribution of selected species

01. Abundance and distribution of selected species

Key policy question: Have declines in common species in Europe been halted?

Key message

Overall, Europe's common bird populations reduced by around 10 % since 1980. Common farmland birds declined most severely (around 50 %) but common forest birds also declined by some 9 %. Falls have levelled off since the late 1990s. Europe's grassland butterflies have declined dramatically (60 %) since 1990 and this reduction shows no sign yet of levelling off.

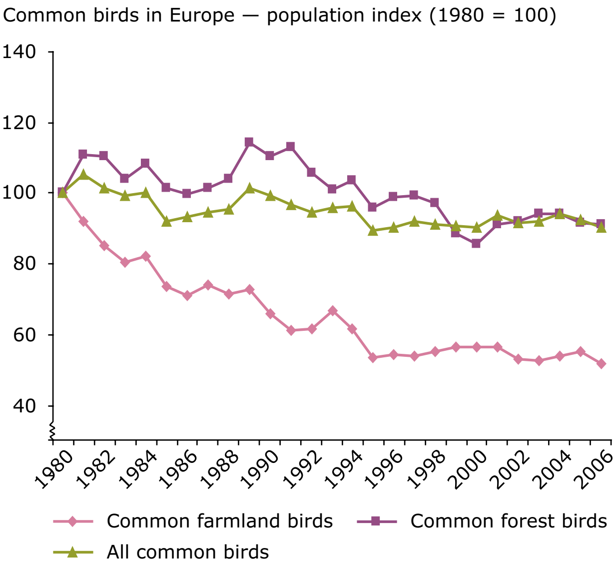
Assessment

For some populations of European common birds, downward trends appear to have slowly levelled off but it needs to be borne in mind that significant losses had already happened by 1980.

Of the more common bird species, farmland birds have declined. The initial steep decline of farmland birds was associated with increasing agricultural specialisation and intensity in some areas, and large-scale marginalisation and land abandonment in others. The falling trend has levelled off since the late 1990s, partly because of stabilising inputs of nutrients and pesticides and the introduction of set-aside in the EU-15, and partly because of drastically lower nutrient inputs in the EU-10 as a result of political reforms and the resulting economic crisis in the agricultural sector. An increase in agricultural production in eastern Europe, if linked to higher inputs of nutrients and pesticides, combined with further land abandonment in some parts of Europe and the proposed abolition of set-aside, may lead to a new decline.

Conservation measures adopted under the EU Birds Directive have proven effective in the recovery of threatened bird populations (Donald *et al.*, 2007) but

Figure 3 Common birds in Europe, population index (1980 = 100)



Note: How to read the graph: since 1980 the number of common farmland birds has declined by around 50 %.

For common farmland bird species, n = 36; for common forest bird species, n = 29; for all common bird species (this line includes the farmland and forest birds as well as other common species that are not primarily associated with either of these habitats), n = 135.

Country coverage (i.e. reflecting the availability of high-quality monitoring data from annually-operated common bird monitoring schemes, employing generic survey methods and producing reliable national trends): Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, France, Finland, Germany, Hungary, Ireland, Italy, Latvia, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom. See www.ebcc.info for more technical information on the calculation of the index.

It should be underlined that the methodology for calculating the farmland bird index has recently changed. The new index presents a much sharper drop around the years of 1995 and 1996. While the new index is recognised as integrating better expertise in terms of species selection, further investigation is necessary to explore what is behind this drop. In addition, the influence of including both new species and the new Member States in the selection, and the starting year of monitoring schemes in some countries should be further investigated. In any case, the trend from 1996 onwards is consistent with the previous methodology and shows the index to be fairly stable.

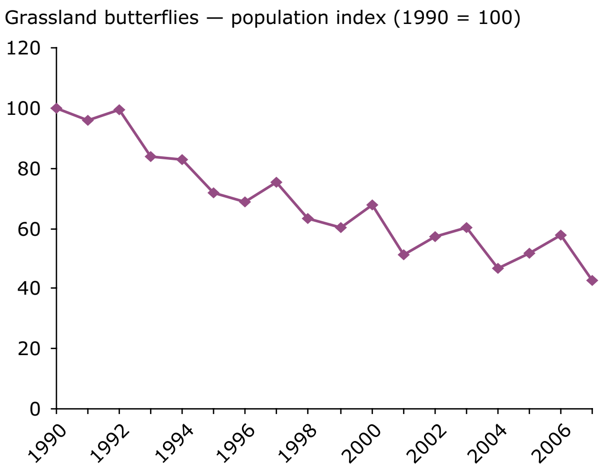
Source: EBCC/RSPB/BirdLife International/Statistics Netherlands, 2008.

not in the case of more widespread bird species, where different recovery mechanisms are now required. Well-designed agri-environment measures have been shown to reverse bird declines at local levels.

The challenge now is to deploy the Birds Directive conservation measures or others widely enough to help populations recover at national and European scales. Trends in species in Europe are also driven by pressure outside Europe, e.g. for migratory bird species, and a comprehensive response would need to be effective beyond European territory.

Grassland butterflies are declining severely; their populations have declined by 60 % since 1990 and there is no sign of levelling off. Intensification is the most important threat to butterflies across the relatively flat areas of western Europe: ranging from the eastern half of the United Kingdom, over the north of France, Belgium, the Netherlands, Northern Germany and Denmark — as well as flat areas in other parts of Europe. By contrast, abandonment and lack of sustainable grazing is the chief threat in southern and eastern Europe, in mountainous areas or areas with relatively poor soils

Figure 4 Grassland butterflies, population index (1990 = 100)



Note: How to read the graph: since 1990, grassland butterflies have declined by 60 %.

For this graph, the data used for grassland butterfly species were from Butterfly Monitoring Schemes in nine countries: Belgium – Flanders (1991–2004); Estonia (since 2004); Finland (since 1999); France (since 2005); France – Doubs region (2001–2004); Germany (since 2005); Germany – Nordrhein Westfalen (since 2001); Germany – Pfalz region (Maculinea nausithous only, 1989–2002); Jersey (since 2004); Portugal (since 1998); Spain – Catalunya (since 1994); the Netherlands (since 1990); and the United Kingdom (since 1976).

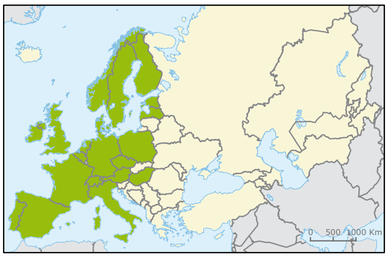
Source: De Vlinderstichting/Butterfly Conservation Europe/ Statistics Netherlands, 2008.

Notes

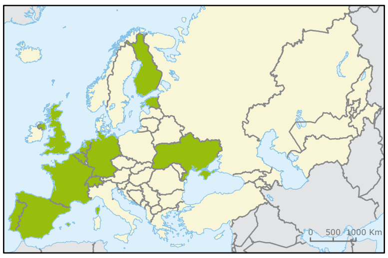
An increase in the population index means that there are more species with populations increased than species with populations decreased: it does not necessarily mean that the population of all species has increased. It can be due to expansion of some species (typically, generalists) at the expense of other species (typically, specialists). It must also be noted that populations fluctuate on a yearly basis.

In the absence of the information on abundance, information on the distribution of species can help assess species status. However, at a European level, this type of information is still weak for other groups of species.

Geographical coverage



Birds



Butterflies

Web links

European Bird Census Council (EBCC): www.ebcc.info.

Butterfly Conservation Europe: www.bc-europe.org.

Headline indicator: change in status of threatened and/or protected species

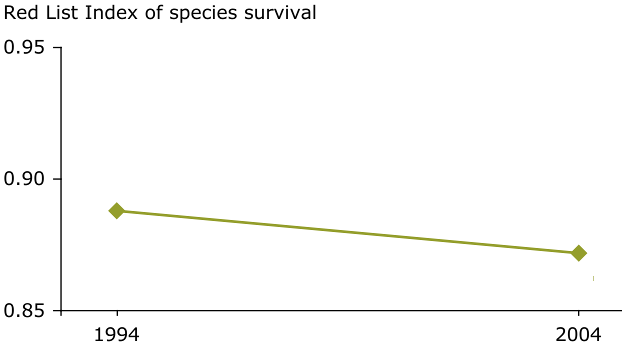
02. Red List Index for European species

Key policy question: Has the risk of extinction for European birds changed?

Key message
To date, the Red List Index has been calculated only for bird species at a European level, so the information in the current indicator is limited to European birds.

The overall risk of extinction among Europe's birds has generally been on the rise over the last decade. While the status of some species has due to conservation action, many more have deteriorated because of worsening threats and/or declining populations.

Figure 5 Red List Index (RLI) for European birds based on pan-European extinction risk in 1994–2004



Note: How to read the graph: the smaller the RLI is, the greater the number of European bird species with an increased extinction risk.

n = 522 species.

Source: BirdLife International, 2008.

Assessment
Extinction risk overall is increasing for European bird species. In the figure above, for example, the decrease from a value of 0.89 to 0.87 reflects the balance between 19 species (out of a total of 522) improving in status during 1994–2004 but 51 species deteriorating in status.

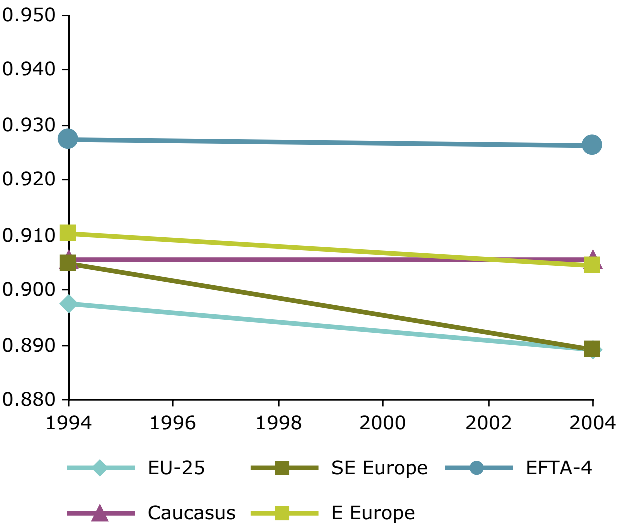
All European groups of countries show a consistent decline, except possibly the Caucasus. The EU-25 shows a continuing decline, from a starting point that was already lower than in other sub-regions, indicating that species in the EU-25 are more threatened overall.

Notes
The IUCN Red List categorises species as 'Extinct', 'Extinct in the Wild', 'Critically Endangered', 'Endangered', 'Vulnerable', 'Near Threatened', 'Least Concern', 'Data Deficient' and 'Not Evaluated'. The RLI is calculated from the number of species that moved from one category to another between assessments owing to a genuine improvement or deterioration in status (i.e. category changes owing to revised taxonomy or improved knowledge are excluded).

If for more species the extinction risk has increased instead of decreased the RLI goes down. Extinction risk for this indicator is assessed at the European level, i.e. the risk that a species ceases to exist in Europe (even if the species may survive in other regions of the world).

Decreasing RLI values mean that biodiversity is being lost at an increasing rate. No change in the RLI value means that there are no changes in the expected rate of species extinctions (it does not mean that biodiversity loss has stopped, or that the biodiversity will remain unchanged). Increasing RLI values mean that there is a decrease in the expected future rate of species extinctions (i.e. a reduction in the rate of biodiversity loss).

Figure 6 **Red List Indices (RLIs) for birds in the EU-25, EFTA-4, Eastern Europe, the Caucasus and South-Eastern Europe during 1994–2004, based on their extinction risk at pan-European level**



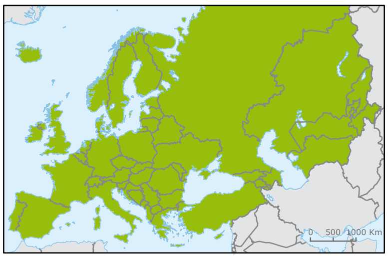
Note: n = 522 species

How to read the graph: a lower value means a lower chance of survival (increased extinction risk).

Country groupings: EU-25 (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom); EFTA (Iceland, Liechtenstein, Norway and Switzerland); Caucasus (Armenia, Azerbaijan and Georgia); Eastern Europe (Belarus, Republic of Moldova, Russian Federation, Ukraine); South-Eastern Europe (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, Romania, Serbia, the Former Yugoslav Republic of Macedonia and Turkey).

Source: BirdLife International.

Geographical coverage



Web links

IUCN Red List: www.redlist.org.

03. Species of European interest

Key policy question: What is the conservation status of species of Community interest?

Key message

Around half of the species of Community interest (those species which, within the territory of the European Union are listed in Annexes II, IV and V of the Habitats Directive) have an unfavourable conservation status, with variation across biogeographic regions ([3]). There are still significant gaps in knowledge, especially for marine species.

Assessment

Unfavourable status is most frequently reported for the species in the marine Baltic region and the continental region (100 and 70 %, respectively). The variation amongst species groups is limited, but amphibians appear to be most threatened, with nearly 70 % having an unfavourable conservation status. In most cases, the trend information was not available. For many species, recovery to a favourable conservation status will take considerable time. The next evaluation, due in 2013, will help assess the efficiency of the Directive.

Notes

Figure 7 and Map 3 are based on assessments of species as listed in Annexes II, IV and V of the Directive. Member States are required to assess each species in each biogeographical zone in which it exists in the country. A regional assessment has been calculated based on the Member State assessments.

Geographical coverage

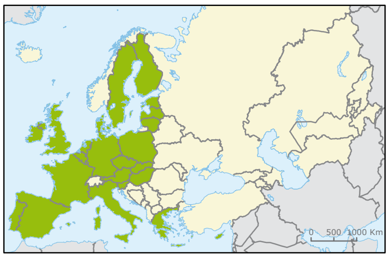
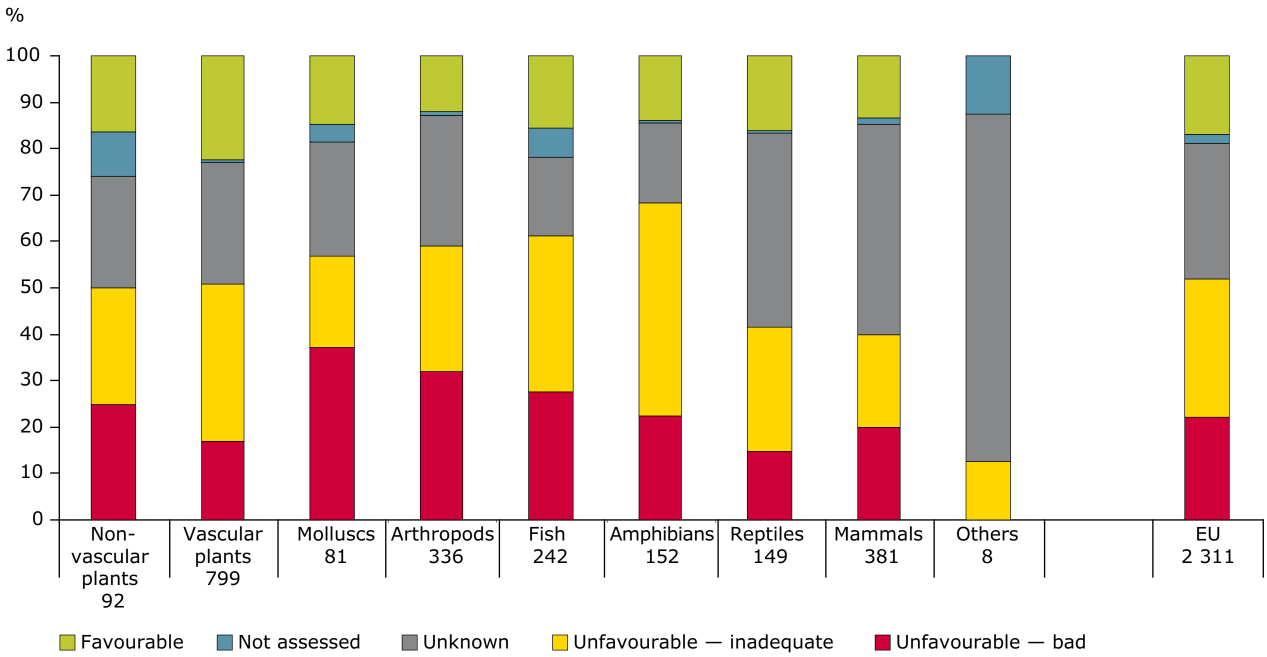


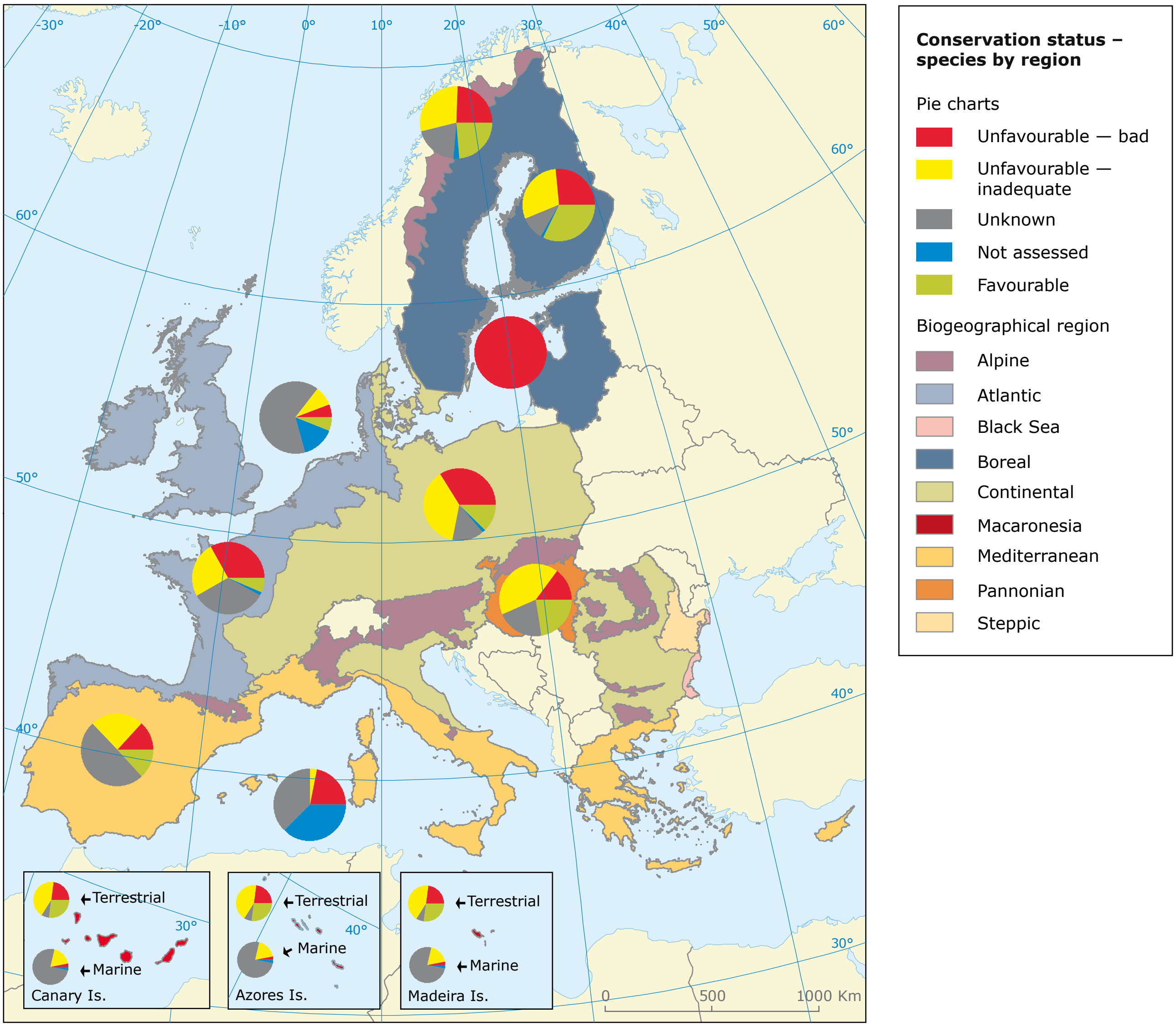
Figure 7 Conservation status — species by taxonomic group



Note: The EU column shows the total of the assessments in all other columns.

([3]) The reporting format uses three classes of Conservation Status. 'Good' (green) signifies that the species or habitat is at Favourable Conservation Status (FCS) as defined in the Directive and the habitat or species can be expected to prosper without any change to existing management or policies. In addition, two classes of 'Unfavourable' are recognised: 'Unfavourable-Bad' (red) signifies that the habitat or species is in serious danger of becoming extinct (at least locally) and 'Unfavourable-Inadequate' (amber) is used for situations where a change in management or policy is required but the danger of extinction is not so high. The unfavourable category has been split into two classes to allow improvements or deterioration to be reported. (Assessment, monitoring and reporting under Article 17 of the Habitats Directive: Explanatory Notes & Guidelines DRAFT 2 January 2006).

Map 3 Conservation status — species by biogeographical region



Note: How to read the map: in the Alpine region, more than 25 % of species have a 'favourable' status and more than 20 % have an 'unfavourable' or 'bad' status.

Source: DG Environment and ETC/BD, based on data provided by 25 EU Member States (Bulgaria and Romania will be included in the next reporting phase in 2013) through their reports under Article 17 of the Habitats Directive, 2008.

Web links

About species of European interest
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm.

About biogeographical regions
http://ec.europa.eu/environment/nature/natura2000/sites_hab/biogeog_regions/index_en.htm.

About conservation status assessment
http://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm#csa.

http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2001-2007/internet_consultation/draft_consultation/_EN_1.0_&a=d.

Headline indicator: trends in extent of selected biomes, ecosystems and habitats

04. Ecosystem coverage

Key policy question: Which changes are occurring in the distribution of Europe's ecosystems and habitats?

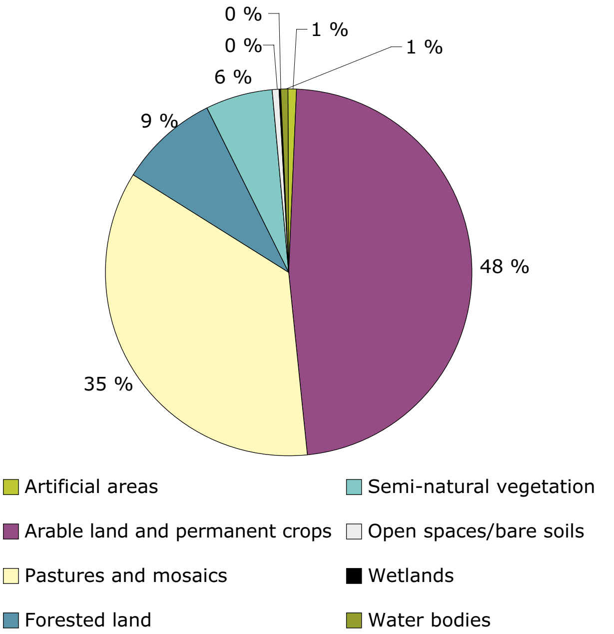
Key message

Built-up areas, infrastructure and woodland are increasing whilst agricultural land, semi-natural and natural habitats decrease. The overall statistics hide more detailed transition patterns. Wetlands, for example, are mainly changing into forest; other (semi-)natural areas primarily give way to agriculture.

Assessment

Figure 8 shows changes in land cover between 1990 and 2000. A large part of west and central Europe has effectively become urban in character. In many areas of lowland Europe and along the coasts, existing urban centres are sprawling to form much larger settlements. In many places, agriculture has been marginalised as an economic activity, often with resulting land abandonment. Elsewhere new areas may be taken into production but on average the loss caused by land abandonment outweighs this.

Figure 9 Changes in land cover between 1990 and 2000: previous status of newly urban land

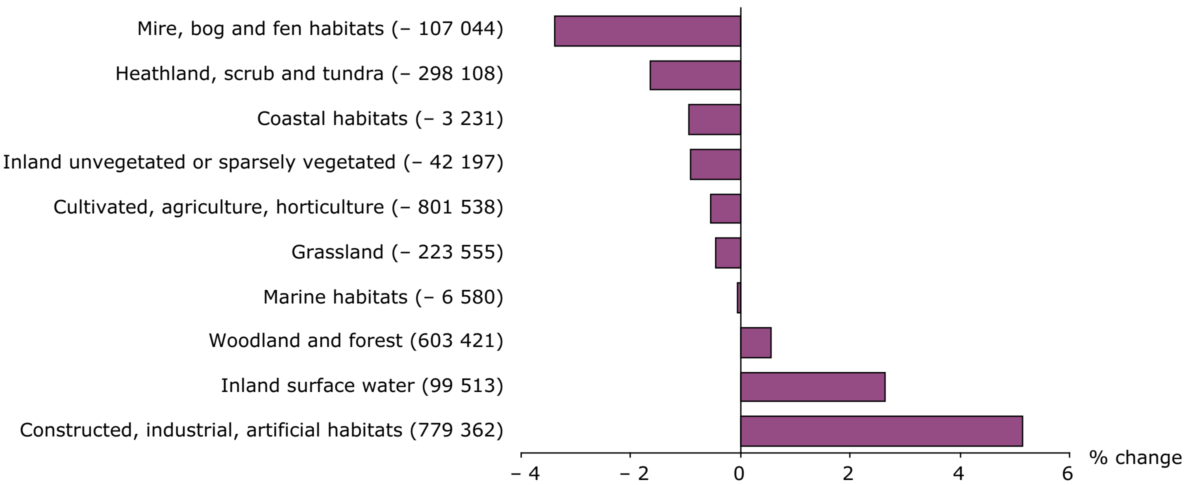


Note: Based on Corine Land Cover data.

How to read the graph: between 1990 and 2000, 35 % of new urban lands were formerly pastures and grasslands.

Source: EEA, LEAC (Land and Ecosystems Accounts).

Figure 8 Land cover change between 1990 and 2000: area change for major habitat classes



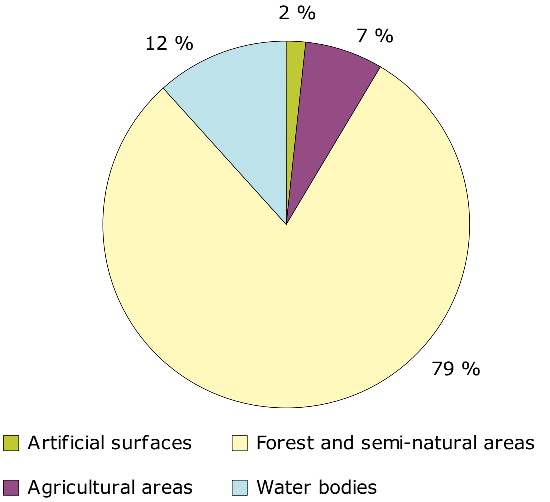
Note: The number in brackets indicates the total area change in hectares.

How to read the graph: from 1990 to 2000, urban (constructed, industrial and artificial) areas increased by more than 5 %, whereas some wetlands (mires, bogs and ferns) decreased by nearly 4 %.

Source: EEA, 2007b.

Forest cover has generally increased. It has been growing at a rate of about 8 000–9 000 km^2 per year since 1990. This expansion has primarily happened in the EU and EFTA, mainly due to decreasing pressure from grazing and spontaneous re-growth, as well as afforestation of abandoned agricultural land.

Figure 10 Conversion of wetlands into other classes, 1990–2000

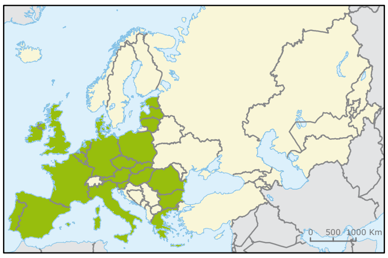


Note: Based on Corine Land Cover data.

How to read the graph: of wetland area converted to other land uses between 1990 and 2000, 7 % became agricultural.

Source: EEA, LEAC (Land and Ecosystems Accounts).

Geographical coverage



Web links

Corine Land Cover: http://reports.eea.europa.eu/COR0-landcover/en.

05. Habitats of European interest

Key policy question: What is the conservation status of habitats of Community interest?

Key message

Conservation status ([4]) is quite variable across the regions. A relatively large proportion of habitats (35 %) have a favourable status in the Alpine region but the situation is much worse in the Atlantic region where more than 70 % have an unfavourable status.That means their range and quality are in decline or do not meet the specified quality criteria. There are still significant gaps in knowledge on marine areas, except for the Baltic.

Assessment

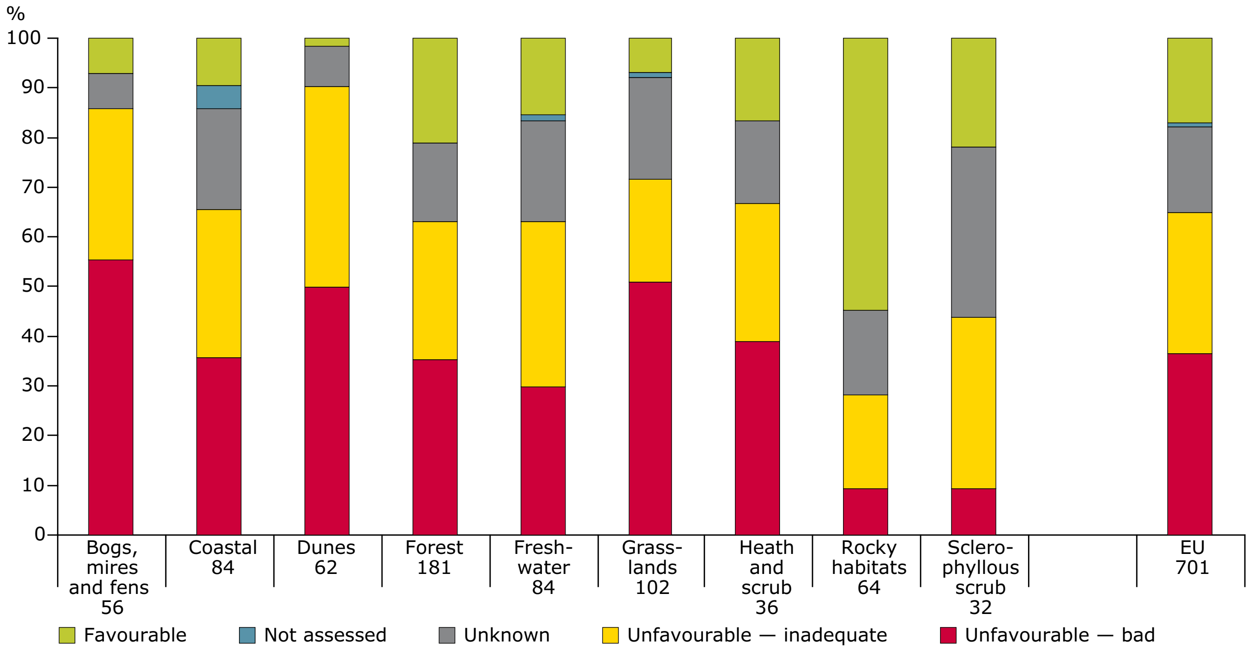
In several biogeographical regions (Atlantic, boreal, continental and Pannonian), around 70 % of habitats listed in Annex I of the Directive have an unfavourable status. More than 70 % of the bogs, grasslands and dunes are in unfavourable status. Trend information was not available in most cases.

