

# **EEA core set of indicators**

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# 1. Guide to the reader of the report on the EEA core set of environmental indicators

## 1.1 Introduction

The EEA has, since 1999, given higher priority to the development and publication of policy relevant indicator-based reports including Environmental Signals reports, and sector-specific reports on transport (TERM), and energy (EERM). These experiences suggest indicators should be replicated for the other sectors and the environmental issues that the Agency supports through its work programme.

The added value of a core set of indicators explicitly linked to policy objectives, includes:

- A core set will foremost provide a relatively stable basis for the EEA to make reports as required under its Regulation.
- An agreed core set will also bring stability to data flows with EIONET and elsewhere and provide a solid basis for the use of Reportnet infrastructure and tools (eg CDR, ROD). More stable data flows over time will improve data quality and comparability and hence support higher quality assessments.
- These data and indicators will in turn enable the Agency to provide policy relevant assessment support to EU policy processes such as mid-term review of the 6<sup>th</sup> Environmental Action Programme (6EAP) or environment-sector integration (Cardiff process) so promoting the use of the same information for many purposes

This is the basis for the development of the EEA core set of policy-relevant indicators for six environmental issues (air pollution, climate change, water, waste and material flows, biodiversity and terrestrial environment) and five sectors (transport, energy, agriculture, tourism and fisheries).

## 1.2 Outcomes of 1<sup>st</sup> round consultation

In the period July to October 2002 the first version of the indicator set was out for country consultation – based on a Internet based application countries were asked to comment on the overall set and the individual indicators. Many good and valuable comments were received in particular to the relevance of the individual indicators.

During the last four months the EEA has revised the core set based on the country comments and other considerations. EEA has made substantial progress on improving the overall coherence and clarity of the proposed indicator sets. **The revised set now generally contains indicators that scored high priority by countries.**

Many countries commented on overlap between indicators in different sets. A detailed review of the indicator sets has found similar or nearly similar indicators in the different sets and cross-references between the different indicators have been made. **A coding system has been developed to ensure the consistency and linkage in the indicator sets.**

Comments were also received on the linkage between the EEA core set and to other international environmental indicator activities. In general EEA aims at working together with other relevant international indicator activities and not to duplicate their activities; however, in many cases EEA can add value to indicators developed elsewhere for example through its assessment of the state and impact in the environment in relation to European policies. In this report there is included for each set a brief section on the relations to other relevant indicator initiatives. These relations to other international

activities will be further explored in the coming years as part of the business process re-engineering that countries would like to see happen to achieve streamlining of data and information flows and their use.

### 1.3 Focus of the second round consultation

The primary objectives of the 2<sup>nd</sup> round consultation are threefold: to show progress made since the 1<sup>st</sup> round consultation on the basis of clients' comments; to provide clients with a further opportunity to comment on the proposals for indicators and their coherence/balance across environmental issues and sectors; to obtain from clients their views on the formal implementation from 2004 of the short-term indicators identified within the core set.

The distinction between short, medium and long-term (ST, MT and LT) indicators is important for the longer term development and implementation of the core set system. The criteria for distinguishing between ST, MT and LT indicators are as follows:

Short term ST	Operational 2003/04	High policy relevance + existing fact sheet; Methodology well developed and in many cases also in other international sets. Indicator can illustrate temporal trend and comparability between countries. Data are available for most countries in 2003. Data expected for all countries 2004/05.
Mid term MT	Operational 2005/6	High policy relevance + descriptive/fact sheet; Methodology understood but not fully tested Data available for some countries (less than 7) in 2003 Data available for most countries by 2006
Long term LT	Under development	High policy relevance (e.g. halting the decline of biodiversity) Methodology little developed or unclear, Data are either scarce, or difficult to aggregate, or yet to defined; Indicator is under development and foreseen to be included in work programmes in the coming years.

It is also important to recognize that the Agency will also consider how to integrate further and hence reduce the number of medium and long-term indicators. This is particularly relevant for spatial indicators where it is recognized there is scope for having more added-value indicators for policy making by integrating spatial data from different domains, for example in the relationships between soil, land, biodiversity, tourism, agriculture and water. The Agency will continue to work on this more integrated approach over the medium term. See more information below on the state of development of indicators for different issues and sectors.

#### *More developed indicator sets*

The indicator sets on **climate change, air pollution, ozone depletion, water (excluding ecological quality), waste and material flows, energy, transport and agriculture** are the most well developed. This reflects a combination of factors.

**Climate change** is now one of the main European policy priorities for the coming years; emissions inventories have been improving continuously for years through intensive scientific co-operation and are one of the EIONET Priority Data Flows; information on state and impacts is increasingly called for and is coming on stream through EU research

programme initiatives and through the use of existing long-term monitoring programmes (eg sea ice) for more policy relevant purposes.

**Air pollution and ozone depletion** are also well-established policy areas with wider EU political processes ongoing for many years. Data on pressures and state are collected through long-established methodologies and processes. There is increased recognition of the need to address health impact (human and ecological) issues and EEA is co-operating with WHO and others to develop coherent and common approaches. These areas have arguably made most progress on linking trends to policy objectives in ways that allows assessment to be made of the effectiveness of measures taken.

In the field of **water**, the picture is more mixed with well-established policy processes focused on water chemical quality (and quantity) and an evolving process for ecological quality under the Water Framework Directive (WFD). Data flows on chemical quality are being developed through Eurowaternet as a EIONET Priority Data Flow. Eurostat under the Joint Questionnaire has collected information on quantity, use and discharges for many years. The WFD will change the situation somewhat particularly on ecology but also on the links between use and quality (stress) and on the links between pressures and impacts. However it will be many years before these information flows are fully established and so current processes need to be used while at the same time aligned to WFD in the longer term.

The area of **waste** is underpinned by the ongoing implementation of waste policies and the waste statistics regulation. The latter will improve data for areas that have for many years been addressed through the Joint Questionnaire and certain Directives (eg packaging waste). **Material flows** accounts have been under development in Eurostat since 1994 and delivered core indicators and data flows derived primarily from economic data. The impetus for indicators has been strengthened through the ongoing development of the Thematic Strategy on resources expected by 2005.

The **agriculture, transport and energy** sectors are relatively well developed under the Cardiff sectoral integration process initiated by the European Council in 1998. For transport three TERM reports have been published by EEA, for energy one EERM report and for agriculture one AERM report is foreseen in 2004. In all these sectors there is extensive co-operation between EEA and Eurostat to ensure best use of socio-economic data and indicators in the reporting mechanisms. For environmental indicators in the mechanisms, extensive use is made of EIONET priority data flows data on air emissions, air quality and water quality.

**For all of these well-developed areas**, many of the indicators have used been several times in different EEA reports. To cover fully relevant EU policies and the DPSIR framework these sets also contain some less developed indicator that will be the focus for development with EIONET and other partners in the coming years.

During this 2<sup>nd</sup> round consultation EEA is in particular asking for comments to these more developed indicator sets, including remarks on:

1. How well do the selected indicators cover the environmental issue/sector and do the indicators reflect the policy objectives?
2. Do the number of indicators and their distribution across DPSIR and policy questions allow for an appropriate and balanced description of the environmental issue/sector on European level?
3. Do you consider the selected short term indicators relevant? Please make specific and concrete comments to the indicators you find problematic.

### ***Less developed indicator sets***

By contrast, the **biodiversity, terrestrial environmental, water ecological quality, tourism and fisheries** indicators sets are less mature in their development, partly because some of the aspects are difficult to describe by indicators, partly because the experts involved in discussions are not always the appropriate ones and partly because of less developed information collections. There is also scope for integrating information across these issues to provide more relevant support to European policies as they in turn become more integrated (eg Water Framework Directive). This will have the added benefit of making multi-use of spatial data that is expensive to collect and maintain (eg CORINE Land Cover 2000 update by EIONET). However, processes to facilitate this more integrated thinking are currently lacking although INSPIRE and GMES provide some basis for optimism at least with respect to technical standards and data collection. EEA aims to work within these processes and others to ensure that policy needs are properly reflected and that new data/information collection proposals are designed to ensure integration with other relevant data/information already available. 2010 is estimated to be the year by which a baseline integrated system for Europe could be established.

Looking at the less developed indicator sets, some considerations for future improvement include linking soil, land cover and terrestrial biodiversity data needs within an integrated information framework; linking between the terrestrial ecology aspects of biodiversity policy and the water ecology aspects of the Water Framework Directive as a further component of such an integrated framework; linking between water ecology and fisheries indicators; and a discussion on whether and/or how to monitor and assess environmental impacts of tourism given that the spatial scale at which these impacts happen does not fit either with the scale at which socio-economic data are collected (eg administrative boundaries) or with the scale at which environmental data are measured or calculated (river basin catchments, biogeographic regions, landscape types)

The indicator sets presented in this report for these less developed issues have to be seen as pilot versions and will be further developed during the coming years. However, comments to these indicator sets will also be valuable to EEA further work; in particular to the two first general questions:

1. How well do the selected indicators cover the environmental issue/sector and do the indicators reflect the policy objectives?
2. Do the number of indicators and their distribution across DPSIR and policy questions allow for an appropriate and balanced description of the environmental issue/sector on European level?
3. Where do you see scope for better definition of individual indicators and/or integration of proposed indicators to provide added value to policy makers?

### ***Internet based indicator management system tool***

For the 2<sup>nd</sup> round consultation an Internet based indicator management system tool has been developed. It allows reviewers to navigate through the indicator sets by environmental issues/sectors and to select per indicators the underlying factsheets and data sources. For the majority of the proposed short term indicators there are fact sheets illustrating the indicators. Some of the factsheets are very well developed, while in other cases the factsheets only contain a first version of the indicator, for example, based on information from a few countries. For the medium and long-term indicators the linked factsheets or description sheets are sparser.

The information and data for indicators may result directly from existing work under the EEA work programme, but in most cases the data come from other organisations, for example, statistical data collected by Eurostat. In some cases EEA is forerunner in international indicator development and the indicator may be based on ad-hoc collections or review of national state of the environment reports.

## 1.4 Next Steps

There are a number of issues to be addressed on how the system will evolve after the core set has been agreed. Some of these are already being tackled, others will be addressed in the coming months, and yet others on a longer term basis. The main ones are:

- To confirm with other organisations respective responsibilities on indicator production and data flows, in particular with Eurostat, but also with OECD and international conventions interested in co-operation on common approaches to indicators.
- To build into the EIONET Priority data flows what is needed for those indicators, which the EEA has responsibility and put these on a regular cycle, either annual or regular.
- To implement gradually the data flows using the Reportnet tools and architecture shared by EEA and EIONET and developed under the Interchange of Data between Administrations (IDA) programme of the EU.
- To develop methodologies and data flows for those indicators not yet developed (which tend to be the more interesting ones) using or building on what has already been developed elsewhere in JRC, EU research programmes and in the work programmes of international organisations (OECD, international conventions).
- To implement the Internet based indicator management system tool populated with indicator factsheets at different levels of development from initial production by ETCs/consultants, to revision following EIONET review, to publicly available via the EEA Reference Centre
- To link EEA indicator management system to those managed by others e.g. Eurostat as a component of the “shared information system” envisaged as part of the streamlining process.
- To produce regular (non-annual) thematic and sector indicator-based reports.
- To review Environmental Signals and make its content from 2003 onwards have added value and complementarily to what is being produced elsewhere in the EEA and other EU institutions.
- **To review the core set of indicators in three years time after the publication of the next EEA State and Outlook report.**

A further issue will be to consider how indicators and the assessment underpinning them can be more effectively used in policy-making processes. This is something the EEA will wish to explore further with countries, the Commission and the European Parliament over the next 12-18 months, in the context of the first phase implementation of the MAWP 2004-2008.

## 2. EEA core set of indicators

### 2.1 Proposals for a Core Set of Indicators

#### *Why develop a core set of indicators?*

A core set of indicators on main environmental issues and economic sectors is needed to:

- Meet the increasing political demands for indicator-based reporting to support the policy making processes across many levels in the EU and elsewhere.
- Streamline indicator needs across these demands, bring a coherent approach to indicator based reporting and so facilitate a consistent and stable information basis to support policy making.
- Provide countries with clear priorities for environmental data collection initiatives that are expensive and involve long-lead times between conception and delivery.
- Allow the many international organisations, both in the EU and elsewhere, with either a mandate or role to produce indicator-based reports and services (e.g. EEA, Eurostat, OECD, UNEP) to work together on a common approach so as to avoid duplication and where there are similar needs, to use the same indicators for many purposes.

The EEA is well-placed to play a role in the development of a core set of indicators as the key information provider on environmental issues at the European level. It is, however, only one of many players who can contribute to the development and implementation of a core set. The overriding objective would be to develop as far as possible a common set supported by a shared system of relevant environmental data information in which all interested parties would co-operate and play a role.

This thinking underpins the concept of the European Environmental Information System described in the EEA Strategy developed in 2001 and approved by its Management Board.

#### *Policy demands*

There have been increasing demands in recent years from the European Union Council of Ministers for indicators to monitor progress on sustainable development, sectoral integration and the main environmental issues of concern. This has been prompted in part by the recognition that policy makers and Ministers do not have the relevant information before them to monitor progress with the implementation of policies and their effectiveness in delivering against environmental objectives and targets. This was captured by the conclusions of the Environment Council in 1999 on the Global Assessment of the 5th Environmental Action Programme, which stated that:  
*The new programme (6EAP) would set general objectives that will need to be translated into quantifiable targets to steer the development of both environmental measures and the strategies in the economic sectors<sup>1</sup>.*

Since then there have been a wide-range of initiatives and processes requiring indicators as tools to support the policy making process. A few of the major ones include:

- The annual “Synthesis” or “Spring” report, first published in March 2002, on progress with the EU Sustainable Development Strategy, based on 36 structural

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<sup>1</sup> The Global Assessment COM(1999) 543  
<http://europa.eu.int/comm/environment/newprg/global.htm>

indicators covering the economic, social and environmental dimensions of sustainable development.

- The “Cardiff Process” on sectoral integration (e.g. energy, transport, agriculture etc) which calls for specific strategies and indicators, and for which indicator-based reporting mechanisms for transport (TERM) and energy (EERM) are already well established.
- The adoption of the 6th Environmental Action Programme in June 2002 which includes a commitment to develop thematic strategies which include indicators to monitor progress on a range of environmental issues.

There are many overlaps in indicator needs for these different processes. For example, greenhouse gas emissions indicators are needed for all three processes since climate change is a priority both for the 6th EAP and the EU SDS, while main sectors such as energy, transport and agriculture are key contributors to overall emissions levels.

### ***Streamlining and prioritising data collection in countries***

Countries have been asking repeatedly for many years that more should be done at the international level to streamline reporting systems and to provide clear guidance on the priorities for environmental data collection. The Bridging the Gap Conference in 1998, driven by a few EU member states, gave further impetus to these calls. The proceedings of that Conference put forward some questions to be addressed for streamlining and improving the situation. These were:

- What are the current and prospective priorities for environmental information in order to meet policy and environmental management needs?
- To what extent are the existing information needs already being met, or are no longer needed, and where are the perceived gaps?
- How can these information needs be met most efficiently and what kind of frameworks are needed for optimal environmental monitoring and modelling?
- How can the information be put to most effective use, to meet the demands placed upon it by both policy makers and the public?

Bridging the Gap has helped to address the widely held view that there is much environmental data, but not enough “policy relevant” information. The need to do so is increased by the pending Accession Process when a further 13 countries are expected to join the EU in the coming years. These countries will wish to avoid the mistakes and high costs of inappropriate monitoring and reporting of previous years while still meeting their obligations under the *Acquis Communautaire*. The political importance of “Bridging the Gaps” in policy relevant information has been underlined in the 6th Environmental Action Programme with the commitment to review the current environmental reporting system in the European Union.

A core set of indicators help to tackle many of the shortcomings to be addressed by this review by using them:

- To link to policy objectives and targets;
- To optimise institutional co-operation at the EU level and beyond, so that information needs are mapped to institutional remits and expertise and duplication is avoided;
- To prioritise data needs;
- To assess how current reporting systems meet these needs and where there are gaps.

### ***Institutional Co-operation***

In addition to the policy demands outlined above, various international institutions are either producing or planning reports and services, which require indicator-based inputs. Some of the main examples at the EU level are:

- DGENv's annual report on policy implementation
- Eurostat's Pressure Indices Report
- EEA's Environmental Signals series
- Eurostat Sustainable Development Indicators within the CSD process
- EEA's planned reports in 2003 on water environment, climate change, agriculture and environment, tourism and environment and fisheries and environment

Outside the EU, the OECD has for many years been developing indicators on environment, sectoral integration and sustainable development. There is also increasing interest in international conventions such as the marine environment to develop common approaches based on indicators. At the global level there is also scope for collaboration on common approaches with UNEP through its work on the Global Environmental Outlook.

## **2.2 The approach taken to developing a core set of indicators**

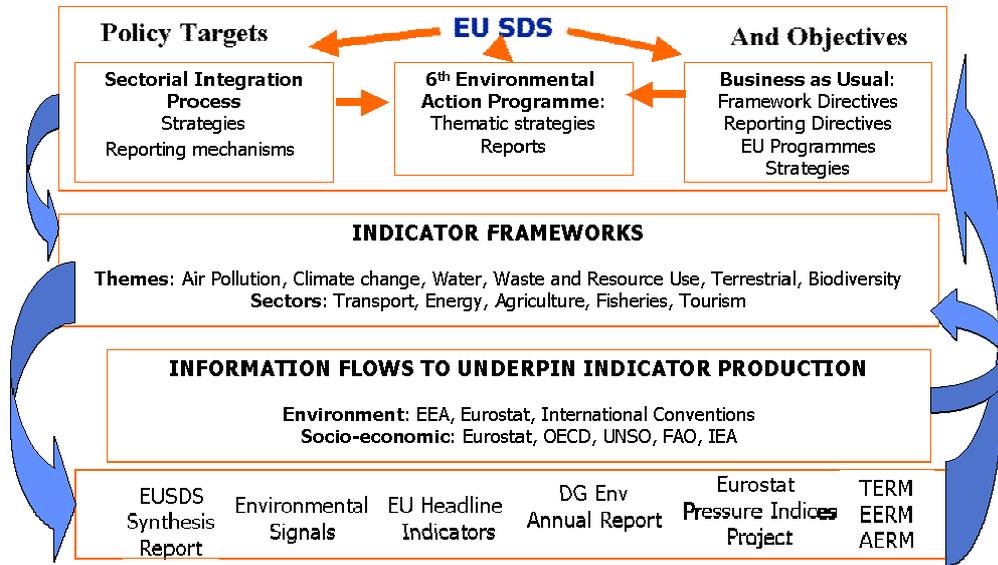
### ***The SOE Reporting chain – linking data flows to policy needs***

The fundamental principles underpinning the indicator approach are to establish the policy relevance of the indicators (by linking to objectives and targets), to define the data flows needed to underpin indicator production, to identify institutional responsibilities at the international level for existing data flows, and to show that there is multi-purpose use of the same indicators in many reports. Furthermore, the Agency recognises there are substantial synergies between policy objectives at the “operational end” of the policy framework (e.g. in Directives) and those at the “strategic end” (e.g. the 6th EAP and the Sustainable Development Strategy), so there is a lot of potential to develop policy-relevant indicators that can serve several policy objectives simultaneously.

Data are expensive to collect and so it is important that the reasons for collection are explicitly linked to policy objectives. It is also important that institutional responsibilities for data collection are clearly delineated so that duplication is avoided, and the responsibilities for producing guidance and supporting countries through capacity building are clear and budgeted for by the respective international institutions.

The diagram below attempts to show that there are inter-linkages between the objectives and targets set under different policy processes, that many of these processes can be supported by the indicator frameworks within the proposals for the core set and that there are many existing data flows (though many can be improved and gaps need to be filled) to international institutions that can be used to support indicator production. The final part of the diagram shows that indicators can contribute to many outputs currently produced within the EU.

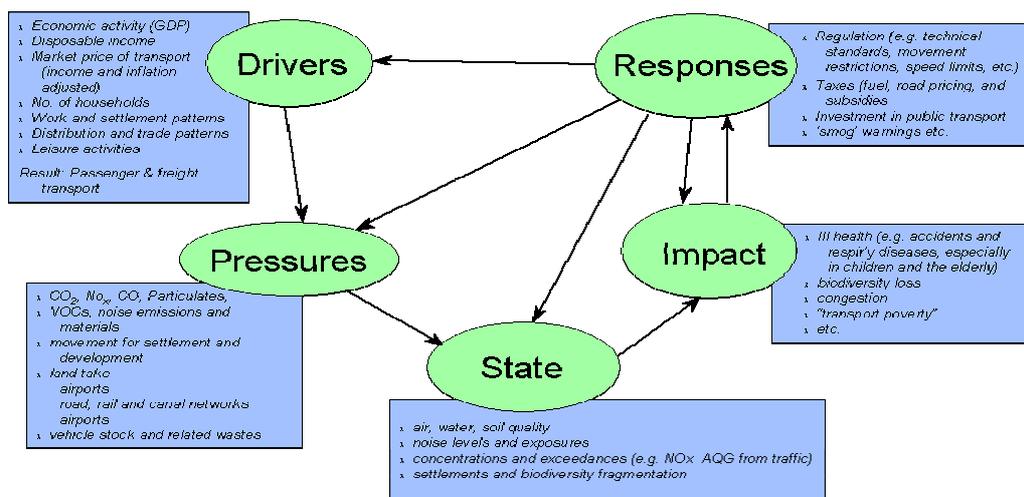
## SOE Reporting Chain



### The DPSIR Assessment Framework

The Driving Force-Pressure-State-Impact-Response (DPSIR) framework has been used as a starting point, alongside policy questions, when developing the core set of indicators. It can be considered as a tool for organising environmental information and for presenting causal links between environmental indicators to decision-makers. It shows the chain of links from the causes of environmental problems to their impacts, and society's responses to them in an integrated way. A DPSIR example is shown below. The EEA Indicator Typology is a further tool used for the core set that helps to distinguish between the different types and balance of indicators needed. More details on the DPSIR and Typology is available at <http://reports.eea.eu.int/TEC25/en>.

**Figure 1: The DPSIR Framework for Reporting on Environmental Impacts of Transport**



Establishing causality across the DPSIR chain is a leading principle underpinning the development of EEA indicators and story lines. The choice of indicators for a particular theme/sector is driven largely by the relevance for example of the data on driving forces to what is happening in the P, S and I parts of the DPSIR chain. So for example on Transport, relevant D indicator/datasets such as number of households and disposable income are linked to land take for housing and roads (P) to noise levels and exposure (S)

and then to habitat fragmentation and human health impacts (I). The response (R) may take the form of a Regulation to restrict building or reduce noise levels but the choice of measure is also linked to the main priorities identified for P, S and I when considering environmental policies, and D where policies have a mainly socio-economic dimension.

Establishing causality is arguably the greatest challenge facing the Agency and EIONET in the implementation of the indicator approach. Indicators are a tool to help us along the road and not the total solution. For example, information is needed on the state of implementation of legislation in countries and on the policies and measures taken to achieve the objectives set down in legislation. This type of effectiveness analysis is needed to establish causality but is much broader than indicators in terms of information needs and tools/methodologies to be implemented (e.g. modelling/scenario activities).

### **2.3 What do we mean by a core set?**

For the EEA, the core set of indicators is in essence a set of story lines by theme/sector, clusters of indicators by theme/sector grouped by generic and more specific policy questions, and sets of indicator fact sheets or description sheets. Factsheets are available for indicators that have already been developed; description sheets are being developed for those indicators for which we have a medium to long-term timescale (2-5 years) for implementation. The availability of factsheets and description sheets differs by issue and sector depending on the maturity of the work in the respective areas.

The main function of the “storyline” around each indicator subset or cluster of indicators is to communicate to our clients what is the framework within which the indicators will be assessed in broad terms. This text of the story line, together with the policy questions should serve to improve the discussion with stakeholders on the “right” focus of the selected indicators.

A core set implies the production of a limited number of indicators that are necessary to monitor progress with both broad and specific policy processes, such as sectoral integration, the 6th Environmental Action Programme, and the EU Clean Air For Europe (CAFÉ) strategy. The core set does not need to address all details of all policies (e.g. on water, not all 31 substances and 7 water types and 31 countries individually), rather address issues on an aggregate level or focus on main current priorities. In being policy relevant, however, that does not mean that they need to be strictly limited to priorities expressed in existing legislation. Many policy priorities, from the public and NGO side for instance, are not phrased in legislation but are addressed in the core set.

The core set includes indicators under development (so called demonstrator indicators), or indicators based on incomplete data. If, however there is no realistic 5-10 years expectation to have the indicator available for a European coverage, then the indicator is not considered for the EEA core set. The indicators by theme/sector may result directly from existing work under the EEA work programme, but in most cases the data come from other organisations and in some cases the basic assessment is also coming from another source. The added value the Agency provides is to put the indicators into the (mainly) EU policy context and to adjust the assessment to take account of this context.

With indicator sets on both environmental issues and sector-environment there are many overlapping indicators e.g. a pressure from a sector (agriculture) such as nutrient balance is relevant for the water indicator set on eutrophication. EEA is aiming at a core indicator set where indicators relevant to more than one theme/sector are not repeated in the different sets rather they are recognised in cross-reading tables showing the inter-linkages.

Once the consultation process is complete, final cross-reading tables will be produced showing the inter-linkages between indicators across themes/sectors. Likewise, lists of

the main policy reference documents, highlighting main objectives and targets will be available by theme/sector as part the core set.

**2.4 Main and sub-indicators**

In general an indicator is information describing an issue. In many cases the issues being described are broad and several aspects may be illustrated. For example, indicators describing *greenhouse gas emissions (GHG)* can illustrate:

- The overall (total) trend in GHG emissions and compare it with targets;
- GHG emissions by pollutants (CO2, N2O, CH4 and fluorinated gases);
- GHG emissions by main sectors and the trend by individual sectors; and
- Country comparisons.