Notes

The map and graph for this indicator are based on Member State assessments of habitats, which are provided in Annex I of the Directive. The Member States were required to assess each habitat in each biogeographical zone in which it exists in the country. A regional assessment was calculated based on the Member State assessments.

For many habitats, recovery to a favourable conservation status will take a considerable time; the next evaluation, due in 2013, will help assess the efficiency of the Directive.

Figure 11 Conservation status by main type of habitats

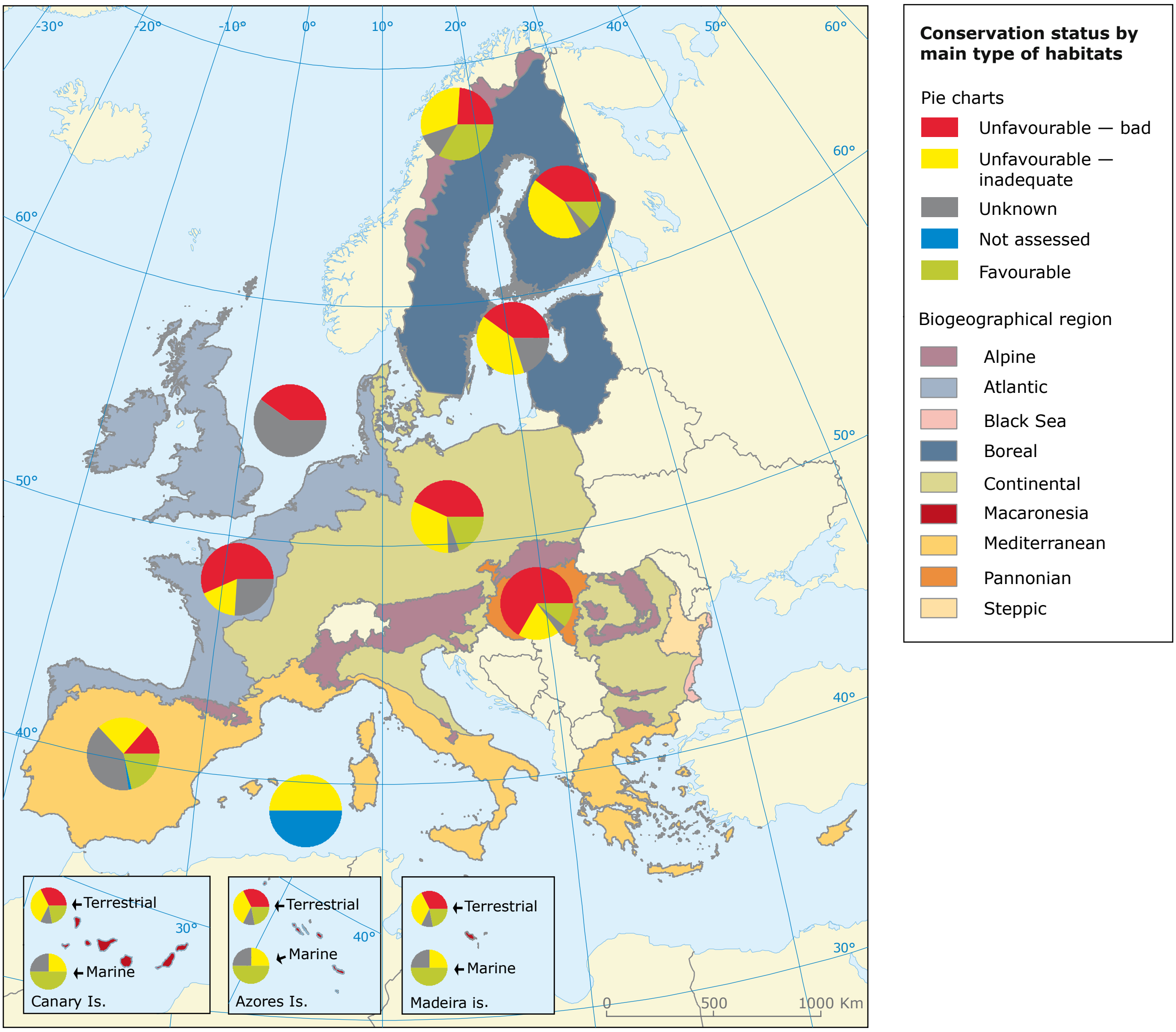


Note: How to read the graph: 10 % of coastal habitats have a favourable status and more than 30 % have an unfavourable-bad status. Numbers below the bars refer to the cumulated number of habitat assessments made at regional level. The EU column shows the total of the assessments in all other columns.

Source: Data provided by 25 EU Member States (EU-27 except Bulgaria and Romania that will be included in the next reporting phase in 2013) through their reports under Article 17 of the Habitats Directive. 2008.

([4]) The reporting format uses three classes of conservation status. 'Good' (green) indicates that the species or habitat is at Favourable Conservation Status as defined in the Directive and the habitat or species can be expected to prosper without any change to existing management or policies. Two classes of 'Unfavourable' are also recognised. 'Unfavourable-Bad' (red) signifies that a habitat or species is in serious danger of becoming extinct (at least locally) and 'Unfavourable-Inadequate' (amber) is used for situations where a change in management or policy is required but the danger of extinction is not so high. The unfavourable category has been split into two classes to allow improvements or deterioration to be reported. (Assessment, monitoring and reporting under Article 17 of the Habitats Directive: Explanatory Notes & Guidelines DRAFT 2 January 2006).

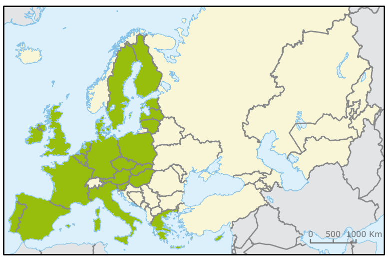
Map 4 Conservation status — habitats by biogeographical region



Note: How to read the map: in the Mediterranean biogeographical region, about 21 % of habitats have a favourable conservation status but 37 % have an unfavourable (bad plus inadequate) status.

Source: DG Environment and ETC/BD, based on data provided by 25 EU Member States (Bulgaria and Romania will be included in the next reporting phase in 2013) through their reports under Article 17 of the Habitats Directive (2008).

Geographical coverage



Web links

About habitats of European interest
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm.

About biogeographical regions
http://ec.europa.eu/environment/nature/natura2000/sites_hab/biogeog_regions/index_en.htm.

About conservation status assessment
http://ec.europa.eu/environment/nature/knowledge/rep_habitats/index_en.htm#csa.

http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2001-2007/internet_consultation/draft_consultation/_EN_1.0_&a=d.

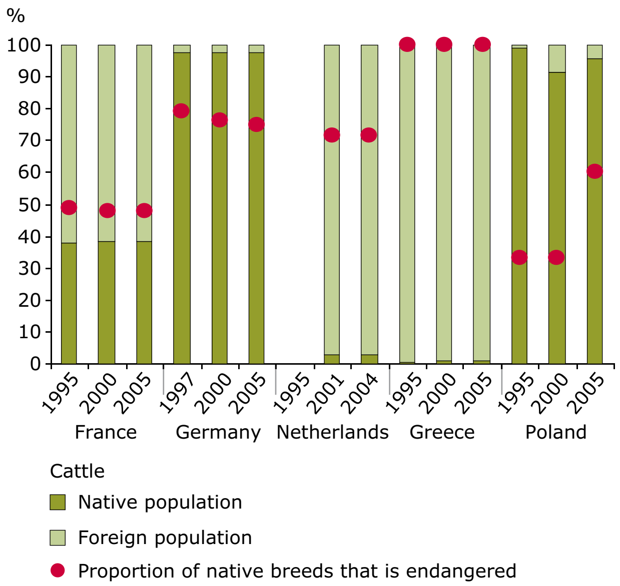
Headline indicator: trends in genetic diversity of domesticated animals, cultivated plants, fish species and trees of major socioeconomic importance

06. Livestock genetic diversity

Key policy question: Are fewer livestock breeds being used in Europe?

Key message
In several countries, populations of native breeds, although generally well adapted to local circumstances and resources, remain in critically low numbers, being replaced by a few and widespread highly productive breeds, introduced for this purpose. The fact that native breeds make up only a small part of the total population, and that a high percentage of native breeds are endangered (5) indicates a risk of loss of biodiversity. Although data are available for only a few countries, these indicate that many native cattle breeds are endangered. The situation for sheep is also problematic. Overall, the situation is stable but negative.

Figure 12 Cattle genetic diversity in selected countries



Note: How to read the graph: In France in 2005, around 40 % of the cattle population was native and 50 % of native cattle breeds were endangered.

Source: ETC/BD and BRG Paris (Bureau des Ressources Génétiques), 2009.

Assessment
The situation of endangered breeds is highly variable across countries and between cattle and sheep. In France and Germany, which have implemented breed conservation strategies and programmes, the situation of endangered cattle breeds is slightly improving while it is worsening for sheep. In Poland, where conservation strategies are more recent, the situation fluctuates. Cattle breeds are in a critical situation in the Netherlands and in Greece.

Animal breeds constitute a pool of genetic resources of considerable potential value in a changing society and environment. An increase in the proportion of introduced (non-native) breeds shows a trend towards a homogenisation of the genetic pool across European countries, with widespread use of the same highly productive breeds. Generally this happens at the expense of native breeds populations which have their own genetic characteristics, more specific to a country and which contribute to the overall genetic diversity across Europe. Both the widespread use of the same highly productive introduced breeds and the decline of some native breeds represent a risk to livestock genetic diversity.

While old native breeds may be less productive than highly specialised breeds, they are generally well adapted to local circumstances and resources and may increase resilience in the long term. They are an important source of genetic variability for future breeding programmes.

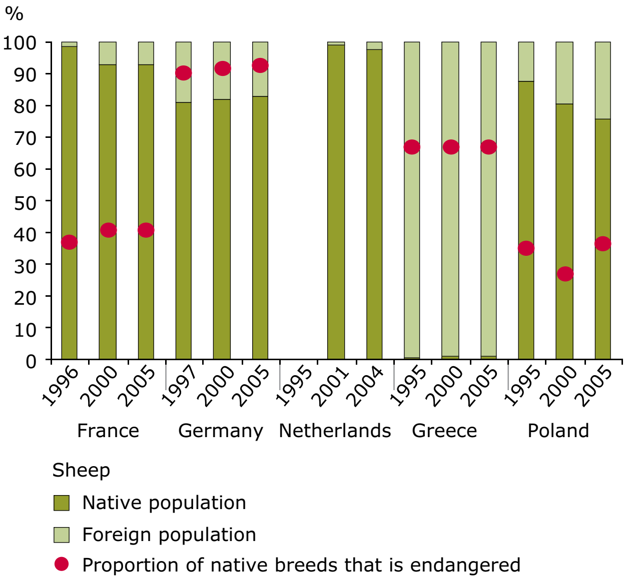
Breeds with small populations are in general more vulnerable than those with large populations . The main response to the loss genetic diversity is through adopting specific conservation programmes for native breeds. In the case of native breeds, the objective of all conservation programmes should be to increase the breeding female populations or at least stabilise them.

Whether a target should be set for the percentage of a country's cattle or sheep population that should consist of native breeds is a societal choice. However, as regards the proportion of native breeds endangered, the target should be zero if the loss of genetic diversity is to be halted.

At this stage, the livestock genetic diversity indicator should be interpreted with care because:

(5) According to FAO, an endangered breed is assessed on quantitative criteria as the total number of breeding females or the overall population size and the percentage of purebred females. Here, however, each country has its own interpretation.

Figure 13 Genetic diversity of sheep in selected countries



Note: How to read the graph: in France in 2005, around 90 % of the sheep population was native and 40 % of native sheep breeds were endangered.

Source: ETC/BD and BRG Paris (Bureau des Ressources Génétiques), 2009.

(i) there is still no agreement among countries on the definition of 'native' and 'non-native' breeds. The figures provided are those reported by individual countries, based on their own definitions and this obviously determines the patterns seen in Figures 12 and 13;
(ii) loss of native breeds, when they change status from endangered to extinct, can reduce the proportion of native breeds that are endangered.

At EU level, the Community programme on the conservation, characterisation, collection and utilisation of genetic resources in agriculture, established by Council Regulation (EC) No. 870/2004, co-funds actions for conserving genetic resources, increasing the use of under-utilised species and varieties in agriculture, and improving the coordination of actions in the field of international undertakings on genetic resources. The programme has a budget of EUR 10 million.

The Community programme complements the actions co-funded by the new Rural Development Council Regulation (EC) No. 1698/2005 [Article 39(5)] (http://ec.europa.eu/agriculture/rurdev/leg/index_en.htm), and by the Framework Programmes of the European Community for Research and Technology Development.

Geographical coverage

Web links

Bureau des Ressources Génétiques: www.brg.prd.fr.

FAO: www.fao.org/biodiversity/geneticresources/en.

http://ec.europa.eu/agriculture/envir/biodiv/genres/index_en.htm.

http://ec.europa.eu/agriculture/rurdev/leg/index_en.htm.

Headline indicator: coverage of protected areas

07. Nationally designated protected areas

Key policy question: What is the progress with the national designation of protected areas as a tool for biodiversity conservation?

Key message

The total area of nationally designated protected areas in Europe ([6]) has increased over time. The total area of nationally designated sites in 39 European countries was around 1 million square kilometres in 2007. In EECCA countries, the total area of nationally designated sites is at least 1.8 million square kilometres (for 30 % of sites no size information is available).

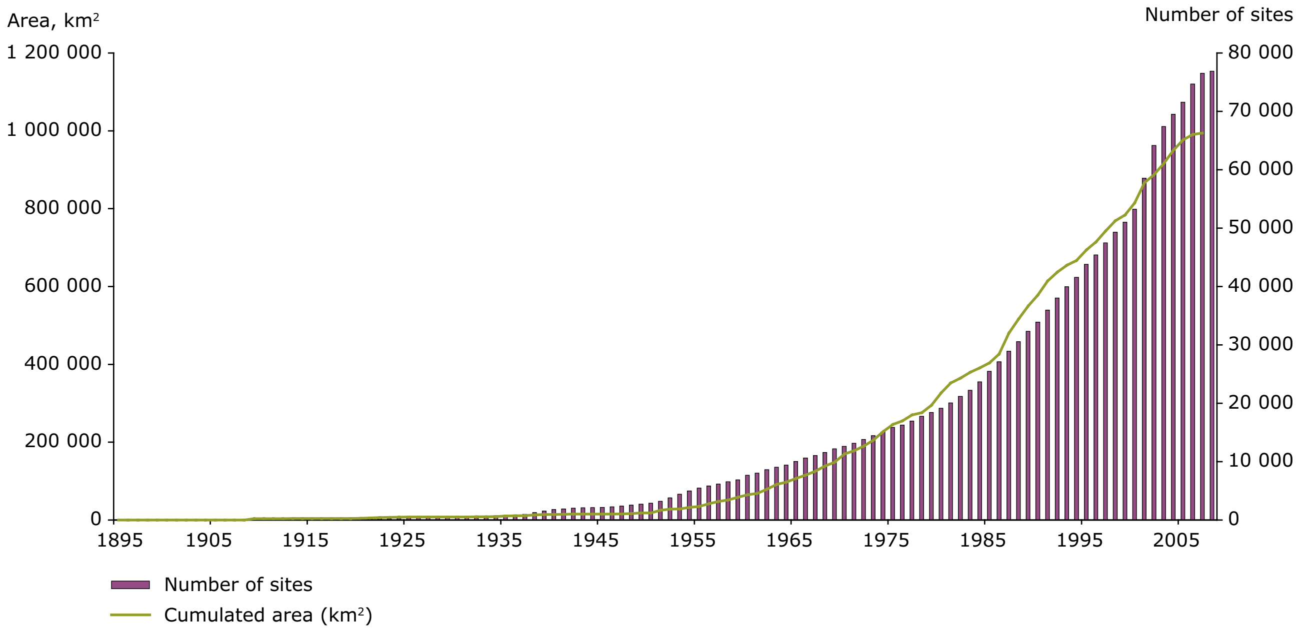
This quantitative information needs to be complemented by a qualitative assessment of the effectiveness as a tool for conserving biodiversity, including good management practices, and representativeness of the network of designated areas.

Assessment

Countries have national legislation that enables them to establish various types of protected areas. For nationally designated protected areas, the total area protected in Europe continues to increase.

On one hand it is difficult to know exactly how far these areas contribute to halting biodiversity loss without any specific information on site management

Figure 14 Growth of nationally designated protected areas in 39 EEA countries



Note: How to read the graph: in 2007, the total number of sites for 39 European countries in the Common Database on Designated Areas (CDDA) was 76 876, with a combined surface of 994 550 km².

Country coverage: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Overestimations may exist due to multiple designations for a single site but the overestimation may be offset by underestimation of the inventory because some national data sets are not complete.

Source: CDDA (Common Database on Designated Areas) version 7, 2007.

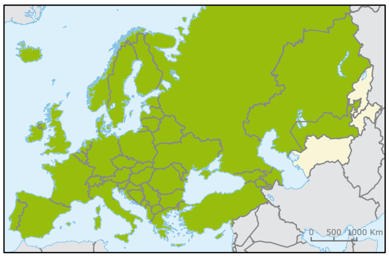
([6]) A 'Nationally Designated Area' is an area designated by a national instrument based on national legislation. If a country has included in its legislation the sites designated under the EU Birds and Habitats Directive, the Natura 2000 sites of this country are included in the total area.

and quality. On the other hand, other indicators can show how much pressure on biodiversity outside those areas increases as a result of growing urbanisation and transport infrastructures for instance. Therefore, the expansion of protected areas and their role in protecting biodiversity have to be considered and assessed within the wider environment.

In 39 countries, on average 16 % of the terrestrial area has been designated as a national protected area.

The growth in nationally designated areas has been exponential but has levelled off in recent years. A precise assessment of trends over time is much more difficult to make for EECCA countries because of gaps in the data. These countries contain around 18 000 sites covering in total 1.8 million km^2 (source: World Database on Protected Areas (WDPA) December 2007 for EECCA countries (except Kyrgyzstan, Tajikistan, Turkmenistan)). However, for more than two-thirds of the sites no designation date is known and for a third no size information is known.

Geographical coverage



Web links

About nationally designated areas: European data set: http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=1017 .

Global data set: www.unep-wcmc.org/wdpa/index.htm?http://www.unep- wcmc.org/wdpa/download.cfm~summary_tab.

08. Sites designated under the EU Habitats and Birds Directives

Key policy question: Have countries proposed sufficient sites under the Habitats and Birds Directives?

Key message

By mid-2008, most EU Member States were close to reaching the target levels for designation of Natura 2000 sites thought necessary to protect habitats and species targeted by the Habitats Directive. Twenty-one countries had a sufficiency of above 80 % and the new Member States (EU-10+2) were doing well given their recent accession. This is measured against a threshold that is considered adequate to achieve a favourable conservation status for the species and habitats of concern.

Assessment

Under the Habitats Directive, each Member State shall contribute to the creation of Natura 2000 by designating sites in proportion to the representation within its territory of the natural habitat types and the habitats of species of European interest.

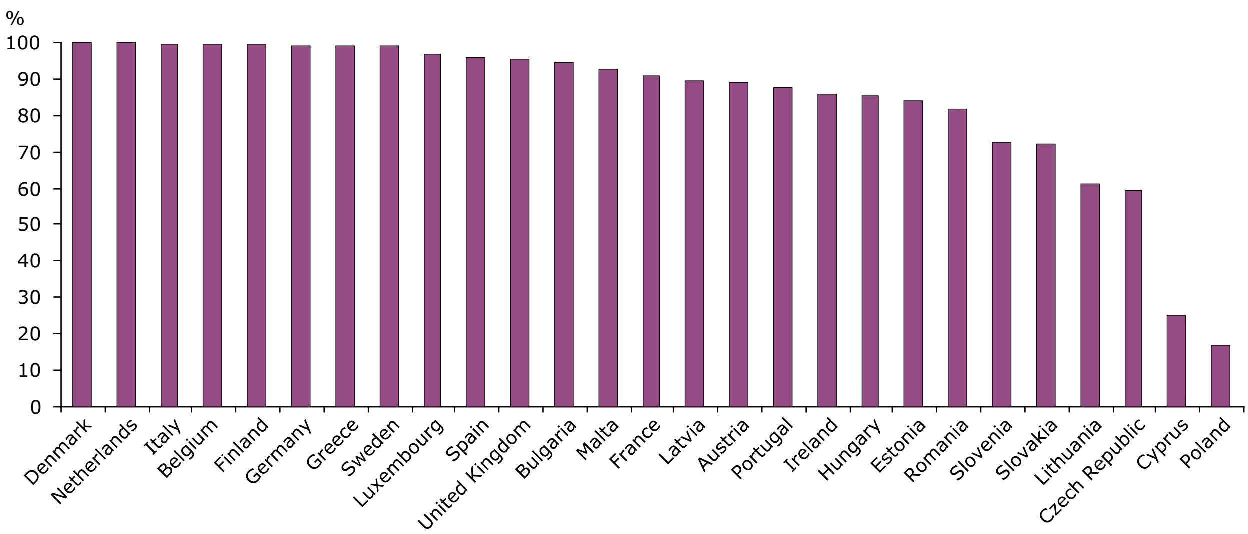
At EU level, around 10 % of the terrestrial territory is designated under the Birds Directive and around 13 % under the Habitats Directive. Many sites are designated under both directives.

The evaluation of sufficiency is based on the range of each species and habitat in the full territory of each Member State and within the sites proposed by the Member States. The representativeness is assessed by experts during scientific seminars led by the European Commission. Only terrestrial habitats and species are evaluated because marine areas are still under consideration. If the assessment concludes that designations are insufficient, proposed sites must be enlarged or new sites must be proposed that include a larger proportion of species population or habitat area.

At a biogeographical level, proposals for the Macaronesian and Black Sea regions are complete but additional proposals are needed for other regions.

In recent years there has been a steady increase in the cumulative area of the Natura 2000 network. Sites of Community Importance (SCIs) increased in coverage from 45 to more than 65 million hectares and Special Protected Areas (SPAs) increased from approximately 29 to 50 million hectares. These increases occurred mainly due to the fact that 10 new countries joined the EU in 2004, followed by Bulgaria and Romania in 2007. Another factor

Figure 15 State of Member State progress in reaching sufficiency, as stipulated in the Habitats Directive (Annex I for habitats and Annex II for species)

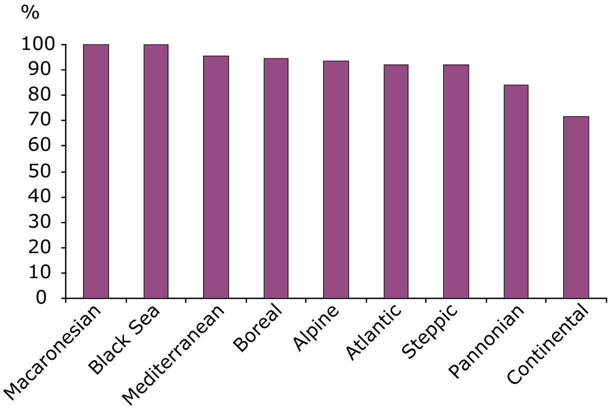


Note: Marine areas are excluded.

How to read the graph: sites proposed by Denmark are considered sufficient — in number and location — for all habitats and species listed in the Habitats Directive and present in Denmark. Sites proposed by the Czech Republic are sufficient for only 60 % of the species and habitats from the directive that are present in the Czech Republic; therefore, more sites need to be designated to reach 100 % sufficiency.

Source: DG Environment, 2008.

Figure 16 State of progress by biogeographical region in reaching sufficiency as stipulated by the Habitats Directive (Annex I for habitats and Annex II for species)



Note: Marine areas are excluded.

How to read the graph: sites proposed within the Atlantic region are insufficient to cover habitats and species listed in the Directive and present in this region. Member States of this region must make additional proposal of sites to reach 100 % sufficiency.

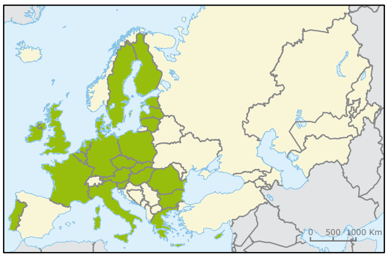
Source: DG ENV, June 2007.

was new designations of protected areas made by the Member States, particularly under the Birds Directive.

As of June 2008, eight Member States had designated more than 15 % of their territory as SCIs: Slovenia (31.4 %); Bulgaria (26.5 %); Spain (23.6 %); Portugal (17.4 %); Estonia (16.8 %); Greece (16.4 %); Luxembourg (15.4 %) and Hungary (15.0 %). As concerns SPAs, only four Member States had designated more than 15 % of their territory: Slovakia (25.1 %); Slovenia (23 %), Bulgaria (20.4 %) and Spain (19.1 %). there are no quantitative targets on the area to be designated and cover generally also depends on the ecological and other characteristics of a specific Member State.

The process of designating marine areas is still under way.

Geographical coverage



Web links

About Sites of Community Importance and Special Protected Areas
http://ec.europa.eu/environment/nature/natura2000/sites_hab/index_en.htm.

http://ec.europa.eu/environment/nature/natura2000/sites_birds/index_en.htm.

About biogeographical regions
http://ec.europa.eu/environment/nature/natura2000/sites_hab/biogeog_regions/index_en.htm.

Focal area: threats to biodiversity

Headline indicator: nitrogen deposition

09. Critical load exceedance for nitrogen

Key policy question: What are the trends in nitrogen emissions and where in Europe does atmospheric nitrogen deposition threaten biodiversity?

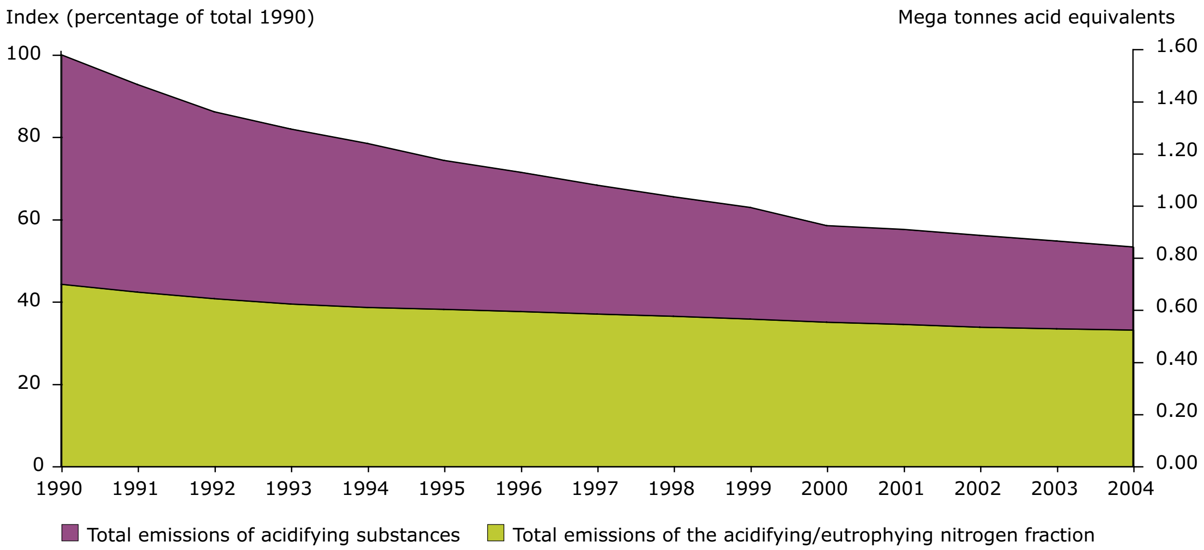
Key message

Nitrogen emissions and deposition of nitrogen compounds have decreased since 1990 but relatively little compared to sulphur emissions. Agriculture and transport are the main sources of nitrogen pollution (EEA, 2007c). In addition, nitrogen components can lead to eutrophication of ecosystems. When this pollution exceeds certain levels ('critical load'), it is damaging to biodiversity. Critical load exceedance is still significant ([7]).

Assessment

Across the EU-25, approximately 47 % of (semi-) natural ecosystem areas were subject to nutrient nitrogen deposition leading to eutrophication in 2004. A relatively smaller 15 % of the ecosystem area received deposition of acidifying compounds including nitrogen (CCE/EMEP, 2007). Ecosystem types in use by European countries for critical load calculations are forests; marine and coastal habitats; littoral zones; mire, bog and fen habitats; grasslands and tall forb habitats; heathland, scrub and tundra habitats; inland un-vegetated or sparsely vegetated habitats; agricultural habitats; inland and surface water habitats (for details see CCE, 2007). The extent to which critical loads are exceeded varies significantly across Europe.