All these sub-indicators relate to the indicator on GHG emissions and is based on the same data set and data collection i.e. national reporting to the EU and the UNFCCC. Each sub-indicator may have a specific assessment to the issue it describes and there may therefore be produced more than one fact sheets for each main indicator. In the core set the use of sub-indicator will ensure consistency between the different indicators describing different aspect of the main indicator.

Another example on the use of main and sub-indicator is the climate change indicator describing the *state of cryosphere* to this main indicator is related five sub-indicators describing different aspects how climate change affects the cryosphere such as

- Extent of mountain glaciers;
- Extent and duration of arctic sea ice;
- Snow cover;
- Lake and river ice; and
- Permafrost.

The use of main indicators and sub-indicators has been used throughout the EEA core set.

**2.5 Overview of EEA core set of indicators**

The proposed EEA contains in **total 354 indicators** (main indicators and sub indicators altogether) 206 of these are from more developed areas and 148 from less developed areas.. There are **224 main indicators** in the core set; or on average around 15 main indicators per issue/sector. Describing an environmental issue in the DPSIR framework and related to main policy questions generally requires 10-20 indicators to describe the different aspects. The water and waste and material flow indicator sets cover more issues: for water: water quantity, organic and nutrient pollution and hazardous substances and therefore the indicator sets contains more indicators than the average. The 224 main indicators have altogether 130 sub indicators e.g. air emissions by sectors or water use by sectors being based on the same data collection; other sub-indicators describe different aspect of an issue (see example in section above).

The **more developed indicator sets** have a majority of short term indicators (91) and relative few proposed longer term indicators. However, the indicator sets for these more developed environmental issues and sectors are not static and in the coming years there will be an ongoing refinement and improvement of the indicators.

The **less developed indicator sets** are characterised with a high proportion of sub-indicators and medium and long term indicators reflecting that these indicator sets are in a testing and development phase. Similar aspects relate to the high number of sub-indicators in the climate change set with many proposed indicators to illustrate the impact of climate change. When the indicator sets gets better developed and more focused the number of sub-indicators be reduced

**Table 2.5.1:** Overview of the proposed EEA core set of indicators

	Main	Main and sub	Main indicators
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	indicators	indicators	ST/MT/LT
<b>More developed indicator sets</b>			
Air pollution	14	29	11/ 3/ 0
Ozone layer depletion	4	4	4/ 0/ 0
Climate change	13	36	12/ 1/ 0
Waste and material flows	22	28	5/10/ 7
Water without ecological quality	38	46	14/17/ 7
Agriculture	18	19	8/ 7/ 3
Energy	16	16	16/ 0/ 0
Transport	28	28	21/ 6/ 1
<b>Total</b>	<b>153</b>	<b>206</b>	<b>91/44/18</b>
<b>Less developed indicator sets</b>			
Water ecological quality	8	27	1/ 1/ 6
Biodiversity	15	54	5/ 8/ 2
Terrestrial environment	17	22	4/ 10/ 3
Tourism	15	17	10/ 2/ 3
Fishery	16	38	4/ 3/ 9
<b>Total</b>	<b>71</b>	<b>148</b>	<b>24/24/23</b>

ST: short term; MT: Medium term and LT: Long term

## 3. Indicators related to environmental issues

### 3.1 Introduction

This chapter describes for the selected environmental issues the EEA core set of indicators: air pollution including stratospheric ozone; climate change; nature protection and biodiversity; terrestrial environment; water; and waste and material flows. Each section has been structured by the following outline:

1. First a brief description of the issue covered including state and impact and pressures and driving forces.
2. Then an overview of the main EU policy objectives and measures.
3. A table provide an overview of the indicators including how the indicators relate to generic and more specific policy questions. The policy questions have been grouped into four 1) how is the problem developing? (*state indicators*); 2) how are sectors/actors/processes contributing? (*pressure indicators*) 3) how are impacts developing? (*impact indicators*) and 4) how effective is the response? (*response indicators*). For some issues the overview table may be structured different. Relevant indicator from other issues or sectors are listed with a lighter colour to illustrate that they are relevant for this issue but being produced in the other list.
4. The linkage to other EEA indicator lists is described under the next section.
5. The relation to relevant international indicator activities related to this specific issue is described; including relevant cooperation between EEA and the international organisation.
6. A section on how the country comments during the first round of consultation have affected the revised set is then included.
7. At last there is a section describing ongoing EEA activities and foreseen activities in relation to this specific issue set such as indicator-based reports, needed data flow for indicators and other activities related to the indicator set.

### 3.2 Air pollution

#### ***State, impact and main source sectors***

The main air pollution issues are: *Air quality* (air pollutants in ambient air at ground level, including ozone), *acidification and eutrophication*, deposition of *toxic substances* (metals and persistent organics) and *stratospheric ozone*.

Currently, the greatest air pollution threats within the whole EEA area to human health are ambient air concentrations of ground-level ozone, fine particles (PM10) and nitrogen dioxide. These pollutants exceed limits set in EU legislation. In accession candidate countries, concentrations of the classical air pollutants such as sulphur dioxide, total particles, carbon monoxide and lead have decreased dramatically as a result of economic restructuring.

Deposition of acidifying and eutrophication substances causes damage to ecosystems and materials. The percentage area of exceedance of critical load for acidification has decreased significantly in most countries since 1990; however, the critical load for eutrophication is exceeded in large parts of the sensitive ecosystems in many countries in Europe.

Atmospheric deposition of toxic and genotoxic substances leads via intake of food, water, and dust to human exposure. The most important toxic substances being addressed in

policies are mercury, lead, cadmium, arsenic, nickel and persistent organic pollutants (POPs). Concentrations of lead have decreased dramatically since the 1980s in the EU with the introduction of lead-free petrol.

The thickness of the stratospheric ozone layer, that protects us from UV radiation from the sun and is of key importance to the structure and dynamics of the atmosphere is still decreasing. International regulations have led to almost complete reductions in the production, usage and emissions of ozone depleting substances. However, the long life of these substances in the atmosphere means that the ozone layer may not recover fully until after 2050.

For many air pollution issues, there is an important interaction with the climate change issue (see section 3.3). For instance, measures reducing emissions of greenhouse gases in the energy and transport sectors will often reduce air pollutant emissions considerably. Another example, HCFCs that are increasingly used, as surrogates for Ozone Depleting Substances, are a potent greenhouse gases.

### ***Policy objectives***

The EU 6<sup>th</sup> Environmental Action Programme has in relation to air quality an overall objective: *To achieve levels of air quality that do not give rise to unacceptable impacts on, and risks to, human health and the environment*<sup>2</sup>.

For air quality and ground level ozone, the most relevant policy frameworks are the EU legislation and the Convention on Long-range Transboundary Air Pollution<sup>3</sup>. EU air quality Directives<sup>4</sup> (for SO<sub>2</sub>, NO<sub>x</sub>/NO<sub>2</sub>, PM<sub>10</sub>, Pb, CO, Benzene and Ozone) set concentration limit values that protect human health and ecosystems and require assessment in all member state territory. For various pollutants these limit values are exceeded; MS are obliged to set up abatement plans and report on these and on progress in their implementation.

At the European level, the NEC Directive<sup>5</sup>, setting national emission ceilings for SO<sub>x</sub>, NO<sub>x</sub>, NH<sub>x</sub> and VOC is designed to address and partially solve some of these regional scale problems - simultaneously ground level ozone and acidification and eutrophication. Emission legislation (Large Combustion Plant Directive; Sulphur in fuels,..) supports this. In the CLRTAP, PM<sub>10</sub> and Ozone are priority pollutants. Emission reduction protocols for sulphur and nitrogen compounds and VOC have been agreed, and more or less parallel the NECD. Policy evaluation and new policy development takes place in CAFE, the Clean Air for Europe programme<sup>6</sup> of the Commission that should lead to a thematic strategy for air pollution in the 6th EAP<sup>7</sup> in 2005.

For acidification and eutrophication, the relevant policy frameworks are also CLRTAP and EU legislation. In CLRTAP, critical loads describe the capacity of sensitive soils/waters/ecosystems to absorb acidifying and eutrophication deposition. CLRTAP emission reduction protocols have been agreed to reduce (areas of) exceedance of critical loads. EU has also adopted this approach in their coordinated ozone and acidification strategy, leading to the NEC Directive.

For the deposition of toxic substances (metals and persistent organics) the most relevant framework is CLRTAP, where emission reduction protocols have been agreed for some metals (Hg, Pb and Cd) and several persistent organic pollutants (POP). In the EU, no

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<sup>2</sup> 6EAP Priority area on Environment and health. Section 5.7 Air pollution.

<sup>3</sup> LRTAP <http://www.unece.org/env/lrtap/welcome.html>

<sup>4</sup> Directives 96/62/EC; 1999/30/EC; 2000/69/EC; 2002/3/EC

<sup>5</sup> Directive 2001/81/EC

<sup>6</sup> see <http://www.europa.eu.int/comm/environment/air/cale/index.htm>

<sup>7</sup> 6EAP see <http://www.europa.eu.int/comm/environment/newprg/index.htm>

legislation exists (except for air quality of Pb); a draft Directive on Ni, As, Cd , Hg and PAH was proposed by the Commission.

For stratospheric ozone, the policy framework is the Montreal Protocol<sup>8</sup> on substances that deplete the ozone layer, with its Amendments and Adjustments. EU and individual countries have ratified this protocol. Council Regulation 2037/2000<sup>9</sup> is the European Union's current legislative instrument to phase-out Ozone Depleting Substances. Some of the challenges involved are helping developing countries to meet their obligations for phasing out ozone depleting substances and preventing smuggling and illegal production

### ***List of core set indicators air pollution***

The indicator set on air pollution contains 14 main indicators primarily describing emissions to air, exceedence of air quality standards and impact on human health and ecosystems.

**Table 3.2.1** Air Pollution indicators in relation to policy questions.

<b>Generic question</b>	<b>Policy question</b>	<b>Indicator title</b>	<b>DPSIR</b>	<b>S/M/L</b>	<b>Other sector/issues</b>
How is the problem developing? (distance to targets, overall de-coupling)	What is the progress towards NECD (for EU MS) and CLRTAP?	APE1 Emissions acidifying pollutants	P	ST	
		APE2 Emissions ozone precursors	P	ST	
		APE3 Urban emissions NOx, VOC, PM, SO2, NO2	P	ST	
		APE5 Emissions SO2	P	ST	
		APE5a Emissions SO2 (total & by sector)		ST	Energy
		APE5b Energy related SO2 emissions		ST	Energy
		APE5c SO2 emissions intensity from power production		ST	Energy
		APE5d SO2 emissions from public electricity production		ST	Energy
		APE6 Emissions NOx	P	ST	
		APE6a Emissions NOx (total & by sector)		ST	Energy
		APE6b Energy related NOx emissions		ST	Energy
		APE6c Emissions intensity of NOx from power production		ST	Energy
		APE6d Emissions of NOx from public electricity production		ST	Energy
		APE7 Emissions NH3	P	ST	
APE7a Emissions NH3 (total & by sector)	ST				
APE7b Agriculture ammonia emissions		ST			

<sup>8</sup> see [http://europa.eu.int/comm/environment/ozone/international\\_action.htm](http://europa.eu.int/comm/environment/ozone/international_action.htm)

<sup>9</sup> see [http://europa.eu.int/comm/environment/ozone/community\\_action.htm](http://europa.eu.int/comm/environment/ozone/community_action.htm)

		APE8 Emissions NMVOC APE8a Emissions NMVOC (total & by sector) APE8b Energy related NMVOC emissions	P	ST  ST	Energy
		APE9 Emission of particulates APE9a Emissions primary and secondary PM10 (total & by sector) APE9b Emissions secondary+primary PM2.5 APE9c Energy-related particulate emissions	P	ST  MT  ST	Energy
		APE10 Emissions Heavy metals and POPs (total & by sector)	P	MT	
	What is the progress towards AQ limit values? (Exceedances critical loads ecosystems, health)	APQ11 Exceedance days of air quality target in urban areas	S/I	ST	
		APQ11a Exceedance days of SO2 target in urban areas		ST	
		APQ11b Exceedance days of NO2 target in urban areas		ST	
		APQ11c Exceedance days of PM10 target in urban areas		ST	
		APQ11d Human exposure to O3 exceedance		MT	
		APQ11e Exceedance days of CO target in urban areas		MT	
		APQ11f Exceedance days of benzene target in urban areas		MT	
		APQ12 Exceedances of air quality objectives due to traffic	S/I	MT	Transport

		APD13 Ecosystem exposure to exceedance of critical levels and loads APD13a Percentage Area Exceedance Critical Loads Total acidity APD13b Percentage Area Exceedance Critical Loads nutrient Nitrogen APD13c Atmospheric deposition of nitrogen to marine and coastal waters APD13d Exposure of ozone to crops/forests APD13e Atmospheric deposition waters of heavy metals and persistent organic pollutants (POPs) to marine and coastal waters	S/I	ST  ST  MT  ST  MT	Water  Water
How are actors sectors processes contributing?	Emissions by sector/pollutant?	APE4a,b Transport air emissions APE5b,c,d; APE8b, APE9c Energy related air emissions APE7b Agriculture air emissions		ST  ST ST	Transport  Energy Agriculture
How are impacts developing	Impacts from AP on health (exposure)	APQ11g Human health exposure and risk by air pollutants	I	MT	
	Impact on nature	APD13d Exposure of ozone to crops/forests	I	ST	
	Impacts from AP on material	<i>(No specific indicators available)</i>			
How effective is the response (What are the socio-economic implications of measures? Overall policy effectiveness ; Efficiency of measures)	Number of / which countries that have ratified various protocols (LRTAP)	<i>(No specific indicators available)</i>			
	Policy-effectiveness of measures	APM14 Effect of measures on past trends APM14a Effect on emissions of SOx and NOx	R	ST	

Indicators with lighter fonts are used in other lists. AP: Air Pollution; AQ: Air Quality ; PM : Particulate Matter.

A small set consisting of four indicators is proposed to describe the issue on ozone layer depletion.

**Table 3.2.2** Ozone layer depletion indicators in relation to policy questions.

Generic question	Policy question	Indicator title	DPSIR	S/M/L	Other issues
How is the problem developing? (distance to targets, overall de-coupling)	Are ODP substances phased out according to agreed schedule?	OD1 Production of ODP	D	ST	
		OD2 Sales/Consumption of ODP	P	ST	

How are impacts developing		OD3 Trend in global tropospheric potential chlorine and bromide	S	ST	
		OD4 Average ozone column	S	ST	

### ***Linkage to other EEA sets***

The emission indicators in the air pollution core set link to the sectors Energy, Transport and Agriculture. Indicators APD13c and 13e link to water. The other sub-indicators under APD13 are related to Soil and to Biodiversity.

### ***Country comments***

The following section describes considerations on choosing the core set of indicators; reactions to comments of countries. Data and information that is to be reported by member countries under EU legislation and Protocols in force of the CLRTAP is – or will be in the nearby future – available, and the corresponding indicators were marked as short term priorities. Some countries questioned the indicators on CO, Pb and benzene (APQ12) because that there are few exceedances left, however, in our opinion we not show only problems but also successes. For benzene, very few concentration data are reported to AIRBASE.

An indicator hierarchy has been chosen where there is one indicator for air pollution emissions, with sub-indicators on the emissions of individual pollutants as well as some aggregates of those, and likewise one for exceedance days or potential exposure of the urban population. The issue of aggregate indicators has raised contradictory comments from the countries. Most countries were in favour of an indicator for acidifying acidifying emissions; we propose to keep the indicator for ground level ozone precursors as well. emissions; we propose to keep the indicator for ground level ozone precursors as well.

Objections against the method of calculation are not considered as crucial: an indicator is indicative, not a full scientific assessment. At a WHO/EEA workshop in Berlin in September 2002 there was a strong recommendation not to compile aggregate air quality indicators; this recommendation is followed. There was not much support for the indicators that describe how environmental pressures would have developed without implementation of certain policies and measures. We recommend that these should be developed in view of the ex-post evaluation foreseen under CAFÉ.

### ***Other indicator systems***

The best-known indicator system is that of OECD. In their report “ Key environmental indicators” OECD presents indicators for air quality and the ozone layer. The air quality indicator addresses SO<sub>2</sub> and NO<sub>x</sub> emissions per GDP and per capita. Population exposure to air pollution is considered as a medium term indicator, for which additional data collection is necessary. The air quality trend indicator has been of limited value because the station set reported varies from year to year and is not well documented. OECD and EEA have agreed to exchange data and prefill questionnaires to avoid duplication. The OECD indicators for stratospheric ozone are largely similar to EEA indicators, and often extracted from the same sources.

### ***EEA future work on air pollution indicators***

Indicators APE9b (Emissions PM<sub>2.5</sub>) and APE10 (Emissions of heavy metals and POP) await more data to become available. The same is true for indicators APQ12e (exceedance days CO) and APQ12f (exceedance days benzene). Indicator APD13c (Deposition of nitrogen compounds on water) may be calculated using the EMEP model. More work is needed for the definition and development of the indicators APE3 (Urban emissions) and APE12g (Human health exposure and risk by air pollutants), in collaboration with WHO.

### 3.3 Climate change

#### ***State, impact, emissions, main sources***

Global and European average temperatures are increasing, sea level is rising, glaciers are melting and the frequencies of extreme weather events and precipitation are changing. Most of the warming can be attributed to emissions of greenhouse gases from human activities. Climate change is expected to have widespread consequences, including an increased risk of floods, and impacts on natural ecosystems, biodiversity, human health and water resources, and on economic sectors such as forestry, agriculture (food productivity), tourism and the insurance industry.

Carbon dioxide is the most important greenhouse gas, followed by methane, nitrous oxides and fluorinated gases. The main source sectors are, in decreasing order: energy industries (electricity and heat production), transport, industry, agriculture, waste, and small users of energy, including households. Greenhouse gas emissions in the EU fell by 3.5 % between 1990 and 2000, decreases from energy industries, the industry sector, agriculture and waste were partly offset by increases from transport. Emissions are projected to decrease further or remain stable, but further reductions would be needed to reaching the Kyoto Protocol target (see below).

#### ***Main Policy Objectives, Policies and Measures***

The UN Framework Convention on Climate Change (UNFCCC)<sup>10</sup> and the Kyoto Protocol, which sets binding targets for industrialised countries to reduce their greenhouse gas emissions, addresses climate change.

The ultimate objective of the UNFCCC is:

- *To reach atmospheric concentrations of greenhouse gases that prevent dangerous anthropogenic interference with the climate system, within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*

In 1997 the Kyoto Protocol was adopted, which is generally seen as a first step towards the more substantial global reductions (about 50% by the middle of the 21st century) that will be needed to reach this long-term UNFCCC objective.

Under Kyoto Protocol, the EU has an emission reduction target of 8 % from 1990 levels for 2008-2012. The EU and its Member States agreed on different emission limitation and/or reduction targets for each Member State, the ‘burden sharing’ agreement (Council Decision 2002/35<sup>11</sup>).

The Kyoto Protocol covers six greenhouse gases (carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>)). In 2001/2002 UNFCCC adopted concrete rules for the use of the flexible mechanisms Joint Implementation (JI), Clean Development Mechanism (CDM) and Emissions Trading (ET) and on the extent to which carbon sequestered by land-use change and forestry activities (‘carbon sinks’) can be used for achieving the reduction commitments. By January 2003, more than 100 countries (28 industrialised countries) had ratified the Protocol, but this has not yet entered into force, because that would need ratification by Russia (expected in 2003).

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<sup>10</sup> UN Framework Convention on Climate Change, 1992

<sup>11</sup> Council Decision 2002/35 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments there under. OJ L 130, 15.5.2002, p. 1.Brussels.

The EU 6EAP<sup>12</sup> and SDS<sup>13</sup> objectives on climate change are:

- *To pursue entering into force of the Kyoto Protocol;*
- *To realize by 2005 demonstrable progress in achieving the KP commitment;*
- *To negotiate (by 2005) an international agreement on more stringent reduction targets for the second KP commitment period, taking into account the necessity to move towards a global equitable distribution of greenhouse gas emissions.*
- *To aim at a long term objective of a maximum global temperature increase of 2 °C over pre-industrial levels (which means 1.4 °C above current global mean temperature) and a CO<sub>2</sub> concentration below 550 ppm. In the longer term this is likely to require a global reduction in emissions of greenhouse gases by 70 % as compared to 1990.*

#### *Main policies and measures*

Many countries have adopted National Programmes that focus on reducing greenhouse gas emissions in all key sectors (energy, transport, industry, agriculture, waste). Carbon dioxide taxes are in place in Denmark, Finland, Germany, Italy, The Netherlands, Norway, Sweden and the United Kingdom. The UK introduced a national emission-trading scheme in 2002.

EU-wide policy actions to reduce emissions are presented in the 6EAP and SDS and delivered through the European Climate Change Programme (ECCP)<sup>14</sup> and include:

- Agreement with the European, Japanese and Korean car industry to reduce carbon dioxide emissions from new passenger cars by 25% between 1995 and 2008;
- Requirement of the Landfill Directive to reduce the amount of organic waste to landfills and to collect landfill gas for energy use; and
- Directives on energy efficiency requirements for appliances and agreements on minimum energy standards.
- Emission Trading Directive (CO<sub>2</sub>), adopted end of 2002.

New proposed (ECCP) policies and measures are:

- Bio-fuels (energy and transport sector);
- Promotion of Renewable Energy Sources (energy sector);
- Energy Performance of Buildings (energy sector);
- Energy Efficient Public Procurement (energy sector);
- Fluorinated gases (industrial sector).

However, even immediate large reductions in emissions will not prevent some climate change and environmental and economic impacts, due to time delay between the reduction of emissions and the stabilisation of greenhouse gas concentrations. Measures will therefore be necessary to adapt to the consequences of climate change, in addition to emission reduction measures.

#### ***List of core set of indicators***

The core set of climate change indicators is structured in line with the main EU policy objectives, and the main policy questions and related indicators are provided in the table (below).

**Table 3.3.1** Climate change indicators in relation to policy questions.

<b>Generic question</b>	<b>Policy question</b>	<b>Indicator title</b>	<b>DPSIRS/M/L</b>		<b>Other Sectors/issu s</b>

<sup>12</sup> 6EAP

<sup>13</sup> European Commission, 2001. A sustainable Europe for a better world: A European Union strategy for sustainable development. Communication from the Commission. COM (2001) 264 final.

<sup>14</sup> European Commission, 2001. Communication on the implementation of the 1st phase of the European Climate Change Programme, COM (2001) 580 final



	What are changes in cryosphere?	CC7 State of cryosphere CC7a Mountain glaciers (extent and mass-balance) CC7b Arctic sea ice (extent/duration) CC7c Snow cover CC7d Lake and river ice CC7e Permafrost	S	ST ST ST MT MT	Water
	What are impacts on: • Soils, land resources and forestry?	CC8 Impacts on soils, land resources, forestry CC8a Net carbon uptake terrestrial biosphere CC8b Forest growth	I	ST MT	Biodiversity
	• Ecosystems and biodiversity?	CC9 Impacts on ecosystems and biodiversity CC9a Growing season length CC9b Plant phenology CC9c Animal (e.g. birds) phenology CC9d Species responses (population, migration routes, geographic distribution) CC9e Ecosystem responses (composition, functions) CC9f Plankton distribution (shift)	I	ST MT MT MT LT ST	Biodiversity Biodiversity Biodiversity Biodiversity Water
	• Hydrology and water resources?	CC10 Impacts on hydrology and water resources CC10a Annual river discharge CC10b Low and high river discharges/flows (frequency)	I	ST MT	Water Water
	• Marine environment and coastal zones?	CC11 Impacts on marine environment and coastal zones CC11a Sea level rise CC11b Sea surface temperature	I	ST MT	
	• Human health?	CC12 Impacts on human health CC12a Seasonal Change of allergenic pollen (onset and duration) CC12b Vector-borne diseases (e.g. encephalitis) (distribution) CC12c Deaths (number of) due to heat waves CC12d Deaths (number of) due to floods CC12e Food and water-borne diseases (distribution)	I	ST ST MT ST MT	Terrestrial
How effective is the response (in the past and projected)?	What is the effectiveness of existing policies and measures in the sectors electricity/heat generation and road transport in the past?	CC13a Effectiveness of policies and measures (ex-post)	R	ST	

	What are the projected emissions in 2010?	CC13b Projected emissions of key source sectors (energy, transport, industry, agriculture, waste)	R	ST	Sectors
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Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

The indicator set has links to more detailed indicators, in particular on eco-efficiency, on greenhouse gas emissions from energy and transport and to a lesser extent (less available information) from agriculture and waste management. These are included as sub indicators of the main indicator “Emissions of greenhouse gases by pollutant and by sector”. The indicators on greenhouse gas emissions versus the targets (by country), by pollutant and by sector are produced annually for all EEA member countries as an integrated set of indicators.

Other links are with the indicator sets for water (quantity) because of the impacts of climate change on the seasonality of high river flow and for the marine environment and coastal zones because of sea level rise and changes in sea surface temperature. Furthermore links exist with nature and biodiversity because of the already occurring or projected impacts of climate change on growing season length, plant and animal phenology (change in the timing of life cycle events), species responses (migration routes and geographic distribution) and ecosystem responses (distribution). Finally links exist with (other) indicators on environment and health, because of the occurring and projected impacts of climate change on health (seasonal change of allergenic pollen, distribution of vector-borne diseases, number of deaths due to heat waves and floods, distribution of food and water-borne diseases).

### ***Reference to other international indicator sets***

Most of the proposed indicators on greenhouse gas emissions are comparable to indicators used by other international organisations such as the OECD core set of indicators and the indicators can also generally be found in national State of the Environment (SoE) or indicator-based reports. Furthermore the indicator on greenhouse gas emissions compared to the Kyoto targets is one of the Structural Indicators used for the annual EU Spring Council reporting on sustainability. The detailed greenhouse gas emission indicators by country, pollutant and sector and of the projected emissions of key source sectors are all part of the annual reporting under the EU greenhouse gas Monitoring Mechanism Decision (to be revised in 2003), agreed between the Commission and Member States and for which EEA maintains the database and prepares various annual indicator reports. This database contains the official national GHG data reported to both the EU and the UNFCCC (EEA, 2002a).

EEA has close cooperation with Eurostat on the development of greenhouse gas intensity indicators from energy, which are being made consistent with Eurostat’s energy efficiency indicators, through the use of a shared emission database (EEA) and a consistent energy database (Eurostat).

The indicators on state and impact are comparable to those developed and presented by the IPCC in their assessment reports, although these are mostly on a global scale. Apart from a few exceptions, indicators of climate change impacts are less well developed. The proposed set for indicators of the impact of climate change on human health is being developed in close collaboration with WHO.

The indicators on net carbon uptake (“carbon sinks”) and forest growth will make use of the indicators developed by Ministerial Conference on the Protection of Forests in Europe

(MCPFE)<sup>15</sup>, in particular “Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles” in collaboration with JRC.

### ***Country comments***

The indicator set has been revised taking into account country comments in the first round consultation. The revised set now generally contains indicators that scored high priority by countries. Several countries commented that the definition and the geographical scope of the impact indicators should be improved and that the list of impact indicators should be more consistent with the proposed list and description sheets (of approximately 50 climate change indicators) distributed during the 1st consultation. The impact indicators are now better defined and the list has been expanded and made more consistent, also with other EEA indicators. It should however be noted that further work is ongoing during 2003 (see below). Some countries had questions concerning policy response indicators and indicators on emission projections (2010). These have been retained in the core set, because of the need for assessment of achieving the key policy objective of the Kyoto Protocol targets.

### ***EEA current and future work on indicators***

EEA, assisted by ETC/ACC, will continue to improve the quality and timeliness of indicators on greenhouse gas emissions, projections and on effectiveness of policies and measures, as part of its work for the EU GHG Monitoring Mechanism, jointly with Eurostat (energy related) and JRC (carbon sinks).

Development of climate change state and impact indicators will continue during 2003, and will include approximately 15 (sub) indicators (fact sheets) to be available in May 2003. These will form the basis for an EEA environmental issue report due to be distributed for comments to EIONET in September 2003, jointly with the underlying indicator fact sheets. In this work EEA will seek further collaboration with IPCC and WHO.

## **3.4 Biodiversity**

The indicators on biodiversity have been divided into three groups. Indicators related to

- State and trends in Europe’s biodiversity;
- Conservation and restoration of Europe’s biodiversity;
- Integration of biodiversity issues into sectorial policies.

### ***State and trends in Europe’s biodiversity***

Europe's biodiversity in its widest sense - from wild to cultivated species, with all their genetic variability, and from little-utilised to highly-cultivated ecosystems- is embedded in a complex network of natural-semi natural-rural-urban landscapes fragmented by transport infrastructures. Europe is, together with Asia, the most densely populated continent in the world. The human use of the land has a long history and the continent's landscapes thus results from a marriage of nature and human settlements and this is a significant part of the European heritage. Only in the very north and e.g. in some mountains and isolated islands can be found areas with little anthropogenic impact.

Modern society exerts pressures on biodiversity mainly as identified in the 6EAP<sup>16</sup> related to three main categories:

- Pollution from transport, industry and agriculture;
- Changes in how we utilise land and exploit natural resources;
- Risks associated with introduction of non-native species (including GMOs).

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<sup>15</sup> Ministerial Conferences for Protection of Forest in Europe <http://www.minconf-forests.net/>

<sup>16</sup> European Commission, 2001. Environment 2010: Our future, our choice, 6th Environmental Action Programme. COM (2001) 31 final. Brussels, Commission of the European Communities.

Concern about the ongoing loss of biodiversity is expressed in the overall objective in the programme "to halt the loss of biodiversity" by 2010. The biodiversity core set of indicators must thus be designed to monitor the development of "Europe's biodiversity" in order to inform about the progress in meeting the objective to mitigate the current loss. This assessment will have to build upon information related to relevant indicators of the whole DPSIR framework. As shown in table 3.4.1 for "State" and "Impact" all the three levels (ecosystem/habitat, species and genetic levels) identified in the Convention on Biological Diversity<sup>17</sup> will be taken into account, the relative importance of "Pressures" will be identified and quantified as well as the "Responses" according to conservation measures for species and areas and to the integration of biodiversity concerns into sectoral policies.

The complexity of biodiversity requires information at ecosystem/habitat level, not the least to assess the ecological services delivered by the biological communities. Important ecosystems continue to be at risk, including natural forests, many types of wetlands, species-rich agricultural habitats, certain dry and arid areas, and some marine areas. The generic indicator *habitat diversity* (BDIV1) addresses the state and trends of the main European habitat types. Through the EUNIS database it is possible to show the area of the ten main habitat types. This information is based on Corine Land Cover (CLC). This information will obtain a time perspective when the CLC is updated. Even the present data will enable e.g. to assess the overall pressures to European biodiversity (in particular when presented according to the bio geographic regions, well defined in the NATURA2000 process). Information related to ecosystem quality will increase the value of this indicator. The sub indicator Naturalness thus provides additional information about the impacts on habitats; presently data is available only for forests.

The continent is also home to a large proportion of the world's domestic animal diversity, and nearly half of Europe's breeds are at risk of extinction (*genetic diversity*, BDIV4). The trends for wild living species populations are mixed - some previously highly *threatened species* (BDIV3) are starting to recover, others continue to decline at alarming rates, generally as a result of the disappearance or degradation of their habitats. Decline is now also perceptible in previously common species. As in other continents, the spread of *invasive alien species* (BDIV7) is an increasing problem.

### ***Conservation and restoration of Europe's biodiversity***

Europe fulfils the engagement to conserve biological diversity with different legal and financial instruments (EC directives, action plans, LIFE projects). The table 3.4.2 proposes indicators describing the implementation of these instruments. A more comprehensive approach to develop Biodiversity Implementation Indicators will be made in the Bio-IMPs project, see the section on EEA current and future work.

Indeed, conservation and restoration of biodiversity rely on different types of legal or management instruments which can be applied at different levels: genes, species and ecosystems.

In the present core set there is no response indicator related to genetic biodiversity. The state of species may change quicker than the binding instruments. The information about threatened species is, to a certain extent, updated regularly and also allows a global perspective. A analysis of the lists of threatened species produced at different levels and the annexes of international conventions and European directives gives thus an insight in the effectiveness of the latter. This is the aim of the indicator (BDIV8) Protection of threatened species.

For the time-being, data about the restoration of specific habitat types and protection through designation are mainly expressed in overall quantitative ("total area") terms, cf

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<sup>17</sup> United Nations, 1992. Convention on Biological Diversity

the indicators *restoration (BDIV9)* and *designated areas (BDIV10)*. Habitat measures must also be evaluated in terms of quality. The efficiency of networks of designated areas should be addressed by evaluating the positive impacts on species populations; *species populations in designated areas (BDIV11)*. A further step compared to overall area figures for designated areas will be data about habitat types protected, as reflected in the indicator *habitat diversity in designated areas (BDIV12)*. An analysis of the designation of areas will also need information about impacts as reflected in the indicator *human impacts on designated areas (BDIV13)*.

### ***Integration of biodiversity issues into sectorial policies***

Action to designate areas, protect species and genetical resources must be supplemented by integration of biodiversity concerns in sectors, as well as taking biodiversity into account when combating broad influences like climate change. In the proposed EEA core set several indicators of pressures relevant to biodiversity can be found under a number of sectoral and issue headings. In the biodiversity set a limited number of indicators are added, as shown in table 3.4.3. These indicators should be seen as complementary to make an integrated assessment possible.

The development of *agriculture* is of major importance to Europe's biodiversity. Both trends of agricultural intensification and marginalisation of farmland affect diverse areas causing major change, decline and loss of biodiversity. To support the assessment of agricultural policies, as reflected in chapter 4.2 Agriculture a number of sub indicators have been specified to agricultural aspects under the generic indicators Habitat, Species and Genetic diversity as well as under Human impact on designated areas.

In Europe forests once were ubiquitous and still cover a significant part of the land. A key factor for the biodiversity of forests is the impact of *forestry*. To achieve the objective of sustainable forest management biodiversity concerns must be implemented. Eight of the agreed specific biodiversity indicators according to the pan-European policy framework (MCPFE, see below) have been included in the tables 3.4.1 – 3.4.3. In a broader perspective information about the forest resources and forestry is extensive and on an international level presented mainly by FAO/UNECE. Data for many aspects have been collected during several decades, often as field measures by national forest inventories. Much of these data, for example, development of forest area and stand characteristics and conditions are of relevance for biodiversity assessments. This is also the case for the pan-European monitoring of air pollution, cf. below. The selection of forest indicators (and sub indicators) in the biodiversity tables 3.4.1-3.4.3 is kept limited to those specifically related to biodiversity, also taking into account possibilities to use other datasets developed by EEA and EIONET.

*Aquaculture* and *fishery* also impact wider aspects of biodiversity, as reflected in several of the indicators presented in chapter 4.3 Fishery. A selection of these are also listed in table 3.4.3.

With respect to the *transport* sector the biodiversity list (table 3.4.3) only highlights a special area where European level information successively should be developed: concerns about fauna by direct effects (road kills) and specific measures and investments for fauna protection (fauna passages).

*Climate change* is a potential threat to biodiversity that may have severe consequences. In the short-medium term the proposed biodiversity core set includes indicators of an early-warning nature, changes in the phenology of plants (data presently available) and animals (data exist but further work is needed to develop the indicator). Impact on species responses can be expected and some aspects, like changes in migration routes or distribution, may be identified in the medium term (relevant data exist but need to be clarified with respect to time scale and geographical coverage). In a longer term

indicators on ecosystem responses should be developed, both to show integrated effects on biological communities and ecosystem services.

### **Main Policy Objectives**

While at global level the Johannesburg Summit agreed on “*the achievement by 2010 of a significant reduction in the current loss of biological diversity*”<sup>18</sup>, the 6EAP expresses a stronger commitment, i.e. “*to halt the loss of Europe's biodiversity by 2010*”<sup>19</sup>.

The Convention on Biological Diversity CBD gives the overall policy framework for “*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*” (Article 1, CBD). The implementation of the CBD is organised in a number of thematic and horizontal issues but hitherto the objective formulation (and subsequent reporting obligations) have been of a relatively generic nature, mainly focussing on implementation aspects.

In application of global, European, regional or national commitments, the countries and the European Union are implementing plans to halt the further degradation of biodiversity. Designated areas and protection of species continue to be major instruments for such conservation strategies and constitute core elements for the establishment of a “Pan-European Ecological Network”. In EU the NATURA2000 process, i.e. the implementation of the Birds and Habitats Directives, is a coherent initiative to contribute to this network of designated areas.

Meanwhile integration of biodiversity concerns into sectors is progressively becoming reality. Biodiversity is a part of the concerns for Sustainable Forest Management developed on a pan-European level through the Ministerial Conferences for Protection of Forest in Europe (MCPFE)<sup>20</sup>. In the framework of the EU Biodiversity Strategy<sup>21</sup>, the sectoral concerns are reflected e.g. in the Biodiversity Action Plans developed for Agriculture<sup>22</sup> and for Fisheries<sup>23</sup>.

### **Table with revised set indicators**

**Table 3.4.1** Indicators related to state and trends in Europe's biodiversity

Policy question	Indicator title & sub indicators	DPSIR	S/M/L	Other issues/sectors

<sup>18</sup> <http://www.johannesburgsummit.org/>

<sup>19</sup> European Commission, 2001. Environment 2010: Our future, our choice, 6th Environmental Action Programme. COM (2001) 31 final. Brussels, Commission of the European Communities.

<sup>20</sup> Ministerial Conferences for Protection of Forest in Europe <http://www.minconf-forests.net/>

<sup>21</sup> European Commission, 1998. Communication of the European Commission to the Council and to the European Parliament on a European Community Biodiversity Strategy. COM (1998) 42. Brussels, Commission of the European Communities.

<sup>22</sup> European Commission, 2001. Communication of the European Commission to the Council and the European Parliament : Biodiversity Action Plans in the areas of Agriculture.

<sup>23</sup> European Commission, 2001. Communication of the European Commission to the Council and the European Parliament : Biodiversity Action Plans in the areas of Fisheries

What is the state and trends of biodiversity? Will the loss of biodiversity be halted 2010?	BDIV1 Habitat diversity BDIV1a State of 10 main EUNIS habitats types per biogeographic region and per country BDIV1b Change of 10 main EUNIS habitats types per biogeographic region and per country (including agro-ecosystems) BDIV1c Percentage and trends in wilderness areas by country, biogeographic region, Europe BDIV1d Naturalness of Forests	S	ST MT MT ST	MCPFE 4.3
	BDIV2 Species diversity BDIV2a Species richness in proportion to surface area of the countries BDIV2b Species richness in proportion to surface area of biogeographic regions BDIV2c Species richness by main 10 main EUNIS habitats types BDIV2d Tree species composition in forests BDIV2e Changes in species composition in wetlands BDIV2f Endemic Species richness in proportion to surface area of biogeographic regions BDIV2g Trends of species groups (carnivores, raptors, geese, species of economic interest...) BDIV2h Trends of representative selection of species associated with different ecosystems (including agro-ecosystems)	S	ST ST MT ST ST MT ST/MT ST/MT	Agriculture MCPFE 4.1 Agriculture
	BDIV3 Threatened species BDIV3a Number of threatened taxa occurring at different geographical levels BDIV3b Number of globally threatened species endemic to Europe BDIV3c Percentage of globally threatened species per biogeographic region BDIV3d Percentage of European threatened species per biogeographic region BDIV3e Threatened forest species	I	ST ST ST MT ST	MCPFE 4.8
	BDIV4 Genetic diversity BDIV4a Forest Genetic resources BDIV4b Wild relatives of cultivated plants BDIV4c Crops and breed genetic diversity	S	ST ST ST	MCPFE 4.6 Agriculture
What are the causes of the loss of biodiversity? Will this change?	BDIV5 Threats to ecosystems BDIV5a Threats in and around wetland sites	I	ST/MT	
	BDIV6 Landscape changes BDIV6a Landscape-level spatial pattern of forest cover BDIV6b Diversity of linear features and diversity of crops in farmlands		LT LT	MCPFE 4.7 Agriculture

	BDIV7 Introduced and invasive species	I		
	BDIV7a Percentage of introduced species that have become invasive per biogeographic region		MT	
	BDIV7b Spread of invasive selected species over time		MT	
	BDIV7c Introduced tree species		MT	Agriculture
	BDIV7d Introduced species in fresh surface waters		ST	
	WEC8b Introduced species in marine and coastal waters		ST	

Indicators with lighter fonts are used in other lists.

**Table 3.4.2** Indicators related to conservation and restoration of Europe's biodiversity

Policy question	Indicator title & sub indicators	DPSIR	S/M/L	Other issues/ sectors
What measures are taken to conserve or restore biodiversity?	BDIV8 Protection of threatened species BDIV8a Proportion of globally threatened fauna species protected by European instruments (EC Directives and Bern Convention) BDIV8b Proportion of known species present in Europe protected by European instruments BDIV8c Proportion of species only present in Europe protected by European instruments BDIV8d Progress in implementation of action plans for globally threatened species BDIV8e Funds spent through LIFE Nature projects for species and habitats	R	ST  ST S ST ST	
	BDIV9 Restoration BDIV9a Total area of wetlands (and other ecosystems types) reclaimed by country, biogeographic region, Europe	R	MT	
	BDIV10 Designated areas BDIV10a Cumulated area of sites over time under international conventions and initiatives BDIV10b Cumulated area of sites proposed over time under EU Directives BDIV10c Proportion of sites under EU Directives already protected under national instruments BDIV10d Cumulated area of national designated areas over time in Pan-Europe	R	ST ST ST ST	
Are these measures effective in reaching the objectives?	BDIV11 Species diversity in designated areas BDIV11a Bird species distributions and Special Protection Areas (SPAs) coverage BDIV11b Range of Species of European Interest or Threatened Species present in designated areas BDIV11c Trends of selected species population within and outside designated areas	R	ST MT MT	
	BDIV12 Habitat diversity in designated areas BDIV12a Percentage (in surface area) of Annex I habitat-type included in potential Sites of Community Interest (pSCIs) BDIV12b Change (in surface area) of Annex I habitat-type included in pSCIs BDIV12c Range of Habitats of European Interest present in designated areas	R	ST MT MT	
	BDIV13 Human impacts on designated areas BDIV13a Percentage of main activities reported in pSCIs BDIV13b Agricultural land in designated areas TELC13 Land cover changes in the surroundings of designated areas	I	ST MT MT	Agriculture

**Table 3.4.3** Indicators related to integration of biodiversity issues into sectorial policies

Policy area/sector	Indicator title & subindicators	DPS	S/M/L	Other issues/sectors
Agriculture	See also: BDIV1a State of 10 main EUNIS habitats types per biogeographic region and per country BDIV1b Change of 10 main EUNIS habitats types per biogeographic region and per country (including agro-ecosystems) BDIV2h Trends of representative selection of species associated with different ecosystems (including agro-ecosystems) BDIV4b Wild relatives of cultivated plants BDIV4c Crops and breed genetic diversity BDIV13b Agricultural land in designated areas			Agriculture
Forestry	BDIV14 Deadwood	S	LT	MCFPE 4.5
	See also: BDIV1d Naturalness of Forests BDIV2d Tree species composition in forests BDIV2e Changes in species composition BDIV3e Threatened forest species BDIV4a Forest Genetic resources BDIV6a Landscape-level spatial pattern of forest cover BDIV7c Introduced tree species			
Climate Change	CC8b Plant phenology	I	ST	Climate change
	CC8c Animal phenology	I	MT	
	CC8d Species responses CC9d1 Demographic parameters and population levels CC9d2 Migration routes CC9d3 Geographic distribution, altitude range	I	LT MT MT	
	CC8e Ecosystem responses CC9e1 Ecosystem and community structure (ACC5.5) CC9e2 Ecosystem functions	I	LT LT	
Transports	BDIV15 Impacts of transports on biodiversity BDIV15a Number of individuals per main fauna species group killed on roads per length per year	I	LT	Transport
	BDIV15b Number of fauna passages per infrastructure length unit	R	MT	Transport
	BDIV15c Financial investment for fauna passages	R	MT	Transport
Fishery	FISH4a Fisheries impact on habitats and ecosystems		LT	Fisheries
	FISH2f Accidental catch: birds, mammals, and turtles		MT	
	WEC07 impact of aquaculture		ST	

Indicators with lighter fonts are used in other lists.

***Linkage to other EEA indicator sets***

Biodiversity and nature are heavily impacted or influenced by different sectors and environmental issues. Therefore several links can be made with the other topics of the EEA indicator set.

As described in the table above, The nature and Biodiversity area will produce indicators on biodiversity and agriculture, transport, climate change. But the biodiversity indicator set will also benefit from indicators produced by terrestrial environment on fragmentation, transports and designated areas, from water on indicators on oiled seabirds and ecological quality. Indicators from fishery set such as accidental catch (by-catches) and physical damage to habitats will also be relevant.

The development of agri-environmental indicators in the biodiversity set contributes to the IRENA operation<sup>24</sup>. The IRENA indicators correspond to the list of agri-environmental indicators published in COM(2001) 144, which builds on previous OECD work.

### ***Reference to other international indicator sets***

Several indicator activities with relations to biodiversity are ongoing by different types of institutions. ETC/NPB and EEA follow as much as possible these initiatives.

The "*Ministerial Conference on the Protection of Forests in Europe*" (MCPFE) is a pan-European political initiative addressing threats related to forests and promoting sustainable management of forests (SFM) in Europe. A first set of Pan-European SFM Indicators was developed in response to the second Ministerial Conference in Helsinki in 1993<sup>25</sup> and this set was revised in 2002<sup>26</sup>.

The current MCPFE indicator set comprises quantitative Pan-European Indicators for SFM under six Criteria. A set of nine indicators is given for Criterion 4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems.

In the proposed EEA core set (Table 34.3) the following indicators/ sub-indicators directly correspond to eight of the MCPFE biodiversity indicators:

- BDIV1d Naturalness of Forests (= MCPFE 4.3)
- BDIV2d Tree species composition in forests (= MCPFE 4.1)
- BDIV3e Threatened forest species (= MCPFE 4.8)
- BDIV4a Forest Genetic resources (= MCPFE 4.6)
- BDIV6a Landscape-level spatial pattern of forest cover (MCPFE 4.7)
- BDIV7c Introduced tree species (= MCPFE 4.4)
- BDIV14 Deadwood (= MCPFE 4.5)

In several cases the MCPFE biodiversity indicators need further development, cf. the section about future work below. The MCPFE indicator 4.2 "Regeneration" is for the time being not included for scientific reasons (relevance unclear) and it should furthermore be noted that several MCPFE indicators presented under other criteria might be used in assessments related to forest biodiversity.

Unlike OECD and MCPFE, CBD SBTTA doesn't work in the way to define or produce a set of international indicators but in a way to propose to the parties guidelines to produce national sets of indicators. ETC/NPB follows this work which helps to complete the knowledge on national initiatives

WWF with the help of WCMC-UNEP develops the so-called Living Planet Index (LPI)<sup>27</sup> at global level. WCMC-UNEP has started a project in 2002 in order to analyse the possibilities to implement this indicator and also the Natural Capital Indicator<sup>28</sup> (NCI) at

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<sup>24</sup> see section 4.2 Agriculture for further description

<sup>25</sup> see MCPFE website <http://www.minconf-forests.net/>

<sup>26</sup> MCPFE Advisory Group Recommendations for Improved Pan-European Indicators for SFM 2002, see <http://www.minconf-forests.net/>

<sup>27</sup> WWF Living Planet Index

[http://www.panda.org/news\\_facts/publications/general/livingplanet/lpr02.cfm](http://www.panda.org/news_facts/publications/general/livingplanet/lpr02.cfm)

<sup>28</sup> see Natural Capital Indicators for OECD countries <http://www.unep-wcmc.org/species/reports/>

European level. ETC/NPB is involved in this project as data provider but also as support to discussion.

#### *Pan-European monitoring of forest condition (Forest Focus)*

In response to the UNECE Convention on Long-Range Transboundary Air Pollution a monitoring programme for forest condition (ICP Forest) is operational since ca 10 years. In 2002 ICP Forest initiated a process to develop indicators to assess effects of air pollution on biodiversity. A proposed new EU Regulation concerning monitoring of forest and environmental interactions in the Community (Forest Focus), which will give legal basis for EU support to forest monitoring intends to expand the monitoring programme to include e.g. biodiversity aspects. In the upcoming three years Forest Focus is thus expected to develop indicators to be applied for assessing biodiversity. EEA actively participate to implement relevant indicators from the proposed core set into the monitoring of forest condition.

#### *OECD Agri-Biodiversity Framework (ABF)*

OECD recommended drawing different agri-biodiversity indicators (ABI) of genetic resources, habitats, and wild species within a coherent and comprehensive framework. The ABF offers the possibility to identify and structure a range of indicators for different policy purposes and at varying spatial scales. Indicators can be used, for example, to highlight the risk of genetic erosion of domesticated crop varieties and livestock breeds; to track the performance of a particular policy measure aimed at reducing wetland loss to agriculture; and monitor the progress of a policy measure seeking to increase the population size of rare and endangered wild species associated with agriculture. Also combining indicators to measure current or future trends concerning the impact on wild species of changes in agricultural land use and cover patterns, habitat structure and farm management practices and systems.

The OECD work could thus provide useful synergies and input into other international efforts to develop ABIs, especially under the CBD and the FAO's work on monitoring trends in global agricultural biodiversity. Experts also noted the need for cooperation in work on ABIs, drawing on the expertise and databases of other international organisations, such as Birdlife International, ECNC, the EEA and its European Topic Centres, FAO, IUCN, Wetlands International and the World Bank. (OECD expert meeting on Agri-Biodiversity Indicators, 2001, <http://www1.oecd.org/agr/biodiversity/index.htm> ).

#### *OECD Soil Biodiversity*

OECD organises an Expert Meeting on Soil Erosion and Soil Biodiversity Indicators, in Rome (Italy), 25-28 March, 2003. EEA and ETC/TE will attend this meeting. Due to the huge work which should be done in terms of definitions, methodologies and different agreements between the experts, very few indicators could be integrated in the EEA core set in medium term.

#### *OECD Wildlife*

EEA via its ETC/NPB is in direct contact with OECD on the wildlife and habitats questionnaire and data collection in order to streamline dataflows between EIONET, EEA and OECD.

#### **Country comments**

Twenty countries has answered to the first round consultation on biodiversity indicators. The main comments were as followed:

- Some indicators were considered to be too generic and in need of more precise definition;
- In the indicator set presented the ecosystem level and landscape approach were missing;

- Several countries have problems with data availability and financing envisaged data collection.

Furthermore a strategy should be developed how to harmonise the different scales: regional, national, and European levels.

In response to these comments the indicator set has been revised. This was, together with draft description/factsheets, further discussed with country experts at a EIONET NRC seminar 20-21 February 2003. The seminar discussions contributed e.g. to the definition of indicators and to the identification of new indicators. This has resulted in the following main improvements, reflected in the current proposed set:

- Definitions have been improved as reflected in the indicators titles. Methodological aspects for the different geographical levels have been improved (will be reflected in the descriptive sheets/factsheets);
- Ecosystem and landscape approaches are better taken into account in this new version but also by the indicators proposed by the Terrestrial Environment in collaboration with the Nature and Biodiversity;
- The indicators have been discussed with respect to data availability and this issue must be further tackled in future work on monitoring.