Figure 17 Total emissions of acidifying substances (sulphur, nitrogen) and of nitrogen in the EEA-32 from 1990 to 2006

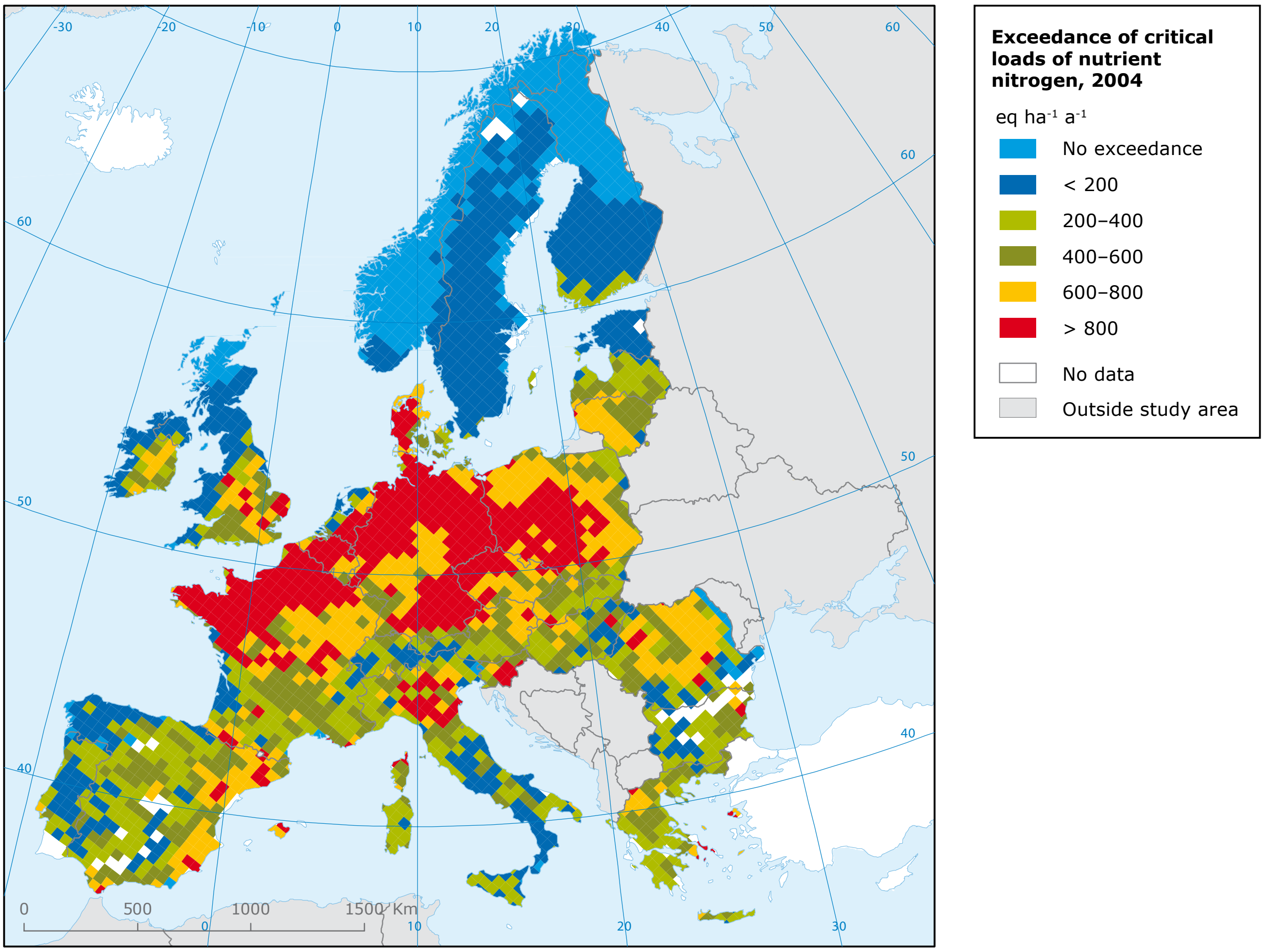


Note: How to read the graph: in 1990, the total of acidifying emissions was around 1 500 Gg, while for nitrogen fractions it was more than 500 Gg.

Source: EEA/ETC ACC.

([7]) The critical load of nutrient nitrogen is defined as 'the highest deposition of nitrogen as NO_X and/or NH_Y below which harmful effects in ecosystem structure and function do not occur according to present knowledge' (ICP, M&M, 2004).

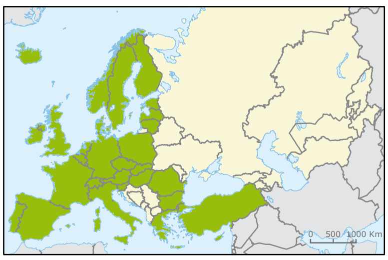
Map 5 **Exceedance of critical loads of nutrient nitrogen for the most sensitive ecosystems in each 50 x 50 km grid cell**



Note: How to read the map: for Norway, exceedances of the critical load for nutrient nitrogen are in general not a major problem. Exceedances can only be found in southern Norway. For northern Belgium, the critical load for nutrient nitrogen is exceeded by more than 800 equivalents nitrogen per hectare and year ('nitrogen' is the sum of airborne nitrate-N and ammonium-N deposited).

Source: Critical loads from the Coordination Centre for Effects and deposition data from the European Monitoring and Evaluation Programme — Meteorological Synthesizing Centre-West.

Geographical coverage



Web links

RAINS/GAINS (CIAM): www.iiasa.ac.at/rains.

EMEP/MSCW: http://projects.dnmi.no/~emep.

CCE: www.mnp.nl/cce.

Headline indicator: trends in invasive alien species

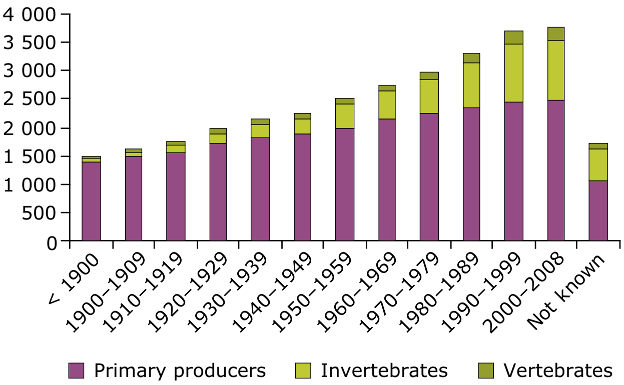
10. Invasive alien species in Europe

Key policy question: Is the number of alien species in Europe increasing? Which invasive alien species should be targeted by management actions? ([8])

Key message

The cumulative number of alien species introduced has been constantly increasing since the 1900s . While the increase may be slowing down or levelling off for terrestrial and freshwater species, this is certainly not the case for marine and estuarine species. A relatively constant proportion of the alien species establishedcause significant damage to native biodiversity, i.e. can be classified as invasive alien species according to the Convention on Biological Diversity. This increase in the number of alien species established thus implies a growing potential risk of damage to native biodiversity caused by invasive alien species.

Figure 18 Cumulative number of alien species established in terrestrial environment in 11 countries

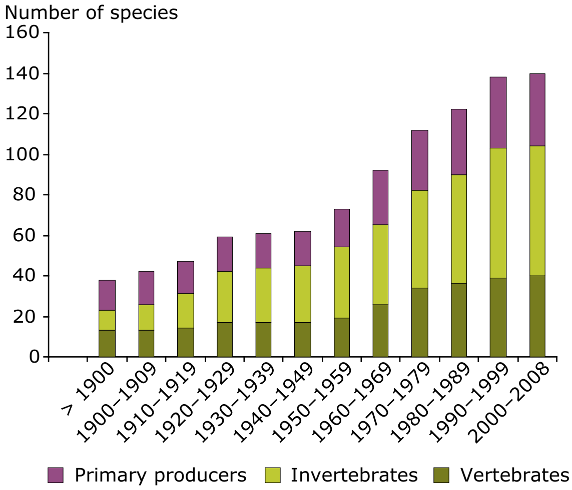


Note: How to read the graph: in the 1990s, the total number of terrestrial alien species reached more than 3 500 Species.

Geographic coverage: Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Poland, Norway, Russia and Sweden.

Source: EEA/SEBI2010; NOBANIS.

Figure 19 Cumulative number of alien species established in freshwater environment in 11 countries



Note: How to read the graph: in the 1990s, the total number of freshwater alien species reached around 140 species.

Geographic coverage: Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, Russia and Sweden.

Source: EEA/SEBI2010; NOBANIS.

While the majority of the approximately 10 000 alien species recorded in Europe (DAISIE project) have not (yet) been found to have major impacts, some are highly invasive. To identify the most problematic species to help prioritise monitoring, research and management actions, a list of 'Worst invasive alien species threatening biodiversity in Europe' ([9]), presently comprising 163 species/species groups, has been established.

While invasive alien species are recognised as a major driver of biodiversity loss, the issue of 'alien species' may in the future need to be considered in the context of climate change and particularly adaptation. For example, as agricultural food production adapts to a changing climate, farmers may welcome the arrival of pollinator species that match the new plant varieties that are used. Indeed, the movement of plant and animal species together may be necessary to facilitate adaptation.

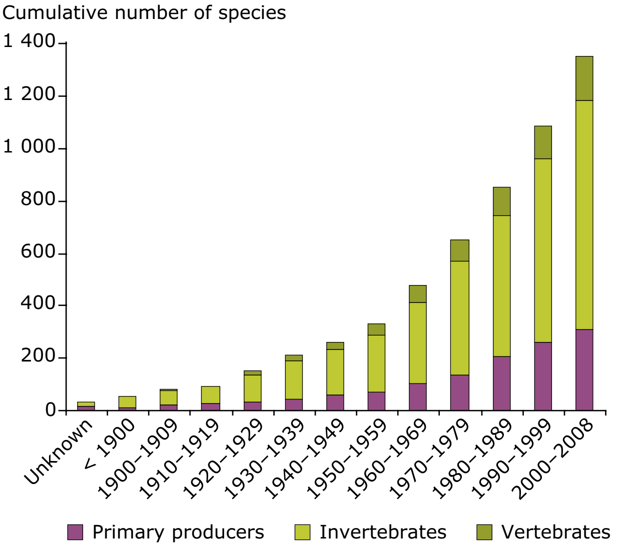
Assessment

The trend in establishment of new species indicates that the problem is far from under control, with

([8]) A species, subspecies or lower taxon, introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs or propagules of such species that might survive and subsequently reproduce. An invasive alien species is an alien species whose introduction and/or spread threaten biological diversity (www.cbd.int/invasive/terms.shtml, accessed on 2 December 2008).

([9]) Based on expert opinion in the SEBI 2010 expert group on invasive alien species.

Figure 20 Alien species in European marine/ estuarine waters (October 2008)



Note: How to read the graph: In the 1990s, the total number of alien marine species increased to around 1 000.

Geographic coverage: all European countries with marine/estuarine waters. Casual records are to some extent included (casual records < 1920) excluded as well as casual records that have later not been found again and therefore assumed extinct).

For an additional 31 species (15 primary producers, 16 invertebrates) the date of establishment is unknown.

Source: SEBI 2010 Expert Group on invasive alien species, based on national data sets (Belgium, Denmark, Germany, Malta and the United Kingdom) available online; review papers (Netherlands and Turkey); NEMO database for the Baltic; Black Sea database; HCMR data base for the Mediterranean; project reports (ALIENS, DAISIE); and the contributions of experts from France, Spain and Russia made during a dedicated workshop.

impacts on biodiversity expected to increase because of the growing number of species involved, and an increasing vulnerability of ecosystems to invasions, which results from other pressures such as habitat loss, degradation, fragmentation, over-exploitation and climate change. Particularly worrying is the situation in marine and island ecosystems.

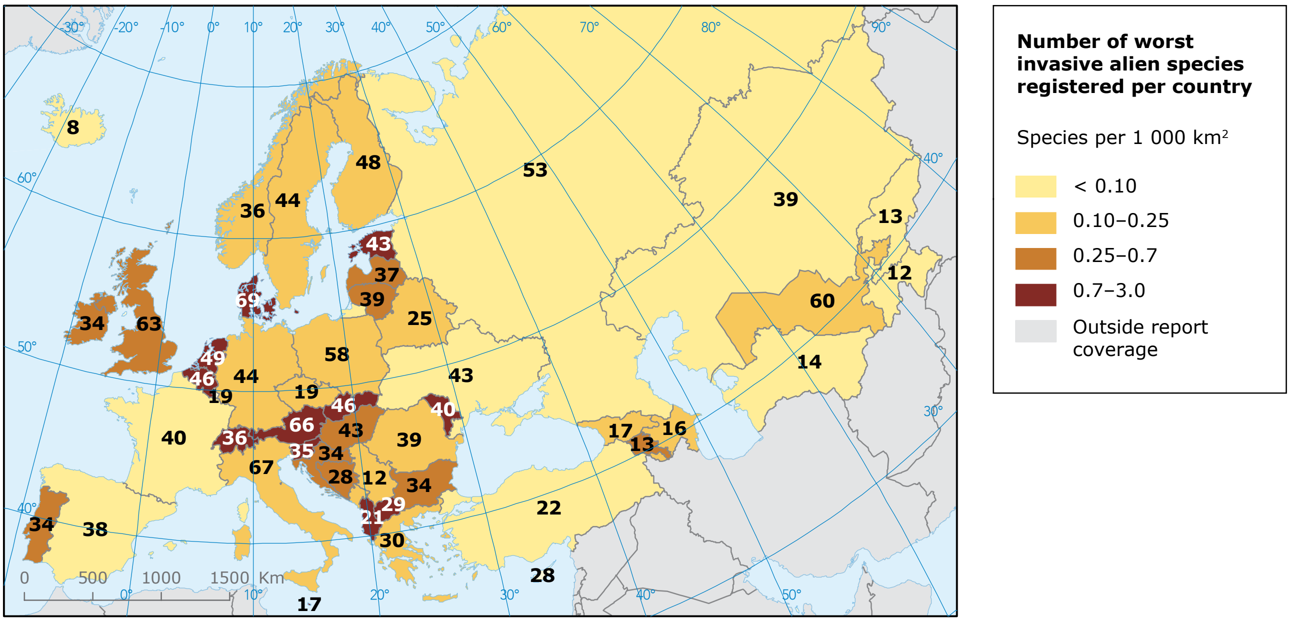
The indicator on the cumulative number of alien species established in Europe includes data from all European countries with marine/estuarine waters (and non European countries bordering European seas). For terrestrial and freshwater ecosystems, however, data are currently available for 11 European countries. Nevertheless the indicator may be considered fairly representative for the European area. Data coverage on the cumulative numbers of alien species established in Europe will be expanded to cover more European countries in the near future.

The number of invasive alien species establishing themselves in Europe should be minimized and management actions should be taken to reduce the impact of at least the worst invasive alien species to acceptable levels. There is, however, no quantitative target for this indicator. The list of 'worst invasive alien species threatening biodiversity'([10]) identifies species that should be a priority for more detailed monitoring, research and management. The 163 species/species groups on the present list, of which vascular plants are the biggest taxonomic group with 39 species, are judged to have a significant impact on native biodiversity through competition with other species. They may also affect human health and damage economic activities. Map 6 shows a preliminary estimate of the number of worst invasive species in European countries. The main conclusion to draw from the map is that fairly high numbers of listed species can be found in all European countries. These country figures are only rough indications of the actual impact, which may differ markedly between species and regions.

There is a consensus (e.g. in the context of the Convention on Biological Diversity) that the best strategy of addressing invasive alien species would be through control of pathways of introduction to prevent establishment of new alien species. The opportunities for eradicating established alien species are best at an early stage (or in limited areas such as small islands). An early warning system identifying potentially invasive alien species, including newly established ones and/or species expected to spread, would be of high value in this context. This indicator, therefore, will need to be complemented by information on developing and implementing strategies to manage the problem of invasive alien species.

([10]) Based on expert opinion expressed at the SEBI 2010 expert group on invasive alien species.

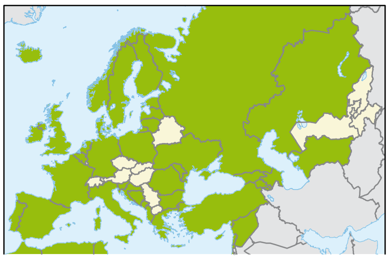
Map 6 **Number of species listed as 'worst invasive alien species threatening biodiversity in Europe' per country**



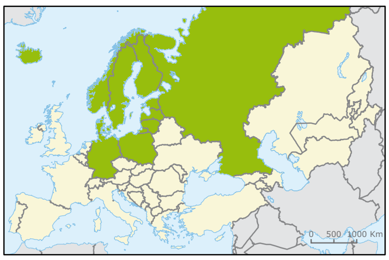
Note: How to read the map: of the list of 163 'worst invasive alien species', 34 are present in Portugal.

Source: EEA/SEBI2010, 2006.

Geographical coverage



Marine species



Terrestrial and freshwater species

Web links

North European and Baltic Network on Invasive Alien Species (NOBANIS): www.nobanis.org.

DAISIE (Delivering Alien Invasive Species Inventories for Europe): www.europe-aliens.org.

NEMO: Baltic Sea Alien Species Database: www.corpi.ku.lt/nemo/mainnemo.html.

Headline indicator: impact of climate change on biodiversity

11. Impact of climatic change on bird populations

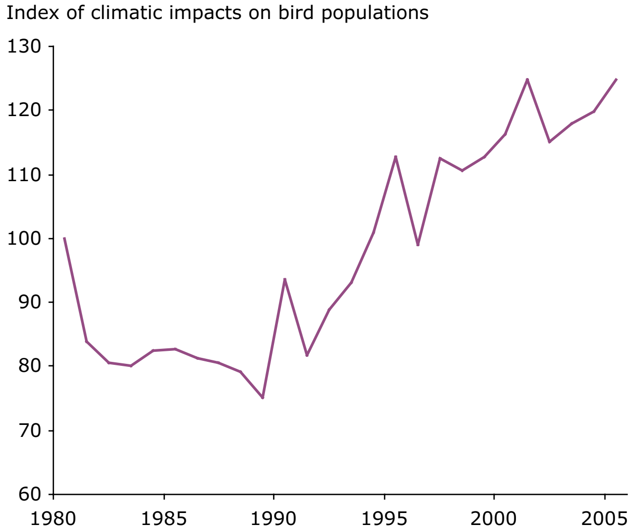
Key policy question: What are the negative (and positive) impacts of climate change on biodiversity?

Key message
Climate change is having a detectable effect on bird populations at a European scale, including both negative and positive effects.

The number of bird species whose populations are observed to be negatively impacted by climatic change is three times larger than those observed to be positively affected by climate warming in this set of widespread European land birds.

The Climatic Impact Indicator, which illustrates the impact of climate change on bird populations, has increased strongly in the past twenty years, coinciding with a period of rapid climatic warming in Europe. Potential links between changes in bird populations and ecosystem functioning and resilience are not well understood.

Figure 21 Climatic impact indicator for European birds



Note: How to read the graph: the indicator demonstrates the impact of climate change on widespread bird populations has increased strongly in the past twenty years.

Source: Gregory *et al.*, 2009.

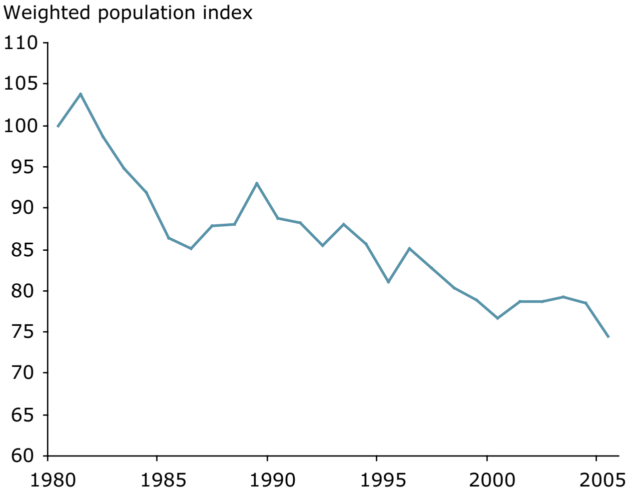
Assessment
The Climatic Impact Indicator (CII) measures the divergence between the population trends of bird species projected to expand their range and those predicted to shrink their range due to climatic change. The indicator is based on a combination of observed population trends monitored from 122 common bird species in 20 European countries over 26 years, and projected potential shrinkage or expansion of range size for each of these species at the last part of this century (2070–2099), derived from climatic envelope models. The ensemble in this case is the average climate envelope forecast based on six differing future scenarios.

As with any biological data, there is annual variation and statistical noise around the observed trend in the CII. However, the general trend of the CII is clearly upwards indicating that climatic change is having an increasing impact on bird populations. Where the trend is downwards, this means that the impact of climate warming on bird populations is being overridden by other pressures in the environment; these could be man-made pressures, or natural ones, such as cold winter weather. The CII demonstrates unequivocally and for the first time that climatic change has affected bird populations at a European scale. It shows conformity between observed population trends and modelled projections of how each species should respond to climatic warming

The CII fell in the 1980s reflecting the influence of cold winter weather events during this time (especially around 1980 and 1985 when such events significantly increased mortality in small birds) combined with other known drivers, such as land use change and agricultural intensification, which acted to depress bird populations. The indicator shows no signal of climatic warming until approximately 1986. The stable temperatures in the early 1980s represent the end of a period of stable annual average temperature in Europe that began around 1950.

From the late 1980s, however, the CII shows the effects of climatic warming on bird population trends, similar to that predicted by the climatic envelope models; and the impacts have increased roughly linearly to date. The number of bird species whose populations are observed to be negatively impacted by climatic change is three times larger than those observed to be positively affected by climate warming in this set of widespread European land birds. The CII has increased rapidly in the past twenty years, coinciding with a period recognised by climatologists as a time of rapid observed climatic warming in Europe.

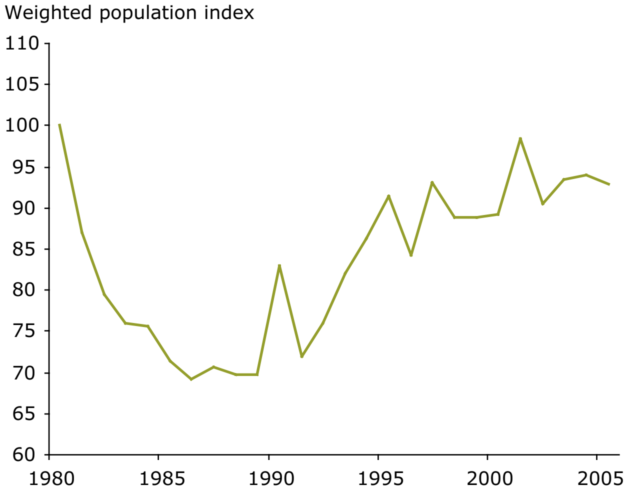
Figure 22A Weighted population trend of species predicted to lose range in response to climatic change (92 species)



Note: How to read the graph: the weighted population index of species expected to lose in range due to climatic change has decreased by 20 % since 1989.

Source: Gregory *et al.*, 2009.

Figure 22B Weighted population index of species predicted to gain range in response to climatic change (30 species)



Note: How to read the graph: the weighted population index of species expected to gain in range due to climatic change has increased by 30 % since 1989.

Source: Gregory *et al.*, 2009.

A closer analysis reveals that the sub-indicator figures, which lie behind the construction of the CII (Figures 22A and 22B), show differing fortunes for those species whose ranges are predicted to be negatively impacted by climatic warming compared to those positively impacted. While many European land birds show signs of decline in response to warming (92 species predicted to shrink in range size, reflected in sub-indicator A), some bird populations have responded positively to climatic change and have increased in number (the 30 species predicted to gain range size, reflected in sub-indicator B). This is likely to have led, and will increasingly lead, to changes in species composition at a regional scale. We can only speculate as to the potential correlation between such changes in bird populations and ecosystem function and resilience. It is suggested that increasing climatic effects might alter ecosystem functioning and resilience.

The effects of climate change for some migratory bird species may be most severe outside their European range and a comprehensive response would need to be effective beyond European territory.

Notes
The indicator is based on the combination of two data sets:

(i) Population trend data on 122 common and widespread bird species for any part of the period between 1980 and 2005 in 20 European countries (from the Pan-European Common Bird Monitoring Scheme: PECBMS). See Gregory *et al.* (2005, 2008);
(ii) Climatic envelope model projections for each of the 122 species for the simulated future between 2070 and 2099 showing an expanding potential geographical range or a decreasing potential geographical range. These are based on an ensemble forecast built on three General Circulation Models and two IPCC SRES emissions scenarios. See Gregory *et al.* (2009), Huntley *et al.* (2007, 2008).

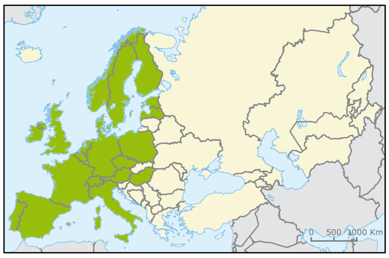
Methods in brief
The CII is calculated in two steps. First, the 122 bird species were divided into those for which the ensemble climatic envelope model projection indicated an increase in a potential geographical range (30 species: sub-indicator B) and those with projected decreases in their geographical range (92 species: sub-indicator A). For each of the two groups of species, a multi-species population index (proceeding from population indices for individual species) was then calculated, with the weight of the contribution of each species to the index being based on the modelled projected change in a potential range

extent. Extreme projections of the range increase, or loss, for individual species, thus, have a greater influence on the line. In simple terms, population trends displayed by birds predicted, in the models, to be significantly affected by climatic changes (either negatively or positively) register a strong influence over the direction of the lines shown in the sub-indicator figures.

In the second step, the CII itself is calculated for a given year. It is done as a ratio between the index for species whose potential range is projected to increase (30 species, reflected in sub-indicator B) and the index for the species whose geographical range is projected to decrease (92 species, reflected in sub-indicator A). The two lines have equal weighting in the indicator.

The methodology developed here is equally applicable to any other species group where equivalent information is available. For full methods and discussion, see Gregory *et al.* (2009).

Geographical coverage



Note: The bird trend data come from 20 European countries. Climate envelope models were fitted to European species' ranges and the climatic projections cover the whole of Europe.

Web links

European Bird Census Council: www.ebcc.info.

Focal area: ecosystem integrity and ecosystem goods and services

Headline indicator: Marine Trophic Index

12. Marine Trophic Index of European seas

Key policy question: What is the impact of existing fisheries and maritime policies on the health of fish stocks in European seas?

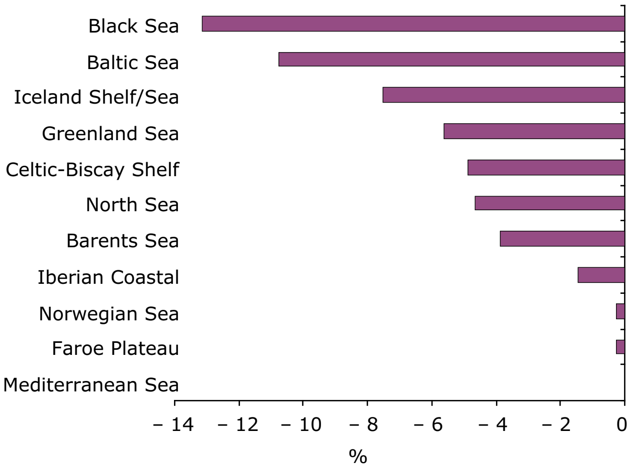
Key message

In the majority of European seas, the Marine Trophic Index (MTI) has been declining since the mid-1950s, which means that populations of predatory fishes decline to the benefit of smaller fish and invertebrates.

Assessment

A multispecies fishery can be assumed to be unsustainable if the mean Trophic Level of the species it exploits keeps declining. The decline in MTI is happening at different rates in different seas and four seas have shown no overall changes in their MTI since 1950. A more thorough analysis of the individual fisheries is required to assess causes of declines and specific effects on the wider marine ecosystems. Figures 24A and 24B show the MTI in European seas in two groups. The seas have been grouped according to the evolution in their MTI since 1950. Figure 24A shows seas with a more or less continuous decline in MTI. Figure 24B shows those seas where the trend is more stable. It is noteworthy that the trend since 1950 is different for most seas from the trend considered over a shorter recent time period (since 2000 MTI declines seem less severe or MTI is even going up).

Figure 23 Marine Trophic Index change between 1950 and 2004



Note: How to read the graph: the MTI for the Black Sea was about 13 % lower in 2004 than it was in 1950.

Source: Sea Around Us Project, www.seaaroundus.org.

The levelling off since 2000, however, may still mean that biodiversity has been lost, because considerable declines had already taken place before 1950 (e.g. in the North Sea). Increases in the Barents and Norwegian Seas since 1980, and in the Greenland Sea and on the Iceland shelf since 2000, signify a potential positive sign for biodiversity. It is also worth noting that when a country halts the fishery of a species with a low trophic level, the calculated MTI for the sea will go up, which distorts the message, for example if a fishery is halted because the stock is at a very low level.

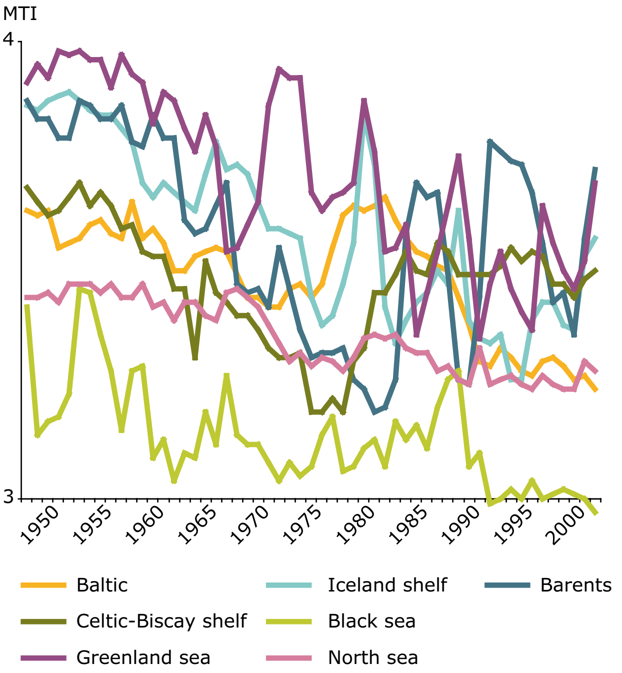
Pursuant to the Marine Strategy Framework Directive (Art. 8) the EU requires that by mid-2012 the Member States should make an integrated 'initial assessment' of the environmental situation of their marine waters .