#### ***EEA current and future work on indicators***

One of the priorities is to implement the proposed indicators. Some proposed indicators need further development work to be defined with optimal relevance (taking into account ongoing research) and methodologically adapted for implementation in the varying conditions of Europe in the potential monitoring programmes (i.e. on forestry and deadwood, landscape-level spatial pattern of forest cover or on climate change and species and ecosystems responses).

#### **Biodiversity Implementation Indicators (Bio-IMPs)**

In 2003 EEA initiated the work on the Biodiversity Implementation Indicators (Bio-IMPs) for the European Commission. The aim of the Bio-IMPs indicator set is to enable assessment of the implementation and effectiveness of the Community Biodiversity Strategy and its related four Biodiversity Actions Plans (natural resources, agriculture, fisheries and development). The Bio-IMPs indicator set will be defined and developed on the basis of a policy analysis of objectives and actions and their instrumentation of the Strategy and the Action Plans Bio-IMPs will develop a framework for analysis of implementation and effectiveness of the EU biodiversity policy and will identify the indicators that should feed the framework. These indicators can come from the existing indicator sets (core-set, IRENA, OECD, MCPFE), modified exiting ones or proposals for new ones if necessary.

As part of the Bio-IMPs project the ETC/NPB will develop two high level indicators to be used for the Spring Report on the progress of the Community Sustainable Development Strategy. Two biodiversity indicators are selected by the Council for this purpose. An indicator on protected areas for biodiversity that should report about the progress made in the achievement of Natura 2000 and a generic biodiversity index that should give an relevant overall impression of the status of biodiversity in the European Union.

The Bio-IMP's project ends in early 2005 with recommendations how the reporting on the implementation of the European biodiversity policy can be improved and what indicators are necessary. The core set on biodiversity and Bio-IMPs shall be merged to be maintained by EEA fully or in collaboration with other bodies.

In 2003, short term indicators will be improved and finalised and work should continue to develop monitoring and data flows in order to support the production of indicators on trends and changes in cases where at present only state can be demonstrated. To address the objective of halting biodiversity loss producing change data is particularly important for the indicator BDIV1 Habitat diversity.

In the 5th EU RTD framework programme substantial funds were allocated to projects assessing and developing indicators of biodiversity. The current and planned EU funded research projects are expected to give a significant contribution to the further development of the indicators and it is noteworthy that e.g. the upcoming 6th EU RTD Framework programme has indicated further efforts e.g. to develop datasets for the indicator BDIV7 Introduced and invasive species. As regards the indicator BDIV4 Genetic diversity the scientific knowledge is extensive but feasible methods to monitor genetic aspects of wild species on a European scale hardly exist. Because of this EEA plans to initiate state of the art studies to propose strategies for monitoring and assessment of genetic level biodiversity.

Nature and biodiversity is a priority area in the EU 6th Environment Action Programme. This will thus be an important issue in the coming EEA State and Outlook Report to be published in 2005. In connection with this also reports regarding specific biodiversity issues are foreseen.

### **3.5 Terrestrial environment**

*The present list of terrestrial environment indicators is not a comprehensive 'core set' that fully describes the DPSIR story for a number of priority issues of the terrestrial environment. It is for the moment a fragmented selection of policy relevant indicators that EEA together with the ETC TE is able to produce over a short period and anticipate expected medium and long term needs. As foreseen in the 6EAP it will take another year or two before decision makers will be able to formulate a more precise demand for indicators based on an agreed framework related to soil monitoring, urban and coastal environment.*

#### ***Description of the issue***

The main terrestrial environment issues addressed are:

- Assessment of the *changes of land use and land cover* at the European scale;
- Assessment of the *degradation and protection of soils* against erosion, sealing and contamination;
- Regional assessment of specific areas, starting with the *urban and coastal environment*.

Terrestrial environment issues link the sustainable use of land and soil to the development of human activities and the related infrastructures. These activities and developments may result in conflicts in land use in specific areas such as coasts, mountains, urban or rural areas, which in turn may result in the degradation of the landscape and the soil. These ongoing pressures and changes can have implications for the renewal of nature as well as for the quality of human life and to some extent the efficacy of the economic activities themselves.

These issues are strongly inter-connected. They cut across many environmental issues such as biodiversity conservation, management of river basins or carbon sequestration in soil and vegetation. Similarly, the ecology of the terrestrial environment is a key element for understanding the impacts of sectors such as agriculture, forestry, transport or tourism on the environment. In many cases, we are only able to gain an understanding of the interactions, conflicts and potential synergies that exist by integrating information and data from different sources on a spatial level as the basis for analysis.

In terms of environmental pressures and economic drivers, the conflicts between land use practices and environmental policies relevant to land use include:

- Influences of demographic and economic and social changes coupled with increased wealth on the development of the rural landscape, on the urban-rural interaction (urban sprawl), on the quality of the urban environment itself as well as coastline development;
- The impacts of infrastructure development and (de-)industrialisation on soil quality alongside the impacts of natural hazards and environmental accidents.

Environmental impacts of land and soil degradation that are addressed by the indicators include:

- The specific impacts of land use and land cover changes on biodiversity (habitat loss and fragmentation) and on our own quality of life (including proximity to infrastructure developments);
- The impacts of soil contamination, sealing on the ecological quality of inland waters and the availability of water resources;
- The specific impacts of economic, infrastructure and demographic developments that contribute to coastal erosion;

The issues that are addressed regarding effectiveness of policy responses include:

- The ways in which current policies address access by urban citizens to basic essential services and general amenities;
- The progress that is being made on the restoration of contaminated sites;
- The progress being achieved on the integrated management of the coastal zones in Europe.

### ***Main policy objectives***

Although land and soil are implicitly part of most environmental issues, little specific legal or policy provisions, exist at the European level. Therefore, the identification of policy questions linked to indicators of terrestrial environment has to start from the analysis of the policy documents related to land use and soil protection, urban development plus those in other areas (i.e. water, air, waste, nature, agriculture, transport) that require the territorial dimension to be considered.

The key reference is the 6<sup>th</sup> Environment Action Programme<sup>29</sup> and the thematic documents related to it such as the Commission Communication “Towards a thematic strategy for Soil protection<sup>30</sup>” and the communications under preparation on “Environment and planning” planned for 2004) and “Towards a thematic strategy on Urban environment” (planned for 2004).

Main policy objectives are:

- *to protect soils against erosion and pollution;*
- *to protect and restore the functioning of natural systems and halt the loss of biodiversity;*
- *to achieve a quality of the environment where the levels of man-made contaminants do not give rise to significant impacts or risks to human health.*

Important references can be as well found in the EU Strategy for Sustainable Development<sup>31</sup>, the new general regulation for the Structural Funds<sup>32</sup>, the guidelines for

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<sup>29</sup> Reference to 6EAP COM (2001) 31

<sup>30</sup> Reference to soil thematic strategy COM (2002) 179 final etc

<sup>31</sup> Strategy on Sustainable Development COM (2001) 264

<sup>32</sup> Council Regulation (EC) no 1260/1999

INTERREG III<sup>33</sup> and the ESDP Action Programme and ESPON guidelines for 2001-2006<sup>34</sup>.

For the coastal zones, the Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management<sup>35</sup> provides an overall guidance.

As for the urban issues, the 1990 Green Paper on the Urban Environment (91/C 33/02), marked the start of a new focus on urban issues at the European level. The communication “Sustainable Urban Development in the European Union - A Framework for Action<sup>36</sup>” addresses the development of European-level policy and instruments.

Finally, the spatial dimension of most policies leads to cross-cutting reference, in particular with the Water Framework Directive, the Habitats Directive, the Common European Transport Policy; other more specific environmental directives as well as with the general European policies and in particular Agriculture<sup>37</sup> and Transport.

Other international Conventions such as Climates Changes, Desertification, and Biological Diversity and the Council of Europe's European Landscape Convention (2000) also contain relevant policy objectives related to terrestrial environmental issues..

**Table with revised set of TE indicators.**

*The present list of terrestrial environment indicators is not a comprehensive ‘core set’ that fully describes the DPSIR story for a number of priority issues of the terrestrial environment. It is for the moment a fragmented selection of policy relevant indicators that EEA together with the ETC TE is able to produce over a short period and anticipate expected medium and long term needs.*

**Table 3.5.1:** Main terrestrial environment indicators and sub-indicators.

<b>Environmental issue</b> TExx Indicator title	<b>ST/ MT/ LT</b>	<b>Fact sheet</b>	<b>related sectors/ issues</b>
<b>Soil pollution</b>			
TEP1 Soil contamination from localized sources	ST	Y	Industry, Waste, Water, Health
TEP1a Progress in management of contaminated sites	ST	Y	
TEP1b Expenditures on contaminated sites remediation	ST	Y	
TEP1c Risk of contamination of surface and groundwater from contaminated sites	MT	N	
TEP2 Heavy metal accumulation in soil	MT	N	Air pollution
TEP3 Soil contamination by pesticides	LT	N	Agriculture
TEP4 Application of sewage sludge on agricultural land	LT	N	Waste
<b>Soil erosion</b>			
TES1 Soil erosion risk	ST	N	Agriculture
TES1a Loss of organic matter in top soils	MT	N	
TES1b Actual soil erosion	LT	N	
<b>Land use and land cover changes</b>			
TELC1 Land cover changes in the surroundings of designated areas	ST	Y	Biodiversity, Transport
TELC1a Proximity of transport infrastructure to designated areas	ST	Y	

<sup>33</sup> Published on 23.05.2000 (OJ C 143)

<sup>34</sup> Action Programme for the European Spatial Development Perspective, Ministerial Presidential Conclusions, Tampere, October 1999

<sup>35</sup> Strategy for Europe on Integrated Coastal Zone Management COM(2000)547

<sup>36</sup> Communication on sustainable urban development COM(1998)605

<sup>37</sup> Communication on agri-environmental measures COM(2000)144

TELC2 Fragmentation of ecosystems and habitats by transport infrastructure	ST	Y	Biodiversity, Transport
TELC3 Soil sealing	MT	N	Transport
TELC3a Land take by transport infrastructure	MT	N	
TELC4 Agriculture land cover changes	MT	N	Agriculture
TELC5 Landscape diversity	MT	N	Agriculture
<b>Urban environment</b>			
TEU1 Urban sprawl	MT	N	Agriculture, biodiversity
TEU2 Redevelopment of brownfields for new urban uses	MT	N	Waste, Industry
TEU3 Citizen access to nearby public open areas	LT	N	Health
<b>Coastal environment</b>			
TECO1 Pressures on coastal ecosystems	MT	N	Biodiversity
TECO2 Change in coastal erosion patterns	MT	N	Water
TECO3 Progress in coastal management / ICZM	MT	N	Water
<b>Natural hazards</b>			
TENH1 Area affected by flooding	ST	N	Climate change

### ***Linkage to other EEA indicator sets***

There are several overlaps between the list of terrestrial environment (TE) indicators and the other topics and sector lists. The terrestrial team will take the lead for the indicators mentioned in table 3.5.1.

### ***Reference to other international indicator sets***

#### *Land use and land cover changes*

Since 2000, an informal working group with representatives from Eurostat, DG Agriculture, DG Environment, JRC and EEA is producing on a regular basis joint publications on the development of land use and land cover change (LULCC) indicators. These technical reports are compilations of progress made on indicators using existing data sets such as CORINE land cover, Farm Structure Survey data (FSS), Integrated Agricultural Control System data (IACS), Land Use and land Cover Area frame Sampling data (LUCAS).

The development of agri-environmental indicators in the terrestrial set contributes to the IRENA operation<sup>38</sup>. The IRENA indicators correspond to the list of agri-environmental indicators published in COM(2001) 144, which builds on previous OECD work. Fact sheets to be developed by the Terrestrial Environment team will be based on the guidance received from the IRENA coordinator.

Terrestrial environment (ETC TE) is participating in a GMES project<sup>39</sup> (2003-2004) to develop indicators on land cover change and environmental stress, using remote sensing as a tool to provide timely consistent data across Europe.

#### *Soil degradation and protection*

EEA developed together with JRC a common framework for the development of soil indicators ([http://reports.eea.eu.int/Technical\\_report\\_No\\_61/en/tab\\_abstract\\_RLR](http://reports.eea.eu.int/Technical_report_No_61/en/tab_abstract_RLR))

#### *Regional Assessment (urban, coastal environment)*

For the urban environment, the initiative that defined a set of “European Common Indicators (ECI) - Towards a Local Sustainability Profile” is used as basis for identifying the relevant indicators on the urban environment that should be included in the EEA core set. This ECI initiative of the European Commission (DG ENV) was launched in 1999, under the umbrella of the Expert Group on the Urban Environment. The ECI initiative

<sup>38</sup> see section 4.2 Agriculture for further description

<sup>39</sup> Global Monitoring for Environment and Security

aims to monitor and compare, by means of indicators, local progress and results relevant for both to the improvement of Local Agenda 21 process and to driving European supporting policies. More than 100 European local authorities from 18 countries signed the agreement to join the initiative and are committed to produce relevant data. More information on the European common indicators can be found on <http://www.sustainable-cities.org/indicators/>

The MOLAND project of JRC tested a number of spatial indicators relevant for the urban environment. Results were published jointly by JRC and EEA ([http://reports.eea.eu.int/environmental\\_issue\\_report\\_2002\\_30/en/tab\\_abstract\\_RLR](http://reports.eea.eu.int/environmental_issue_report_2002_30/en/tab_abstract_RLR)).

For the coastal environment, the European Topic Centre on Terrestrial Environment (ETC TE) is leading a new working group on coastal data/indicators, established end 2002 by DG ENV. The tasks of the working group are to support the work of the Expert Group on ICZM<sup>40</sup> recommendations to help Member States in the preparation of their ICZM National Strategies.

The European Spatial Development Perspective is aiming for a balanced and sustainable development of the territory of the EU. The ESPON 2001-2006 Programme (European Spatial Planning Observation Network) is developing so called territorial indicators e.g. urban polycentric development, accessibility and territorial impacts of major infrastructure works (transport, energy, telecommunication). The ESPON programme has as one of its main objectives to create an added value to knowledge with a focus on the European territory.

### ***Country comments***

EEA received comments from 18 EIONET member countries during the first consultation process of the EEA core set of indicators, referring mainly to data (40%) and definition (50%) problems.

Other comments considered were:

- To fit firmly the indicators into the storyline and further develop the terrestrial environment topic into the core set;
- To emphasize the spatial scale
- To regroup some of the indicators and classify them as sub-indicators.

As a result, the list of terrestrial environment indicators has been modified accordingly: priority revision, addition of new indicators, avoidance of duplications with other thematic lists (agriculture, air pollution, biodiversity, etc.), improvement of definition, methodology, among others.

### ***EEA current and future work on indicators***

*Dataflows:*

- Land cover: update of the CORINE land cover database CLC2000, expected to be completed in 2004.
- Soil contamination: technical report published in 2002: “Assessment of data needs and data availability for the development of indicators on soil contamination”. ([http://reports.eea.eu.int/technical\\_report\\_2002\\_81/en/tab\\_abstract\\_RLR](http://reports.eea.eu.int/technical_report_2002_81/en/tab_abstract_RLR))
- Revised soil questionnaire to be agreed with EIONET in May 2003 during annual Terrestrial environment workshop.
- Land use and land cover changes: joint publication of DG Agriculture, Environment, Eurostat, Joint Research Centre, EEA : “Building agro-environmental indicators – Focussing on the European area frame survey LUCAS”, published in 2002

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<sup>40</sup> Integrated Coastal Zone Management

*Planned reports:*

- Environment issue report on impact of environmental and technological hazards (end 2003)

*Other activities:*

- ETC TE lead of ICZM Working Group on indicators and data
- ETC TE lead or co-lead of the working groups on local soil contamination (Soil thematic Strategy)
- ETC TE participation in the working group on sustainable urban management
- EEA participation in the Eurostat Land Use Statistics Working Group

### **3.6 Water**

The issue on water has been split into four issues: 1) water quantity; 2) nutrients and organic pollution; 3) hazardous substances and 4) ecological quality each with their own storyline and a set of indicators.

#### **3.6.1 Water quantity**

Water is being used in agriculture for irrigation, in industry for cooling and chemical processes, in households for washing and drinking. Water availability problems occur when the demand for water (water exploitation) exceeds the amount available during a certain period. They occur frequently in areas with low rainfall and high population density, and in areas with intensive agricultural or industrial activity. Over-exploitation of water has led to the depletion of ground water, the depletion of water collected in reservoirs, the drying-out of natural areas in western and southern Europe, and to salt-water intrusion in aquifers in coastal areas.

The overall abstraction and consumption of water resources is currently sustainable in the long-term perspective. However, some areas may be facing unsustainable trends, especially in southern Europe where much improved efficiency of water use, especially in agriculture, is needed to prevent seasonal water shortages.

While water shortage is one quantity problem, too much water is the other problem. Increased precipitation and related increased river discharges lead to flooding incidents. Climate change may heavily affect water quantity through flooding or desertification, which impact resources and demand.

#### ***Policy objectives water quantity***

The main policy objectives are

- *To ensure the rates of extraction from our water resources are sustainable over the long term<sup>41</sup> and to promote sustainable water use based on a long-term protection of available water resources<sup>42</sup>*
- *To ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status by 2015<sup>43</sup>*

The Water Framework Directive (WFD) obliges Member States to use pricing for water-related services as an effective tool for promoting water conservation. This would also allow the environmental costs of water to be reflected in the price of water. National, regional and local authorities need, amongst other things, to introduce measures to improve the efficiency of water use and to encourage changes in agricultural practices necessary to protect water resources (and quality). Leakage remains a major source of

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<sup>41</sup> 6EAP 5.6 Ensuring the Sustainable Use and High Quality of Our Water Resources (p.45-46)

<sup>42</sup> Water Framework Directive (WFD) Article 1

<sup>43</sup> Water Framework Directive Article 4

inefficiency of water use and in several countries objectives have been set to achieve major reductions in leakage.

EU Member States shall ensure by 2010:

- That water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive,
- An adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services.

### *Overview of indicators related to water quantity*

**Table 3.6.1** Water quantity indicators in relation to policy questions.

<b>Generic question</b>	<b>Policy question</b>	<b>Indicator title</b>	<b>DPS</b>	<b>SIR</b>	<b>M/L</b>	<b>Other issues/sectors</b>
Are the abstractions from our water resources sustainable over the long term?	Are we using less water? Are some areas of Europe facing unsustainable trends regarding water resources (i.e. overexploitation)?	WQ1 Water exploitation index WQ1a Freshwater resources WQ1b Total water abstraction WQ1c Water exploitation index	P		ST	
Is the water use by socio-economic sectors sustainable?	In which sector is water consumption increasing/decreasing ?	WQ2 Water use by sectors	P		ST	(Tourism)
	Is agricultural production becoming less water intensive?	AGRI1 Agricultural water consumption WQ2a Water use by agriculture	D		ST	Agriculture
	Is industrial production more water efficient?	WQ2b Water use by industry	P		MT	
	Are the households reducing the water use?	WQ2c Water use by households	P		ST	
	Is the tourism sector reducing water use?	WQ2d Water use by tourism	P		LT	Tourism
	What are the impacts of climate change on water resources?	CC10 River discharge CC6a Precipitation	I		MT ST	Climate change
Is water stress due to water abstractions being reduced?	Are there indications of negative trends in water resources (e.g. river flows, aquifer levels, storage reservoir levels)?	WQ3a Groundwater levels WQ4 Overall reservoir stocks	I		LT	Agriculture
	Are there indications of low water availability/reduced water quality?	WQ3b Saltwater intrusion	S		MT	
	Are water prices and water saving technologies used as a tool for water conservation?	WQ5 Water prices WQ6 Efficiency of water use	R		MT	

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

The indicator set on water quantity has linkage to the indicator set for agriculture where the activities relevant for agricultural water use are described (irrigated land) as well as some of the water indicators can be used to illustrate of over abstraction of water by agriculture. Climate change (precipitation and temperature) will affect water resources and there is therefore linkage to these indicators in the climate change indicator set. One of the impacts of climate change will be change in river flow such as the season for high flow, and it is the intension in the medium term to establish an indicator on river discharge. The water quantity set is providing indicators on the specific sectors water use.

### ***Reference to other international indicator sets***

Most of the proposed indicators on water quantity are comparable to indicators used by other international organisations such as the OECD core set of indicators and the indicators can also generally be found in national State of the Environment (SoE) or indicator-based reports. EEA has close cooperation with Eurostat on data collection in relation to indicators on water abstractions and water use by sectors. The data set used is based on information reported by countries in OECD/Eurostat joint questionnaire. Indicators related to state and impacts are less developed.

### ***Country comments***

The indicator set has been revised taking into account country comments in the 1st round consultation. The revised set now generally contains indicators that scored high priority by countries. Many countries commented that the individual indicators on water use by specific sectors should be merged in the indicator on sectoral water use. Some countries found indicators on water price and water efficiency less relevant, but they have been retained in the set because of the close relation to the policy objective of using water-pricing policies to provide adequate incentives for users to use water resources efficiently.

## **3.6.2 Nutrients and pollution with oxygen consuming substances**

The overloading of seas, coastal waters lakes, and rivers with nutrients (nitrogen and phosphorus) can result in a series of adverse effects known as eutrophication. In severe cases of eutrophication, massive blooms of algae (sessile and planktonic) occur. Some blooms are toxic and harmful to humans and the environment. As dead algae decompose, the oxygen in the water is used up; bottom-dwelling animals die and fish either die or leave the affected area. Increased nutrient concentrations can also lead to changes in the aquatic vegetation. The unbalanced ecosystem and changed chemical and microbial composition make the water body unsuitable for recreational (bathing water) and other uses, and the water becomes unacceptable as drinking water for human consumption.

In many catchments, runoff from agricultural land is the principal source of nitrogen pollution, especially if manure and fertiliser application have lead to too high surplus for agricultural soils. For coastal and marine areas, atmospheric deposition of nitrogen is an additional source of input. For phosphorus, households and industry tend to be the most significant sources, but in areas, where such point source discharges have already been significantly reduced, agriculture runoff becomes the major diffuse source for phosphorus.

High quantities of organic matter (microbes and decaying organic waste) in water lead to reduced river water chemical and biological quality, as well as impaired biodiversity of aquatic communities, and microbiological contamination affecting drinking water and bathing water quality. Sources of organic matter are discharges from wastewater treatment plants, industrial effluents and agricultural runoff.

### ***Policy objectives nutrients and organic pollution***

The main Directives, which address nutrients and organic pollution are the Nitrates Directive on diffuse nutrients pollution from agriculture and the Urban Waste Water Directive on point source nutrient and organic pollution from urban waste water treatment plants.

Further policy objectives are

- *To prevent further deterioration and protect and enhance the status of aquatic ecosystems and to ensure the progressive reduction of pollution of groundwater and prevent its further pollution<sup>44</sup>.*
- *To achieve levels of water quality that does not give rise to unacceptable impacts on, and risks to, human health (and the environment)<sup>45</sup>. (i.e. to achieve levels of microbiological contamination that do not give rise to significant impacts on or risks to human health (drinking water and bathing water quality) and nitrate in drinking water less than standards (25/50 mg NO<sub>3</sub>/l)).<sup>46</sup>*
- *A progressive reduction of anthropogenic inputs of organic matter and nutrient into the water environment where these inputs are likely to cause such eutrophication and depleted oxygen problems<sup>47</sup>.*

Proper and full implementation of the Urban Waste Water and of the Nitrates Directives will be an important positive factor in reducing eutrophication<sup>48</sup>. Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water and implement the measures necessary to prevent or limit the input of pollutants into groundwater.<sup>49</sup>

### ***Overview of indicators related to nutrients and organic matter pollution***

**Table 3.6.2** Nutrient and organic pollution indicators in relation to policy questions.

<b>Generic question</b>	<b>Policy question</b>	<b>Indicator title</b>	<b>DPSIR</b>	<b>S/M/L</b>	<b>Other issues/ sectors</b>
Are nutrients and organic pollution decreasing?	Are we reducing the impact of nitrate on our groundwaters?	WEU1 Nitrate in groundwater	S	ST	Agriculture
	Are nutrients concentrations in our surface waters decreasing?	WEU2 Nutrients in rivers	S	ST	Agriculture
		WEU3 Phosphorus in lakes	S	ST	
		WEU4 Nutrients in coastal waters	S	ST	
	Are indicators of pollution with organic matter decreasing ?	WEU5 BOD and Ammonium in rivers	S	ST	
Are discharges of nutrients and organic matter from socio-economic sectors	In which sector are discharges of organic substances and nutrients increasing/decreasing?	WEU6 Sources of nitrogen and phosphorus	P	MT	
		WEU7 Loads (riverine and direct) of nutrients to coastal waters	P	MT	

<sup>44</sup> Water Framework Directive Article 4

<sup>45</sup> 6EAP 5.2. Overall Environment-Health Objective & Drinking Water Directive

<sup>46</sup> Bathing Water Directive (76/160/EEC)

<sup>47</sup> Partly based on Marine Strategy (COM(2002) final)

<sup>48</sup> 6EAP 4. Nature and biodiversity – Protection of a unique resource - Marine environment (p. 35-36) & 5.6 Ensuring the Sustainable Use and High Quality of Our Water Resources (p.45-46)

<sup>49</sup> Water Framework Directive Article 4

decreasing?		APD13c Atmospheric deposition of nitrogen to marine and coastal waters	P		Air pollution
	Is water pollution caused by nitrates from agricultural sources being reduced?	AGRI2a Nutrient balance and surplus for agricultural soils	P		Agriculture
	Are discharges from urban wastewater treatment plants (households and small industries) being reduced?	WEU8 Emissions of organic matter	P	MT	
		WEU9 Emissions of nutrients from UWWT plants	P	MT	
Are we enhancing the status of the aquatic ecosystems and lowering the adverse effects of organic pollution and eutrophication?	Is the water intended for human consumption wholesome and clean?	WEU10 Drinking water quality	I	MT	
	Is bathing water quality improving?	WEU11 Bathing water quality	I	ST	(Tourism)
	Is the state regarding eutrophication of Europe's lakes, rivers and seas improving?	WEU12 Eutrophication indicators (chlorophyll, Secchi depth) in lakes	S	MT	
		WEU13 Chlorophyll in transitional, coastal and marine waters	S	ST	
		WEU14 Phytoplankton algae in transitional and coastal waters WEU14a Harmful algae blooms WEU14b Diatom/flagellate ratio	I	MT ST LT	
WEU15 Frequency of low bottom oxygen in coastal and marine waters	I	MT			
How effective are existing policies in reducing loading of nutrients and organic matter?	Is the Urban Waste Water Treatment Directive being implemented in Member States?	WEU16 Urban waste water treatment	R	ST	Tourism
	Is the Nitrates Directive being implemented in Member States including codes of good agricultural practices and action programmes?	AGRI17 Implementation of Nitrate Directive	R	ST	Agriculture

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

The indicator set on nutrients and organic pollution has linkage to the indicator set on agriculture, which is providing indicators on nutrient balances based on information on fertiliser use and manure production from livestock, and nitrate directive implementation, while indicators in the water set illustrate the impact of agricultural activities e.g. nitrate in groundwater. Air pollution is providing an indicator on deposition of nitrogen to water. The nutrient and organic pollution set could in the longer term provide indicators on waste water treatment in tourist areas and bathing water quality.

### ***Reference to other international indicator sets***

Most of the proposed indicators on nutrients and organic pollution are comparable to indicators used by other international organisations such as the OECD core set of indicators and the indicators can also generally be found in national State of the Environment (SoE) or indicator-based reports. Indicators on state and impact will generally be based on data collected from member countries via Eurowaternet, which also will take into account new or revised requirements when the water framework directive is implemented. EEA works closely together with the Regional Sea Conventions in the development of indicators. A joint workshop of EEA and Marine Conventions member countries on joint development of coastal and marine indicators was held in 2001.

### ***Country comments***

The indicator set has been revised taking into account country comments in the 1st round consultation. The revised set now generally contains indicators that scored high priority by countries. Indicator on nutrients balances has been shifted to the agricultural set due to relevant country comments of the overlap, and similarly the agricultural indicators on nutrients in water have been taken over by indicators in nutrient set.

### **3.6.3 Hazardous substances**

"Hazardous substances" means substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern<sup>50</sup>. Examples are heavy metal and some organic compounds. Elevated concentrations of hazardous substances have been found in many of our waters such as pesticides in groundwater, heavy metals in river and hazardous substances in coastal and more open marine water, in particular near point sources of pollution. Once there, some of these substances may accumulate in the sediment due to their persistence and bio-accumulate in aquatic/marine organisms through the food chain. Environmental Quality Standards and Drinking water standards have been set for concentrations in water to protect environment and human health. Foodstuff limit values have been set for concentrations in organisms used for human consumption. Ecological and health impacts of hazardous substances are complex and may include birth defects, cancers, and damage to nervous, reproductive and immune systems and may affect the different part of the ecosystem. For some marine organisms, such biological effects of certain groups of hazardous substances are monitored. Impacts of oil pollution are oiled beaches and oiled sea birds.

Manufactured chemicals play a key role in the provision of a large range of goods and services that support our lifestyles and economies, such as pesticides in agriculture or use of chemicals in industrial processes and households. During or after use the chemicals may be released and end up in the water environment. Emissions can be from point sources such as discharges from industries, wastewater treatment plants, landfills, contaminated land and storage tanks or accidents and oil discharges from ships and off-shore installations, or via air emissions from burning of fossils fuels or may be related to more diffuse sources such as use of pesticide in agriculture and households or application of anti-fouling paint on ships.

### ***Policy objectives hazardous substances***

The main policy objectives are

- *To achieve levels of water quality that does not give rise to unacceptable impacts on, and risks to, human health and the environment<sup>51</sup> (i.e. to achieve levels of contamination that do not exceed Environmental Quality Standards (EQS))*
- *Enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and*

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<sup>50</sup> Water Framework Directive Article 2

<sup>51</sup> 6EAP 5.6 Ensuring the Sustainable Use and High Quality of Our Water Resources (p.45-46)  
5.2. Overall Environment-Health Objective & Drinking Water Directive

losses of priority substances and ensure the progressive reduction of pollution of groundwater and prevent its further pollution, and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances.<sup>52</sup>

- By 2020, to ensure that chemicals are only produced and used in ways that does not pose significant threats to human health and the environment.<sup>53</sup>
- To eliminate pollution of the waters by the dangerous substances in the families and groups of substances in List I of the Annex and to reduce pollution by the dangerous substances in the families and groups of substances in List II.<sup>54</sup>
- To achieve a situation where the use and levels of pesticides in our environment do not give rise to significant risks to, or impacts on, human health and nature. This will include an overall reduction in the risk associated with the use of pesticides<sup>55</sup>.
- To substantially reduce operational discharges from oil installations and ships and eliminate illegal discharges from these sources by 2010<sup>56</sup>.

A number of initiatives are tackling these problems at global, European, national and regional levels, with some marine conventions providing binding legal frameworks and targeting zero emissions for several hazardous substances by 2020. The measures are generally focused on cessation or phasing-out of the most dangerous substances and a reduction in emissions from point sources (IPPC Directives) as compiled in the EPER and achieved through cleaner technologies.

### Overview of indicators related to hazardous substances

**Table 3.6.3** Hazardous substance indicators in relation to policy questions.

Generic question	Policy question	Indicator title	DPS	IRS/M/L	Other issues/sectors		
Are we reducing pollution of waters with hazardous substances?	Are we reducing the impact of pesticides/haz. substances on our groundwater?	WHS1 Hazardous substances in groundwater	S		Agriculture		
		WHS1a Pesticides in groundwater		MT			
		WHS1b other hazardous substances in groundwater		MT			
		Are we eliminating hazardous substance pollution of Europe's lakes, rivers and seas?	WHS2 Hazardous substances in rivers	S		MT	Agriculture
		Are some areas of Europe facing negative trends regarding hazardous substances?	WHS3 Hazardous substances in lakes	S		LT	
			WHS4 Hazardous substances in transitional, coastal and marine waters	S		(LT)	
WHS5 Hazardous substances in marine sediment	S		(LT)				
WHS6 Hazardous substances in marine organisms	S		ST				
Are discharges of hazardous substances from	In which sector are discharges of hazardous	WHS7 Loads of hazardous substances to coastal waters	P	MT			

<sup>52</sup> Water Framework Directive Article 4

<sup>53</sup> Sustainable Development Strategy p. 11

<sup>54</sup> Dangerous Substance Directive

<sup>55</sup> 6EAP 5.5 Pesticides

<sup>56</sup> Marine Strategy (COM(2002) final)

socio-economic sectors decreasing?	substances increasing/decreasing?	APD13e Atmospheric deposition waters of heavy metals and persistent organic pollutants (POPs) to marine and coastal waters	P		Air pollution
	Is there an overall reduction in the risk associated with the use of pesticides?	AGRI8a Use of pesticides AGRI8b Pesticide risk indicator	P	ST LT	Agriculture
	Are the discharges of hazardous substances from point sources being reduced?	WHS8 Emissions to water of hazardous substances from industry	P	MT	
		WHS9 Emissions to water of hazardous substances from urban waste water treatment plants	P	MT	
	Are we reducing operational discharges from oil installations and ships and eliminating illegal discharges from these sources?	WHS10 Discharge of oil from refineries and offshore installations	P	ST	Energy, transport
		WHS11 Accidental oil spills from marine shipping	P	ST	Energy, transport
		WHS12 Illegal discharges of oil at sea	S	ST	Energy, Transport
Are the levels of hazardous substances so that they do not give rise to unacceptable impacts on, and risks to, human health and the environment?	Are the water intended for human consumption (drinking water) wholesome and clean (free of hazardous substances such as pesticides and lead)?	WEU10 Drinking water quality	I	ST	
	Is the number of locations with less than good (ecological/chemical) status due to pollution by hazardous substances decreasing?	WHS13 Non-compliance with EU Environmental Quality Standards	I	LT	
	Are there indications of negative trends in the aquatic ecosystem due to contamination by hazardous substances?	WHS14 Biological effects of hazardous substances on organisms	I	LT	
		WHS15 Oiled seabirds	I	LT	
How effective are existing policies in reducing pollution with hazardous substances?	Are the emissions, discharges and losses of priority hazardous substances ceased or phased out?	<i>Indicators on Loads of hazardous substances into waters do also include policy evaluation</i>	R		

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

The indicator set on hazardous substances has linkage to the indicator set on agriculture, which is providing indicators on pesticide use, while indicators in the water set illustrate the impact of agricultural activities e.g. pesticide in groundwater. Air pollution is providing an indicator on deposition of hazardous to water. The hazardous substance set provides indicators on oil spills, oil discharges from refineries and off-shore installations to the energy and transport sets.

### ***Reference to other international indicator sets***

Compared to the previous water indicator sets the proposed indicators on hazardous substances are not so found in international sets. Some of the indicators can be found in State of the Environment (SoE) or reports from Regional Marine Conventions and member countries. EEA will use the experience gained here to direct its work on hazardous substance indicators. A joint workshop of EEA and Marine Conventions member countries on joint development of coastal and marine indicators was held in 2001.

### ***Country comments***

The indicator set has been revised taking into account country comments in the 1st round consultation. The revised set now generally contains indicators that scored high priority by countries. Some indicators have been merged. Due to relevant country comments the indicator on pesticide use has been shifted to the agricultural set of the overlap, and similarly the agricultural indicators on pesticide in water have been taken over by indicators in pesticide set. Some countries pointed out that there with the indicators on hazardous substances could be data problems. EEA is aware of the challenges of establishing indicators on hazardous substances in water and in aquatic organisms due to many different substances and methodological problems of establishing European and regional overview. However, we also see hazardous substance as an important water issue that has to be covered by the water set.

### **3.6.4 Ecological quality**

Populations of plants and animals in lakes, rivers and seas react to changes in their environment caused by changes in chemical water quality and physical disturbance of their habitat. Changes in species composition of organism groups like phytoplankton algae, macrophytes, bottom dwelling animals and fish can be caused by changes in the climate, but also indicate changes in water quality caused by eutrophication and organic pollution, hazardous substances and oil (see previous issues) and changes in their habitats caused by physical disturbance through damming, canalisation and dredging of rivers, construction of reservoirs, sand and gravel extraction in coastal waters, bottom trawling by fishing vessels etc. There are also biological pressures on populations, like the introduction of alien species through aquaculture and ballast water from maritime transport, and the stocking of rivers and lakes with fish for recreational angling.

It is generally difficult to determine a clear direct cause-effect relationship between observed changes in the ecosystem and the various chemical, physical and biological pressures that could have caused the effect. Ecological quality is therefore integrating all pressures and showing the overall status of the ecosystem.

### ***Policy objectives ecological quality***

The main policy objectives are:

- Water Framework Directive, which *aims at achieving 'good' surface water and groundwater status by 2015; and prevents further deterioration and protects and enhances the status of aquatic ecosystems;*<sup>57</sup>

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<sup>57</sup> Water Framework Directive Article 4

- Communication on a European Marine Strategy with the aim to protect the Marine Ecosystem: One of the actions foreseen in the 6EAP is the development of a Thematic Strategy for the Protection and Conservation of the Marine Environment (Marine Strategy). Therefore, the overarching objectives are (i) *sustainable and healthy European seas and their ecosystems* and (ii) *sustainable exploitation of renewable marine resources of these seas*<sup>58</sup>.
- Green Paper on Common Fisheries Policy (Ecosystem approach). – SDS: *The Common Fisheries Policy should promote the sustainable management of fish stocks in the EU and internationally, while securing the long-term viability of the EU fishing industry and protecting marine ecosystems*<sup>59</sup>. - SDS: *Improve fisheries management to reverse the decline in stocks and ensure sustainable fisheries and healthy marine ecosystems, both in the EU and globally*.<sup>60</sup>
- Biodiversity Convention: to halt biodiversity decline by 2010. – SDS *Protect and restore habitats and natural systems and halt the loss of biodiversity by 2010*.<sup>61</sup>

The WFD introduce for all surface waters a general requirement for ecological protection, and aims at "good ecological status" for all surface water. Good ecological status is defined in terms of the quality of the biological community based on quality elements such as invertebrate and fish fauna and composition and abundance of aquatic flora, the hydrological characteristics and the chemical characteristics; and are specified as allowing only a slight departure from the biological community, which would be expected in conditions of minimal anthropogenic impact.

As the WFD Framework Directive will be implemented in the coming 10-15 years indicators describing the ecological quality of waters will be available over time. However, much information at member countries level does already exist on the biological quality elements such as benthic invertebrates in rivers and macrophytes in lakes and coastal waters. This information may in the meantime be collated and presented as indicators to illustrate aspects of the ecological quality of European surface waters. In addition, other ecological indicators illustrate biological pressures such as introduction of alien species and relations to impact indicators of fishery and climate change.

### **Overview of indicators related to ecological quality**

**Table 3.6.4** Ecological quality indicators in relation to policy questions.

<b>Generic question Policy question</b>	<b>Indicator title</b>	<b>DPSI R</b>	<b>S/M/L</b>	<b>Other issues/ sectors</b>
Are we enhancing the status of the aquatic ecosystems?	WEC1 Biological quality of transitional waters WEC1a Phytoplankton WEC1b Benthic invertebrate fauna WEC1c Macrophytes and macroalgae WEC1d Fish WEC1e Classification of transitional waters (eventually ecological status classification)	S	LT	Fisheries
	WEC2 Biological quality in coastal waters WEC2a Phytoplankton WEC2b Benthic invertebrate fauna WEC2c Macrophytes and macroalgae WEC2d Classification of coastal waters (eventually ecological status classification)	S	LT	

<sup>58</sup> Marine Strategy (COM(2002) final)

<sup>59</sup> EU Sustainable Development Strategy p. 6

<sup>60</sup> EU Sustainable Development Strategy p. 17

<sup>61</sup> EU Sustainable Development Strategy p. 12

	WEC3 Aquatic habitat quality WEC3a Quality of river habitats WEC3b Quality of lake habitats WEC3c Quality of transitional waters WEC3d Quality of coastal habitats	S	LT	
	WEC4 Biological quality in rivers WEC4a Phytoplankton/phytobenthos WEC4b Benthic invertebrates WEC4c Macrophytes WEC4d Fish WEC4e Classification of rivers (eventually ecological status classification)	S	LT	
	WEC5 Biological quality in lakes WEC5a Phytoplankton/phytobenthos WEC5b Benthic invertebrates WEC5c Macrophytes WEC5d Fish WEC5e Classification of lakes (eventually ecological status classification)	S	LT	
	WEC6 Biological quality of marine waters CC9f Plankton distribution change  CC6b North Atlantic Oscillations	S	LT ST  ST	Fisheries Climate change Climate change
	WEC7 Introduced and invasive aquatic species BDIV7d Introduced species in fresh surface waters WEC7a Introduced species in marine and coastal waters	I	ST ST  ST	Biodiversity Fisheries
How effective are existing policies in improving the ecological quality?	WEC8 Implementation of EU Water Policies	R	MT	
	TECO3 Progress in coastal zone management (Integrated Coastal Zone Management)	R	MT	Terrestrial

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

There is some linkage between the ecological quality indicators and the indicators developed for biodiversity (see section 3.4). There is also some linkage between the ecological quality of transitional, coastal and marine waters and the impact indicators on fishery: FISH4 Fisheries impact on habitats and ecosystems, FISH4a Physical damage to habitats, FISH4b Fisheries effects on benthos, FISH4c Fisheries effects on ecosystem structure, FISH4d Fish catches in large marine ecosystems, FISH5 Accidental by catch: birds, mammals, and turtles. For all ecological quality of all surface waters, there is a linkage to impacts of aquaculture: FISH6 Impact of aquaculture, FISH6a The number of accidentally introduced non-indigenous species versus the production of imported species per area/water body type, FISH6b Aquaculture Impact on habitats, birds and mammals, FISH6c Aquaculture impact on benthos, FISH6d Aquaculture impact on genetic resources.

### ***Reference to other international indicator sets***

The indicator set on ecological quality relates closely to the monitoring and reporting in relation to Water Framework Directive. The process of WFD implementation will be followed closely and will affect the indicator development.

### ***Country comments***

The indicator set has been revised taking into account country comments in the 1st round consultation. EEA is aware of the challenges of establishing indicators on ecological quality due non standardised monitoring and several methodological problems aggregation of biological information at European and regional level. However, we also

see the development in relation to the WFD as important and it has to be covered by the water indicator set. The indicators in relation to ecological quality, in particular, will be established in close connection with the development in relation to the WFD implementation.

#### ***Work on ecological and biological indicators***

The development of ecological quality indicators as well as hydro morphological indicators is under development by ETC Water in 2002 and 2003. It will be closely correlated to the Water Framework Directive ecological working group activities. When the testing of ecological indicators has shown the European level of data needs and aggregation, Eurowaternet guidelines for such biological data will be developed together with the necessary Waterbase component. For the Marine environment, parallel developments of ecological quality indicators are expected to take place in relation to the Marine Strategy. Parts of the EEA aquatic biodiversity indicator core set will be developed in this context as well.

#### ***EEA current and future work on water core set***

EEA and its Topic Canters have developed the water core set during the past 3-4 years. During 2002 about 60 fact sheets for the proposed indicators have been developed by the ETC Water consortium taking into account the Eurowaternet priority data flow and its data in Waterbase and Marinebase (future Waterbase transitional, coastal, marine). Based on these fact sheets, the first indicator based report on water has been produced by ETC Water and EEA. An EIONET review of the fact sheets and the related report resulted in quite positive responses by member countries. This report will be launched in June 2003 at the Water Directors meeting. The fact sheets will be published at EEAs web site.

It is planned to update the fact sheets of the revised water core set annually based on the Eurowaternet priority data flow and data from third parties like Eurostat, Marine Conventions, FAO etc., and to publish them subsequently on the web. EEA will adapt the Eurowaternet guidelines for dataflow to fit the monitoring requirements of the Water Framework Directive. A discussion of the necessary changes is foreseen at the EIONET workshop in May 2003.

For some of the indicators, no regular data flows are available yet. These are especially the long-term demonstration indicators and ecological quality indicators, which depend on dataflow generated from Water Framework Directive monitoring. These indicators will be developed and tested during 2003/2004 and regular dataflows are only anticipated, when the methodology and presentation of the indicators has been agreed. Also indicators on emissions and water quantity need further development and the EPER data collection as well as Water Framework Directive pilot river basin studies will help to develop these further.

Finally, the 6th Environmental Action Programme Marine Strategy foresees annual indicator based reporting on implementation of the objectives and actions of the communication on the Marine Strategy. It is likely, that the water core set will be used for this reporting obligation. Most actions can be covered by indicators of the water core set, but some actions might need additional indicators, not covered by any of the present sector and issue core sets. Here, Marine Conventions could play an important role, by compiling and providing the relevant data sets as well as regional assessment.

### **3.7 Waste and material flows**

#### ***Description of the issue***

The resource productivity of the EU's economy is improving. Total waste generation seems to have stabilised in many EEA member countries. This is mainly due to a stabilisation or even a decrease in the generation of industrial and mining waste in those

countries, probably because of the growing importance of external trade and a reduction of domestic resource extractions. In other words moving the industrial and mining waste problem to countries outside the EU. Within the EU, economic growth and changes in consumer and commercial behaviour have led to an increase in the generation of municipal waste, including packaging waste. In the most advanced countries a shift from landfilling to recycling can be observed. However, many countries still have a long way to go to manage materials and waste streams in a more sustainable way.

### ***Main Policy Objectives***

The policy objectives and targets identified in the EU Sustainable Development Strategy (SDS), the Sixth Environmental Action Programme (6EAP), the EU Waste Strategy and EU waste directives have been the context within which proposals have been considered for indicators on waste and material flows.

The SDS<sup>62</sup> specifically states that ‘*waste volumes have persistently grown faster than GDP*’ and a headline objective is to ‘*break the link between economic growth, the use of resources and the generation of waste.*’

The 6EAP has a priority area on ‘Sustainable use and management of natural resources and wastes’<sup>63</sup>. The 6EAP identifies the following objectives within this priority area:

- *Aiming at ensuring that the consumption of resources and their associated impacts do not exceed the carrying capacity of the environment and breaking the linkages between economic growth and resource use. In this context the indicative target to achieve a percentage of 22% of the electricity production from renewable energies by 2010 in the Community is recalled with a view to increasing drastically resource and energy efficiency;*
- *Achieving a significant overall reduction in the volumes of waste generated through waste prevention initiatives, better resource efficiency and a shift towards more sustainable production and consumption patterns;*
- *A significant reduction in the quantity of waste going to disposal and the volumes of hazardous waste produced while avoiding an increase of emissions to air, water and soil;*

Encouraging re-use and for wastes that are still generated: the level of their hazardousness should be reduced and they should present as little risk as possible; preference should be given to recovery and especially to recycling; the quantity of waste for disposal should be minimised and should be safely disposed of; waste intended for disposal should be treated as closely as possible to the place of its generation, to the extent that this does not lead to a decrease in the efficiency in waste treatment operations.

- With regard to specific waste policies, the Commission initially adopted a Community Strategy for Waste Management in 1989<sup>64</sup>. The strategy sets out four strategic guidelines and waste hierarchy: Prevention; recycling and recovery; optimisation of final disposal and regulation of transport, together with a number of recommended actions. It states that ‘...the key objective of any Community waste policy based on the precautionary and preventive principle must be to prevent the generation of waste and, furthermore, to reduce the content of hazardous materials in waste’

Furthermore, a large number of directives have been adopted to regulate waste prevention and management in EU Member States. A few examples of objectives, qualitative targets and intentions of the directives are outlined below:

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<sup>62</sup> Reference SDS

<sup>63</sup> Reference to 6EAP

<sup>64</sup> Reference to Community Strategy for Waste Management  
<http://www.europa.eu.int/comm/environment/waste/index.htm>

- Waste Incineration Directive<sup>65</sup>: ‘The aim of this Directive is to prevent or limit as far as practicable negative effects on the environment, in particular pollution by emissions into air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste’ (.
- End-of-Life Vehicles Directive<sup>66</sup>: ‘This Directive lays down measures which aim, as a first priority, at the prevention of waste from vehicles and, in addition, at the reuse, recycling and other forms of recovery of end-of-life vehicles and their components so as to reduce the disposal of waste...’
- Packaging Directive<sup>67</sup>: ‘Member states shall, where appropriate, encourage the use of materials obtained from recycling packaging waste for the manufacturing of packaging and other products’ (CEC 1994b).
- Sewage Sludge Directive<sup>68</sup>: ‘The following rules shall be observed when using sludge: the sludge shall be used in such a way that account is taken of the nutrient needs of the plants and that the quality of the soil and of the surface and ground water is not impaired’.
- Batteries Directive<sup>69</sup>: ‘Member states shall take appropriate measures to ensure that spent batteries and accumulators are collected separately with a view to their recovery or disposal’.
- Waste Oil Directive<sup>70</sup>: ‘Member States shall further ensure that the waste oils used as fuel do not constitute a toxic and dangerous waste...and do not contain PCB/PCT in concentrations beyond 50 ppm’ .

Early phases of Community waste legislation focused on clearly identified problems, including hazardous waste shipments, PCB disposal and waste from the titanium dioxide industry. The legislation reflected the declared aim of the Treaty of approximation of national regulation affecting directly the common market. Later amendments of the Treaty, particularly the Single European Act (1987) and the Maastricht Treaty (1992) introduced a more general objective of protecting and improving the quality of the environment. This general approach was specified in the environment action programmes as documented by the 6EAP.

### ***Table with revised set indicators***

The indicator list on waste and material flows has been split into three tables related to the following generic policy questions:

- Are we reducing the total material resource use and the related potential pressures on the environment and waste generation?
- Are we preventing the generation of waste? and
- Are we managing our waste more sustainable?

**Table 3.7.1:** Material flow indicators related to policy questions.

<b>Policy question</b>	<b>Indicator title</b>	<b>DPSIR</b>	<b>S/M/L</b>	<b>Other issues/ sectors</b>
I.a) Are we reducing the use of the resources of concern?	WMF1a Total Material Requirement (TMR) by main resource categories		MT	
	WMF1b Direct Material Input (DMI)		ST	
	WMF1d Direct Material Consumption (DMC)		ST	

<sup>65</sup> [Directive 2000/76/EC](#) on incineration of waste

<sup>66</sup> [Directive 2000/53/EC](#) on end-of- life vehicles

<sup>67</sup> [Directive 94/62/EC](#) on packaging and packaging waste

<sup>68</sup> Directive 86/278/EEC on agricultural use of sewage sludge

<sup>69</sup> [Directive 75/439/EEC](#) on the disposal of waste oils

<sup>70</sup> [Directive 91/157/EEC](#) on batteries and accumulators

I.b) Are we decoupling resource use from economic growth?	WMF1c Resource productivity (GDP/DMI)		ST	
I.c) Are we reducing environmental pressures associated with the extraction of resources?	WMF3 Waste generation from total resource extraction		MT	
I.d) How effective are policies aimed at using resources more sustainable?	WMF4 Indicator of "shifting environmental burden" <sup>71</sup>		MT	

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<sup>71</sup> This indicator should provide insight into the recent tendency in the industrialised nations to diminish certain activities (e.g. mineral extraction, manufacturing of semi-processed products etc.), and meet the demand by imports rather than by domestic production. This may result in preventing related environmental problems from occurring in the consumer country, as the most polluting activities take place in the exporting country (i.e., burden shifting).