Notes

Most preferred fish catches consist of large, high value predatory fish, such as tuna, cod, sea bass and swordfish. The intensification of fishing has led to the decline of these large fish, which are high up in the food chain. As predators are removed, the relative number of small fish and invertebrates lower in the food chain tends to increase and the mean trophic level (i.e. the mean position of the catch in the food chain) of fisheries landings, goes down. The mean trophic level of a species

(7) The critical load of nutrient nitrogen is defined as 'the highest deposition of nitrogen as NO_X and/or NH_Y below which harmful effects in ecosystem structure and function do not occur according to present knowledge' (ICP, M&M, 2004).

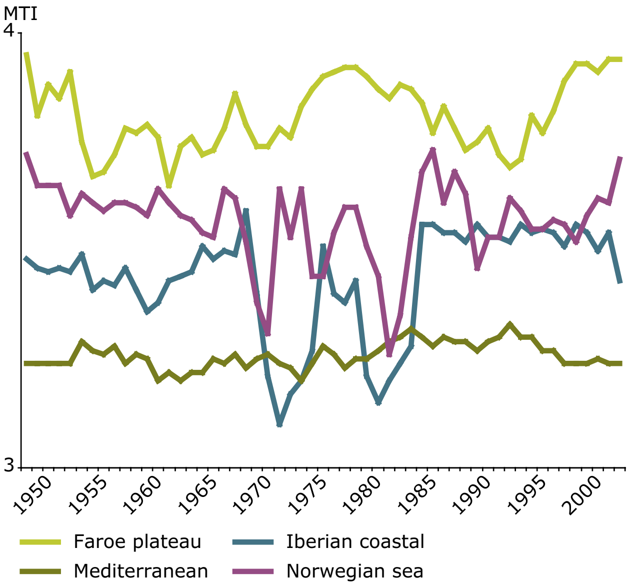
Figure 24A Marine Trophic Index for selected European seas



Note: How to read the graph: in the Baltic Sea, MTI has been decreasing since 1950.

Source: www.seaaroundus.org.

Figure 24B Marine Trophic Index for selected European seas



Note: How to read the graph: in the Mediterranean Sea, MTI has been stable since 1950.

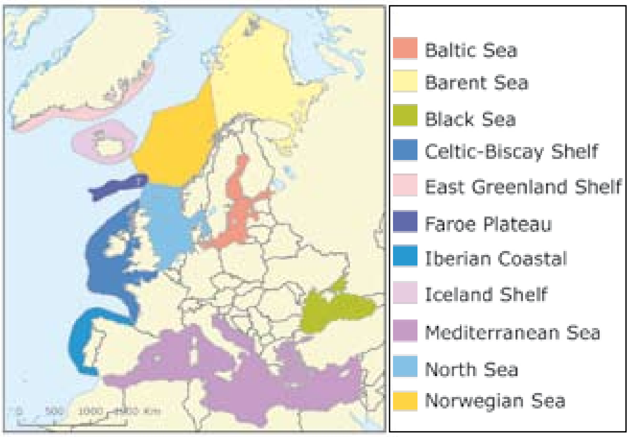
Source: www.seaaroundus.org.

is a calculated value, which reflects the species abundance balance across a trophic range from large long living and slow growing predators to fast growing microscopic primary producers. It is therefore a reflection of the biodiversity status of the system. It is derived by assigning a numerical trophic level to selected taxa, established by size, diet or nitrogen isotope levels.

Thus, the MTI describes a major aspect of the complex interactions between fisheries and marine ecosystems and communicates a measure of species replacement induced by fisheries. What is most important in the MTI is the trend, rather than the specific value.

Some improvements of this indicator (calculating an MTI using commercial landings and existing lists of trophic level of adult fish by species) as well as supplementary indicators have been suggested. Some of these will be explored during 2009–2010.

Geographical coverage



Web links

Marine Trophic Index at the Sea Around Us Project: www.seaaroundus.org/sponsor/cbd.aspx.

Headline indicator: connectivity/ fragmentation of ecosystems

13. Fragmentation of natural and semi-natural areas

Key policy question: Are European natural/ semi-natural lands becoming more fragmented? Are forest landscapes becoming more fragmented?

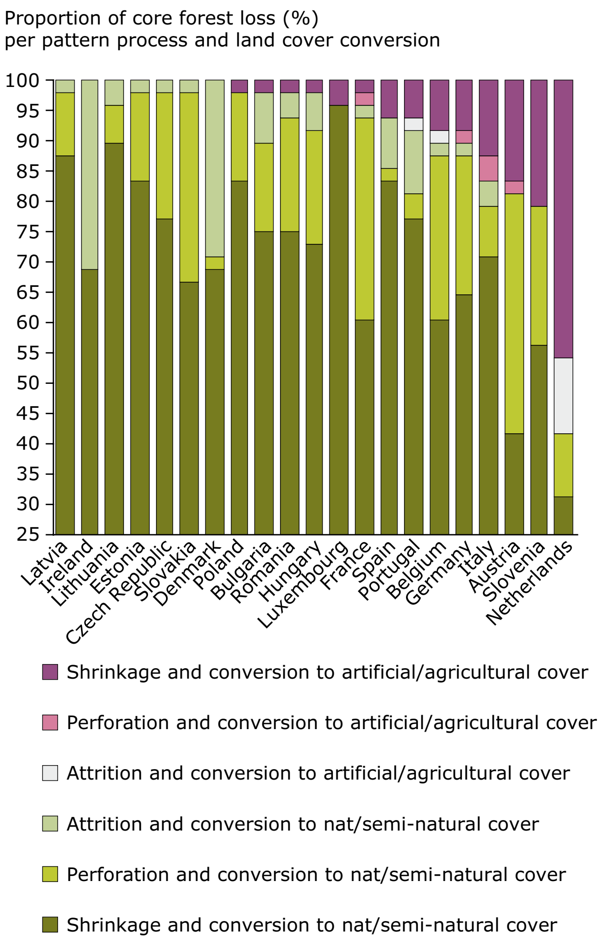
Key message
European ecosystems are literally cut to pieces by urban sprawl together with a rapidly expanding transport network. The increase of mixed natural landscape patterns due to the spread of artificial and agricultural areas into what used to be core natural and semi-natural landscapes is more significant in south-western Europe.

Fragmentation is in many places caused by forest harvesting and has a dynamic and cyclic nature but in south-western Europe, losses towards agricultural and artificial surfaces are more frequent. In the period 1990–2000 the connectivity for forest species was stable in approximately half of Europe's territory and increasing or decreasing slightly for another 40 %. The decrease was significant in about 5% of provinces spread in Denmark, France, the Iberian Peninsula, Ireland and Lithuania.

Assessment
Patterns of natural/semi-natural landscapes (Map 7) ([11])
Pattern changes can be naturally-occurring phenomena but are mostly driven at this scale by anthropogenic causes. The increase in mixed natural landscape patterns due to the spread of artificial and agricultural areas into previously core natural/semi-natural landscapes was found to be more significant in south-western Europe (see Map 7). The increase in core natural landscape patterns, when observed, is generally driven by the spread of core forest and other wooded landscape.

Core forest fragmentation in the period 1990–2000 (Figure 25 and Map 8)
It is well known that forest area is currently increasing in Europe but this is not uniformly distributed. Locally, the spatial forest pattern is

Figure 25 National patterns of core forest loss (%) by type of forest conversion and forest fragmentation process



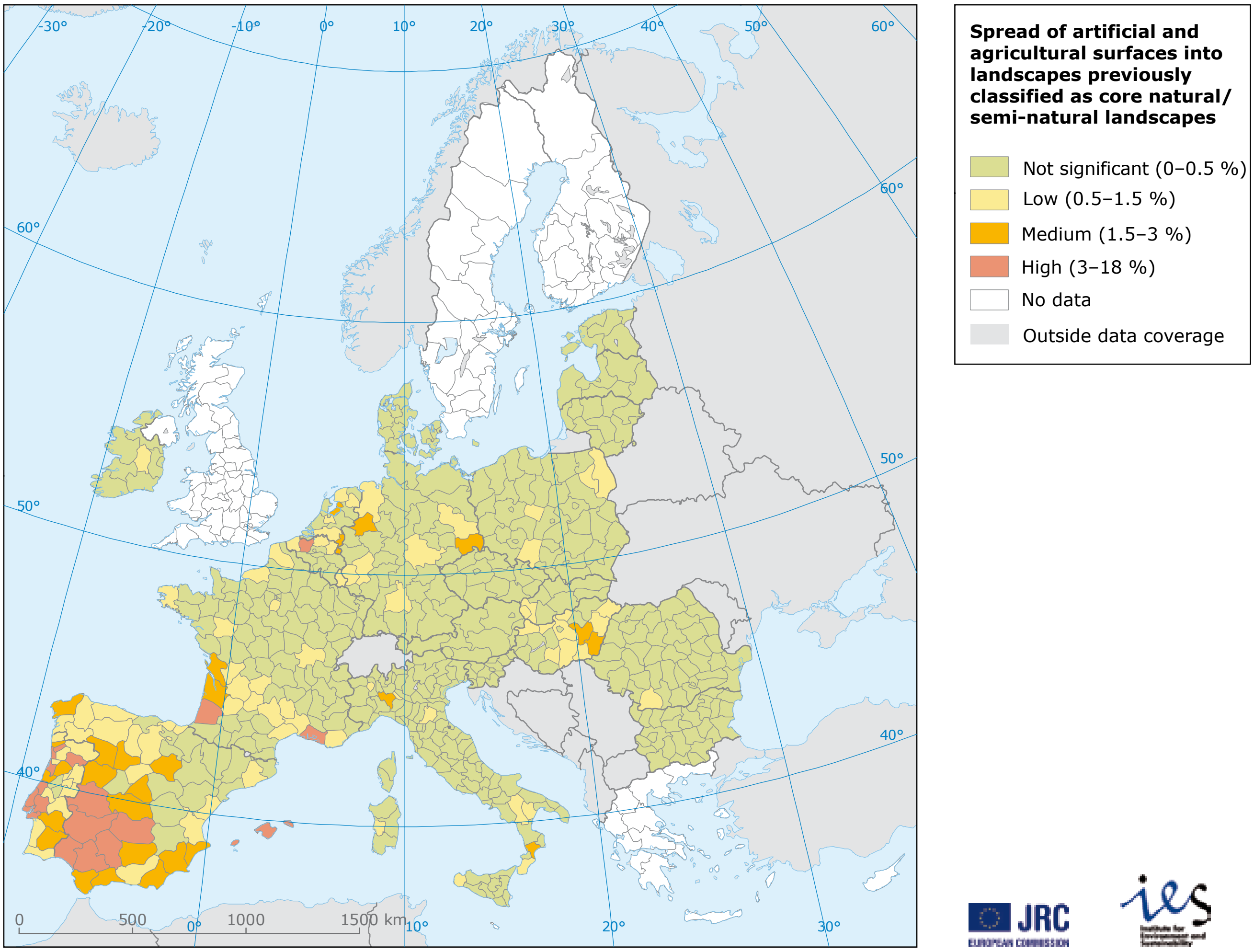
Note: How to read the graph: In Netherlands, nearly 60% of core forest loss is towards artificial/agricultural cover and dominated by shrinkage (around 45%), then attrition (above 10%). Core forest loss, when observed, is predominantly towards natural/semi-natural non–forested cover and occurring through shrinkage of core forest patches.

Data from Corine Land Cover (CLC) for years 1990 and 2000, hence with same geographical coverage and forest definition as CLC; Results are focused on loss and aggregated at country level (gains not accounted).

Source: JRC, Estreguil and Mouton, 2009; European Forest Data Centre (JRC EFDAC Map viewer at http://efdac.jrc.ec.europa.eu/).

([11]) Natural/semi-natural lands include forest, transitional wooded land, grassland/shrub land, open space with little vegetation, inland and coastal wetlands. Patterns of natural/semi-natural lands are defined according to the composition in terms of natural/ semi-natural, artificial/built-up and agricultural surfaces in the 50 ha surroundings of each natural/semi-natural land pixel (1 ha). Core natural landscape patterns are natural/semi-natural lands with a 100 % natural neighbourhood. Mixed natural landscape patterns are natural/semi-natural lands with at least 60 % natural neighbourhood and the rest as agricultural and/or artificial.

Map 7 **Spread of artificial and agricultural surfaces into previously core natural or semi-natural landscapes**



Note: How to read the map: in south-west Spain, the spread of artificial and agricultural surfaces into previously core natural/ semi-natural landscapes was significant between 1990 and 2000.

Data from Corine Land Cover (CLC) for years 1990 and 2000, hence with same geographical coverage and class definition as CLC. Landscape mosaic index adapted from Riitters *et al.* (2009).

Source: JRC, Estreguil and Mouton, 2009; European Forest Data Centre (JRC EFDAC Map viewer at http://efdac.jrc.ec.europa.eu/).

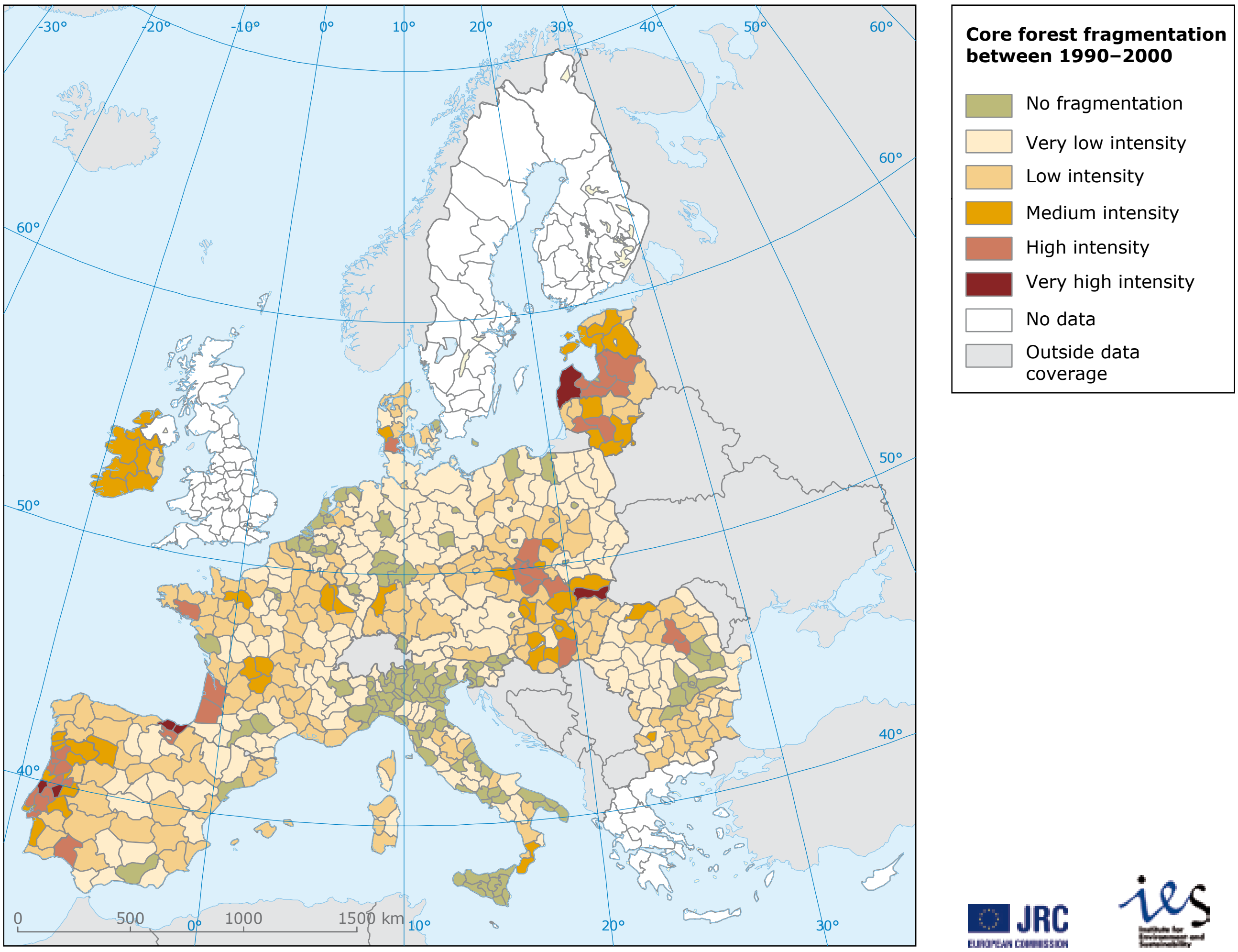
changing due to different dynamics: loss of forest areas, fragmentation of forest cover and therefore loss of connectivity. Those processes are likely to have ecological effects.

Fragmentation is in many places caused by forest harvesting and has a very dynamic and cyclic nature that may be beneficial to some species and highly detrimental to others (land mechanically disturbed after clear cut may be replanted or left to natural regeneration).

The term 'core forest' refers to the area of a forest patch minus a 100 m edge ([12]). Fragmentation processes in core forest loss potentially lead to effects on species (reduction of resource base,

([12]) Because edge effects are species specific, a 100m edge width was arbitrarily selected as a generic protection belt for interior forest species (100 m is for example the penetration distance of noise disturbances affecting interior forest birds). Forest class: a single forest class after dissolving boundaries between Corine classes 3.1.1 (broad-leaved forest), 3.1.2 (coniferous forest) and 3.1.3 (mixed forest); include young plantation when 500 subjects/ha, transitional woodland when canopy closure > 50 %. Non-forest class: includes transitional other wooded land, young plantations (< 500 subjects/ha), clear cuts, burned areas, forest nurseries and natural/semi-natural non-wooded vegetation (CLC classes 3.2 and 3.3), artificial (CLC class 1) and agricultural (CLC class 2) surfaces, wetlands (CLC class 4).

Map 8 Core forest fragmentation between 1990 and 2000



Note: How to read the graph: in western Latvia, the fragmentation process in the sense of breaking apart of core forest into smaller units was significant (very high and high intensity) between 1990 and 2000.

The data derive from Corine Land Cover (CLC) for the years 1990 and 2000 and hence have the same geographical coverage and forest definition as CLC ; core forest from mathematical morphology based software GUIDOS from Soille and Vogt, 2009 and GIS analysis;

Results aggregated at provincial units, NUTS level 2 or 3 ([13]).

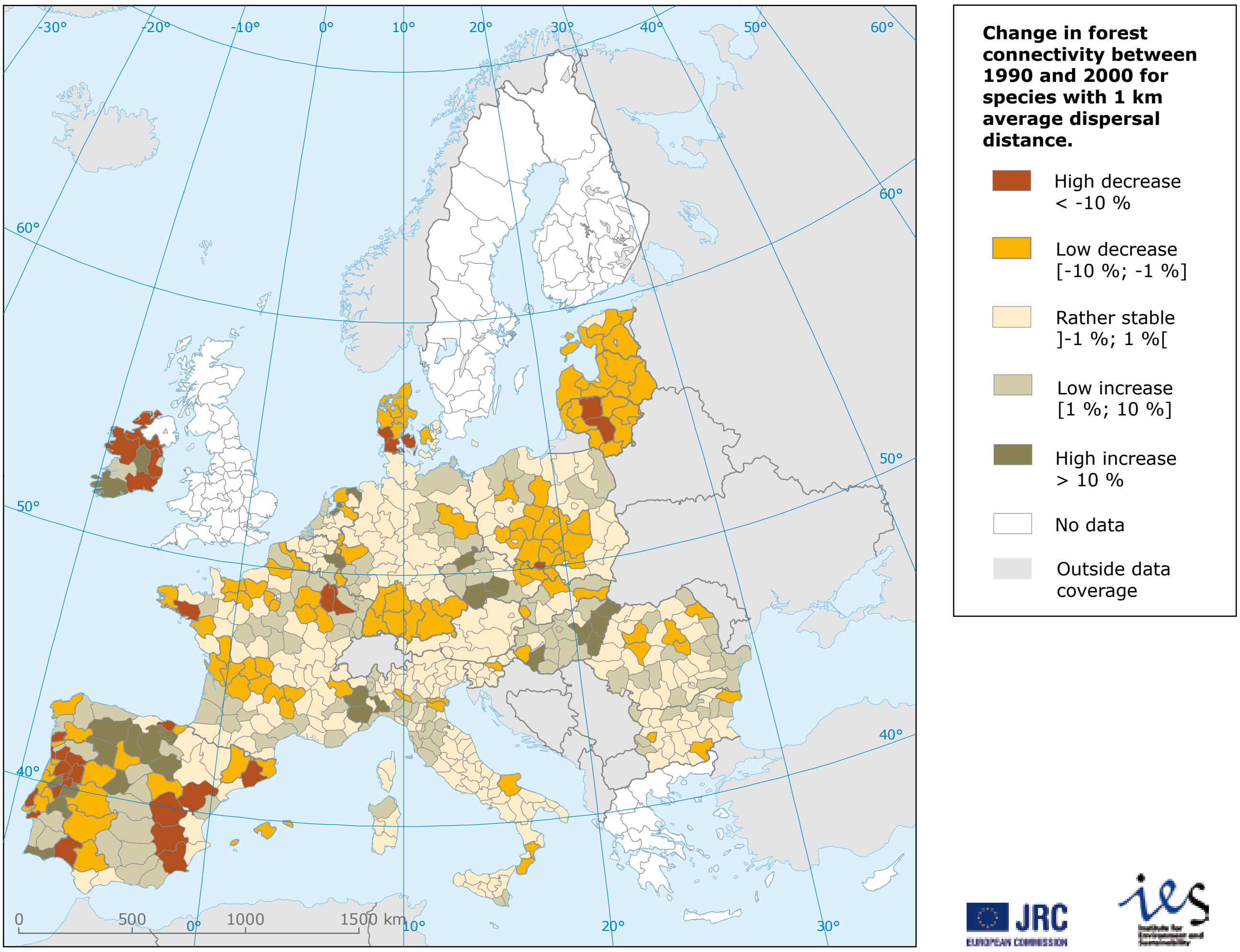
Ranges for levels of increase are: very high for above 100 % increase with respect to the total number of core forest patches in 1990; high for the range 50–100 %; medium for the range 25–50 %; low for the range 5–25 %; and very low for below 5 %.

Source: JRC; Estreguil and Mouton, 2009; European Forest Data Centre. (JRC EFDAC Map viewer at http://efdac.jrc.ec.europa.eu/).

vulnerability to external disturbances, etc.). They can be due to different spatial pattern processes that were quantified at national level, e.g. forest patch shrinkage (forest loss at the periphery of a forest patch, with potential area effects on species), patch perforation (forest loss in the interior part of the patch introducing potential edge effects on species), patch attrition (the forest patch is totally removed, with potential sample effects on species). Countries in Figure 25 were ranked according to the proportion of total losses being converted towards artificial and agricultural cover in the period 1990–2000.

([13]) Geographical units for aggregation: provinces from NUTS (Nomenclature of Territorial Units for Statistics) level 2 for Austria, Belgium, Germany, Greece, the Netherlands and the United Kingdom and NUTS level 3 for the rest of the countries.

Map 9 Change in forest connectivity between 1990 and 2000



Note: How to read the map: in eastern Spain, there was a high decrease in forest connectivity between 1990 and 2000 for forest-dwelling species with 1 km average dispersal distance.

The data derive from Corine Land Cover (CLC) for the years 1990 and 2000 and hence have the same geographical coverage and forest definition as CLC; connectivity derived from Conefor Sensinode software of Saura and Torné 2009, and GIS analysis. Range levels are expressed as % of increase (or decrease) of equivalent connected area in 1990.

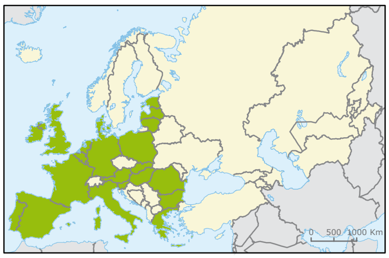
GIS analysis and results aggregated at provincial units, NUTS level 2 or 3 ([13] see previous page).

Source: JRC; Estreguil and Mouton, 2009; Saura, Mouton and Estreguil, 2009; European Forest Data Centre (JRC EFDAC Map viewer at http://efdac.jrc.ec.europa.eu/).

Forest connectivity (Map 9)
The connectivity measure considers the inter-patch and intra-patch connectivity for forest dwelling species with a selected dispersal distance. In particular, the measures accounts for the shortest paths and potential dispersal flux between every pair of forest patches, the connected area existing within the patches themselves, and the role of forest patches as connectors or stepping stones that facilitate dispersal between other patches in the landscape. The non-forested landscape is considered as homogeneous.

Connectivity was rather stable in half of the provinces. The most significant decrease was found in about 5 % of provinces spread in the eastern and western part of the Iberian Peninsula, the northern part of Ireland, southern Denmark and locally in France and Lithuania. All provinces in the hemi boreal countries, central Poland, south Germany, central France and parts of Portugal and Spain experienced connectivity loss.

Geographical coverage



Web links

JRC EFDAC Map viewer: http://efdac.jrc.ec.europa.eu (select Forest Pattern Query).

Forest Web site: http://forest.jrc.ec.europa.eu (select Forest Pattern).

14. Fragmentation of river systems

Key policy question: How fragmented are rivers in Europe?

This indicator is not yet available.

Headline indicator: water quality in aquatic ecosystems

15. Nutrients in transitional, coastal and marine waters

Key policy question: What is the status of transitional, marine and coastal waters in Europe?

Key message

In countries that reported data, 85 % of stations reported no changes in oxidised nitrogen levels in transitional, coastal and marine waters in the period 1985–2005 and 82 % reported no change for orthophosphate. At stations that identified changes, decreases were more common than increases.

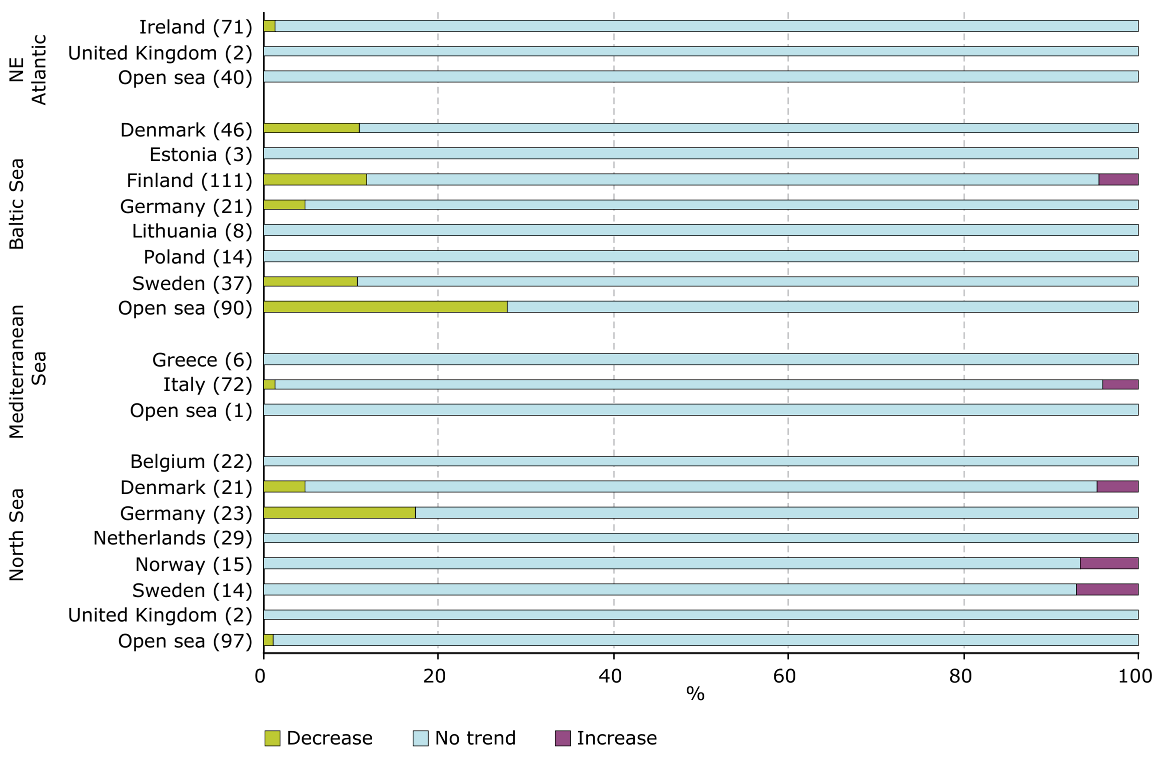
Assessment

Some 12 % of measuring stations reported a decreasing trend in oxidised nitrogen concentrations in 2005. Increasing trends were found at 3 % of stations whilst the majority of stations (85 %) indicate no statistically significant change.

Decreasing trends in orthophosphate concentrations were found at 11 % of stations, compared to increasing concentrations at 7 %. The majority of stations (82 %) reported no statistically significant change in orthophosphate concentration.

Nitrogen (N) and phosphorus (P) enrichment can result in a chain of undesirable effects, starting with excessive growth of planktonic algae, which

Figure 26 Trends in mean winter oxidised nitrogen concentrations in the Atlantic Ocean, Baltic Sea, Greater North Sea, Skagerrak and part of the Mediterranean in 1985-2005



Note: Numbers in parentheses indicate number of stations included in the analysis for each country.