**Table 3.7.2:** Waste generation indicators related to policy questions.

Policy question	Indicator title	DPSIR	S/M/L	Other issues/ sectors
II.a) Is the quantity of priority waste streams (streams 'targeted' by EU policy documents) decreasing?	WMF5 Total waste WMF5a Total generation of waste		MT	
	WMF6 Municipal waste WMF6a Generation of municipal waste WMF6b Waste generated by tourism		ST LT	Tourism
	WMF7 Generation of industrial waste		MT	
	WMF8 Generation of construction and demolition waste		LT	
	WMF9 Generation of packaging waste		ST	
	WMF10 Generation of waste from electrical and electronic equipment		LT	
	WMF11 Generation of waste from end-of-life vehicles		ST	Transport
	WMF12 Generation of waste oils and tyres		ST/MT	Transport
	WMF13 Generation of hazardous waste		MT	
	II.b) Are we de-coupling waste generation from economic growth?	WMF5b Waste intensity (total waste generated per unit of GDP)		MT
II.c) Is the content of dangerous substances in priority waste streams decreasing?	WMF14 Content of dangerous substances in products which end up in priority waste streams (ratio to total material content)		LT	
II.d) How effective are policies aimed to prevent waste generation?	<i>Indicator to be defined</i>			

**Table 3.7.3:** Indicators on management of waste related to policy questions?

Policy question	Indicator title	DPSIR	S/M/L	Other issues/ sectors
III.a) Are we improving the recovery of waste?	WMF15 Waste recovery by operation categories and waste stream: Sewage sludge, waste tyres, paper and cardboard, glass, municipal waste and packaging waste		MT/LT	
III.b) Are we disposing waste in a sustainable way?	WMF16 Waste disposal WMF16a Waste disposal (total and by operation categories) WMF16b Waste disposal specific waste streams		MT MT/LT	
	TEP4 Application of sewage sludge on agricultural land		LT	Terrestrial, agriculture

III.c) Are we reducing the environmental pressures from waste recovery and disposal?	CC5j GHG emissions from waste recovery and disposal		LT	Climate change
	WMF17 Land use associated with waste recovery and disposal WMF17a Land use for landfills		LT	Terrestrial
	WMF18 Leachate formation from landfills TEP1c Risks of contamination of surface and groundwater from contaminated sites		LT	Terrestrial
III.d) Is the transportation of waste being minimised?	WMF19 Total amount of waste transported for disposal (tonne km)		LT	
	WMF20 Transboundary movements of waste WMF20a Transboundary movements of hazardous waste WMF20b Transboundary movements of total waste		MT LT	
III.e) Are the current and future (planned) waste management capacities sufficient?	WMF21 Treatment capacity WMF21a Treatment capacity (amount of waste) WMF21b Treatment capacity number of facilities		LT MT	
	III.f) What are the costs and benefits of waste management?	WMF22 Waste management costs per ton by treatment category	LT	
III.g) How effective are policies aimed at managing waste more sustainable?	<i>Indicator to be defined</i>			

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

WMF indicators are on a few indicators related to other issues of EEA core set. Emissions from waste management facilities (landfills, treatment plants and recycling activities) contribute to the GHG total emissions and therefore to the overall air quality (link to air/climate change indicators). Sewage sludge (priority waste stream) has to be linked with issues such as water (generation of sewage sludge from waste water treatment plants) and terrestrial environment (disposal on land and relevant environmental impacts).

### ***Reference to other international indicator sets***

Both European Commission (Eurostat) “Structural Indicators” and The OECD “Environmental Indicators” reflect the issue of waste and material flows based on available data from joint questionnaires. The coherence to the hereby proposed set of indicators are clear. Although the list of indicators are structured different. Both structural indicators and the OECD indicators concentrate on the indicators with available

data: municipal waste and treatment options, hazardous waste generation as top of the information.

### ***Country comments***

Comments have been received from 31 parties including other stakeholders than countries. Some comments are in contradiction to other comments. Other comments are concerning specification of particular indicators giving amendments or ideas for improvement and finally a lot of comments concern the data availability at the present stage.

The overall structure of the core set have not changed a few indicators have been omitted and a few have been added, comments on the individual indicators will be used for adjusting the description sheets. Concerning the availability of data this is still a problem for a number of proposed indicators of mid and long term, the problem should be less evident after implementation of waste statistics regulation in year 2006 (long term perspective).

Within this year's work programme the following activities will be undertaken in order to further develop the indicator framework, both as new/up-dated sets as well as the establishment of relevant methodologies: A technical paper on possible frameworks, methodologies, and indicators for the assessment of environmental pressures related to waste management and how these can be linked to impacts.

- Refined core sets of indicators for waste and material flows, including the identification and development of those indicators that can be produced for the Thematic Strategies of the 6EAP (this task is to be carried out within the framework of development of the EEA core indicator set).
- A proposal for a methodology on how to produce policy response information.
- Production of training/guiding material on data collection, harmonisation classifications for the production of EEA core sets of indicators.
- Support to improving the data flows, and simplifying reporting obligations related to the Waste Statistics Regulation (WSR).

Furthermore the proposed set of indicators will be amended taking the comments and suggestions of the EEA-consultation into account.

### ***EEA current and future work on indicators***

- Within this year's work programme the following activities will be undertaken in order to further develop the indicator framework, both as new/up-dated sets as well as the establishment of relevant methodologies: A technical paper on possible frameworks, methodologies, and indicators for the assessment of environmental pressures related to waste management and how these can be linked to impacts.
- Refined core sets of indicators for waste and material flows, including the identification and development of those indicators that can be produced for the Thematic Strategies of the 6EAP (this task is to be carried out within the framework of development of the EEA core indicator set).
- A proposal for a methodology on how to produce policy response information.
- Production of training/guiding material on data collection, harmonisation classifications for the production of EEA core sets of indicators.
- Support to improving the data flows, and simplifying reporting obligations related to the Waste Statistics Regulation (WSR).

Furthermore the proposed set of indicators will be amended taking the comments and suggestions of the EEA-consultation into account.

By the end of 2003/beginning of 2004, a report on sewage sludge will be produced as a cross-cutting activity (WMF,WTR,TE) in which the methodological framework for the development of relevant sewage sludge indicators will be developed.

## 4. Sector-environment indicators

### 4.1 Introduction

This chapter describes the sector-environment indicators in the EEA core set: agriculture, energy, fishery, transport and tourism. It is structured into the following sections:

1. Brief description of sector activities (driving forces) and how these activities affect the environment (pressures);
2. Overview of the main EU policy objectives and measures;
3. Indicator table showing how the indicators relate to generic and more specific policy questions. The policy questions group the indicators into five sections:
  - a. Is the environmental performance of the sector improving? (pressure indicators)
  - b. Is the sector efficiency improving? (pressure/driving force indicators)
  - c. How is the size and shape of the sector developing? (driving force indicators);
  - d. What is the progress in economic integration? (response indicators)
  - e. What is the progress in management integration? (response indicators)

For some issues the overview table may be structured different. Relevant indicator from other issues or sectors are listed with a lighter colour to illustrate that they are relevant for this sector but being produced in the other list.

4. Linkage to other EEA indicator lists;
5. Relation to relevant international indicator activities related to the specific sector; including relevant cooperation between EEA and the international organisation;
6. Use of country comments from the first consultation in revising the core set;

Ongoing EEA activities and foreseen activities in relation to this specific sector set such as indicator-based reports; data flow required for indicator development and other activities related to the indicator set.

### 4.2 Agriculture

#### *State and impact*

Europe's countryside has been shaped by agriculture over centuries. Nearly all our cultural landscapes arose from agricultural practices and 50 % of all species in Europe depend on agricultural habitats. European agriculture is still very diverse, ranging from large and specialised commercial holdings to part-time farming using mainly traditional practices. Nevertheless, agricultural modernisation and intensification have led to significant impacts on the environment, in particular during the last 50 years.

The mechanisation of agriculture has facilitated the elimination of many landscape elements and hedgerows, the drainage of wetlands and the ploughing up of semi-natural grasslands. The species richness and habitat diversity of nearly all farmland has also declined due to higher pesticide and fertiliser use and the simplification of crop rotations.

Nutrient surpluses arising from high fertiliser use and big livestock populations lead to increased nitrate levels in groundwater and the eutrophication of surface water bodies. High applications of mineral and organic fertilisers as well as livestock as a direct source cause significant emissions of ammonia and greenhouse gases from agriculture, with 94% and 10% of total EU emissions, respectively. The area of irrigated agricultural land has grown substantially, in particular in southern Europe. This results in increasing total water consumption by agriculture and is regionally affecting ground water tables negatively. Increased field sizes, the elimination of landscape elements and modern

agricultural practices can lead to an increased risk of soil erosion. This in turn can have negative effects on soil fertility and quality.

### ***Driving forces and pressures***

Environmental pressures from agriculture are the result of long-term trends that affect the sector. Declining product prices relative to the price of farm inputs, buildings, machinery and labour have provided a strong incentive for the concentration and specialisation of farms to produce more output at less cost. Consequently, the number of farms has decreased along with the numbers employed and the emphasis is increasingly on large-scale units focusing on a limited range of products. This has often been accompanied by intensification in the use of land, fertilisers, pesticides, energy, irrigation and drainage. The trend towards intensification over the past decades has also been driven by the EU Common Agricultural Policy (CAP) in the effort to provide adequate incomes to farmers and create a competitive farming industry. However, successive CAP reforms have increased financial support for agri-environment schemes and other environmental policy measures since the late 1980s. As such CAP policy instruments can be key tools for supporting positive environmental management by farmers there is considerable interest in analysing their effectiveness and overall share of the CAP budget.

### ***Main policy objectives***

The re-orientation of the CAP is also the focus of various policy documents that deal with the interaction between agriculture and environment at EU level. Three policy documents have been analysed in this context.

- 1) The sixth Environment Action Programme<sup>72</sup> sets various objectives relevant for the sector. These include the elaboration of a thematic strategy on the sustainable use of pesticides, the strengthening of agri-environment measures under the CAP, 'encouraging reforms of subsidies that have considerable negative effects on the environment', 'encouraging more environmentally responsible farming [...] and agro-biodiversity in future reviews of the CAP', and various other general objectives of relevance to farming.
- 2) The Agricultural Council Integration Strategy under the Cardiff process (European Council, 1999<sup>73</sup>) builds largely on using environmental elements of the Agenda 2000 CAP reform. It stresses the key role of Member States in implementing such policy integration measures. The Strategy also sets general objectives for water, agro-chemicals, land use and soil, climate change and air quality, as well as landscape and biodiversity.
- 3) The Biodiversity Action Plan for Agriculture<sup>74</sup> is part of the Community response to its commitment under the Convention on Biological Diversity (CBD). The document reviews in detail the link between agriculture and biodiversity in Europe and sets out various policy measures that could be used to the benefit of biodiversity on farmland, including the genetic diversity of agricultural livestock and crops. A key focus is again on using Agenda 2000 policy instruments, in particular the rural development regulation (1257/1999). The Action Plan sets a considerable number of objectives for biodiversity protection in agriculture and also proposes relevant indicators.

### ***Policy questions***

The (general) objectives spelled out in the above documents link to the policy questions and indicators proposed for the agriculture core set. A detailed review of linkages cannot

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<sup>72</sup> Reference to 6EAP

<sup>73</sup> Council of the European Union (1999) Report: agriculture and environment. Council strategy on the environmental integration and sustainable development in the common agricultural policy established by the Agricultural Council. Document 13078/99. CEC, Brussels.  
<http://register.consilium.eu.int/pdf/en/99/st13/13078en9.pdf>

<sup>74</sup> Commission of the European Communities - CEC (2001), Biodiversity Action plan for Agriculture. COM(2001) 162 final, Volume III. Communication from the Commission to the Council and the European Parliament. [http://biodiversity-chm.eea.eu.int/convention/cbd\\_ec/strategy/agri/ENV-2000-681-EN-02-02-AGRI.pdf](http://biodiversity-chm.eea.eu.int/convention/cbd_ec/strategy/agri/ENV-2000-681-EN-02-02-AGRI.pdf)

be provided in this brief text but is available on request. The proposed indicators are grouped into five different sets of questions:

- The first policy questions focus on the environmental impact of the agricultural sector. What is the trend of emissions from agricultural production that negatively affect air, water and soil? What is the impact of agriculture on environmental resources, such as soils and (ground) water reserves? What is the relationship between agriculture and landscapes and biodiversity?
- The second policy question addresses the resource use efficiency of agriculture. Are input and resource use as well as emissions declining relative to total agricultural production? Does the sector contribute to the production of renewable energy?
- The third policy question tackles the structural, technological and management changes in the sector. What are the main changes in terms of farm specialisation or diversification? Are new types of farming emerging, such as organic production or farm systems reliant on genetically modified crops? Does farming move into new areas, such as the production of renewable energy?
- The fourth question looks at environmental policy integration in the sector by analysing policy and market incentives available to farmers. Does agricultural support under the CAP encourage environmentally friendly farm management, for example via agri-environment schemes? Is the market share of organic farming large enough to influence agricultural production systems significantly?
- The fifth question focuses on the use of environmental management tools at farm and policy level. Are farmers adopting environmentally friendly land management methods? What is their level of environmental training? How successful are we in using different policy instruments to encourage or enforce environmental policy goals on farmland?

**Table with revised set of indicators**

The table below lists 30 indicators grouped by policy questions. 11 of these indicators can be developed in the short term, 15 in the medium term and 4 in the long term only. 19 of the indicators (and sub-indicators) are under the direct responsibility of the agriculture group in terms of data flow and fact sheet development. 11 indicators will be developed as part of other indicator sets but feed into the assessment of the environmental impact of agriculture.

**Table 4.2.1** Agricultural indicators in relation to policy questions.

Generic question	Policy question	Indicator title	DPSIRS/M/L	Other sectors/sectors		
Is the environmental impact of agriculture improving?	How are emissions from agriculture developing?	APE7b Agriculture ammonia emissions		ST	Air pollution	
		AGRI1 Surface nutrient balance		ST	(Water Terrestrial)	
		CC5i Agriculture GHG emissions		ST	Climate change	
	What is the impact of agriculture on key environmental resources?		TES1a Soil erosion		LT	Terrestrial
			WQ3a Ground water levels		MT	Water
			TES2 Loss of organic matter content of soils		MT	Terrestrial
			WEU1/WEU2/WHS1/WHS2 Nitrates/pesticides in water		ST	Water
			TELC5 landscape diversity		MT	Terrestrial
	What is the link of agriculture to landscapes and biodiversity?		BDIV2c Species richness		MT	Biodiversity
			BDIV1 Habitats and biodiversity		MT	Biodiversity
AGRI4 High nature value farming areas				MT	Biodiversity	
Is the efficiency of the sector	Is the resource use efficiency of agriculture	AGRI1 Agriculture water consumption		ST	Water	
		AGRI7 Fertiliser consumption		ST	(Water)	

improving?	improving?	AGRI8a Use/consumption of pesticides		ST	Water
		AGRI8b Pesticide risk indicator		LT	
How is the size and shape of agriculture developing (including technological advances)?	What are key trends in agricultural production systems?	BDIV4 Genetic diversity		MT	Biodiversity
		AGRI5 Production of renewable energy		MT	(Energy)
		AGRI6 Organic farming area		ST	
		AGRI9 Cropping/livestock patterns		MT	
		AGRI10 Diversification		MT	
		TELC4 Land cover change		MT	Terrestrial
What is the progress in economic integration?	What policy and market incentives are available to encourage environmentally friendly farm management?	AGRI13 Area enrolled in agri-environment schemes		ST	
		AGRI14 Organic farming market share		LT	
		AGRI15 Environmental elements of CAP spending		ST	
What is the progress in management integration?	How widespread is the use of environmental policy measures and farm management knowledge?	AGRI16 Farm management practices		LT	
		BDIV13b Agricultural land in designated areas		MT	Biodiversity
		AGRI17 Nitrate Directive Implementation		ST	Water
		AGRI11 Use of cross-compliance instrument		MT	
		AGRI18 Environmental training of farmers		LT	

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

Agricultural land use impacts on several environmental media as well as on species and landscape diversity. Consequently, the agriculture set has linkages to various other indicator sets. The Air and Climate Change team provides indicators and relevant information on agriculture air emissions. The ETC and topic team on Terrestrial Environment are responsible for indicators related to soil and landscape/land cover; while the ETC Water develops the indicators ‘Ground water levels’ and ‘Nitrates/Pesticides in Water’. The ETC Nature Protection and Biodiversity has responsibility for the indicators on genetic diversity, species richness and farmland in Natura 2000 areas. The energy team is likely to help with data on the production of renewable energy in agriculture.

At the same time, agriculture indicators feed into the indicators of other teams. This is the case for fertiliser and pesticide consumption, surface nutrient balance, and Nitrate Directive implementation. Indirect links or at least relevant information for the assessment of different environmental issues can also be identified for indicators, such as high nature value farming areas, area of organic farming, pesticide risk, or area enrolled in agri-environment schemes.

## ***Reference to other international indicator sets***

### ***OECD<sup>75</sup>***

The OECD was the first international organisation to tackle the elaboration of agri-environmental indicators in a systematic way and has contributed substantially to conceptual development and indicator definitions since the mid 1990s. It continues to do important work in the field through its Joint Working Party on Agri-environmental indicators, indicator expert meetings and activities of the OECD secretariat. Many of the EEA member countries are also OECD members. Thus, a coordination of the proposed core indicator set on agriculture with the agri-environmental indicators elaborated by the OECD was a key consideration in drawing up the EEA proposal. A comparative document showing the link between the OECD and EEA sets can be provided on request.

It has to be acknowledged that the OECD driving force-state-response model (DSR) is not fully compatible with the EEA DPSIR model. In addition, while the OECD has an international focus the remit of the EEA only covers Europe. EEA response indicators focus on EU policies and go beyond the analytical approach taken by the OECD. Nevertheless, where similar issues are being investigated (such as use of inputs, impacts on soil and water, air emissions, or landscapes and biodiversity) a close match has been achieved.

### ***European Commission***

The European Commission has proposed 35 agri-environmental indicators in two Communication documents (COM(2000) 20<sup>76</sup> and COM(2001)144<sup>77</sup>). The four Directorates General Agriculture, Environment, Eurostat and Joint Research Centre as well as the European Environment Agency have signed a Memorandum of Understanding (MoU) for cooperation on agri-environmental indicators to develop the 35 indicators listed in the Communications. One outcome of this MoU is the IRENA operation for the development of agri-environmental indicators at EU level as a joint activity between the same partners, running until the end of 2004. It is jointly financed by DG Agriculture and DG Environment, builds on the contribution of all five partners, and managed is by the EEA. The IRENA operation has three key outputs:

- a) data sets for the 35 indicators (as far as data are available),
- b) indicator report on the 35 indicators listed in the Communications, and
- c) indicator based assessment on the integration of environmental concerns into agriculture policy.

The joint activities in the MoU, the need for streamlining of reporting and an agri-environmental analysis make it advisable to include 21 of the 35 IRENA indicators (plus three partially) in the EEA agriculture core set, in particular where there also is a strong overlap with the OECD list. We have not included those indicators from the Communications that were conceptually not yet fully developed or that could be merged without too much loss of information (to limit reporting needs as far as possible). The EEA list expands on the IRENA list with regard to emerging issues, such as GMOs and pesticide risk, and with regard to policy response indicators, such as environmental elements of CAP spending, Nitrate Directive implementation or use of cross-compliance. We believe that the latter may also be useful as part of the indicator based reporting on policy integration under the IRENA operation.

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<sup>75</sup> OECD Agri-environmental indicators homepage <http://www.oecd.org/EN/home/0,,EN-home-150-nodirectorate-no-no-no-1,00.html>

<sup>76</sup> COM (2000) 20 final. Communication from the Commission to the Council and the European Parliament. Indicators for the integration of environmental concerns into the Common Agricultural Policy

<sup>77</sup> COM (2001) 144 final. Communication from the Commission to the Council and the European Parliament. Statistical information needed for indicators to monitor the integration of environmental concerns into the Common Agricultural Policy

### *International and research activities*

Next to the OECD, the international organizations FAO and UN-ECE are also active in the development of agri-environment indicators. However, due their international focus, approach taken or stage of development these indicator sets appeared less relevant in the deliberations on the agriculture core set of indicators.

Within Europe many different research projects and national level studies contribute substantially to the understanding and development of agri-environmental indicators. The EEA has sought to benefit from these activities, also in the context of the IRENA operation. An overview of relevant studies is available on request. In addition, the table below provides an (incomplete) list of national and international websites on agri-environmental indicators.

#### International and national agri-environmental indicator initiatives

OECD	OECD Agri-environmental indicators homepage <a href="http://www.oecd.org/oecd/pages/home/displaygeneral/0,3380,EN-home-150-nodirectorate-no-no-no-1,00.html">http://www.oecd.org/oecd/pages/home/displaygeneral/0,3380,EN-home-150-nodirectorate-no-no-no-1,00.html</a>
UK	Towards sustainable agriculture: a pilot set of indicators <a href="http://www.defra.gov.uk/farm/sustain/pilot.htm">http://www.defra.gov.uk/farm/sustain/pilot.htm</a>
France	Agriculture et environnement: les indicateurs. Edition 1997/1998 <a href="http://www.ifen.fr/pages/3indic.htm#agriculture">http://www.ifen.fr/pages/3indic.htm#agriculture</a>
USA	Agricultural resources and Environmental Indicators, 2000 <a href="http://www.ers.usda.gov/emphases/harmony/issues/arei2000/">http://www.ers.usda.gov/emphases/harmony/issues/arei2000/</a>
FAO	Agri-environmental indicators, concepts and frameworks. FAO's Handbook on the collection of data and compilation of agri-environmental indicators <a href="http://www.unece.org/stats/documents/2001/10/env/wp.23.e.pdf">http://www.unece.org/stats/documents/2001/10/env/wp.23.e.pdf</a>
Italy	Agri-environmental indicators to describe agriculture sustainability National Institute of Statistics of Italy (ISTAT) <a href="http://www.unece.org/stats/documents/2001/10/env/wp.21.e.pdf">http://www.unece.org/stats/documents/2001/10/env/wp.21.e.pdf</a>

### ***Country comments***

Two different processes fed into the review of the first agriculture core set proposal. The first was the EIONET review of the EEA indicator core set proposal. In a separate procedure, EU Member States and some accession countries provided comments on the 35 indicators listed in COM(2001) 144 in the framework of a Eurostat Working Group on agri-environment indicators. As all these indicators were included in the first EEA agriculture core set proposal this process also provided important feedback.

Many useful, varied and sometimes contradictory comments were received from member countries. They helped to understand various agri-environmental issues and were taken on board as seemed possible. Two of the indicators proposed for deletion by the countries were taken out of the agriculture set ('groundwater abstraction' and 'environmental measures taken by farmers'). Others were changed to reflect member country comments, e.g. 'holders' training levels' and 'organic farming: prices and income'. The indicator 'ammonia emissions' was added to the agriculture set on proposal by various member countries. In line with general comments to reduce the overall number of indicators and seek synergies with ongoing reporting processes, such as at the OECD level, the agriculture core set was slimmed down from 43 to now 30 indicators. Of these, 19 are under agriculture responsibility, 11 need to be developed as part of other EEA sets.

### ***EEA current and future work on indicators***

The IRENA operation will remain a key activity at the EEA for the development of agri-environmental indicators. Within this framework separate expert meetings on indicators linked to farm management, landscape/land use, trends in the type and intensity of farming systems as well as on policy integration indicators will be held in 2003. A few similar meetings will be organised in 2004 but the precise issues to be discussed are not yet defined.

Staff outside the IRENA operation will focus on the remaining indicators in the agriculture core set. The first indicators to be tackled are likely to fall under the policy response category to complement work within the IRENA operation. However, updates or development of indicator description and fact sheets for a number of agriculture core set indicators remains the priority task.

### **4.3 Fishery**

#### ***State and impact***

Fishing and aquaculture are two of the most important uses of the living resources in the seas and inland waters. As well as providing a healthy and enjoyable source of food they create much-needed jobs in coastal areas and promote the social and economic well-being of the European Union's fishing regions. Fisheries include the catch of fish and also the catch of mussels, shrimps and other shellfish, squids and, in some cases, whales.

However, fishing has an impact on the ecosystem because the target species are overfished and not only the target species are being caught. Several commercial fish stocks, for which management values have been set in order to assure a sustainable spawning stock size and biomass, are outside safe biological limits. The status of several other fish stocks including deep sea species is not known. The structure of the marine ecosystem is changing since the top predators (whales, larger fish) are removed, an effect called 'fishing down the food web'. Since the '50ties, severe changes of catch in the different large marine ecosystems have been observed with major fluctuations in the high biomass stocks of cod like fish, herring like fish and anchovies. The unwanted bycatch of fisheries includes other fish, marine mammals, seabirds, turtles, corals, etc. The bycatch of valuable non-target fish species as well as smaller target fish species is usually discharged and dumped into the sea. Gear-related damage is also inflicted on benthic habitats and communities.

Aquaculture of fish and shellfish is providing an additional food source and an additional income for coastal human communities. Environmental impacts associated with aquaculture are deterioration of quality of effluent water leading to eutrophication, local smothering of the seabed and creation of anoxic bottom sediments under fish farms, transfer of disease agents, and impacts on biodiversity by the introduction of exotic species both intentionally and unintentionally as well as impact on the gene pool of species through escapes of genetically modified fish.

On the other hand, the environment is affecting natural and aquaculture fish and shellfish through pollution with oil, hazardous substances and microbes. Fish farms need high water quality for fish to survive and grow. Fish and shellfish from capture fisheries or aquaculture, for which tissue concentrations exceed foodstuff limit values and maximum residue levels, cannot be marketed.