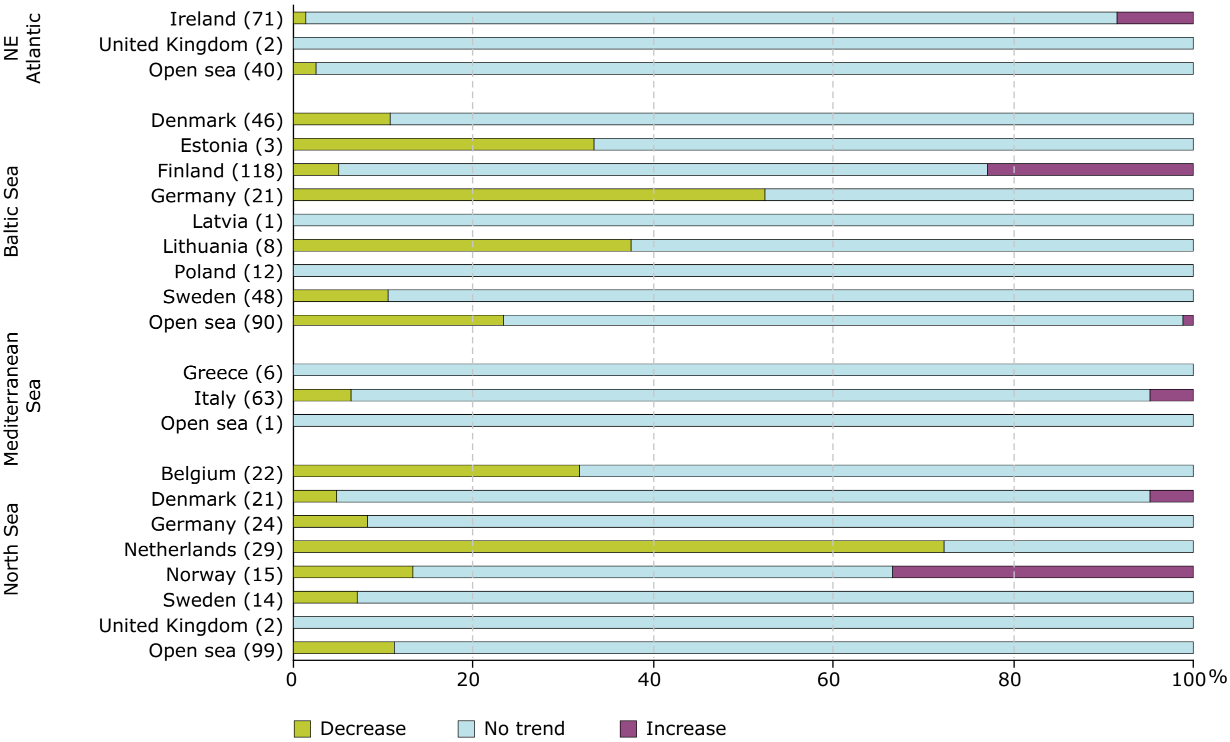
How to read the graph: in the North Sea, a little under 20 % of German stations identified a decrease of oxidised nitrogen concentrations.

For some countries the data include stations with observations made in 2005, for some only up to 2004. The full data set is available at: http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007132008/IAssessment1116503188454/view_content [Accessed 23 June 2009]

Countries included in the analysis: Belgium, Denmark, Estonia, Finland, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Sweden and the United Kingdom. Bulgaria, France, Iceland, Malta, Portugal, Romania, Slovenia, Spain and Turkey reported time series of less than five years duration.

Source: EEA Waterbase/Core Set Indicator 21 (Nutrients in transitional, coastal and marine waters).

Figure 27 Trends in mean winter orthophosphate concentrations in the Atlantic, Baltic Sea, Greater North Sea, Skagerrak and part of the Mediterranean in 1985–2005



Note: Numbers in parentheses indicate number of stations included in the analysis for each country.

How to read the graph: in the North Sea, more than 30 % of Belgian stations present a decrease of orthophosphate concentrations.

For some countries the data include stations with observations made in 2005, for some only up to 2004. The full data set is available at: http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007132008/IAssessment1116503188454/view_content.

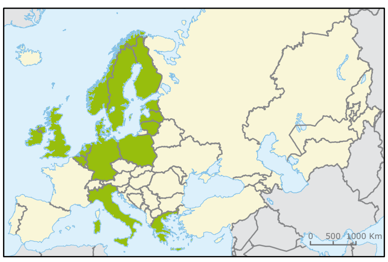
Countries included in the analysis: Belgium, Denmark, Estonia, Finland, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Sweden and the United Kingdom. Bulgaria, France, Iceland, Malta, Portugal, Romania, Slovenia, Spain and Turkey reported time series of less than five years duration.

Source: EEA Waterbase/Core Set Indicator 21 (Nutrients in transitional, coastal and marine waters).

increases the amount of organic matter settling to the seabed. This accumulation may be associated with changes in species composition and altered functioning of the pelagic food web, which may lead to lower grazing prospects for copepods. The consequent increase in oxygen consumption can cause oxygen depletion, changes in community structure and death of the benthic fauna.

For the EU, the Water Framework Directive will bring in better information on the ecological status of transitional and coastal waters, although not before 2010.

Geographical coverage



Web links

EEA CSI 21 http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007132008/IAssessment1116503188454/view_content

16. Freshwater quality

Key policy question: What is the status of freshwater quality in Europe?

Key message

Pollution of rivers with organic matter and ammonium is decreasing as are the levels of other anthropogenic nutrients in freshwater generally (rivers, lakes and groundwater). This reduces stress on freshwater biodiversity and improves ecological status.

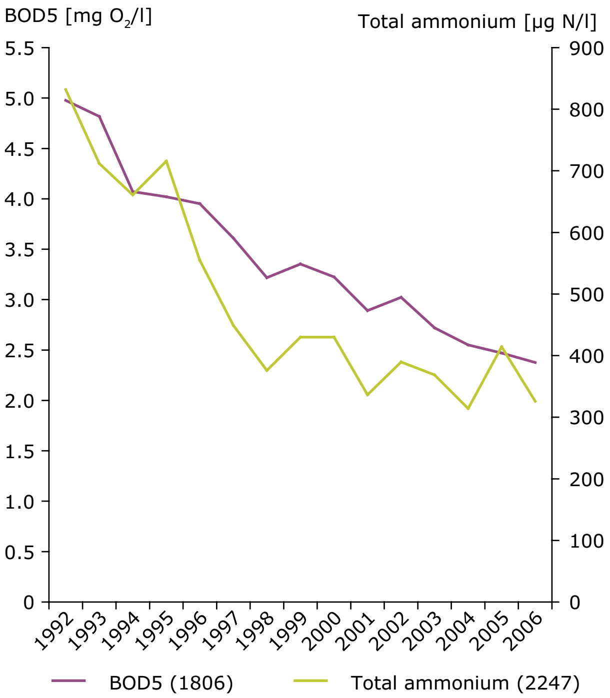
Assessment

Biochemical Oxygen Demand (BOD) and total ammonium concentration have decreased in European rivers over the period 1992–2005, corresponding to the general improvement in wastewater treatment. BOD and ammonium concentrations are generally highest in eastern, southern and south-eastern European rivers. The largest declines in BOD are evident in the rivers of western Europe, while the biggest drops in ammonium are apparent in eastern European countries.

Concentrations of BOD and ammonium are key indicators of the organic matter and oxygen content of water bodies. They normally increase as a result of organic pollution due to discharges from waste water treatment plants, industrial effluent and agricultural run-off. Severe organic pollution may lead to rapid de-oxygenation of river water along with increased ammonium levels and the consequent disappearance of fish and aquatic invertebrates.

The most important sources of organic waste load are household waste water, discharges from industries such as paper production or food processing and occasional silage or slurry effluents from agriculture. Increased industrial and agricultural production, coupled with a greater percentage of the population being connected to sewerage systems, initially resulted in increased discharge of organic waste into surface water across most European countries after the 1940s. Over the past 15 to 30 years, however, the biological treatment of waste water has increased and organic discharges have consequently decreased throughout Europe.

Figure 28 Biochemical Oxygen Demand (BOD5) and total ammonium concentrations in rivers between 1992 and 2006



Note: How to read the graph: between 1992 and 2006, BOD5 decreased from 5 to 2 mg O_2/l. Ammonium declined from 800 to 300 µg N/l.

The number of river monitoring stations included in the analysis is noted in brackets.

BOD5 data were provided by Albania, Austria, Belgium, Bulgaria, the Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Poland, Slovakia, Slovenia, Spain, the Former Yugoslav Republic of Macedonia and the United Kingdom.

BOD7 data were provided by Estonia, Finland, Latvia (1996–2001) and Lithuania (1996–2005). BOD7 data were recalculated into BOD5 data.

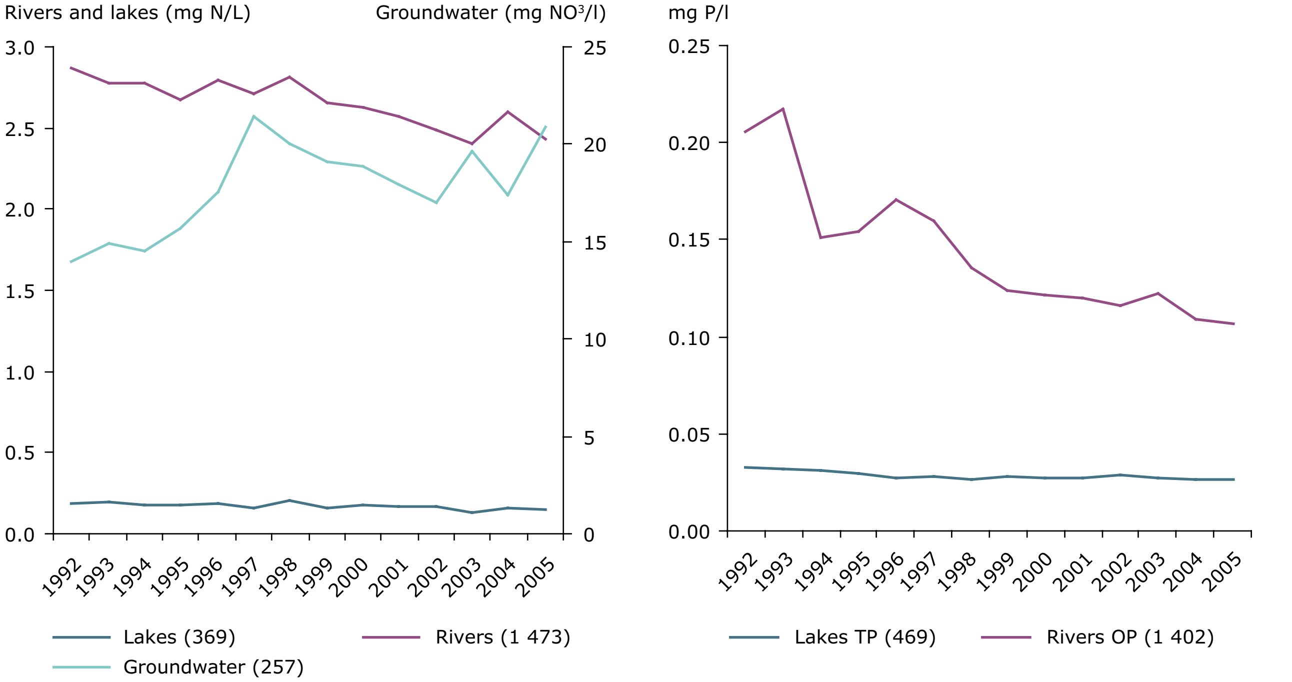
Total ammonium data were provided by Albania, Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Slovenia, Spain, Sweden, the Former Yugoslav Republic of Macedonia and the United Kingdom.

Concentrations are expressed as the station weighted mean of the annual mean concentrations by countries. Stations with time series of at least seven years are included. The number of available mean concentrations/stations per year is different, except for Luxembourg and Norway with constant number.

Source: Waterbase Version 7.

Nutrient levels in freshwaters are decreasing. The average nitrate concentration in European rivers has decreased approximately 10 % since 1998, from 2.8 to 2.5 mg N/l, reflecting the effect of measures to reduce agricultural inputs of nitrate. Nitrate levels in lakes are in general much lower than in rivers but there has also been a 15 % reduction of the average concentration in lakes.

Figure 29 Concentrations of nitrate (left, NO_3) and phosphorus (right, OP (orthophosphate) or TP (total phosphorus)) in European freshwater bodies in the period 1992–2005



Note: Total number of stations in parenthesis. Concentrations are expressed as annual mean concentrations for groundwater and station-weighted means of annual mean concentrations for rivers and lakes. Only stations with time series of at least seven years are included.

Country coverage (the number of stations included per country is given in parenthesis):
Nitrate in groundwater: Austria (14), Belgium (25), Bulgaria (63), Denmark (3), Estonia (5), Finland (38), Germany (9), Great Britain (29), Hungary (18), Ireland (3), Latvia (2), Liechtenstein (1), Lithuania (7), Netherlands (9), Norway (1), Poland (3), Portugal (3), Slovakia (10), Slovenia (5), Spain (1), Sweden (3).

Nitrate in rivers (countries with an asterisk reported total oxidised nitrogen): Austria (145), Belgium (23), Bulgaria (82), Czech Republic (70), Denmark* (39), Estonia (53), Finland* (131), France (287), Germany (125), Great Britain* (139), Hungary (98), Lithuania (64), Luxembourg (3), Latvia (47), Netherlands* (9), Norway (10), Poland (104), Slovakia (52), Slovenia (24) and Sweden* (113).

Nitrate in lakes (countries with an asterisk reported total oxidised nitrogen): Estonia (5), Finland (21), Germany (6), Great Britain (21), Hungary (16), Lithuania (8), Latvia (8), Netherlands* (7), Norway (92), Slovenia (4), Sweden* (181).

Orthophosphate in rivers: Austria (134), Belgium (26), Bulgaria (64), Czech Republic (65), Denmark (40), Estonia (53), Finland (116), France (241), Germany (133), Great Britain (69), Hungary (98), Latvia (47), Lithuania (64), Norway (10), Poland (100), Slovakia (6), Slovenia (23) and Sweden (113).

Total phosphorus in lakes: Austria (5), Denmark (23), Estonia (5), Finland (207), Germany (7), Great Britain (18), Hungary (10), Ireland (7), Latvia (8), Lithuania (7), Netherlands (7), Sweden (165).

Source: Waterbase (version 6).

Agriculture is the largest contributor of nitrogen pollution. Due to the EU Nitrate Directive and national measures the nitrogen pollution from agriculture has, however, been reduced in some regions during the last 10–15 years. European air emissions of nitrogen oxides have gone down by one-third over the last 15 years and the deposition of nitrogen on inland surface waters has also declined.

Phosphorus concentrations in European rivers and lakes generally decreased during the last 14 years, reflecting the general improvement in wastewater treatment and reduced phosphate content of detergents over this period. In many rivers the reduction started in the 1980s. During the past few decades there has also been a gradual fall in phosphorus concentrations in many European lakes. The decrease is due to nutrient removal measures introduced by national and European legislation particularly the Urban Waste Water Treatment Directive. As treatment of urban wastewater has improved and many waste water outlets have been diverted away from lakes, point-source pollution is gradually becoming less important. Agricultural inputs of phosphorus are still significant and need increased attention to achieve a good status in lakes and rivers.

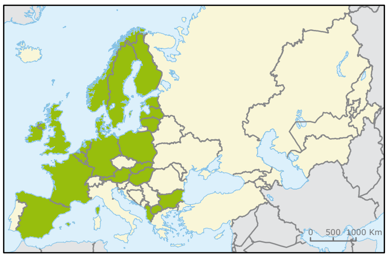
Improving groundwater quality is also important as it can be a source of nitrate in rivers thereby adversely affecting associated river systems, lakes, wetlands and dependent terrestrial ecosystems. At the European level, annual mean nitrate concentrations in groundwater have remained relatively stable since the mid-1990s following an increase during the first half of the 1990s.

Web links

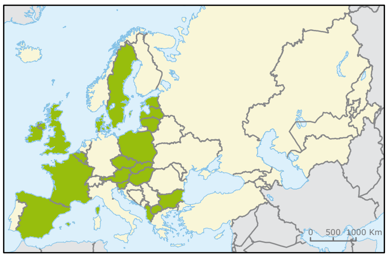
EEA Core Set indicators http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007131940/IAssessment1116505271445/view_content.

http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007131957/IAssessment1116497150363/view_content.

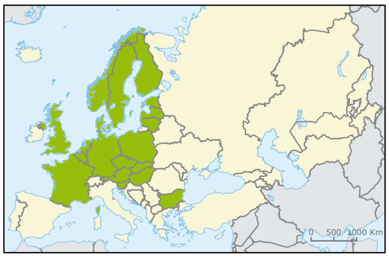
Geographical coverage



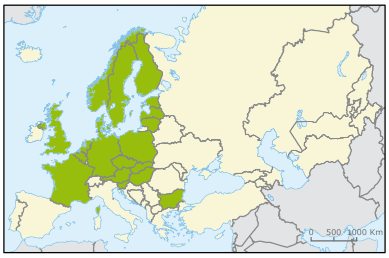
Total ammonium concentrations



Biochemical Oxygen Demand (BOD5)



Concentrations of nitrate



Concentrations of phosphorus

Focal area: sustainable use

Headline indicator: area of forest, agriculture, fishery and aquaculture ecosystems under sustainable management

17. Forest: growing stock, increment and felling

Key policy question: Is forestry in Europe sustainable in terms of the balance between increment of growing stock and felling?

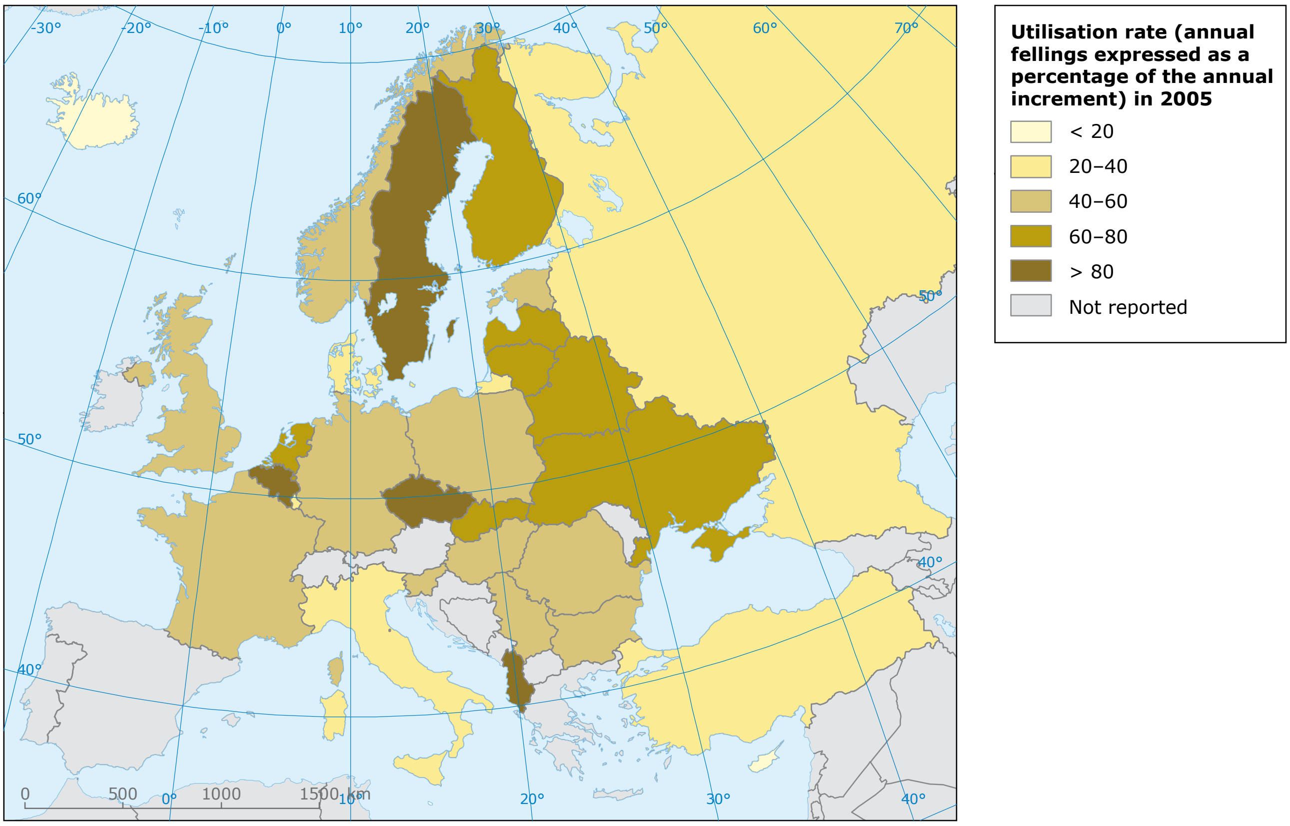
Key message

The ratio of felling to increment is relatively stable at around 60 %. This favourable utilization rate prevails across Europe, with the exception of Albania and the Former Yugoslav Republic of Macedonia, and has allowed growing stock to increase.

Assessment

Incremental production has increased continuously throughout Europe and felling has generally increased proportionally. In general, the amount of wood felled has been less than that planted and

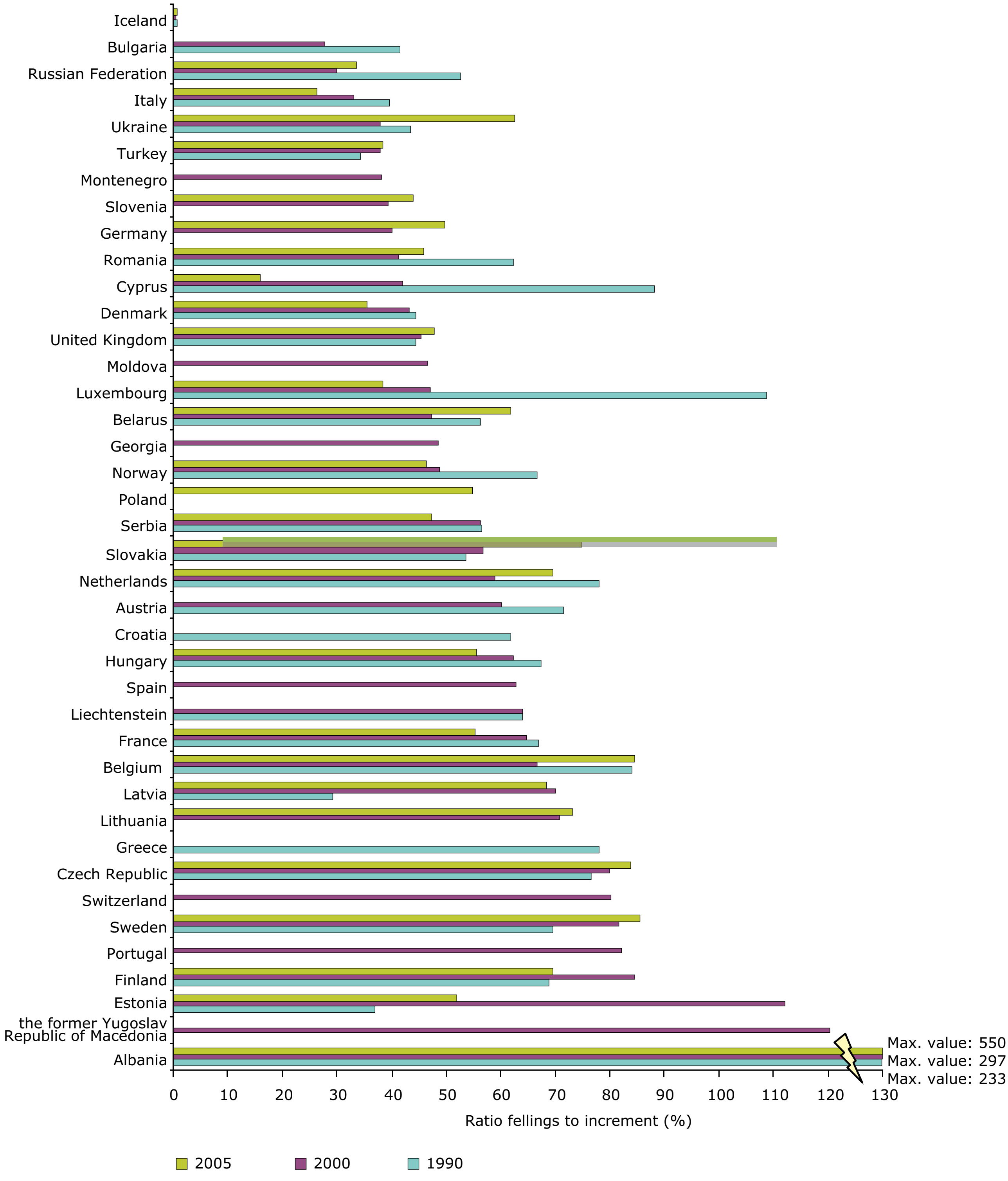
Map 10 Utilisation rate in 2005 (% of annual felling compared with net annual increment in growing stock) for Ministerial Conference on the Protection of Forests in Europe (MCPFE) countries



Note: How to read the map: in 2005, the utilisation rate of forests was of 40–60 %.

Source: Based on MCPFE, 2007.

Figure 30 Balance between felling and increment on forest available for wood supply



Note: Growing stock decreases if the ratio of felling to increment is > 100 %.

Source: MCPFE, 2007.

added as incremental growth. This has allowed a build up of the growing stock. The growing stock in Europe is increasing from a low level after clearances for agriculture and charcoal production in recent centuries. On the European scale, the area of forests probably reached its lowest level at the end of the 17th and beginning of the 18th century (Kirby and Watkins, 1998, in Agnoletti, 2000).

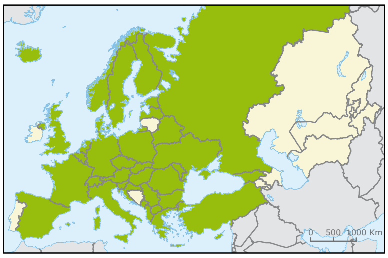
Of the several factors that have contributed to the build up of growing stock, forest management is considered the most important. As shown in Map 10, the 'utilisation rate', which is the percentage of annual felling in relation to the net annual increment, varies considerably between countries but remains generally below the 'sustainability limit' of 100 %. A more in-depth analysis of the forest utilisation rate should preferably be conducted at a more detailed geographical level, taking into account age-class distribution and the silvicultural system. From a biodiversity point of view, such an analysis should also specifically address the proportion of older age classes in the stock and the type of forest management employed.

The ratio of felling to increment is forecast to increase to between 70 % and 80 % by 2010. This is due to an expected increase in demand for wood in the wider European region due to factors such as the development of eastern European markets (MCPFE, 2007; Schelhaas *et al.*, 2006).

Of course the sustainability of forests cannot be measured by a ratio of felling and increment alone. This particular indicator addresses just one aspect of the sustainability of the forest sector. While maintaining felling below incremental production is a necessary condition for sustainability, it is not sufficient on its own. For a more comprehensive assessment, a complete set of forestry sector indicators is needed such as the 35 indicators within six criteria used in reports to the Ministerial Conference on the Protection of Forests in Europe (MCPFE) ([14]).

Moreover, the felling-to-increment ratio indicator does not capture whether the increment is from forestry that is being managed in a biodiversity friendly way or not. It is not apparent whether increment is due to increased use of fertiliser or the planting of fast-growing alien species, for example.

Geographical coverage



Web links

MCPFE: www.mcpfe.org.

European Forest Insititute: www.efi.int.

([14]) Criterion 4 is 'Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems'. Nine indicators are defined within this criterion: tree species composition; regeneration; naturalness; introduced tree species; deadwood; genetic resources; landscape pattern; threatened forest species; and protected forests.

18. Forest: deadwood

Key policy question: How much deadwood is present in European forests?

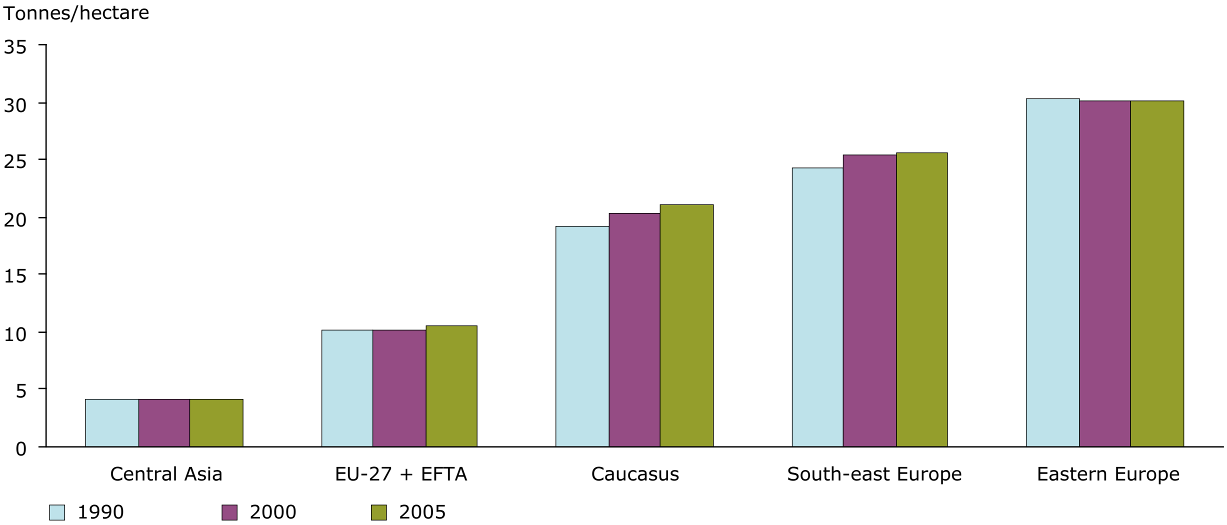
Key message
The quantity of deadwood in Europe's forests, which is an important indicator for forest biodiversity, has strongly decreased since the middle of the nineteenth century due to intense forest exploitation and widespread burning of small wood and other debris. Since 1990, however, an overall increase in this indicator by about 4.3 % has been observed and this may be due to increased compliance with sustainable forest management principles. These principles should be considered in view of increasing wood demand, e.g. for renewable energy production.

Assessment
Deadwood (coarse woody debris) is a proxy indicator for invertebrate biodiversity, since it is a habitat for a wide array of organisms. Deadwood decomposition plays a key role in the recycling of nutrients and organic matter as well as the creation of a wide variety of micro sites for regeneration of plant species and the creation of a wide variety of habitats for other organisms. The amount of deadwood is an excellent indicator of the conservation value of a forest.

Quantities of deadwood in Europe have strongly decreased between the middle of the nineteenth century and latter part of the twentieth century due to intense forest exploitation and widespread burning of small wood and other debris. Moreover, classical forest management is usually based on rotations shorter than the natural longevity of tree species. The number of large old trees, which are more likely to be a source of dead wood in the forest, is therefore relatively low. Nowadays, however, many European countries have launched initiatives to increase the amount of deadwood, though not all increases are the result of biodiversity considerations. Available evidence suggests that the amount of deadwood increased in the pan-European region by about 4.3 % in the period 1990–2005. The deadwood stock in forests might decline again, however, as wood demand increases for such things as renewable energy production. Overall, deadwood in most European countries remains well below optimal levels from a biodiversity perspective.

The amount of deadwood that will naturally accumulate in forests varies greatly depending on

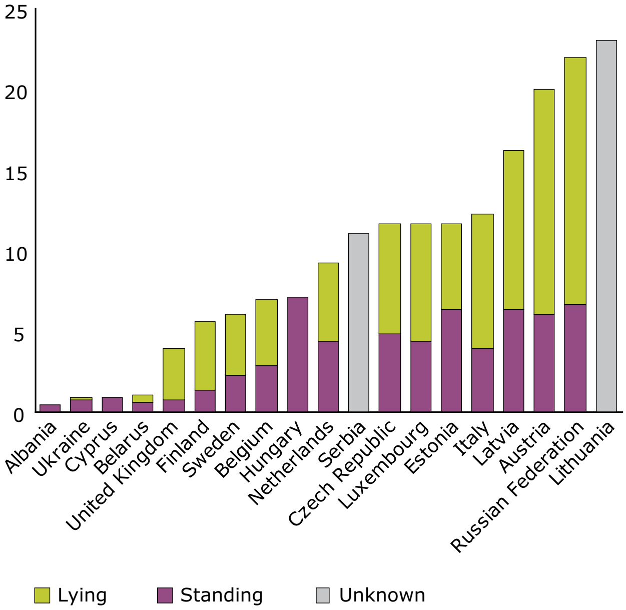
Figure 31 Deadwood in pan-European forests, 1990–2005



Note: Central Asia comprises Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. EU-27 + EFTA comprises Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom and Iceland, Liechtenstein, Norway and Switzerland. Caucasus comprises Armenia, Azerbaijan and Georgia. South-east Europe (SEE) comprises Albania, Bosnia and Herzegovina, Croatia, Montenegro, Serbia, the Former Yugoslav Republic of Macedonia and Turkey. Eastern Europe (EE) comprises Belarus, the Republic of Moldova, the Russian Federation and Ukraine.

Source: FAO, 2005.

Figure 32 Deadwood per hectare in forests, 2005



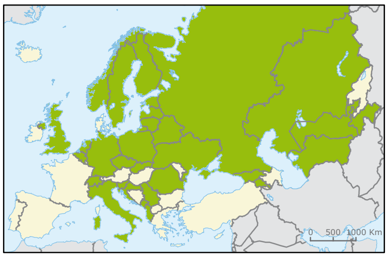
Note: How to read the graph: in 2005, Estonian forests averaged 6 m³/ha of standing deadwood and 5 m³/ha of lying deadwood.

Source: MCPFE, 2007.

forest type, development stage, site productivity, climate, natural disturbance and forest history. In a study of beech forest reserves in Europe, deadwood volumes ranged from almost 59 m³/ha (northern boreal forest) up to 216 m³/ha (mixed mountain forest in central Europe) (Hahn and Christensen, 2004). In a study of boreal forests in Fennoscandia, deadwood volumes ranged from 19 m³/ha up to 145 m³/ha with values at the lower end of the range at higher latitudes near the timberline (Siitonen, 2001). In managed forests deadwood volumes can range from 2 m³/ha to 10 m³/ha (Siitonen, 2001).

In some areas the accumulation of deadwood may not be desirable, for example where the risk of insect pests (such as invasions of bark beetles) or forest fires is considered unacceptable. This occurs in Mediterranean coniferous plantations where deadwood must be removed to avoid fires.

Geographical coverage



Web links

MCPFE: www.mcpfe.org.

European Forest Insititute: www.efi.int.

19. Agriculture: nitrogen balance

Key policy question: Is the nitrogen surplus from agriculture being reduced?

Key message

Agricultural nitrogen surpluses (the difference between all nutrient inputs and outputs on agricultural land) show a declining trend, thereby potentially reducing environmental pressures on soil, water and air. Many countries, however, still maintain a large surplus.

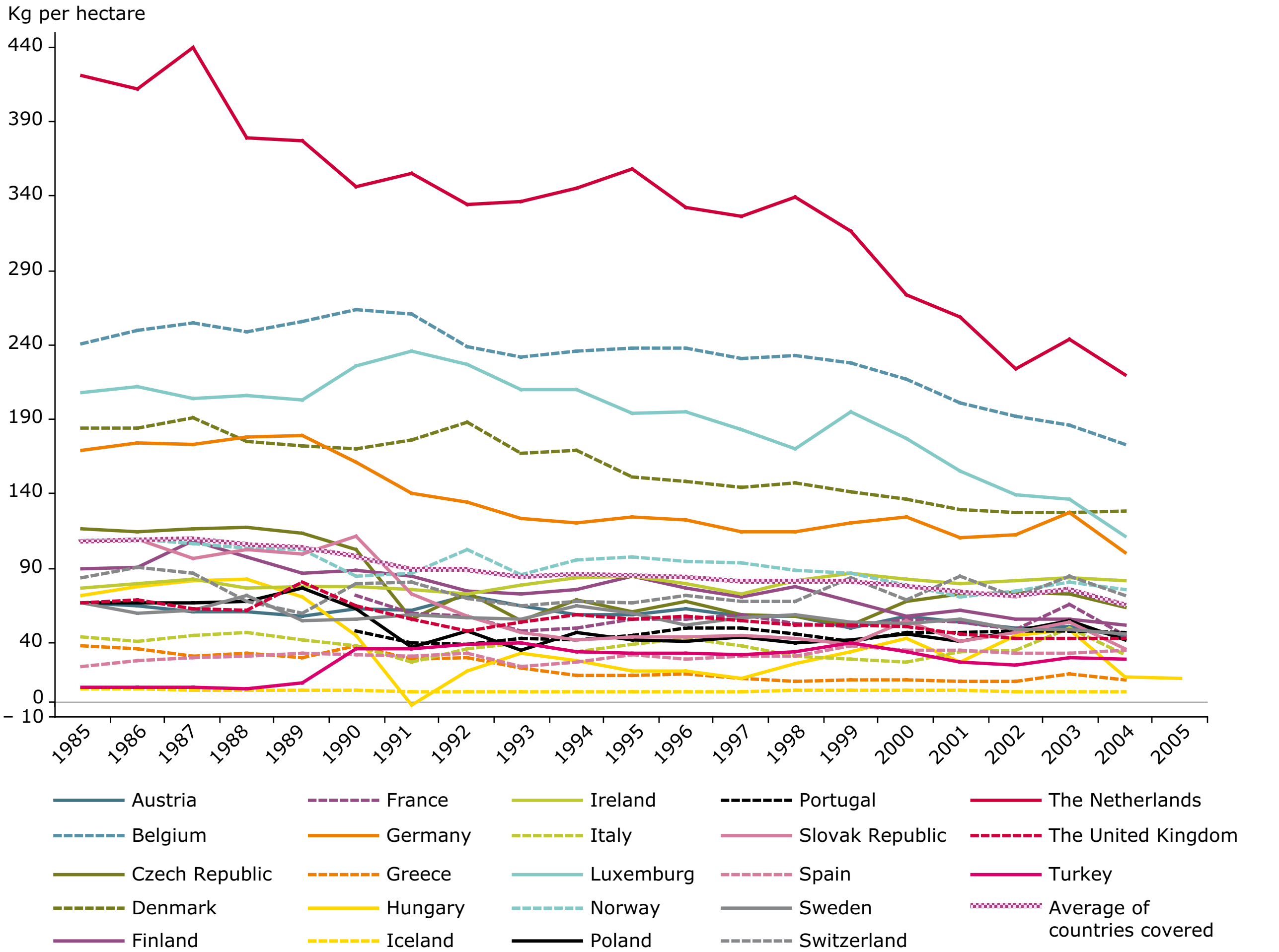
Assessment

A nutrient balance describes the difference between all nutrient inputs and outputs on agricultural land. A positive balance or surplus reflects inputs that are in excess of crop and forage needs. It can result in diffuse pollution through the loss of nutrients to water bodies, decreasing water quality while promoting eutrophication. Surplus nitrogen can also be lost to air as ammonia and other greenhouse gases.

All European countries exhibit a nitrogen surplus. Overall however, these surpluses have declined since the mid-1980s, reducing the environmental pressures on soil, water and air. The adoption of nutrient management plans and environmental farm plans has had a key role in this reduction.

It is, however, important not only to consider rates of surplus decline but also their absolute values. Belgium and the Netherlands, for example, show significant decreases although nutrient surpluses in these two countries currently remain much higher than the average across all countries, indicating high productivity and pressure on biodiversity. Conversely, some countries show an increase but still remain below the average.

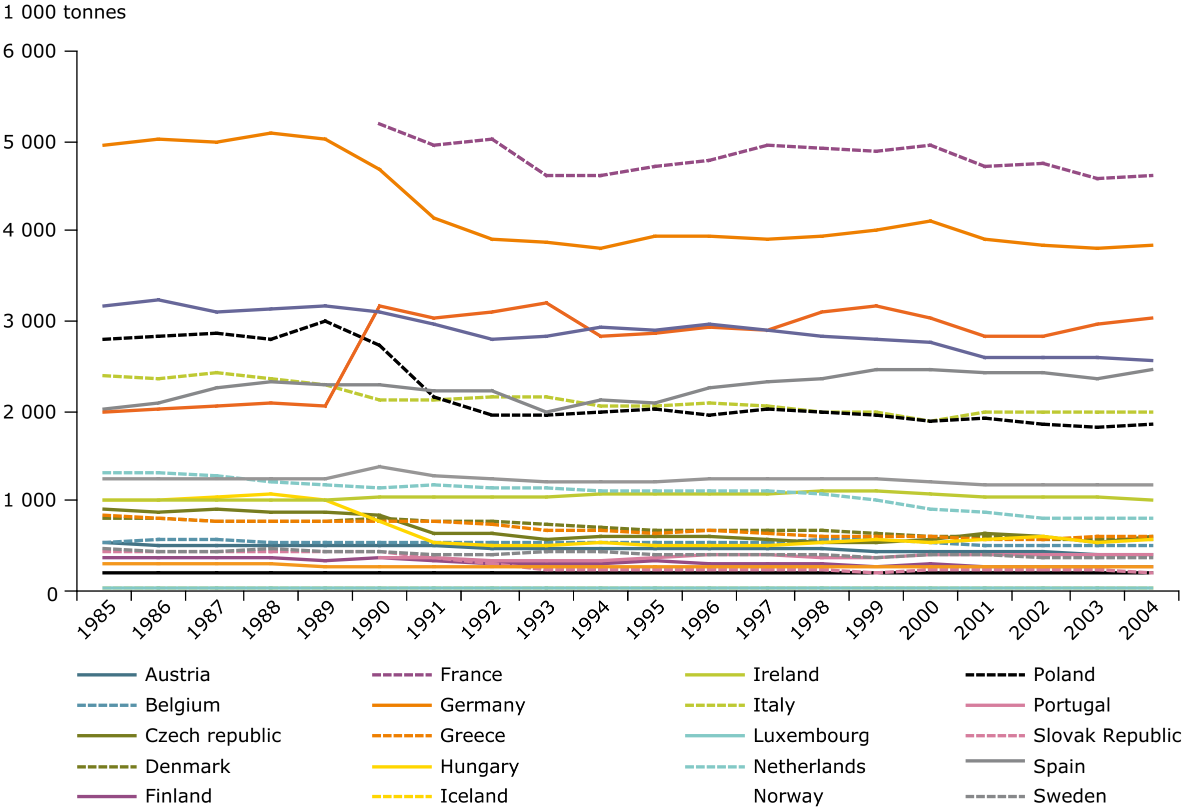
Figure 33 Nitrogen balance per hectare of agricultural land



Note. How to read the graph: in 20 years, nitrogen balance per ha was reduced from 240 to 173 kg/ha in Belgium.

Source: Based on OECD, 2008.

Figure 34 Nitrogen input on agricultural land in Organisation for Economic Co-operation and Development (OECD) countries



Note: How to read the graph: between 1995 and 2004, total nitrogen input on agricultural land in Germany decreased from about 5 to about 4 million tonnes.

Country coverage: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. For France and Portugal, the data are from 1990 only.

Source: Based on OECD, 2008.

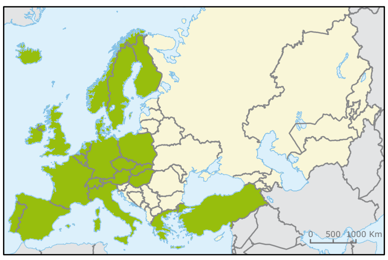
In most countries, national nutrient balances typically mask considerable regional variation due to variation in the type and intensity of farming.

Notes

Although gross nitrogen balance can show areas where ground and surface waters may be at risk from nitrogen leaching, it should not be interpreted as data on actual losses to the environment. In order to assess the environmental impact of excess nitrogen, more information is needed on farm nitrogen management, soil type, and climate conditions, all of which play a role in the fate of nitrogen in the environment.

'Gross nitrogen balance' is also an agri-environmental indicator and part of the compulsory indicators of the Common Monitoring and Evaluation Framework (CMEF) for rural development. Work is ongoing on streamlining similar indicators used in different processes.

Geographical coverage



Web links

OECD: www.oecd.org/tad/env/indicators.

20. Agriculture: area under management practices potentially supporting biodiversity ([15])

Key policy question: To what extent is European agriculture geared towards prevention of biodiversity loss?

Key message

Europe has significant areas of High Nature Value (HNV) farmland, which provide habitats for a wide range of species. Such areas are under threat, however, from intensification of farming and land abandonment. The mere presence of HNV farmland is of course not proof of sustainable management but promoting conservation and sustainable farming practices in these areas is crucial for biodiversity. Map 11 presents the first estimate of HNV farmland distribution and can therefore not yet be analysed for trends.

Agri-environment schemes have been used widely to make agriculture more sustainable. Not all agri-environment measures are explicitly targeted on biodiversity, however, and further analysis is required to determine their effectiveness.

Organic farming has developed rapidly since the beginning of the 1990s and continues to do so. While it is difficult to assess its impact on biodiversity it is assumed that this type of farming reduces stress on ecosystems and provides a wider range of niches for farmland species.

Assessment

Countries in Europe contain HNV farmland to varying degrees. The identification and conservation of HNV farmland was given high priority in the Kiev Resolution on Biodiversity (UNECE, 2003).

South-east Europe and EECCA countries (eastern Europe, Caucasus and central Asia) are not covered in the data sets used to make Map 11 and, hence, are not represented. The share of HNV farmland in these regions is probably higher than in western and central Europe but current data do not allow a precise estimate. Finally, while the map indicates the location of HNV, no indicator is yet available to help assess countries' efforts in managing these areas for biodiversity.

The European Commission has contracted a separate study on an HNV indicator for evaluation including a guidance document to the Member States on the application of the HNV impact indicator (IEEP, 2007).

Agri-environment schemes are the most relevant policy tool in the EU for conserving biodiversity on farmlands. They support agricultural production methods that help protect and improve the environment, in particular the landscape and its features, natural resources, the soil and genetic diversity. Some agri-environment measures are aimed directly at biodiversity protection. In the EU, the share of agricultural land under agri-environment schemes varies from less than 5 % in Greece and the Netherlands to more than 80 % in Austria, Finland, Luxembourg and Sweden.

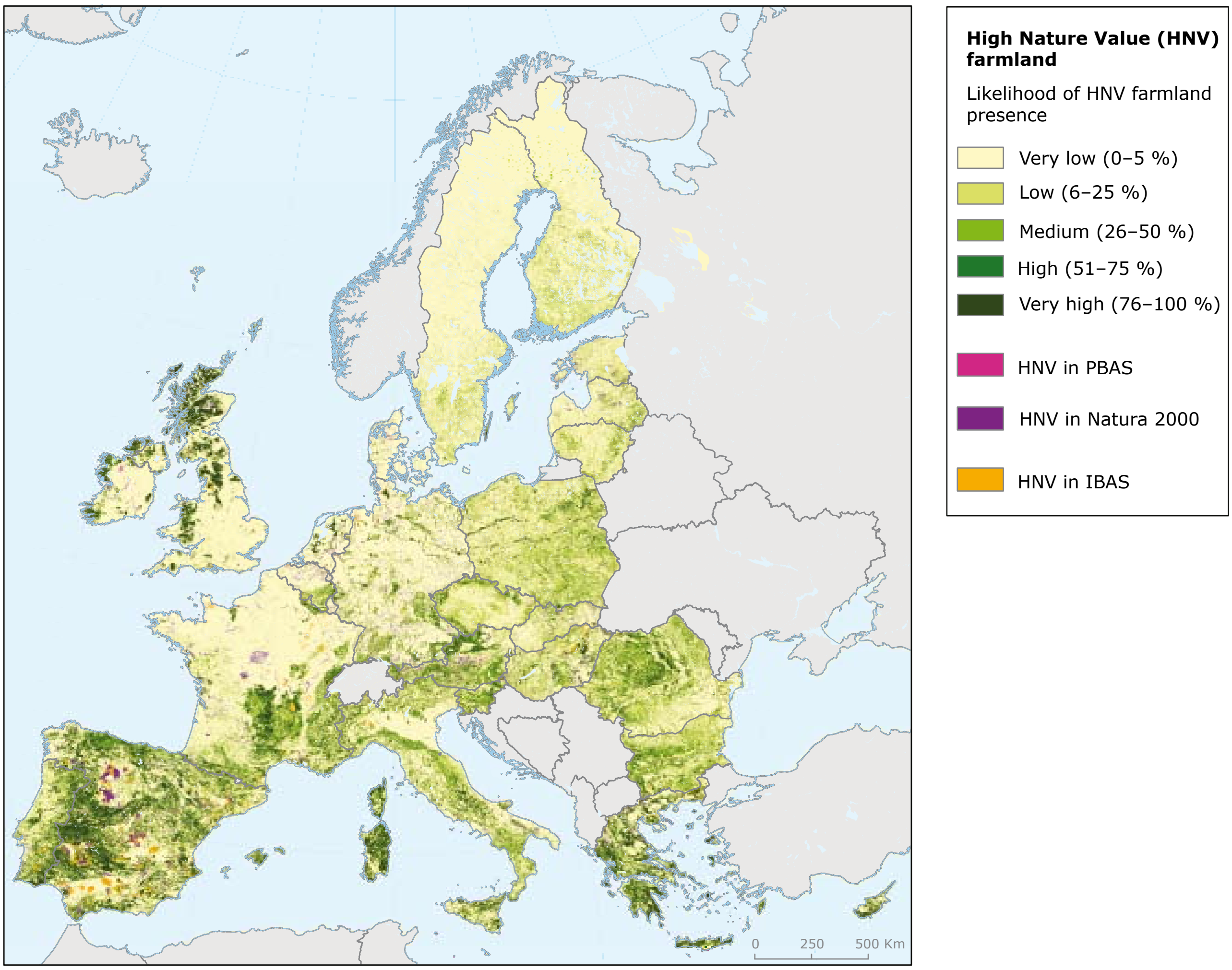
The new EU guidelines for rural development explicitly encourage the targeting of agri-environment schemes (and other rural development measures) on EU environmental priorities, including biodiversity in general and High Nature Value farming systems in particular. However, the success of such targeting at national and regional level cannot be assessed at this stage and better information on the effectiveness of the agri-environment measures is still desirable. As information on HNV farmland and forestry has become a compulsory element of rural development evaluations, relevant data should be available in due course.

Organic farming can enhance biodiversity by reducing the use of inputs, rotation practices or livestock extensification. For this indicator, farming is only considered to be organic at the EU level if it complies with Council Regulation (EEC) No. 2092/91 and its amendments.

Organic farming has developed rapidly since the beginning of the 1990s so that by 2004, 6.5 million ha in Europe were managed organically (by around 167 000 farms). Of these, more than 5.8 million ha were in the EU — 3.4 % of the utilised agricultural area. In the SEE and EECCA regions organic farming covers less than 0.5 % of the agricultural land. It needs to be noted, however, that 'conventional' farming is not the same in all sub-regions of Europe covered by this report. For example, non-organic

([15]) This indicator comprises two elements: a quality parameter (distribution of high nature value farmland) and a response parameter (area under agri-environment and organic farming). Both are relevant for an assessment of environmental sustainability although they are not necessarily linked.

Map 11 High Nature Value Farmland in Europe



Note: Based on Corine Land Cover (CLC), hence with same geographical coverage as CLC.

How to read the graph:

- green areas are likely to contain primarily HNV land, on the basis of a stratified selection of CORINE land cover classes per country and environmental zone, and national biodiversity data when available
- violet areas are likely to contain primarily HNV land in selected Natura2000 sites
- orange areas are likely to contain primarily HNV land in selected Important Bird Areas
- pink areas are likely to contain primarily HNV land in Primary Butterfly Areas

Since the layers are displayed on top of each other the more visible is the green one. The values in the map are a proxy for the proportion of HNV in each 1 km^2 cell.

Source: JRC and EAA, 2008.

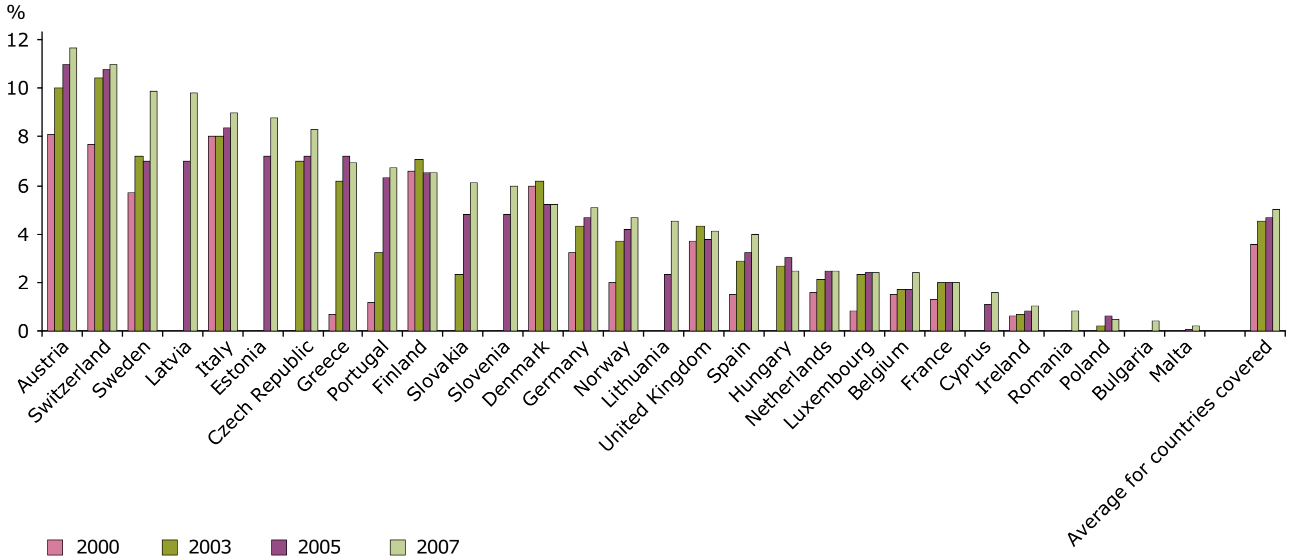
areas outside western Europe may still be much less intensively farmed than non-organic areas in the west. Another point for consideration is that organic farming tends to be less intensive and therefore may require a larger area of land to produce the same amount of food as intensive conventional agriculture, which may put pressure on natural habitats.

Notes

The three main categories of HNV farmland are (adapted from Andersen *et al.*, 2003):

- Type 1: farmland with a high proportion of semi-natural vegetation;
- Type 2: farmland with a mosaic of low intensity agriculture and natural and structural elements,

Figure 35 Share of total utilised agricultural area (UAA) occupied by organic farming



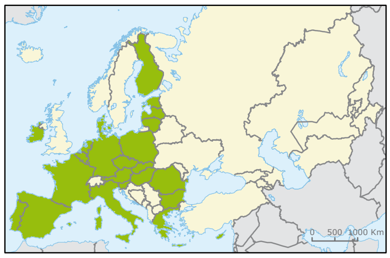
Note: Covers existing organically farmed areas and areas in process of conversion. The values for the following are estimates: France (2000), Luxembourg (2005), Poland (2005), Denmark (2007), Luxembourg (2007), Malta (2007), Poland (2007), Romania (2007).

Source: Based on Eurostat, 2009. Data for Switzerland from Biodiversity Monitoring Switzerland, 2009.

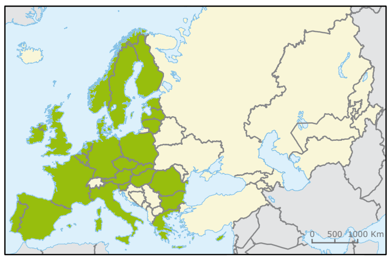
such as field margins, hedgerows, stonewalls, patches of woodland or scrub, and small rivers;

- Type 3: farmland supporting rare species or a high proportion of European or world populations.

Geographical coverage



High Nature Value Farmland



Organic farming

21. Fisheries: European commercial fish stocks

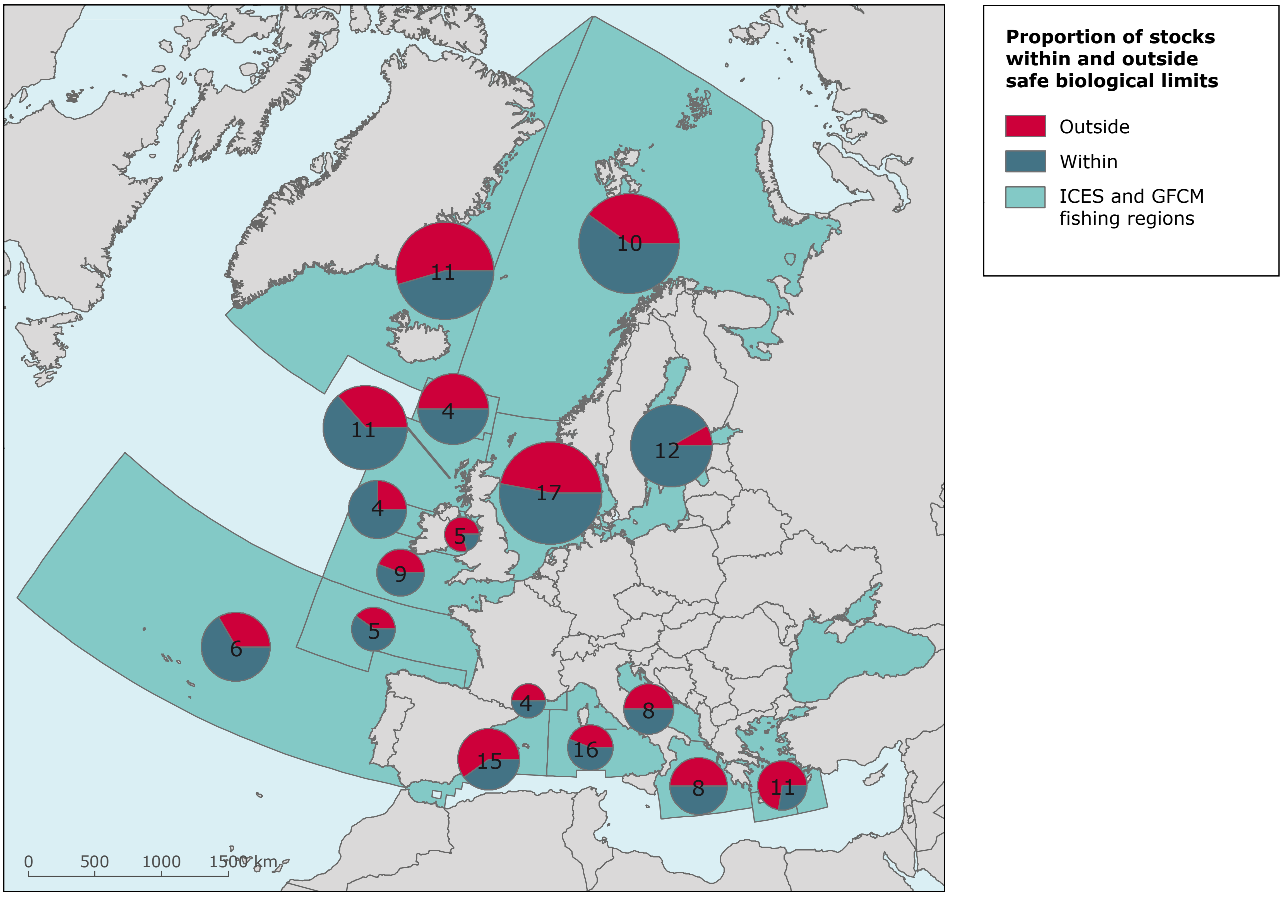
Key policy question: What is the status of European commercial fish stocks?

Key message
Of the assessed European commercial stocks, about 45 % are outside safe biological limits ([16]).

Assessment
For many commercial fish stocks in European waters an assessment on whether they are within safe biological limits has not been made. In the north-east Atlantic, the percentage of stocks that are non-assessed ranges from 3 % (west of Scotland and Ireland) to 34 % (Irish Sea and Iberian Peninsula). Moving from north to south the percentage of stocks that are non-assessed generally increases. In the Mediterranean region, the percentage ranges from 23 % in the Adriatic Sea to 70 % for tuna and tuna-like species for the entire Mediterranean. In the Black Sea no stocks have been assessed.