#### ***Driving forces and pressures***

Despite the EU being the world's third largest fishing power, the market demand for fish exceeds production. The imbalance between imports and exports resulted in a deficit of over EUR 6.5 billion in 1995. Fish consumption per capita gives an indication of the consumer pressure on natural resources. Fish capture and farming is an important income source and fishermen, fish farmers as well as the processing industry try to maximise their profit, economic yield and wage. Price developments for certain fish species are an important incentive, which can cause even higher fishing pressure on fish from already over fished stocks.

The socio-economic importance of fisheries and aquaculture as a source of employment in areas where there are often few alternatives is highly significant. Fisheries, aquaculture and their related activities on the production side (processing, packing, transportation and

marketing) and on the service side (shipyards, fishing gear manufacturing, chandlers and maintenance) form the backbone of many remote coastal areas throughout the Community.

The needs for fish as food for human consumption and as feedstuff for agriculture and aquaculture and the related profit for the fishing industry have created huge overcapacity of the European fishing fleet. Subsidies for fleet modernisations have made the situation even worse. On the other hand the EU has facilitated the transition towards a better balance between vessels and fish stocks by instigating a decline in fleet capacity, which is too large for the available fish and has become uneconomic with too little catch per unit effort. However, there is still much too much capacity in the fishing fleet.

Due to increased fishing effort, total landings of catch have increased by 25% since 1990. This increase has occurred throughout Europe and for all major fish types – demersal, pelagic and shellfish.

Pressure from aquaculture due to waste and wastewater can be reduced, if the efficiency in use of feedstuff is increased and if the amount of chemicals used for veterinarian purpose is being reduced.

### ***Policy objectives***

Main policy objectives are:

- The objective of the Common Fisheries Policy (CFP), is ‘to provide for rational and responsible exploitation of living aquatic resources and of aquaculture, while recognising the interest of the fisheries in its long-term development and its economic and social conditions and the interest of the consumers taking into account the biological constraints with due respect to the marine ecosystem’.
- The Cardiff process promotes environmental integration into the Common Fisheries Policy.
- The Biodiversity Action Plan on Fisheries.
- European Council conclusions on the strategy for sustainable development (European Council, 2001): ‘The review of the common fisheries policy in 2002 should, on the basis of a broad political debate, address the overall fishing pressure by adapting the EU fishing effort to the level of available resources, taking into account the social impact and the need to avoid over fishing’.
- The Green Paper on the future Common Fisheries Policy (European Commission, 2001c) (ecosystem approach) identifies four main objectives: ‘(i) improving conservation and the protection of marine ecosystems, (ii) increasing the involvement of stakeholders in decision-making, (iii) securing an economically viable and self-sufficient fisheries sector and (iv) promoting sustainable fisheries beyond Community waters’.
- One of the actions foreseen in the sixth environmental action programme (EAP) (European Commission, 2001d) is the development of a thematic strategy for the protection and conservation of the marine environment (marine strategy). Therefore, the overarching objectives of the communication on a European marine strategy with the aim to protect the marine ecosystem are (i) sustainable and healthy European seas and their ecosystems and (ii) sustainable exploitation of renewable marine resources of these seas.

### ***Responses***

Governments and regulatory bodies respond to the pressures, impacts and effects that fisheries and aquaculture exert on the environment by attempting to control these influences. In both cases, control can take the form of attempting to reduce the pressure exerted (e.g. fishing capacity/the amount of aquaculture production allowed) or lessen the impact the activity has (e.g. the amount of catch/discharges allowed). Whilst controls on the driving force (e.g. capping prices, sales or salaries) are not often considered, greater consideration is being given to employing the power of market forces to effect such

control – through more informed use of fiscal and taxation policy, and much reduced and more sensitive use of subsidy as a tool of control.

Whatever the control method used, responses are very difficult to compare between different types of fishery or aquaculture operation and between areas and years. This is because a whole range of measures are used together in the Common Fisheries policy with related Directives, Regulations and Communications; for example, a combination of TACs, gear controls, closed areas for fishing and vessel restrictions are used throughout Europe to control fisheries. The Financial Instrument for Fisheries Guidance (FIFG) provides public aid for the fleet renewal, for the equipment and modernisation of fishing vessels, whereas scrapping of fishing vessels to reduce overall fishing effort is supported by special funds under Regulation EC 2370/2002. A response of individual countries to effect reduction in fisheries impacts on the environment is reflected in their level of participation in international organisations whose aim is to manage international fisheries cooperatively.

The response each country makes to the impacts that aquaculture has on the environment can be assessed by reviewing the different national regulatory measures in place e.g. use of environmental impact assessments, control of discharges, registration of farms, etc. The level of response can then be scored based on use of all methods and cross-country comparisons can be made. No specific European level legislation is regulation aquaculture directly, but for the purpose of the Water Framework Directive countries need to reduce the impact of aquaculture to assure good status of surface waters.

**Table with revised set indicators**

**Table 4.3.1** Fishery indicators in relation to policy questions.

Generic question type	Policy question	Indicator title	DPSIR	Priority	Other sectors/issues	
1. Is the environmental performance of the fisheries sector improving?	Is the use of commercial fish stocks sustainable?	FISH1 Status of marine fish stocks	S	ST		
		FISH 1a Percentage of stocks outside safe biological limits	S	ST		
		FISH 1b North Sea cod stocks	S	ST		
		FISH 1c Spawning Stock Biomass	S	ST		
		FISH1d Metrics of fish community structure	S	LT		
		FISH2 Discards	I	LT		
	Is aquaculture sustainable?	FISH3 Aquaculture production	P	ST		
	What is the impact of fisheries on habitats, benthos, mammals, birds, and turtles	FISH4 Fisheries impact on habitats and ecosystems	FISH4a Physical damage to habitats	I	LT	Biodiversity
			FISH4b Fisheries effects on benthos	I	MT/LT	
			FISH4c Fisheries effects on ecosystem structure	I	MT/LT	
FISH4d Fish catches in large marine ecosystems			I	ST		

		FISH5 Accidental by catch: birds, mammals, and turtles	I	MT	Biodiversity
What is the impact of aquaculture on habitats benthos birds, mammals, and turtles?		FISH6 Impact of aquaculture	I	ST/LT	Biodiversity Water Biodiversity
		WEC07a Introduced species in marine and coastal waters	P	ST	
		FISH6a Aquaculture Impact on habitats, birds and mammals	I	LT	
		FISH6b Aquaculture impact on benthos	I	LT	
		FISH6c Aquaculture impact on genetic resources	I	LT	
What is the impact of environment on fisheries/aquaculture ?		FISH7 Quality of fish for human consumption (F & A)	S	ST	Water
		FISH7a Hazardous substances in biota	S	ST	
2. Are we getting better at reducing fishing effort and aquaculture discharges?	Has the need to limit fishing effort been met?	FISH8 Fishing capacity of fleets	P	ST	
	Has the fishing industry been modernised towards effectiveness?	FISH8a Fishing effort (horsepower/day or categories/gear)	P	MT	
		FISH8b Catch per unit effort	P	MT	
		FISH8c Insurance value of fleet	P	LT	
Is the eco-efficiency of aquaculture plants improving?		FISH9 Aquaculture waste: Inputs to Output ratio	P	MT	Water
		FISH9a Quality of effluent water	P	LT	
3. How can the present situation and future development be described?	How is the present situation and future developments described in relation to the market needs?	FISH10 Fish consumption per capita	D	ST	
		FISH11 Catches by major species and areas	P	ST	
		FISH11a Fish landings	P	ST	
	How is the present situation and future developments described in relation to the social situation and profitability?		FISH12 Average wage in fisheries and aquaculture / average national wage	D	ST/MT
FISH12a Profit and /or added value			D	LT	
FISH12b Maximum Economic Yield (first hand value of catch per fisherman)			P	LT	
		FISH12c Price trends for farmed fish	D	ST/MT	
4. What is the progress in economic integration?	Does Community aid help the sector to restructure?	FISH13 Fleet decommissioning subsidies (compared to Investment/Modernisation subsidies)	R	MT/LT	

5. What is the progress in the management of integration environmental policy into fisheries policy	How is restricting catches aiding management of fisheries?	FISH14 Quota/Zone management (R )	R	MT	
		FISH14a Multi-annual management plans in place (or not)	R	LT	
		FISH14b International fisheries agreements	R	ST	
	Is the industry complying to the integration of environmental considerations in policy-making?	FISH15 'Green' fisheries	R	LT	
FISH15a Number of fisheries certified under an eco-labelling process FISH15b Products (percentage of) certified under an eco-labelling process		R	LT		
		FISH16 National legislation with specific provision for environmental management of aquaculture	R	LT	

Indicators with lighter fonts are used in other lists.

#### ***Linkage to other EEA indicator sets***

There are some linkages to biodiversity (Biodiversity Action Plan on Fisheries) and to the water core sets (impacts of aquaculture on water quality and impacts of hazardous substances in water on fish food quality for human consumption).

#### ***Reference to other international indicator sets***

Prior to the development of the core set of fisheries and aquaculture indicator, a review of existing indicators and indicator lists from fisheries organisations and other relevant international organisations like FAO, OECD, ICES, Eurostat has been undertaken to for the basis for the selection of a first proposal for a core set. This review is published as EEA Technical Report 87.

#### ***Country comments***

Most comments on pressure, state and impact indicators were taken up in the revision of the core set. However most of the socio-economic indicator on driving forces and responses were regarded as not relevant by countries and here we disagree. Nominated NRCs for fisheries are in most cases environment experts and do not work at fisheries institutions, which might have biased the judgement on the sector.

#### ***EEA current and future work on indicators***

A workshop with international fishery organisations has been held jointly by EEA, DG FISH and DG ENV in October 2002 to discuss the proposed core set. Workshop recommendations for changes in the core set have been taken up into the revision of the core set. It was recommended by workshop participants to have a joint fisheries indicator working group in order to streamline data flow and indicator development among international organisations. The first meeting should take place by April 2003. It is not the aim of EEA to collect the data for the indicators via EIONET, but to built the indicators upon data flows through existing fisheries networks of FAO, Eurostat, OECD, ICES, DG FISH etc.

An issue report on fisheries and aquaculture in Europe is being produced at present by ETC Water with support from external experts to form the background for the further development of the indicators. A regular fisheries/environment reporting mechanism (FERM) is envisaged for the future.

## **4.4 Energy**

### ***Description of the issue***

The production and consumption of energy is altering the state of the environment. Fossil fuels (i.e. coal, lignite, oil and natural gas), which currently account for around 80 % of European energy supplies, are attributed to increased levels of air pollution (including acidifying substances, ozone precursors and particulate matter), major oil spills, contaminated soil and water, and higher concentrations of greenhouse gases in the atmosphere.

The use of biomass and waste as fuels also results in combustion-related emissions, such as nitrogen oxides and other renewable energy sources can also alter the state of the environment as well, giving rise to a loss of natural amenities, loss of habitat, visual intrusion and noise. Nuclear energy sources, which produce negligible emissions during normal operation, may accidentally release radioactivity, and accumulate substantial quantities of long-lived, highly radioactive wastes, for which no generally acceptable disposal route has yet been established.

Energy use results in undesirable impacts on the environment, including harm to buildings and vegetation, adverse impacts on biodiversity (species loss or migration), damage to ecosystems, detrimental effects on human health (respiratory problems, premature death) and erratic weather patterns (increased flooding or drought and temperature rise).

Such environmental issues continue to exist because energy has become central to social and economic well-being. Energy provides personal comfort and mobility and is essential to most industrial and commercial activities. In addition, converted fuels (such as gasoline and fossil-fuelled electricity) continue to increase their share of final energy consumption, resulting in a disproportionately greater increase in fossil fuel use.

The type and extent of energy-related pressures on the environment depends on the sources of energy and how they are used. But one way of reducing energy-related pressures on the environment is to use less energy. This may result from reducing the demand for energy-related activities (e.g. for warmth, personal mobility or freight transport), or by using energy in a more efficient way (thereby using less energy per unit of demand), or from a combination of the two.

Changes in the fossil fuel mix in favour of natural gas — a much cleaner fuel than coal, lignite or oil — reduce energy-related pressures on the environment, per unit of energy consumed, as do emission-specific abatement measures (e.g. flue gas desulphurisation) and the use of less polluting technologies (e.g. low NO<sub>x</sub> burners). The deployment of less polluting, renewable energy sources (such as biomass, wind energy and hydro power) not only provides an even greater benefit in terms of reducing pollution, but can also contribute to security of supply by replacing imported fossil fuels.

But environmental pressures are not the only factors that affect international and national energy policies, which are also concerned with security of supply, competitive energy prices, market liberalisation and social factors. In some cases these concerns move in harmony with the environment, for example increased energy efficiency is beneficial to most, if not all, energy policy goals. But there are also conflicts. For example concerns over job creation and security of supply may prompt financial support for indigenous energy production, acting as a disincentive towards energy saving through lower prices,

and preventing the import of cleaner alternatives. Energy prices may also be kept low to support economic recovery and reduce social impacts. Market liberalisation, which can help attract international investment to modernise energy systems, can deliver lower energy costs in the long run, which, in the absence of appropriate policies to internalise the external costs of energy and improve energy demand management, may lead to reduced energy prices and even increased energy consumption.

Certain European countries and the EU have adopted policies to reduce the environmental pressures associated with energy. These include support for energy-saving measures, increased efficiency measures in energy conversion and consumption, switching to less-polluting fuels, removal of subsidies that favour more-polluting fuels, the promotion of renewable energy sources and price structures that are more representative of the full cost to society of the energy being used.

### ***Main policy objectives***

The three main goals of EU energy policy — security of supply, competitiveness and environmental protection — are strongly inter-related. For example, improvements in energy efficiency benefit security of supply and reduce emissions of greenhouse gases and other pollutants. Market liberalisation and increased price competition benefit competitiveness through reduced prices, but may act as a disincentive to energy saving investments and may even encourage consumption.

In line with the three main policy goals, the specific environmental objectives of EU energy policy in the area of environmental integration<sup>78</sup> are to:

- Reduce the environmental impact of energy production and consumption
- Promote energy saving and the efficient use of energy
- Increase the share of production and use of cleaner energy sources

Since energy use is increasing, a key challenge for economic, energy and environmental policy is to develop instruments and measures that encourage further social and economic development, while reducing and ultimately breaking the linkage between energy use (both production and consumption) and environmental pressures. Examples of best practice in Member States on the development of such approaches will be a feature of the indicator-based assessments made by the EEA in its reports.

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<sup>78</sup> COM(1998) 571 final.

**Table 4.4.1** Energy indicators in relation to policy questions.

Generic question	Policy question	Indicator title and definition	DPSIR	S/M/L	Other issues/sectors
Is the environmental performance of the sector improving?	Is the use of energy having less impact on the environment?	Emissions of GHG	P	ST	Climate change
		CC5c Energy-related greenhouse gas emissions		ST	
		CC5d Energy-related carbon dioxide emissions		ST	
		CC5e Energy-related carbon intensity		ST	
		CC5f Emission of CO2 from conventional thermal power production		ST	
		CC5g Emissions of CO2 from public electricity production		ST	
		Other air emissions	P	ST	Air pollution
		APE5b Energy related SO2 emissions		ST	
		APE5c SO2 emissions intensity from power production		ST	
		APE5d SO2 emissions from public electricity production		ST	
		APE6b Energy related NOx emissions		ST	
		APE6c Emissions intensity of NOx from power production		ST	
		APE6d Emissions of NOx from public electricity production		ST	
		APE8b Energy related NMVOC emissions		ST	
		APE9c Energy-related particulate emissions		ST	
		WHS11 Accidental oil spills from marine shipping (EN16)		ST	Water
		WHS10 Discharge of oil from refineries and offshore installations (EN17)		ST	Water
	Are we using less energy?	EE18 Final energy consumption by sectors		ST	Transport Agriculture Tourism
		EE19 Electricity consumption		ST	

Is the efficiency improving?	How rapidly is energy efficiency being increased?	EE20 Total energy intensity		ST	
		EE21 Efficiency of electricity supplied by fossil fuels		ST	
		EE22 Share of electricity produced by combined heat and power		ST	
		EE23 Final energy intensity		ST	
How are the size and the shape of the sector developing?	Are we switching to less polluting fuels to meet our energy needs?	EE24 Total energy consumption by fuel		ST	
		EE25 Electricity production by fuel		ST	
	How rapidly are renewable energy technologies being implemented?	EE26 Total energy consumption by renewable energy source		ST	
		EE27 Share of renewable electricity in gross electricity consumption		ST	
What is the progress in economic integration?	Are we moving towards a pricing system that better incorporates environmental costs?	EE28 End-user (Final) energy prices (inclusive of taxes) by economic sector		ST	
		EE29 Energy Taxes		ST	
		EE30 The external costs of electricity production		ST	
		EE31 Energy subsidies by fuel type		ST	
		EE32 Energy-related research and development expenditure		ST	

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

Energy-related air emission indicators may be considered as a sub-set of general air and climate change indicators. Similarly many transport indicators may be considered as a sub-set of energy-related indicators.

### ***Reference to other international indicator sets***

Eurostat<sup>79</sup> and the IEA<sup>80</sup> both produce basic energy indicators, supported by their data collection activities, although their indicators pay little or no attention to environmental assessment.

An inter-institutional meeting will be held in May 2003 to consider joint indicators for sustainable development. The participants include Eurostat, IEA, IAEA, DG-TREN, EEA and others.

### ***Country comments***

Most comments received were highly constructive and assisted in the grouping and linking of indicators, especially air emissions indicators.

<sup>79</sup> [Energy Indicator List](#)

<sup>80</sup> International Energy Agency: Indicators for Sustainable Energy Development (pdf) <http://www.iea.org/envissu/files/CSD-9.pdf>

### ***Current and future work on indicators***

The most significant work is the inclusion of the candidate countries. This is initially being developed as a separate indicator (fact sheet) set.

## **4.5 Transport**

### ***Description of the sector***

The environmental performance of the transport sector, measured in terms of energy consumption, pollutant and noise emissions, land take, waste production and accidents, is under pressure by continuously increasing passenger and freight transport demand. Technological developments have improved the eco-efficiency of the transport sector, but these improvements have so far not been sufficient to lower the environmental impact of growing transport demand and the shift of this demand towards road and aviation. These impacts manifest themselves in climate change, exceedances of air quality objectives, noise nuisance, fragmentation of habitats and ecosystems and disturbances of designated areas.

Freight transport demand, closely linked to the volume, structure and spatial distribution of economic activity, is driven by globalisation and liberalisation of the internal market (enlargement) and by a decrease in real freight transport prices. The modal split in freight transport is driven by differences in accessibility to markets by mode and differences between real freight transport prices by mode.

Passenger transport demand is driven by increasing welfare and infrastructure availability, enabling people to travel faster, and by spatial distribution of settlements and every-day destinations, increasing the average passenger journey length. Both developments are stimulated by the development of real passenger transport prices, which made passenger transport prices increase less than disposable income. The modal split in passenger transport is driven by differences in accessibility to basic services by mode and by differences between real passenger transport prices by mode.

Accessibility by mode (in terms of time to reach a certain destination) is influenced by developments in the spatial distribution of settlements, markets and every day destinations, and by the transport infrastructure capacity by mode to reach such destinations. Investments in transport infrastructure by mode in turn affect this supply of capacity. Investments in transport infrastructure are also known to have a direct effect on the spatial distribution of settlements, markets and every day destinations.

Total transport price-levels influence passenger and freight transport demand and modal split. The share of transport taxes and charges in the total transport price is important to whether the external (and infrastructure) costs of transport are being internalised. Fuel taxes are a good tool to internalise climate change costs, whereas a variable kilometre charging system is considered to be the most promising tool to internalise infrastructure and (non climate change) external costs. Such price-structure is needed for the internalisation of external costs and for giving the incentive to reduce emissions.

Improvements in transport's eco-efficiency are driven by the development of more stringent EU legislation on emissions and fuel quality standards and a voluntary agreement with the car manufacturers association to improve the energy efficiency of new passenger cars. This has led to a higher overall energy efficiency (i.e. oil equivalents per vehicle-kilometre) and lower specific pollutant emissions (i.e. emissions of NO<sub>x</sub>, NMVOC, PM<sub>10</sub> and SO<sub>x</sub> per vehicle-kilometre) – in particular for new road vehicles. Depending on the vehicle fleet size and average age it takes some years (cars) or many years (trucks, aircraft, ships) before these new technologies penetrate the vehicle fleet sufficiently to make a notable difference in environmental performance. The proportion of the vehicle fleet meeting certain air and noise emissions standards (by mode) indicates

the speed in which new technologies penetrate the vehicle fleet. Technology improvements, to conclude, may be partly annulled due to low occupancy rates and load factors, as these worsen the performance of vehicles in terms of energy consumption and emissions per passenger- or tonne-kilometre.

At the Cardiff European Council in 1998, the European Council called for the integration of environmental concerns into, among others, transport policy. Implementing a strategy addressing transport and environment is considered to be the ultimate form of this integration. The number of Member States that implement an integrated strategy and that have set up a national transport and environment monitoring system to review such strategies, indicates progress in the integration of environmental concerns into transport policy. The development and implementation of a strategy and monitoring system requires effective institutional cooperation. Another form of integration could arise from the uptake of strategic environmental assessment (2001/42/EC) in the transport sector. Such assessment contributes to taking environmental considerations into account from the earliest possible stage of plan- and programme-formulation. Addressing public awareness and behaviour, to conclude, can have a significantly impact on the sustainability of transport, through changes in travel patterns and behaviour.

### ***Main policy objectives***

The main policy objectives are:

- *Decouple transport significantly from growth in GDP and bring about a shift in transport use from road to rail, water and public passenger transport so that the share of road transport in 2010 is no greater than in 1998 (SDS<sup>81</sup>, CTP<sup>82</sup>)*
- *Improve environmental performance of vehicles (emissions per vehicle-km) by addressing both engine design and fuel quality (fuel quality and vehicle emission standard Directives, voluntary agreement with car manufacturers)*
- *Optimally use the entire transport infrastructure capacity by building missing links, revitalise rail and shipping and turn multi-modal systems into reality (CTP)*
- *Introduce fair and efficient pricing, according to the users pay principle (SDS, CTP)*
- *Integrate environmental concerns into transport policy (European – Cardiff – Council<sup>83</sup>)*

### ***Table with revised set indicators***

The original TERM indicator list was developed through consultation with the Commission's services, national experts, other international organisations and researchers. The indicator list reflects policy information needs rather than availability of data. The current indicator list should be seen as a long-term vision of an ideal set of indicators.

In the development of three succeeding TERM reports, some small adjustments to the ideal list have been made. Such adjustments were mainly made from the indicators addressing accessibility and spatial planning, and pricing.

TERM is used to streamline and improve data collection and usage. Improving the data for the whole set of indicators would be an enormous task. Therefore, a step-by-step approach towards improving and harmonising TERM statistics is chosen, based on a selection of key-indicators. This selection was already made during the development of TERM 2000, and was recently confirmed by the TERM steering group and joint expert group and transport and environment.