Of the assessed commercial stocks in the north-east Atlantic, 8 % (Baltic Sea) to 80 % (Irish Sea) are outside safe biological limits (SBL). For the other

Map 12 Status of fish stocks in ICES (International Council for the Exploration of the Sea) and GFCM (General Fisheries Commission for the Mediterranean) fishing regions of Europe in 2006



Note: The chart shows the proportion of assessed stocks that are overfished (red) and stocks within safe biological limits (blue). The numbers in the circles indicate the number of stocks assessed within the given region. The size of the circles is proportional to the magnitude of the regional catch.

How to read the graph: in the Baltic Sea, 12 stocks were assessed and 20 % of them are overfished.

Source: GFCM and ICES, 2006.

([16]) A stock is considered to be outside 'Safe Biological Limits' (SBL) when the Spawning Stock Biomass (SSB) (the mature part of a stock) is below a biomass precautionary approach reference point (Bpa), or when fishing mortality (F) (an expression of the proportion of a stock that is removed by fishing activities in a year) exceeds a fishing mortality precautionary approach reference point (Fpa), or when both conditions exist.

areas in the north-east Atlantic the percentages of stocks outside safe biological limits vary between 25 % and 55 %. Pelagic stocks (fish living in the waters column well above the sea bottom and sometimes close to the sea surface) like herring and mackerel are doing better in general than demersal (fish living close to the sea bottom) stocks like cod, plaice and sole. In the Mediterranean the percentage of stocks outside SBL ranges from 44 % to 73 %, with the Aegean and the Cretan Sea in the worst condition. Here the small pelagic stocks like anchovy and sardine are doing better than demersal stocks like hake and red mullet or larger pelagics such as bluefin tuna.

Examining the north-east Atlantic stocks more closely, the following conclusions can be drawn:

- The pelagic stocks are generally fished sustainably;
- Almost all demersal stocks have declined and are currently not sustainable. Over the recent decades there has been a slight, but steady decline in the stocks and there is still no clear sign of a stop of this trend;
- Industrial species especially the capelin and sandeel stocks are not doing well. This is, however, more due to natural causes than high fishing pressure (ICES Advisory Report 2006).

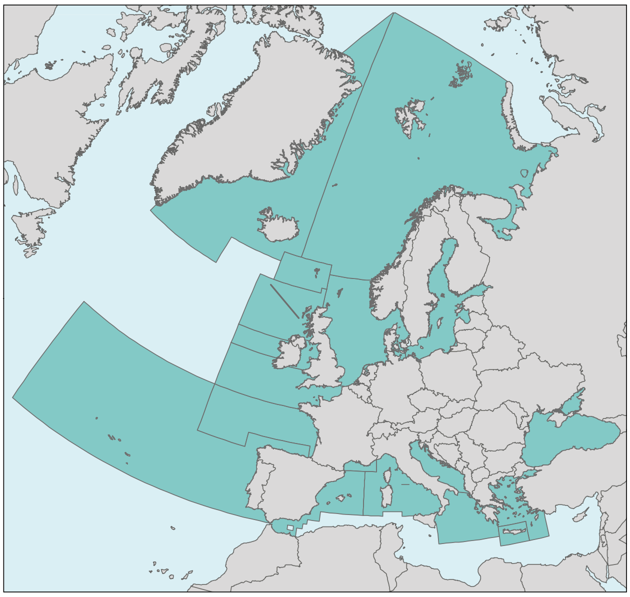
In the Mediterranean region the following conclusions can be drawn:

- Only two demersal and two small pelagic species are monitored by the General Fisheries Commission for the Mediterranean (GFCM), with a limited spatial coverage. Demersal stocks remain outside safe biological limits. Small pelagic stocks in the same area exhibit large-scale fluctuations but are not fully exploited anywhere except for anchovy and pilchard in the Southern Alboran and Cretan Sea;
- According to the latest assessment by the International Commission for the Conservation of Atlantic Tunas (ICCAT) a strong recruitment of swordfish over recent years has rendered the exploitation of the stock sustainable;
- Concern still remains about the over-exploitation of bluefin tuna. Uncertainties of stock assessment and lack of documented reporting (including EU Member States) still hinder management of these highly migratory species. Bluefin tuna catches continue to exceed the sustainable rate.

EU Member States will make an integrated 'initial assessment' of the environmental situation of their marine waters pursuant to the Marine Strategy Framework Directive Art. 8, by mid-2012.

It is important to note that the indicator may not reflect the complete ecological impact of stock status. For example, even if relatively few stocks in the Baltic are outside biological limits the demise of cod stocks has a very significant impact on the ecosystem (probably relatively much more so than some other stocks).

Geographical coverage



Web links

International Council for the Exploration of the Sea (ICES): www.ices.dk.

General Fisheries Commission for the Mediterranean: www.gfcm.org/gfcm.

International Commission for the Conservation of Atlantic Tunas: www.iccat.int.

ICES advice: http://www.ices.dk/products/icesadvice.asp.

EEA Core Set Indicator 032 Status of marine fish stocks: http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007132227/IAssessment1116498234748/view_content.

22. Aquaculture: effluent water quality from fish farms

Key policy question: What are the main trends in aquaculture across Europe?

Key message

Aquaculture production in Europe has increased in the EU since 1990, levelling off slightly since 2000 although Norway and Iceland continue to show large increases. This overall increase implies a rise in pressure on adjacent water bodies and associated ecosystems resulting mainly from nutrient release from aquaculture facilities. Annual production in the current version of the indicator is a proxy for the environmental impacts of aquaculture. Work is underway to develop a more advanced indicator to assess the sustainability of aquaculture.

Assessment

Total European aquaculture production has grown significantly in the past 15 years due to expansion in the marine sector in the EU and EFTA countries although this has slowed since 1999. This represents a rise in pressure on water bodies and associated ecosystems resulting mainly from nutrient release from aquaculture facilities. The increase in both production and pressure on the environment has not been uniform across countries or production systems. Mariculture has increased significantly, brackish water production has increased at a much slower rate and freshwater production has declined.

Improvements in the efficiency of feed and nutrient utilisation as well as environmental management have to some extent mitigated environmental pressures.

The biggest European aquaculture producers are found in the EU-15 + EFTA region. Norway has the highest production, followed by Spain, France, Italy and the United Kingdom. These five countries account for nearly 75 % of all aquaculture production amongst 34 European countries.

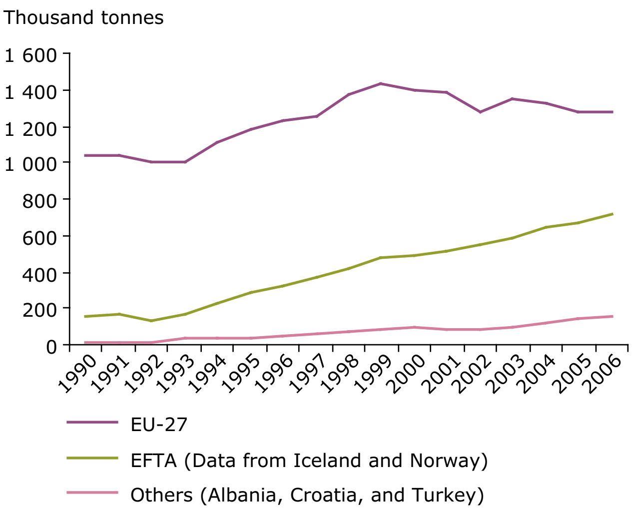
Different types of aquaculture generate different pressures on the environment although the main pressures are discharges of nutrients, antibiotics and fungicides. In addition, wild fish is often used as the basis for fish food. According to one estimate (UNEP, 2004), 4–6 kg of wild fish are ground into meal to produce 1 kg of farmed fish.

Intensive finfish production (mainly salmonids in marine, brackish and freshwaters, and sea bass and sea bream in the marine environment) exerts the greatest pressure on the environment. Precisely this sector has grown fastest in recent years. The cultivation of bivalve molluscs also creates pressures (removal of plankton and local concentration and accumulation of organic matter and metabolites) but these are less severe than those from intensive finfish cultivation. Environmental pressure per unit production in inland waters (e.g. pond aquaculture of carp) is generally less than for the more intensive coastal salmonid production.

The amount of antibiotics used has been reduced drastically in recent years following the introduction of vaccines and improved husbandry practices. Improvements in the efficiency of feed and nutrient utilisation as well as environmental management also mitigate the environmental pressure of marine farms.

The greatest marine aquaculture production in relation to coastline length is found in Spain, France, the Netherlands, Romania, Bulgaria, and Turkey.

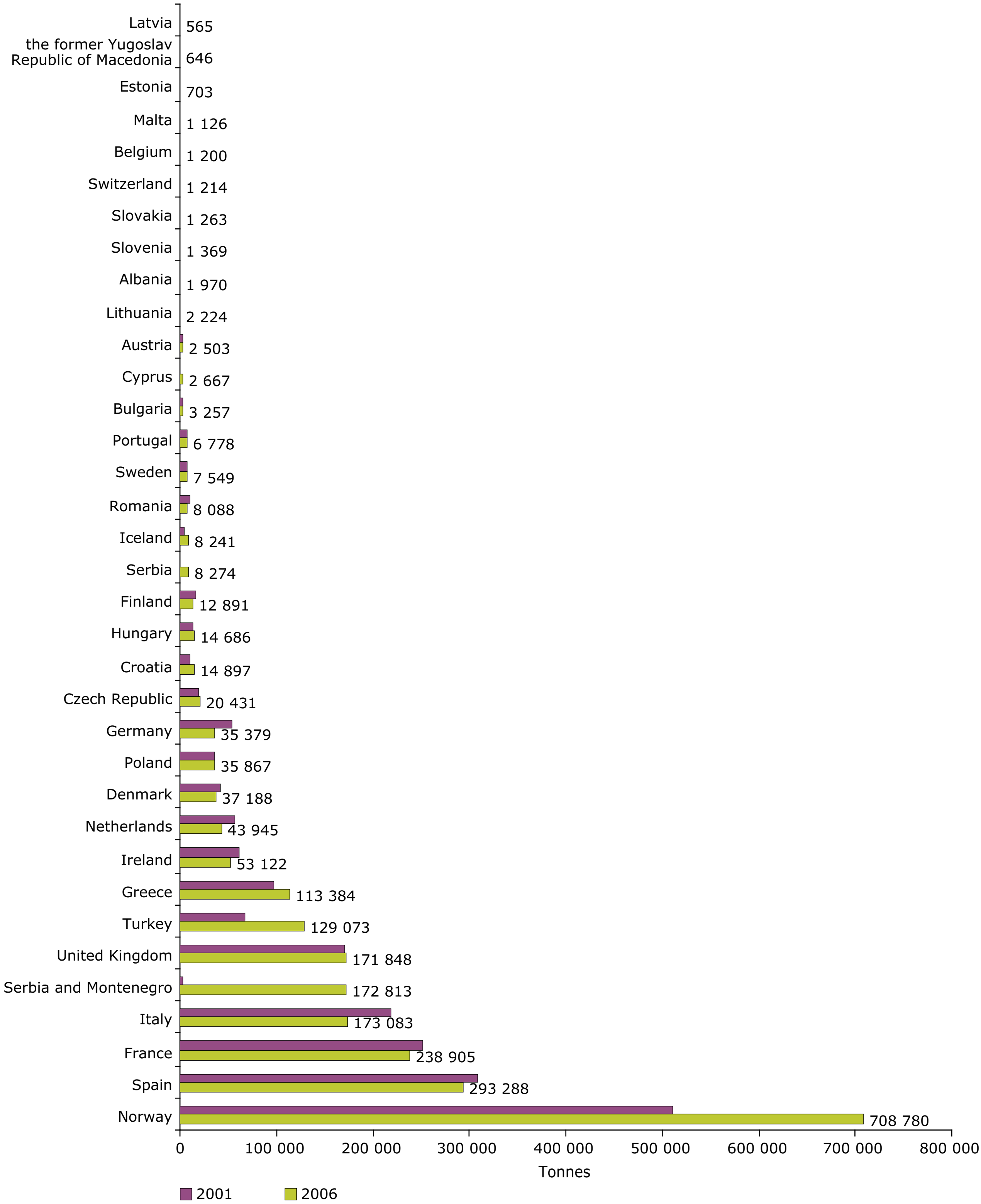
Figure 36 Annual aquaculture production by major area



Note: How to read the graph: in EFTA between 1990 and 2006 the annual aquaculture production increased from 150 000 to 720 000 tonnes.

Source: FAO Fishstat Plus.

Figure 37 Annual aquaculture production by country in 2001 and 2006



Note: How to read the graph: in Spain the annual aquaculture production decreased from 310 000 tonnes in 2001 to 293 000 tonnes in 2006.

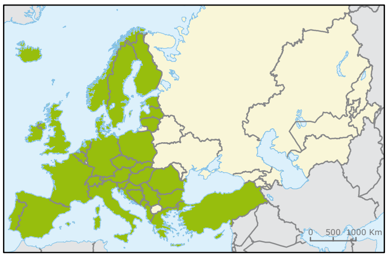
Production includes all environments i.e. marine, brackish and freshwater.

2005 data are used for Serbia and Montenegro

Source: FAO FISHSTAT Plus.

Production intensity is on average eight tonnes per km of coastline in EU-10 + EFTA countries compared with two tonnes per km in the EU-10 + Romania + Bulgaria + Balkan region. As production of species such as cod, halibut and turbot becomes more reliable, growth of aquaculture (and related pressures) is likely to continue to increase. At the same time, significant improvements have been made in reducing effluents from fish farms. For example, it was reported (Enell, 1995), that in Nordic fish farms between 1974 and 1994, the loads of nitrogen were reduced from 132 kg per tonne of fish produced to 55 kg/t, and levels of phosphorus were reduced from 31 kg/t to 5 kg/t. Similarly, nitrogen discharge per tonne production in EU aquaculture was three times lower in 2003 than in 1983 (INDENT, 2006).

Geographical coverage



Web links

EEA Core Set Indicator 33 (Aquaculture production): http://themes.eea.europa.eu/IMS/CSI.

Headline indicator: Ecological Footprint and biocapacity of European countries

23. Ecological Footprint of European countries

Key policy question: Are Europeans using more than their share of the world's resources?

Key message
The Ecological Footprint for pan-Europe ([17]) has been increasing almost constantly since 1961, while Europe's biocapacity ([18]) has decreased. This results in an ever larger deficit, with negative consequences for the environment within and outside Europe.

Assessment
Europe's ecological deficit is considerable. Overall biological resource use and waste emission is well above the biological capacity available within Europe, showing that the continent cannot sustainably meet its consumption demands from within its own borders.

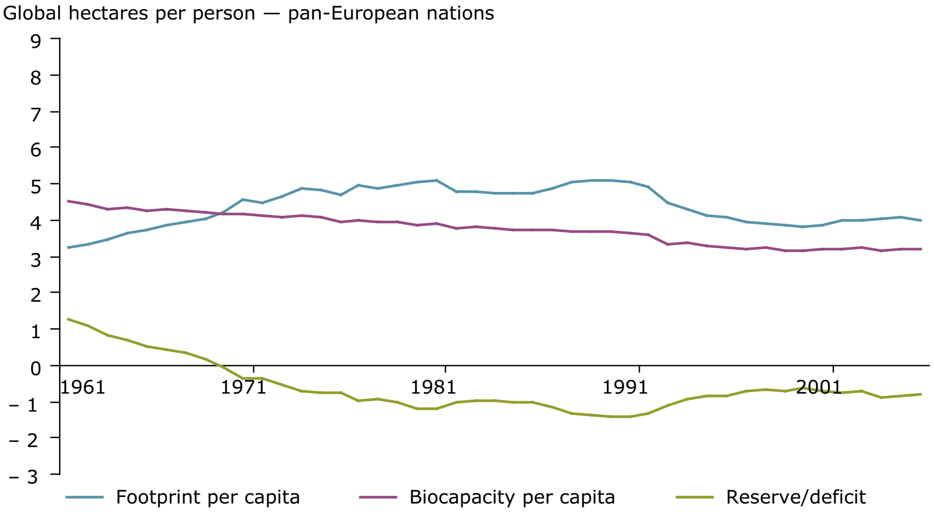
The EU-27 on its own has a Footprint of 4.7 global hectares per person, twice the size of its biocapacity. For pan Europe — as shown in Figure 38 — the deficit per person is significantly smaller. While the Footprint does not measure biodiversity, it correlates with the main biodiversity threats.

A regional or national ecological deficit means that the region is either importing biocapacity through trade or liquidating regional ecological assets. Evidently, a global ecological deficit cannot be compensated through trade and therefore corresponds to liquidation of natural capital.

In a world that is already in ecological overshoot, Europe's ecological deficit contributes to the diminishing amount of renewable natural resources available in the future, adds to overall waste accumulation and puts regional and global ecosystems at greater risk of degradation. Further work should examine in more detail the linkages between the Ecological Footprint and biodiversity.

Figure 39 shows that Europe is not the only region where the Ecological Footprint (shown as per

Figure 38 European Ecological Footprint, biocapacity and reserve or deficit

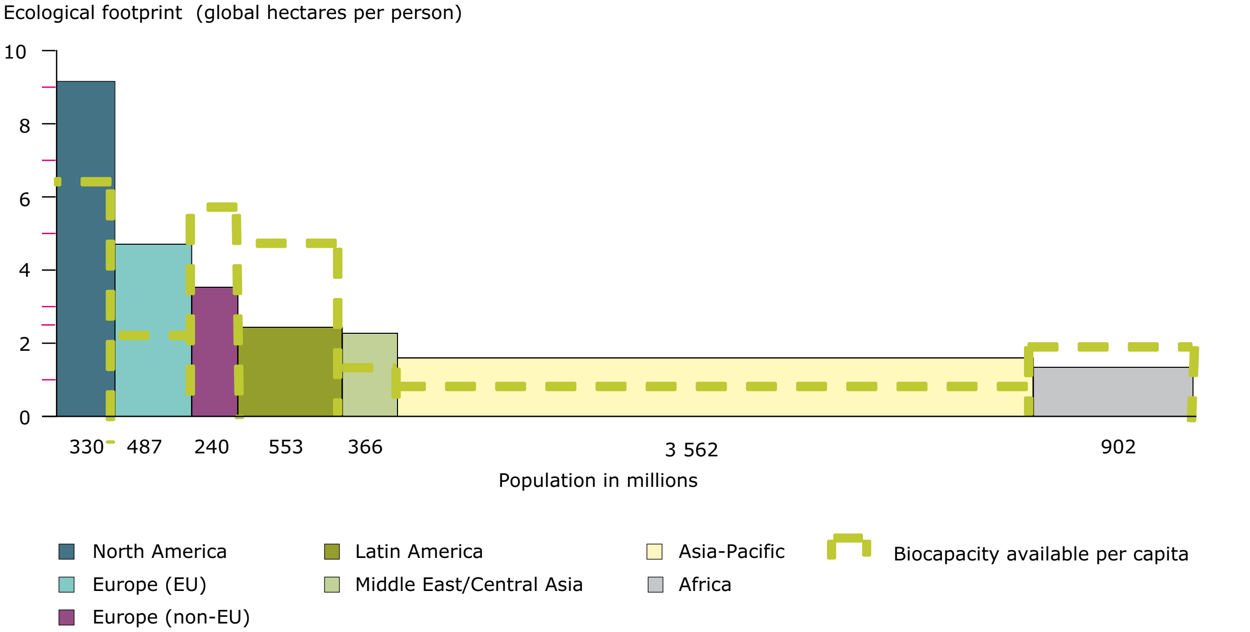


Note: How to read the graph: from 1961 to 2003, Europe's Ecological Footprint increased from 3 to 4 ha/person.

Source: Global Footprint Network, National Footprint Accounts 2008 Edition.

([17]) For this analysis, data from all European countries were used, except for nations that were excluded because of insufficient population (Cyprus, Iceland, Liechtenstein, Luxembourg and Malta,) and nations for which data are lacking (Andorra, Monaco, San Marino).
([18]) The capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies.

Figure 39 Ecological Footprint variation per region (2005)



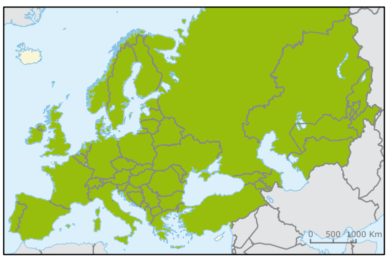
Note: How to read the graph: the EU has 487 million citizens, and a biocapacity of two global hectares per person. The Ecological Footprint however, is 4.5 hectares per EU citizen.

The Footprint is the area used to support a defined population's consumption including the area needed to produce the materials consumed and to absorb the waste. The deficit is the difference between the biocapacity and Ecological Footprint of a region or country.

Source: Global Footprint Network, National Footprint Accounts 2008.

person Footprint times population size) exceeds the biocapacity (per person biocapacity shown as green dotted line). Europe beyond the EU actually has a biocapacity that is slightly larger than its Footprint. North America, the EU-25 and the remaining European nations have a per person Footprint that is significantly larger than that in any other continent.

Geographical coverage



Web links

Global Footprint Network: www.footprintnetwork.org.

Focal area: status of access and benefits sharing

Headline indicator: percentage of European patent applications for inventions based on genetic resources

24. Patent applications based on genetic resources

Key policy question: What share of European patents is biodiversity-related?

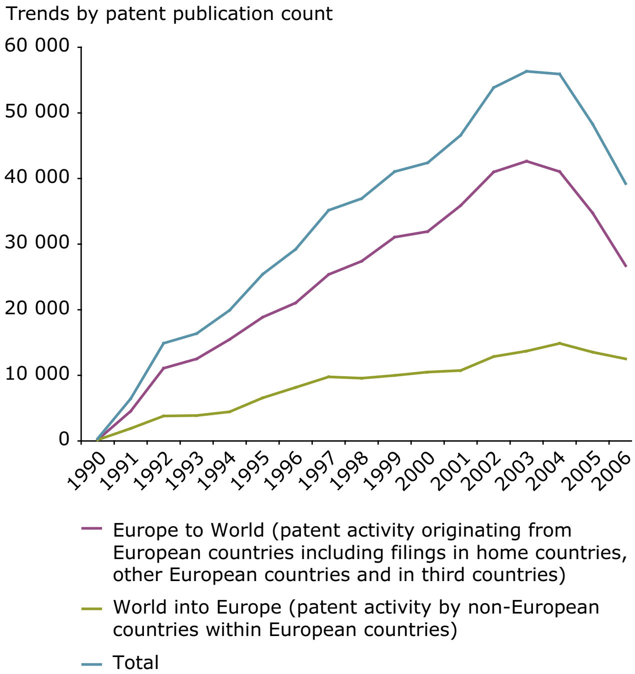
Key message
Biodiversity has served as a major resource for patent activity across a wide swathe of science and technology sectors ranging from agriculture to cosmetics, functional foods, traditional medicines, pharmaceuticals, biotechnology and emerging developments such as synthetic biology. About 9 % of European patent activity relates to biodiversity, rising to 16 % if the full spectrum of pharmaceutical activity is included. After rapid growth, patent activity for biodiversity now shows a declining trend.

The decrease from 2005 seen in Figure 41 is due to the time lag between the filing of a patent and its publication (2 years and more). This means that for recent years, the data may not yet be in the database (see Oldham and Hall, 2009). Additional work is required to link the data with wider economic and geographical information.

Assessment
The third objective of the Convention on Biological Diversity is concerned with the equitable sharing of the benefits arising from the utilization of genetic resources. This objective is linked to access to genetic resources encompassing a spectrum of biodiversity and the traditional knowledge of indigenous peoples and local communities. Parties to the Convention are negotiating an international regime on access and benefit-sharing to implement the third objective. Intellectual property of all types generated an estimated $110 billion in licensing revenue in 2004 and is an important issue with respect to access, benefit-sharing and 'biopiracy'. Data from the World Patent Statistical Database allows for the analysis of country portfolios for biodiversity and traditional knowledge, and of overall and sectoral trends.

Trends in biodiversity related patents are of direct relevance to the access and benefit sharing provisions of the Convention on Biological Diversity in four areas:

Figure 41 Biodiversity patent trends for European countries (publication portfolio)

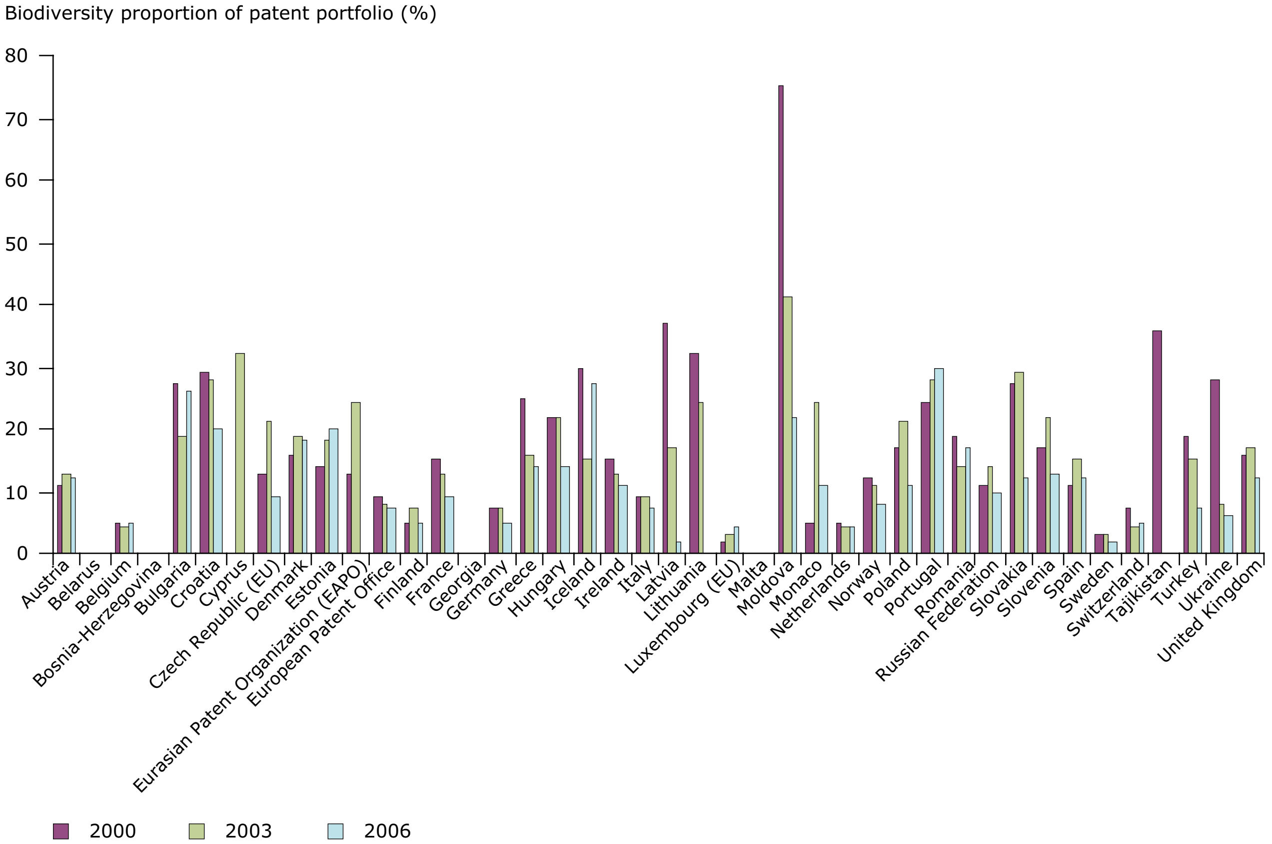


Note: Patent publication counts by publication year. 1990 is used as year zero in this figure. Counts can be conducted at different levels and in accordance with different years. Trends presented here capture applications, grants and procedural republications.

Other counts such as priority filings of applications provide insights into underlying innovative activity.

Source: Oldham and Hall, 2009.

Figure 40 Biodiversity as a Share of European Patent Portfolios for Target Years



Note: Data is presented as a percentage of country level patent publications for target years. Countries display marked variation in the size of their patent portfolios (e.g. Moldova). When viewed as percentages low levels of activity may display high percentage scores. Conversely, countries with large portfolios may display relatively modest proportions.

Patent activity for biodiversity displayed rapid growth in during the 1990s, reaching a total of 591 120 publications before levelling off and then declining. This figure almost doubles to 1 026 227 publications (16 % of the total) if the full spectrum of the pharmaceutical sector is included. This broader measure followed a very similar growth trend to the conservative indicator presented in this summary.

European countries are both importers and exporters of intellectual property for biodiversity and the indicator allows these trends to be characterised in more detail. Declining total activity results from declines in biotechnology but disguises underlying activity in areas such as traditional medicines and the emerging field of synthetic biology.

Source: Oldham and Hall, 2009.

- first, patent applicants must disclose information on the materials used in a claimed invention. This provides a means to examine access to biodiversity and traditional knowledge in relation to its origin
- second, sectoral trends (i.e. agriculture, traditional medicines, biotechnology) can be examined and linked to economic and geographical data. This provides a bridge to addressing issues of relevance to benefit-sharing;
- third, patents provide a measure of international cooperation where inventors and companies from more than one country are involved and this is linked with the promotion of technology transfer under the Convention;
- fourth, as a standardised global information system, the patent system allows for the detailed monitoring of trends in activity for patents and related forms of intellectual property across multiple areas of science and technology.

Within the context of the Convention on Biological Diversity work is currently ongoing to clarify the meaning and scope of the utilisation of genetic resources and related subjects such as the traditional knowledge of indigenous peoples and local communities. The indicator can contribute to this process and be refined in accordance with the outcomes of these debates. In particular the treatment of patent activity for the pharmaceutical sector has major impacts on the indicator and requires further clarification. Additional work is also required to link the data with wider economic and geographical information and to advance understanding of the origins of material submitted for patent protection from particular countries and indigenous peoples and local communities. The use of emerging information technology and electronic whole-text patent databases will facilitate this process.

Access to genetic resources and benefit-sharing is one facet of the growing appreciation for the social and economic value of biological diversity. In the realm of innovation, new and more 'open' models for innovation and access and benefit-sharing are being proposed to serve the needs of the 21st Century and to reflect these wider values. The patent indicator can contribute to evidence-based approaches to existing trends and be adapted to meet longer term needs as new models emerge.

Growing appreciation for the economic value of biodiversity is being achieved more broadly, as documented by The Economics of Ecosystems and Biodiversity (TEEB) report under preparation and different statements by G8, the United Nations General Assembly and the Conference of the Parties to CBD.

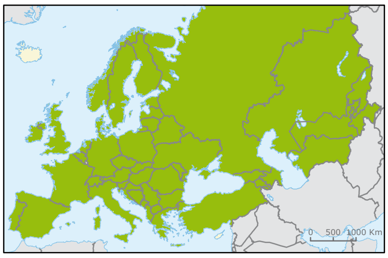
Notes
For the purpose of this indicator, European patent applications are defined as follows:

(i) Patent applications presented to the national intellectual property offices of the pan-European Countries;
(ii) Patent applications presented to the European Patent Office (EPO) under the EPC (European Patent Convention);
(iii) Patent applications presented to the European Patent Office or the World Intellectual Property Organization under the Patent Cooperation Treaty (PCT) when pan-European countries are mentioned among the designated Contracting States of the PCT from which protection is sought.

The draft headline indicator was developed using the World Patent Statistical Database (PATSTAT, October 2007). The PATSTAT database was developed by the European Patent Office in collaboration with the Organisation for Economic Co-operation and Development (OECD) to provide an international baseline for patent statistics. For a detailed discussion on the methodology see Oldham and Hall (2009).

A key emerging issue in debates under the Convention on Biological Diversity is the scope of the meaning of utilization of genetic resources that are the focus of benefit-sharing. The indicator encompasses emerging understandings of the scope of the meaning of utilization of genetic resources. However, the relationship between genetic resources and chemical compounds for use in the pharmaceutical and other industry sectors, known as 'derivatives', has a major impact on the indicator requiring clarification. The indicator is designed to be flexible in order to accommodate emerging understandings under the Convention.

Geographical coverage



Web links

World Intellectual Property Organisation: www.wipo.int/portal/index.html.en.

European Patent Office: www.epo.org.

OECD page on biotechnology: www.oecd.org/topic/0,3373,en_2649_37437_1_1_1_1_37437,00.html.

Convention on Biological Diversity:www.cbd.int.

Focal area: status of resource transfers and use

Headline indicator: funding to biodiversity

25. Financing biodiversity management

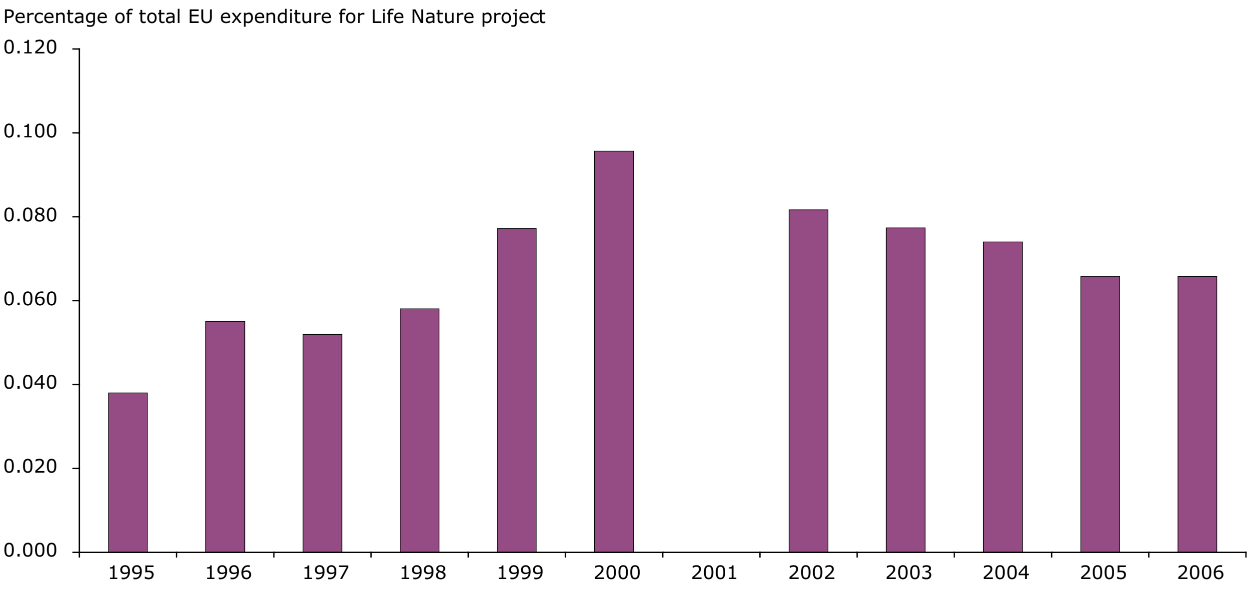
Key policy question: How much public funds are being committed to conservation of biodiversity?

Key message
This indicator currently has a limited scope and only contains information from EU funding of projects using the LIFE financial instrument for the environment. The amount of the EU contribution per LIFE project varies significantly among Member States. Newer Member States tend to spend less money through the LIFE Nature programme (with a small number of notable exceptions). Further detail is required (e.g. on project size) in order to interpret these figures. The LIFE Nature project represents a very small proportion of the total EU budget. European funding benefiting biodiversity may also be 'hidden' in budget lines within other policy areas, such as agriculture, rural development and research. Finally, the indicator currently does not show national funding for biodiversity.

Assessment
The figures are shown for 1995 onwards because that year marked the establishment of the EU-15 and the start of implementing the Habitats Directive. It should be noted that the amounts indicated in Figure 43 represent the EU contribution (from the LIFE Programme) to the projects, not the total cost of the projects in question. LIFE tends to cover 50–75 % of total costs, depending on the target species and/or habitats.

Since 2000, LIFE has enjoyed a more stable budget (although there was no call in 2001) and the amount

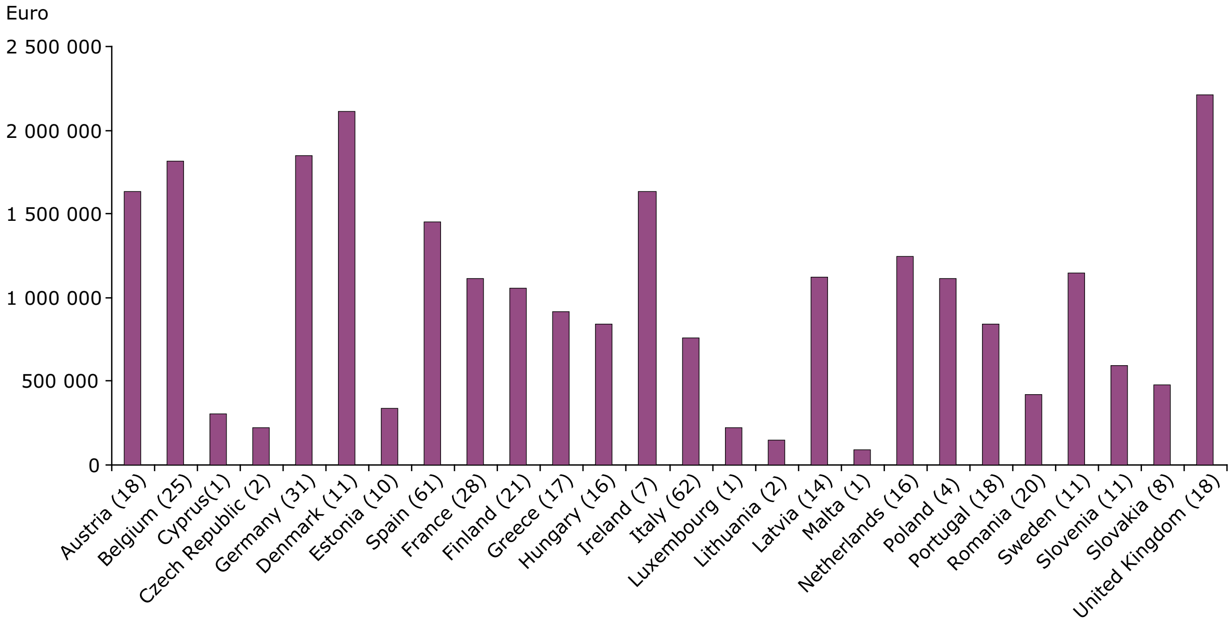
Figure 42 Percentage of total EU expenditure on the LIFE Nature project from 1995 to 2006



Note: How to read the graph: in 2006, EU expenditure on the LIFE project represented 0.066 % of the total EU budget.

Source: DG Environment, LIFE unit, 2008.

Figure 43 Average contribution of LIFE Nature to projects in EU countries, 2000–2006

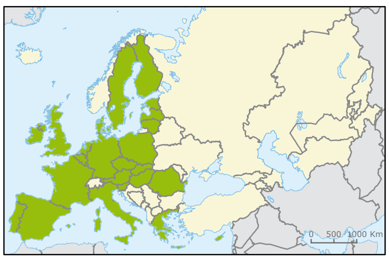


Note: How to read the graph: the EU Life contribution averaged approximately EUR 1.5 million per year for 18 Austrian projects during the period 2000–2006.

Source: DG ENV LIFE unit.

of money allocated for nature has increased under LIFE+. Private or national government spending is not covered by the indicator. Although expenditure on LIFE declined as a proportion of total EU spending between 2000 and 2006 (in part because accessions expanded the total EU budget), this has now levelled out and is set to increase.

Geographical coverage



Web links

About LIFE projects: http://ec.europa.eu/environment/life/index.htm.

Focal area: public opinion

Headline indicator: public awareness and participation

26. Public awareness

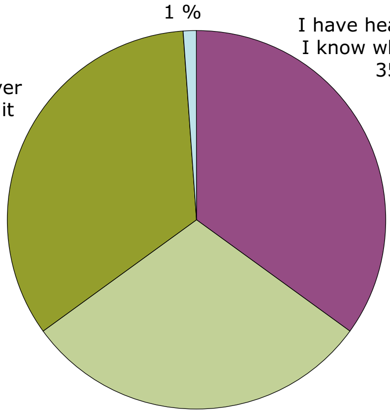
Key policy question: What is the level of public awareness about biodiversity in Europe? Are people willing to take action?

Key message
Two-thirds of EU citizens do not know the meaning of the word 'biodiversity', let alone understand what the threats and challenges to its conservation are. Most EU citizens have never heard of the Natura 2000 network (80 %). However, over two-thirds of EU citizens report personally making efforts to help preserve nature.

Assessment
A recent survey ([19]) showed that only about one-third of EU citizens know the meaning of the word 'biodiversity' and few feel well informed about the issue.

Two-thirds of EU citizens do not know the meaning of the word 'biodiversity', let alone understand the threats and challenges to its conservation. That does not mean, however, they are unaware of environmental matters. When the issue is explained to them, over two-thirds consider the loss of biodiversity a serious problem, albeit more so at the global rather than the local level. The main threats

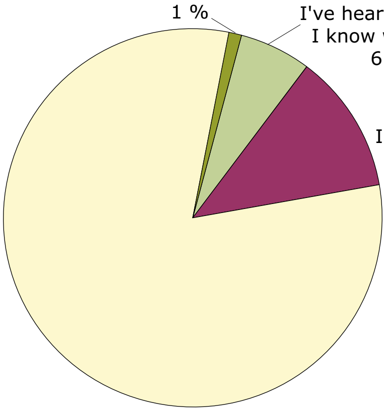
Figure 44 Familiarity with the term 'biodiversity' (EU-27)



Note: How to read the graph: 34 % of EU citizens have never heard of biodiversity.

Source: Gallup Organization, Flash Eurobarometer Series No. 219, 2007.

Figure 45 Awareness of the Natura 2000 Network, share of respondents



Note: How to read the graph: 81 % of EU citizens have never heard of Natura 2000.

Source: Gallup Organization, Flash Eurobarometer Series No. 219, 2007.

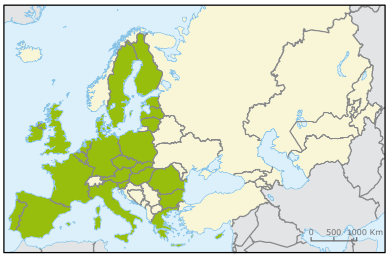
([19]) Gallup Organization, 2007. Flash Eurobarometer Series No. 219.

to biodiversity identified by Europeans (pollution and man-made disasters) indicate that the level of understanding of the problem is still inadequate.

The survey also reveals that Europeans are unaware of what the EU is doing to save biodiversity: Only one in five has ever heard of Natura 2000, the EU's main programme for biodiversity conservation, and only 6 % of respondents indicated they really knew what Natura 2000 meant. Most EU citizens have never heard of the Natura 2000 network (80 %). The Natura 2000 programme needs urgent attention as far as communication to the public is concerned.

If the survey is repeated at regular intervals, it will be possible to identify trends and assess the effectiveness of existing and future policies aimed at raising public awareness and participation with regards to biodiversity. Currently the survey data are insufficient to determine trends of this sort.

Geographical coverage



Web links and references

About Eurobarometer: http://ec.europa.eu/public_opinion/archives/flash_arch_en.htm.

References and further reading

Agnoletti, M., 2000. 'Introduction: Factors and Processes in the History of Forest Resources'. In: Agnoletti, M. and Anderson, S. (eds), *Forest History: International Studies on Socio-economic Change. Report No. 2 of the IUFRO Task Force on Environmental Change*. CABI Publishing, Wallingford, UK.

Andersen, E.; Baldock, D.; Bennett, H.; Beaufoy, G.; Bignal, E.; Brouwer, F.;, Elbersen, B.; Eiden, G.; Godeschalk, F.; Jones, G.; McCracken, D.; Nieuwenhuizen, W., van Eupen, M., Hennekens, S. and Zervas, G., 2003. *Developing a High Nature Value Farming area indicator*. Internal report for the European Environment Agency.

Balmford, A.; Crane, P.; Dobson, A.; Green, R. E.; and Mace G. M., 2005. 'The 2010 challenge: data availability, information needs and extraterrestrial insights'. *Phil. Trans. R. Soc*. 28 February, B 360, pp. 221–228. Available at: www.pubmedcentral. nih.gov/articlerender.fcgi?artid=1569447 [Accessed 4 March 2009].

Balmford, A.; Rodrigues, A. S. L.; Walpole, M.; ten Brink, P.; Kettunen, M.; Braat, L.; and de Groot, R., 2008. *The Economics of Biodiversity and Ecosystems: Scoping the Science*. Cambridge, the United Kingdom. Available at: http://ec.europa.eu/environment/nature/ biodiversity/economics/pdf/scoping_science_report. pdf [Accessed 4 March 2009].

Biodiversity Monitoring Switzerland, 2009. Indicator M5 'Areas farmed organically'. Available at www.biodiversitymonitoring.ch/english/indikatoren/m5.php [Accessed 11 May, 2009].

Bradbury, R. B.; Bailey, C. M.; Wright, D.; and Evans, A. D., 2008. 'Wintering Cirl Buntings Emberiza cirlus in southwest England select cereal stubbles that follow a low-input herbicide regime'. *Bird Study*, 55, 23–31.

Bradbury, R. B.; Browne, S. J.; Stevens, D. K.; and Aebischer, N. J., 2004. 'Five-year evaluation of the impact of the Arable Stewardship Pilot Scheme on birds'. *Ibis* 146 (Supplement 2), 171–180.

Butchart, S.H.M., Akçakaya, H.R., Chanson, J., Baillie, J.E.M., Collen, B., Quader, S., Turner, W.R., Amin, R., Stuart, S.N., Hilton-Taylor, C. and Mace, G. M., 2007. 'Improvements to the Red List Index', *Public Lib. Sci., One* 2(1).

CBD, 1992. Convention on Biological Diversity.

CBD, 1997. *Recommendations for a core set of indicators of biological diversity*. Available at: www.cbd.int/doc/meetings/sbstta/sbstta-03/information/sbstta-03-inf13-en.pdf [Accessed 22 April 2009].

CBD, 2005. *Information on definition of biodiversity loss and work on indicators for assessing progress towards the 2010 biodiversity target*. Secretariat of the Convention on Biological Diversity. Available at: https://cbd.int/ doc/meetings/bs/bswglr-01/information/bswglr-01inf-02-en.doc [Accessed 22 April 2009].

CCE, 2007: 'Critical Loads of Nitrogen and Dynamic Modelling', *Coordination Centre for Effects Progress Report 2007*, MNP Report 500090001/2007.

CCE/EMEP, 2007. *Personal communication*, input to EEA, 2007c.

Clark, C. M. and Tilman, D. 2008. 'Loss of plant species after chronic low-level nitrogen deposition to prairie grasslands'. *Nature* 451, pp. 712–175.

DAISIE project — European Summary. Available at: www.europe-aliens.org/europeanSummary.do [Accessed 4 March 2009].

de Vries, M. and Hiemstra, S. J., 2007. *Regional fact sheets for farm animal genetic resources — Europe and the Caucasus*. European Regional Focal Point for Animal Genetic Resources. Available at: www.rfp-europe.org/ files/ERFP_factsheets_final.doc [Accessed 4 March 2009].

Donald, P. F.; Sanderson, F. J.; Burfield, I. J.; Bierman, S. M.; Gregory, R. D.; and Waliczky, Z., 2007. 'International Conservation Policy Delivers Benefits for Birds in Europe'. *Science* 317: 810.

EC, 2005. *Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)*. Available at: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2005/l_277/l_27720051021en00010040.pdf [Accessed 23 June 2009].

EC, 2006. *Council decision of 20 February 2006 on Community strategic guidelines for rural development (programming period 2007 to 2013)* (2006/144/EC). Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:055:0020:0029:EN:PDF [Accessed 23 June 2009].

EEA 2004. *High nature value farmland. Characteristics, trends and policy challenges*. European Environment Agency Report 1/2004. Available at: http://www.eea.europa.eu/publications/report_2004_1 [Accessed 23 June 2009].

EEA 2007a. *Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe*. EEA Technical report No 11/2007. European Environment Agency, Copenhagen, Denmark. Available at: www.eea.europa.eu/publications/ technical_report_2007_11 [Accessed 4 March 2009].

EEA, 2007b. *Europe's environment—The fourth assessment*. European Environment Agency, Copenhagen, Denmark. Available at: http://reports. eea.europa.eu/state_of_environment_report_2007_1/ en/ [Accessed 4 March 2009].

EEA, 2007c. *Air pollution in Europe 1990–2004*. EEA Report No 2/2007. European Environment Agency, Copenhagen, Denmark. Available at: www.eea.europa.eu/publications/eea_report_2007_2 [Accessed 4 March 2009].

EEA, 2006. *Progress towards halting the loss of biodiversity by 2010*. EEA Report No 5/2006. European Environment Agency, Copenhagen, Denmark. Available at: www.eea.europa.eu/publications/eea_ report_2006_5 [Accessed 4 March 2009].

EEA, 2008a. *European forests—ecosystem conditions and sustainable use*. EEA Report No 3/2008. European Environment Agency, Copenhagen, Denmark. Available at: www.eea.europa.eu/publications/eea_ report_2008_3 [Accessed 4 March 2009].

EEA, 2008b. *Impacts of Europe's changing climate — 2008 indicator-based assessment*. EEA Report No 4/2008. European Environment Agency, Copenhagen, Denmark. Available at: www.eea.europa.eu/ publications/eea_report_2008_4 [Accessed 4 March 2009].

EEA, 2009. *Progress towards the European 2010 biodiversity target*. EEA Report 04/2009. Available at www.eea.europa.eu/highlights/publications/progress-towards-the-european-2010-biodiversity-target/

EEA/SEBI2010, 2006. *SEBI2010 Expert Group 5 — Invasive species*. Available at: http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/fol365614/F1115192484. [Accessed 18 June 2009]

Enell, M., 1995. 'Environmental impact of nutrients from Nordic fish farming'. *Water Science and Technology* 31(10):61–71.

Estreguil, C. and Mouton, C., 2009. *Measuring and reporting on forest landscape pattern, fragmentation and connectivity in Europe: methods and indicators*. Joint Research Centre of the European Commission, Internal publication. Pubsy reference 51802.

Eurostat. 2009. Agriculture statistics. Main tables. Available at http://epp.eurostat.ec.europa.eu/portal/page/portal/agriculture/data/main_tables [Accessed 11 May 2009].

FAO Fishstat Plus. www.fao.org/fishery/statistics/software/fishstat.

FAO, 2005. Global Forest Resources Assessment 2005 — Country tables — Biomass stock in forest and other wooded land. www.fao.org/forestry/32100/en/ [Accessed 27 April 2009].

Fontaine, B. *et al.*, 2007. 'The European Union's 2010 target: Putting rare species in focus'. *Biological Conservation* 139, pp. 167–185. Available at: http://download.naturkundemuseum-berlin.de/hannelore.hoch/2010_target.pdf [Accessed 4 March 2009].

G8, 2009. Carta di Siracusa on Biodiversity, adopted by the G8 Environment ministers at their meeting in Siracusa, 22–24 April 2009. Available at www.g8ambiente.it/public/images/20090424/doceng/09_04_24_Carta%20di%20Siracusa%20on%20 Biodiversity.pdf [Accessed 27 April 2009].

Gallup Organization, 2007. *Flash Eurobarometer Series No. 219. Attitudes of Europeans towards the issue of biodiversity*. Survey conducted by Gallup Organization at the request of the Directorate-General for Environment. Coordinated by

Directorate-General Communication. Available at: http://ec.europa.eu/public_opinion/flash/fl_219_en.pdf [Accessed 1 April 2009].

Global Footprint Network., 2008. *National Footprint Accounts, 2008 Edition*. Available at www.footprintnetwork.org/atlas [Accessed 23 June 2009].

Gregory, R. D.; van Strien, A. J.;, Vorisek, P.; Gmelig Meyling, A. W.; Noble, D. G.; Foppen, R. P. B. and Gibbons, D. W., 2005, 'Developing indicators for European birds' *Phil. Trans. R. Soc.,* London, B. 360, pp. 269–288.

Gregory, R. D.; Vorisek, P.; Noble, D. G.; van Strien, A. J.; Pazderová, A.; Eaton, M. E.; Gmelig Meyling, A. W.: Joys, A.: Foppen, R. P. B. and Burfield, I. J., 2008. 'The generation and use of bird population indicators in Europe', *Bird Conservation International,* No 18, S223–S244.

Gregory, R. D.; Willis, S. G.; Jiguet, F.; Voříšek, P.; Klvaňová, A.; van Strien, A.; Huntley, B.; Collingham, Y. C.; Couvet, D. and Green, R. E., 2009. 'An Indicator of the Impact of Climatic Change on European Bird Populations'. *PLoS ONE* 4(3)

Hahn, K. and Christensen, M., 2004. 'Dead wood in European forest reserves — a reference for forest management'. *EFI Proceedings* 51: 181–191.

HCMR, 2008. *European Database on alien species*. Developed for EEA by the Hellenic Centre for Marine Research. Update of October 2008.

Huntley, B.; Collingham, Y. C.; Willis, S. G. and Green, R. E, 2008, 'Potential impacts of climatic change on European breeding birds', *PLoS ONE* 3.

Huntley, B.; Green R. E.; Collingham Y. C. and Willis, S. G., 2007. *A climatic atlas of European breeding birds*. Lynx Ediciones, Barcelona.

ICP M&M, 2004. *Manual on the methodologies and criteria for modelling critical loads and critical levels and air pollution effects, risks, and trends*. Available at: http://www.oekodata.com/icpmapping/index.html [Accessed 18 June 2009].

INDENT, 2006. *INDicators of ENvironmental integration. Final report*. Tender Reference No FISH/2004/12.

IUCN, 2003. *Guidelines for application of IUCN Red List Criteria at regional levels: Version 3.0*. IUCN Species Survival Commission, Gland, Switzerland and Cambridge, United Kingdom.

Kell, S. P.; Knüpffer, H.; Jury, S. L.; Ford-Lloyd, B. V.; and Maxted, N., 2008. 'Crops and wild relatives of the Euro-Mediterranean region: making and using a conservation catalogue'. In: Maxted, N., Ford-Lloyd, B.V., Kell, S.P., Iriondo, J., Dulloo, E. and Turok, J. (eds.) *Crop wild relative conservation and use*. CABI Publishing, Wallingford, pp. 69–109.

Kirby, K. J. and Watkins, C., 1998. 'Introduction: Historical Ecology and European Woodland'. In: Kirby, K.J. and Watkins, C. (eds.), 1998. *The Ecological History of European Forests*. CABI Publishing, Wallingford, UK.

MA, 2005. *Ecosystems and human well-being: synthesis. Millennium Ecosystem Assessment*. Island Press, Washington, DC. Available at: www.millenniumassessment.org/en/synthesis.aspx [Accessed 4 March 2009].

Mace, G. M. and Baillie, J., 2007. 'The 2010 biodiversity indicators: Challenges for science and policy'. *Conservation Biology* 21, No. 6, pp. 1406–1413.

MCPFE, 2007. *State of Europe's Forests 2007*. Jointly prepared by the Ministerial Conference on the Protection of Forests in Europe Liaison Unit Warsaw, UNECE and FAO. Available at: http://www.mcpfe.org/files/u1/publications/pdf/state_of_europes_forests_2007.pdf [Accessed 23 June 2008].

OECD, 2008a. *OECD environmental outlook to 2030*. Organisation for Economic Co-operation and Development, Paris. Available at: www.oecd.org/docu ment/20/0,3343,en_2649_34305_39676628_1_1_1_3746 5,00.html [Accessed 4 March 2009].

OECD, 2008b. Environmental Performance of Agriculture in OECD countries since 1990. Publications Service, Paris, France, www.oecd.org/tad/env/indicators.

Oldham, P. D. and Hall, S., 2009. *A European Patent Indicator for Access to Genetic Resources and Benefit-Sharing*. Available at SSRN: http://ssrn.com/abstract=1397108 [Accessed 11 May 2009].

Paracchini M.L., Petersen, J.-E., Hoogeveen, Y., Bamps, C., Burfield, I. and van Swaay, C., 2008. *High Nature Value Farmland in Europe — An estimate of the distribution patterns on the basis of land cover and biodiversity data*, Report EUR 23480 E N. Available at: http://agrienv.jrc.ec.europa.eu/publications/pdfs/HNV_Final_Report.pdf [accessed 8 June 2009].

Pauly, D. and Watson, R., 2005. 'Background and interpretation of the 'Marine Trophic Index' as a measure of biodiversity', *Phil. Trans. R. Soc*., pp. 415–423.

Riitters, K. H.; Wickham, J. D. and Wade, T. G., 2009. 'An indicator of forest dynamics using a shifting landscape mosaic'. *Ecological Indicators* 9:107–117.

Saura S.; Mouton, C. and Estreguil, C., 2009. *European-wide maps of change in forest connectivity in 1990–2000*. Joint Research Centre of the European Commission, Internal publication Pubsy reference 51278.

Saura, S. and Torné, J., 2009. 'Conefor Sensinode 2.2: A software package for quantifying the importance of habitat patches for landscape connectivity'. *Environmental Modelling & Software* 2009 24:135–139.

Schelhaas, M-J.; Van Brusselen, J.; Pussinen, A.; Pesonen, E.; Schuck, A.; Nabuurs, G-J. and Sasse, V., 2006. Outlook for the Development of European Forest Resources. A study prepared for the European Forest Sector Outlook Study (EFSOS). Geneva Timber and Forest Discussion Paper 41. United Nations Food Economic Commission for Europe and Agriculture Organization of the United Nations. ECE/TIM/DP/41. Available at. www.unece.org/timber/docs/dp/dp-41.pdf [Accessed 11 May 2009].

Siitonen, J., 2001. 'Forest management, coarse woody debris and saproxylic organisms: Fennoscandian boreal forests as an example'. *Ecological Bulletins* 49: 11–41.

Soille, P. and Vogt, P. 2009. Morphological segmentation of binary patterns. Patterns Recognition Letters. doi:10.1016/j.patrec.2008.10.015.

UNECE, 2003. United Nations Economic Commission for Europe — Kiev Resolution on Biodiversity (ECE/CEP/108). Adopted at the Fifth Ministerial Conference Environment for Europe.

UNEP, 2004. *Resource Kit for Sustainable Consumption and Production Patterns*. Available at: http://www.unep.org/PDF/sc/SC_resourcekit.pdf. [Accessed 23 June 2009]

UNEP, 2007. *Global Environment Outlook 4*. United Nations Environment Programme, Nairobi. Available at: www.unep.org/geo [Accessed 4 March 2009].

Vallauri, D.; André, J.; Dodelin, B.; Eynard-Machet, R. and Rambaud, D. (eds.), 2005. *Bois mort et à cavités. Une clé pour des forêts vivantes*. Editions Tec & Doc, Lavoisier, Paris.

WWF, 2004. *Deadwood – Living Forests*. WWF Report. Available at: http://assets.panda.org/downloads/deadwoodwithnotes.pdf [Accessed 8 June 2009].

Annex 1 SEBI 2010 Coordination Team and phase 2 Working Groups

During the second phase of SEBI 2010 (end of 2007 until mid 2009), the composition of the SEBI 2010 Coordination Team was as follows:

- Gordon McInnes, Ivone Pereira Martins, Frederik Schutyser (European Environment Agency); and Anne Teller (European Commission);
- Ivonne Higuero (Joint Secretariat of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS));
- Damon Stanwell-Smith/Matt Walpole (United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)); Jan Plesnik (the Czech Republic).

Chairs and coordinators of the Working Groups

WG1 interlinkages between indicators — coordinator: Sophie Condé (MNHN-ETC/BD), chair: Ben ten Brink (PBL);

WG2 climate change and biodiversity — coordinator: Dominique Richard (MNHN-ETC/BD), chair: Snorri Baldursson (Icelandic Institute of Natural History);

WG3 communication — coordinator: Lawrence Jones-Walters (ECNC-ETC/BD), chair: James Williams (JNCC-ETC/BD).

All experts that have participated in the SEBI 2010 process are included in consultation processes on draft SEBI 2010 reports.

The full list of experts that participated in the first phase of SEBI 2010 (2005-end of 2007) is included in EEA Technical Report 11/2007 (www.eea.europa.eu/publications/technical_report_2007_11).

The following experts participated in the work of the SEBI 2010 Working Groups during the second phase of SEBI 2010:

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