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<sup>81</sup> SDS: European Union Strategy for Sustainable Development (A Sustainable Europe for a Better World): [http://europa.eu.int/eur-lex/en/com/cnc/2001/com2001\\_0264en01.pdf](http://europa.eu.int/eur-lex/en/com/cnc/2001/com2001_0264en01.pdf)

<sup>82</sup> CTP: White Paper on the Common Transport Policy (European transport policy for 2010: time to decide): [http://europa.eu.int/comm/energy\\_transport/library/lb\\_texte\\_complet\\_en.pdf](http://europa.eu.int/comm/energy_transport/library/lb_texte_complet_en.pdf)

<sup>83</sup> Presidency conclusions of the Cardiff European Council, 15 June 1998: <http://ue.eu.int/Newsroom/LoadDoc.asp?BID=76&DID=54315&LANG=1>

Table 4.5.1 Transport indicators in relation to policy questions

Generic question	Policy question	Indicator title	DPSIR	S/M/L	Other Sectors/issues
Is the environmental performance of the sector improving (use of space, emissions, resource use)?	Is the environmental performance of the transport sector improving?	TERM01 Transport final energy consumption by mode (EN18)	D	ST	Energy
		CC5h Transport emissions of greenhouse gases by mode (TERM 02)	P	ST	Climate change
		APE4a Transport emissions of air pollutants (NO <sub>x</sub> , NMVOCs, PM <sub>10</sub> , SO <sub>x</sub> ) by mode (TERM 03)	P	ST	Air pollution
		APQ12 Exceedances of air quality objectives (TERM 04)	S	MT	Air pollution
		TERM05 Exposure to and annoyance by traffic noise	S/I	LT	
		TELC2 Fragmentation of ecosystems and habitats by transport infrastructure (TERM 06)	P	ST	Terrestrial
		BDIV15 Impacts of transports on biodiversity BDIV15a Number of individuals per main fauna species group killed on roads per length per year BDIV15b Number of fauna passages per infrastructure length unit BDIV15c Financial investment for fauna passages	P	LT MT MT	Biodiversity
		TELC1a Proximity of transport infrastructure to designated areas (TERM 07)	P	ST	Terrestrial
		TELC3a Land take by transport infrastructure (TERM 08)	P	MT	Terrestrial
		TERM09 Number of transport accidents, fatalities and injured (land, air and maritime)	I	ST	
		WHS11 Accidental oil spills from marine shipping & WHS12 Illegal discharges of oil at sea (TERM 10)	P	ST	Water
		WMF11 Generation of waste from end-of-life vehicles (TERM 11a)	P	ST	Waste
		WMF12 Waste oil and tyres from vehicles (TERM 11b)	P	MT	Waste
How is the size and shape of the sector developing (including technological advances)?	Are we getting better at managing transport demand and at improving the modal split?	TERM12 Passenger transport demand by mode and purpose	D	ST	
		TERM13 Freight transport demand by mode and group of goods	D	ST	

	Are spatial and transport planning becoming better coordinated so as to match transport demand to the needs of access?	TERM14 Access to basic services (average passenger journey time and length per mode, purpose and location)	D	MT	
		TERM15 Regional accessibility of markets and cohesion	D	MT	
		TERM16 Access to transport services	D	MT	
	Are we optimising the use of existing transport infrastructure capacity and moving towards a better-balanced intermodal transport system?	TERM18 Capacity of infrastructure networks	D	MT	
		TERM19 Investments in transport infrastructure per capita and by mode	D/R	ST	
	How rapidly are improved technologies being implemented and how efficiently are vehicles being used?	TERM27 Overall energy efficiency and specific CO <sub>2</sub> emissions for passenger and freight transport (per passenger-km and per tonne-km and by mode)	P/D	ST	
		APE4b Emissions per passenger-km and per tonne-km for NO <sub>x</sub> , NMVOCs, PM <sub>10</sub> , SO <sub>x</sub> by mode (TERM 27)	P/D	ST	
		TERM29 Occupancy rates for passenger vehicles	D	MT	
		TERM30 Load factors for freight transport	D	MT	
		TERM31 Uptake of cleaner and alternative fuels	D	ST	
TERM 32 Size of the vehicle fleet		D	ST		
TERM 33 Average age of the vehicle fleet		D	ST		
TERM 34 Proportion vehicle fleet meeting certain emission standards	D	ST			
What is the progress in economic integration?	Are we moving towards a fairer and more efficient pricing system, which ensures that external costs are	TERM20 Transport prices (real change in passenger and freight transport price by mode)	D	ST	
		TERM21 Fuel prices and taxes	D/R	ST	
		TERM 22 Transport taxes and charges	R	ST	
		TERM24 Expenditure on personal mobility by income group	D	ST	
		TERM25 External costs of transport	INFO	ST	

	recovered?	TERM26 Internalisation of external costs	R	ST	
What is the progress in management integration?	How effectively are environmental management and monitoring tools being used to support policy- and decision-making?	TERM35 Number of Member States that implement an integrated strategy		ST	
		TERM36 Institutional cooperation in transport and environment		ST	
		TERM 37 Number of Member States with a national transport and environment monitoring system		ST	
		TERM38 Uptake of Strategic Environmental Assessment in the transport sector		ST	
		TERM40 Public awareness and behaviour		ST	

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

See table above. TERM indicators not falling under the responsibility of transport are listed in the table in the column ‘TERM indicator’ (printed light grey). Some TERM indicators are linked to indicators higher in the hierarchy of indicators (like ‘transport greenhouse gas emissions’ is linked to ‘CC1 – GHG emissions’). These links are specified in the column ‘Sub-indicator of’.

### ***Reference to other international indicator sets***

The OECD developed a set of transport and environment indicators, which formed the main input for the publication ‘Indicators for the Integration of Environmental Concerns into Transport Policies’ (1999). The National Policies Division of OECD’s Environment Directorate is currently updating and expanding the (indicator-based) report, in co-operation with the ECMT and other divisions in the OECD.

The UNECE and WHO work jointly on the establishment of a set of indicators to monitor the integration of environmental and health aspects into transport policies, and their impacts on health and the environment. TERM plays an important role in this process, as the current proposal envisage an elaboration of the TERM set to addresses health.

### ***Country comments***

The number of comments on the TERM indicator set was rather limited (19 sets of comments were received). All indicators – despite severe data and definition limitations – were considered relevant (or highly relevant). Some suggestions to merge indicators were not realistic, and some suggestions were contradictory (more or less aggregation). In certain cases the comments made clear that the indicator fact sheets have not been consulted.

The current indicator set slightly changed since the first round of consultation. The main changes are adjustment of the indicator names and identification of ‘key-indicators’. The link of the TERM indicators to other EEA indicators is now visualised, including the hierarchy of the various indicators.

### ***Current and future work on indicators***

Currently, EEA develops a methodological report on pricing indicators. The aim is to improve those indicators to better monitor progress in internalisation of external transport costs. A resembling study might be needed to improve the indicators on accessibility and spatial planning.

The key indicators (see table 4.5.2) identified are the starting point for data-improvements. EEA, in cooperation with Eurostat, DG TREN and DG ENV, are investigating possibilities to better harmonise those statistics and to safeguard the continuation of TERM.

## 4.6 Tourism

### *Description of the issue*

Tourism is one of Europe's fast-growing sectors and the largest service industry accounting for 6 % of GDP (12 % with indirect effects); it is an increasing source of pressure on natural resources and the environment. Continuing growth may jeopardise the achievement of sustainable development and, unless properly managed, may affect the social conditions, cultures and local environment of tourist areas; it may also reduce the benefits of tourism to the local and wider economy.

The main pressures come from transport, the use of water and land, energy use by buildings and facilities, the generation of wastes, and erosion of soils and biodiversity. In some popular destinations, these pressures have resulted in irreversible degradation of the local environment.

On the demand-side, many different factors affect the tourism growth such as increases in time for leisure activities alongside increased disposable income, changes in demographic factors and in people's expectations. Tourism is the main driver behind the increase in the demand for passenger transport; cars and planes remain the most-used forms of transport for tourism with their associated environmental impacts. This demand is expected to continue to grow, including a doubling of air traffic over the next twenty years. Vacation patterns are changing; people are travelling more often, for shorter stays and further from home. Furthermore, tourism is taking a growing share of household expenditure as relative prices continue to fall, which translates into more journeys and holidays per capita per year, thereby adding to environmental pressures. The high concentration and seasonal nature of tourism create some direct environmental impacts at destinations, especially on environmentally sensitive areas because of their attractiveness. The seaside and mountains remain the favourite destinations.

On the supply-side, the tourism sector is a highly fragmented industry (2 million businesses, 99% of them SMEs), which has highly fragmented services based products (travel agencies, tours operators, carriers, hoteliers, restaurateurs, etc.). The biggest companies that are developing environmentally hungry products (through tourism packages) are instrumental in the development of this sector; moreover the international character of the tourism activity makes them responsible also outside the EU.

The main policy objectives are

- *To develop and implement policies and national strategies or master plans for sustainable tourism based on Agenda 21 (UN-CSD)*
- *Promoting the integration of conservation and restoration of the landscape values into other policies including tourism, taking account of relevant international instruments (6EAP)*
- *To establish environmental impact assessments EIA for tourism projects especially in skiing areas, marine, holiday villages, camping areas, and all potentially damaging tourism projects to be covered in future (Amendment to the EIA Directive 85/337/EEC)*

The Treaty of Maastricht in its Article 3(1) established the principle of subsidiarity for the tourism policy. In 1999, the European Council of Helsinki recalled the need to adopt a strategic approach for tourism in relation with the other Common policies. The Commission in its recent Communication on the future of the European tourism recommends the implementation of actions, in particular to promote sustainable development for tourism by further implementing the Agenda 21 guidelines. This development culminates in the recent Council Resolution of the 21 May 2002 on the

future of European tourism, which includes the elaboration of sustainable indicators for the tourism sector. The Commission and Member states are therefore invited to agree on a framework of coordination between community policies affecting the tourism sector and adopt the appropriate measures. Among these, the Council of Cardiff has asked the working out of strategies for integration of environment into specific sectoral policies, among which tourism, in June 1998. This process is also supported by the EU Sustainable Development Strategy and the 6<sup>th</sup> Environmental Action Programme that focus especially on the carrying capacity of the natural areas regarding tourism development. Various directives on the environment such as the Water framework directive (WFD), the EU Integrated coastal management zones strategy (ICZM), the European spatial development perspective (ESDP), the common Transport policy, and the EU Integrated products policy (IPP) comprise aspects that relate to tourism and environment integration. The expert or technically driven exercise to raise the profile of tourism indicator-based assessment is as from now totally policy driven.

### Revised set of tourism indicators

In its assessments the EEA generally tries where feasible to evaluate the indicator trends with respect to EU or internationally agreed policy objectives or targets. The current lack of a consolidated EU tourism policy constitutes in that sense a significant methodological problem. EEA therefore also hopes that its indicator development can help to make more transparent those areas where additional policies need to be developed. As such EEA's indicator approach on tourism and on other sectors is policy driven, i.e. starts from an analysis of policy information needs rather than constraining its indicator definitions to statistical coverage. The current list is a long-term vision of an 'ideal' list and some of the proposed indicators could not at this stage be quantified.

The lack of data is particularly of concern in tourism statistics. In the economic field, domestic tourism (including tourism transport system) and private accommodations such as second homes are lacking. However, a few countries realize national surveys on these data. In the environmental field, very few data exist and most of them are based on a destination level; examples of natural resources consumption by tourism facilities can be found in the tourism industry reporting (hotels). Thus, most of the tourism and environment data are based on international arrivals and collective tourism accommodations (hotels and campsites). Study cases and surveys can be used to illustrate the contribution of the tourism sector to the environmental pollution.

Many of the tourism indicators on pressures and impact are linked to indicators produced by other sets. For example, tourism water use or waste generation are linked to similar indicators in these sets. However, in many cases more micro-level information is needed to describe the tourism aspects and this information can be difficult to establish on European. Therefore the development of tourism these indicators have a long term perspective. In the table below the indicators with a lighter colour generally refer to their "parent" indicator in the other sets as the more specific tourism indicators have not been included in these sets yet.

**Table 4.6.1** Tourism indicators in relation to policy questions

Generic question	Theme	Indicator title	DPSIR	S/M/L	Other issues/ sectors
What are the environmental impacts of tourism?	1.1 Air pollution relating to transport	APE4b Air pollution by tourism transport	P	LT	Air pollution Transport
	1.2 Resources consumption (energy, water, land)	EN18 Energy use by tourism	P	LT	Energy
		WQ2 Water use by tourism	P	LT	Water
		TELC1 Land take by tourism	P	ST	Terrestrial

	1.3 Biodiversity and land use (fauna, landscapes)	BDIV Potential disturbance to biodiversity from tourism (protected areas in tourism receiving regions)	I	LT	Biodiversity
	1.4 Protection of resources (positive effects)	WEU11 Bathing water quality (in tourism regions)	S	LT	Water
	1.5 Environmental risks	TENH1 Risks caused by ski activity (avalanche occurrence)	I	LT	Terrestrial
	1.6 Impacts to territories (waste and soils)	WMF6d Waste generated by tourism	P	LT	Waste
		WEU16 Quality of wastewater services of tourism accommodations (or in tourism areas)	S	LT	Water
		TOUR1 Tourism density (bed-places per km <sup>2</sup> NUTS 3 level)	P	ST	
		CC4 Global warming potential impact on tourism	I	LT	Climate change
Are we better managing the tourism demand to the need to preserve environment?	2.1 Management of tourism infrastructures	TOUR2 Tourism intensity (bed-places per inhabitant, NUTS 3 level)	D	ST	
		TELC Land use for tourism activities (tourism destinations vs. land cover)	D	LT	Terrestrial
		TE Construction of tourism facilities * tourism accommodations (including second homes) * tourist attractions (golf courses, yacht marinas, amusement parks)	P	LT	Terrestrial
		TENH Plans of prevention of natural risks in tourism zones	S/R	LT	Terrestrial
	2.2 Management of tourism frequentation	BDIV Number of visitors to protected areas	D	LT	Biodiversity
	2.3 Management of tourism mobility and access to destinations	BDIV Accessibility of forest to visitors (versus development of recreational activities in forests areas)	D	ST Partly	Biodiversity
		TERM Traffic density of tourism transport	P	LT	Transport
		TERM Modes of transport used by tourists	D	ST	Transport
		TERM Access to mass tourism destinations by public transport	D	LT	Transport
		TERM Development of less environmental damaging transport system for tourism travels (services)	R	LT	Transport
What characterises and drives the demand for tourism?	3.1 Characteristics of the tourist demand	TOUR3 Tourism arrivals in Europe Residents and non-residents breakdown European geographical regions breakdown	D	ST	
		TOUR4 Change of characteristics of the tourists purposes and profiles (age and sex)	-	ST	

		TOUR5 Change in type of organisation of stays (in % of total)	-	ST	
		TOUR6 Seasonality of tourism and duration of trips	D	ST	
		TOUR7 Overnights spent in tourism accommodations	D	ST	
		TERM Growth in travel distance for tourism	D	LT	Transport
	3.2 Characteristics of the tourism offer	TOUR8 Economic value of tourism industry (GVA) as in % total GDP	-	ST	
		TOUR9 Household expenditure and tourism prices	D	ST	
		TOUR10 Tourism packages and ecotourism products (in % of total)	D	LT	
Are we moving towards a better internalisation of the external costs in the tourism sector?	4. Internalisation of external costs	TOUR11 Tourist tax revenue and environmental expenditure	R	LT	
How effective are environmental management and monitoring tools towards a more integrated tourism strategy?	5.1 Tools of industry	TOUR12 Uptake of environmental management systems by tourism companies (EMAS, EIA)	R	LT	
		TOUR14 Ecolabels of tourism facilities (% of total)	R	ST	
	5.2 Measures of local stakeholders (at destinations)	TE Progress in initiatives implemented by local stakeholders (Integrated Quality Management, Agenda 21, SEA, ICZM; in tourism destinations)	R	MT	Terrestrial
	5.3 Sustainable tourism strategies of national authorities	TOUR16 Progress in integration of tourism and environment into national strategies and monitoring systems	R	MT	
	5.4 Tools and measures of the EC transversal policies	TOUR17 EU support to sustainable tourism projects	R	MT	

Indicators with lighter fonts are used in other lists.

### ***Linkage to other EEA indicator sets***

Tourism is a crosscutting economic activity that interacts with other sectors (with Transport, industry and services and households). As a tourist is a person that travels outside its usual environment and for at least one night (no more than one year), tourism is highly related to transports. Indicators on tourism transport will be delivered as sub-indicators of the transport list.

The intrinsic characteristics of the tourism activity directly affect the environment. As a seasonal activity, tourism creates pressures under the natural resources during short period of the year. This is of importance for energy, water and waste issues (and

management at local level), especially where resources are scarce. Indicators related to these issues are sub-indicators of the indicators already produced for water, waste and energy. As a spatial activity, tourism is highly concentrated in the most environmentally sensitive areas (coastal and mountains zones), which directly affects the terrestrial environment, soils and biodiversity erosion.

Moreover, tourism can lead to conflicts with other sectors such as agriculture and forestry. Reversibly, climate change may have some reverse effects on tourism activity as well as the quality of the environment in general in the choice of destinations.

### **Reference to other international indicator sets**

Various meetings took place to overview progress in linking the EEA definition of the indicators with statistical provision exercises on the one hand and, on the other, the policy issues being addressed by EU Agenda 21 on Tourism. Dialogues with key international partners such as World Tourism Organization (WTO/OMT), UNEP, OECD has continued in this context with the view to exchange approaches on frameworks, assessments and methods for indicators developments.

OECD	Organisation for Economic Co-operation and Development (2002), Working group on Environmental information and outlooks: Indicators for the integration of environmental concerns into tourism policies, ENV/EPOC/SE(2001)3/REV1
WTO	World Tourism Organisation (1996), What tourism managers need to know: A practical guide to the development and use of indicators of sustainable tourism, Madrid. Resources guide on initiatives on sustainable tourism (including indicators), since 2002 and continue updated: <a href="http://www.world-tourism.org/frameset/frame_sustainable.html">http://www.world-tourism.org/frameset/frame_sustainable.html</a>
UNEP / GRI	Tour Operator initiative (UNEP) and Global Reporting Initiative, Tour Operators' sector supplement, for use with the GRI 2002, Sustainability reporting guidelines: <a href="http://www.toinitiative.org/reporting/documents/TourOperatorsSupplementNovember2002.pdf">http://www.toinitiative.org/reporting/documents/TourOperatorsSupplementNovember2002.pdf</a>
UK	English Tourism Council: 'National sustainable tourism indicators, Monitoring progress towards sustainable tourism in England', English Tourism Board, 2001. <a href="http://www.english-tourism.org.uk">http://www.english-tourism.org.uk</a>
France	French Institute for the Environment (IFEN): 'Tourism, environment, territories : les indicateurs', Edition 2000 (262 pages); <a href="http://www.ifen.fr/pages/3indic.htm#tourisme">http://www.ifen.fr/pages/3indic.htm#tourisme</a> and outline in English: 'Indicators for an environmental diagnosis of Tourism in France' (20 pages).
Balearic Islands (Spain)	Centre d'investigacions i technologies turístiques de les Illes Balears (CITTIB), Indicadores de sostenibilidad del turismo en las Islas Baleares: <a href="http://www.cittib.org">http://www.cittib.org</a>
Rimini province (Italy)	Strategies and tools toward sustainable tourism in Mediterranean coastal areas LIFE project MED-COASTS S-T: <a href="http://www.life.sustainable-tourism.org">http://www.life.sustainable-tourism.org</a>
EU tourism destinations	European Indicators for Sustainable Tourism Development in Destinations LIFE project VISIT: <a href="http://www.yourvisit.info/initiative/cont_org_b_.html#">http://www.yourvisit.info/initiative/cont_org_b_.html#</a>

### **Country comments**

The tourism set has been largely revised taking into account country comments. Many countries commented that the tourism set was too long (with 53 indicators), that the titles were not clear enough, and some indicators difficult to assess and/or with a low relevancy.

For the first round, the tourism set was at a very development stage. The absence of policy objectives for the tourism sector explain that a set for tourism and environment indicators has to encompass to various components of the tourism activity that affect the state of the environment including society patterns changes. The purpose is not to be exhaustive, but rather to highlight the different environmental problems that tourism faces and reversibly.

The revised set now is reduced to 38 indicators; 3 were deleted, 14 were merged into other indicators as sub-indicators or more as background information, while 1 was added (on climate change). The structure followed is now made more explicit on the selection of the indicators. The rewriting of most of indicator titles make clearer what was behind. Considering the choice of the indicators, the recognized lack of relevant data is an important consideration for the development of the indicators that cannot be precisely defined in a common framework. This could also explain that some are more proxy indicators, even for the long term. 6 facts sheets already exist and are consultable on the EEA web site ([http://themes.eea.eu.int/Sectors\\_and\\_activities/tourism/indicators](http://themes.eea.eu.int/Sectors_and_activities/tourism/indicators)). While description sheets are in development and are not (yet) available for review.

### ***EEA current and future work on indicators***

The EEA pan-European indicator-based report (for the next ministerial conference in Kiev in 2003) includes a chapter on Tourism. The process to review for EIONET partners' comments has already been processed on the three tourism fact sheets and the chapter.

*A 'zero version' EEA 'Tourism and environment' report ('TOERM') is planned for mid-2003.* In order to gradually identify the need for a well-established and populated information base, the EEA has decided to further develop its work on tourism-environment indicators, following the model set by the indicator-based transport and environment reporting mechanism (TERM) which already delivered three indicator based reports (TERM 2000, 2001, 2002

[http://themes.eea.eu.int/Sectors\\_and\\_activities/transport/reports](http://themes.eea.eu.int/Sectors_and_activities/transport/reports) ). The Tourism report will cover the current 15 EU Member States and the 4 EFTA countries.

Where data availability has prevented a EU level analysis, national examples or proxy indicators will be used.

Tourism indicators are fully developed in contact with Eurostat to ensure a direct linkage with the design of tourism statistics by the corresponding unit. An excellent dialogue is established and *access to the working area of Eurostat tourism data* is granted. 2003 activities of this unit in terms of environmental tourism data is being discussed in a working group with DG ENTR, Eurostat Environment and tourism units and EEA. Some discussions are running to develop a Methodology on environmental tourism indicators in collaboration with Eurostat.

In addition, the EEA, in the context of its EnviroWindow facility, provided in 2002 a new service on information sharing (*DestiNet*: <http://destinet.ewindows.eu.org>), including best practices, in the domain of the tourism destinations and industry.

## 5. Relation to other issues

### 5.1 Introduction

Indicators in the EEA core set of indicators can also be used for describing other issues. For example is their in many of the sets indicators related to environment and health such as air quality in cities or drinking water quality. For a limited number of issues and sectors it is illustrated how the indicators from the EEA core set also can be used for other sets: environment and health; chemicals and hazardous substances; households; industry; and decoupling/eco-efficiency. In addition, a set of background data sets or indicators such as information on population development, economic issues are needed to supplement the EEA core set of indicators.

### 5.2 Environment and health

In relation to environment and health there are a number of relevant indicators in the EEA core set (table 5.2.1). Indicators describe exceedance days of air quality targets; increased ultraviolet radiation due to ozone layer depletion; potential impact of climate change on human health; aspects related to water, sanitation and the quality of drinking and bathing water and shellfish poisoning due harmful algae blooms and the quality of fish for human consumption. In addition there are indications covering the impact of transport such people affected by transport noise and transport accidents, fatalities and injured. Also the number of fatalities affected by floods may be covered.

**Table 5.2.1** Indicators related to environment and health in the EEA core set.

APQ11 Exceedance days of air quality target in urban areas	
APQ11a Exceedance days of SO <sub>2</sub> target in urban areas	ST
APQ11b Exceedance days of NO <sub>2</sub> target in urban areas	ST
APQ11c Exceedance days of PM <sub>10</sub> target in urban areas	ST
APQ11d Human exposure to O <sub>3</sub> exceedance	ST
APQ11e Exceedance days of CO target in urban areas	ST
APQ11f Exceedance days of benzene target in urban areas	MT
APQ12 Exceedances of air quality objectives due to traffic	MT
OD4 Average ozone column	ST
CC12 Impacts on human health	
CC12a Seasonal Change of allergenic pollen (onset and duration)	ST
CC12b Vector-borne diseases (e.g. encephalitis) (distribution)	ST
CC12c Deaths (number of) due to heat waves	MT
CC12d Deaths (number of) due to floods	ST
CC12e Food and water-borne diseases (distribution)	MT
TENH1 Area affected by flooding	ST
WEU10 Drinking water quality	MT
WEU11 Bathing water quality	ST
WEU14 Phytoplankton in transitional and coastal waters	
WEU14a Harmful algae blooms	MT
WHS13 Non-compliance with EU Environmental Quality Standards	ST
FISH7 Quality of fish for human consumption	ST
TERM05 Exposure to and annoyance by traffic noise	LT
TERM09 Number of transport accidents, fatalities and injured (land, air and maritime)	ST

During the last 3-4 years WHO European office has put a lot of effort in establishing a core set environment and health indicators<sup>84</sup>. The proposed WHO core set contains 51 indicators covering most of the indicators described in table 5.2.1 as well as more

<sup>84</sup> WHO work on environment and health indicators see [http://www.euro.who.int/EHindicators/Indicators/20020319\\_1](http://www.euro.who.int/EHindicators/Indicators/20020319_1)

background indicators such as for example passenger transport and waste water treatment, which are also included in the EEA core set. In the WHO set there are aspect such as food safety and workplace safety, which are not covered by the EEA set. EEA has contact and cooperation with WHO on different aspect of the indicators development to ensure consistency and avoid duplication of work.

### 5.3 Chemicals and hazardous substances

In relation to chemicals and hazardous substances there are a number of relevant indicators in the EEA core set (table 5.3.1). Most of these indicators describe the state (e.g. concentration levels in air, water and soil) and impact of hazardous substances.

**Table 5.3.1** Indicators related to chemicals and hazardous substances in the EEA core set.

APE10 Emissions Heavy metals and POPs (total & by sector)	MT
APQ11 Exceedance days of air quality target in urban areas	
APQ11f Exceedance days of benzene target in urban areas	MT
APQ11g Human health exposure and risk by air pollutants	MT
APQ12 Exceedances of air quality objectives due to traffic	MT
APD13 Ecosystem exposure to exceedance of critical levels and loads	
APD13e Atmospheric deposition waters of heavy metals and persistent organic pollutants (POPs) to marine and coastal waters	LT
TEP2 Heavy metal accumulation in soil	MT
TEP3 Soil contamination by pesticides	LT
TEP1 Soil contamination from localised sources	ST
TEP1a Progress in management of contaminated sites	ST
TEP1b Expenditures on contaminated sites remediation	ST
TEC1c Risks of contamination of surface and groundwater from contaminated sites	MT
WHS1 Hazardous substances in groundwater	
WHS1a Pesticides in groundwater	MT
WHS2 Hazardous substances in rivers	MT
WHS3 Hazardous substances in lakes	LT
WHS6 Hazardous substances in marine organisms	ST
WHS7 Loads of hazardous substances to coastal waters	MT
WHS Sources of hazardous substances	
WHS9 Emissions of hazardous substances from urban waste water treatment plants	
WHS8 Emissions of hazardous substances from industry	
WHS Emission from sea-based sources	
WMF13 Generation of hazardous waste	MT
WMF14 Content of dangerous substances in products which end up in priority waste streams (ratio to total material content)	LT
WMF20a Transboundary movements of hazardous waste	ST
AGRI7 Pesticide consumption	
AGRI8a Use/consumption of pesticide	ST
AGRI8b Pesticide risk indicator	MT
AGRI12 Area planted with GMO crops	LT

EUROSTAT has together with the EEA and member states worked on establishing indicators describing the use of chemicals<sup>85</sup>. The Finnish Environment Institute, under contract to the European Commission (DG Environment), is currently preparing a study, +which aims to develop an environmental indicator for hazardous substances. The indicator covers 81 substances (including some pesticides and biocides), selected by their persistence, bioaccumulation and aquatic toxicity. At the national level there are for the moment currently several ongoing activities to establish a indicators related to chemicals see for example Performance Indicators for the UK Chemicals Strategy (January 2003)<sup>86</sup>.

### 5.4 Households

<sup>85</sup> EUROSTAT work on chemicals indicators see [http://forum.europa.eu.int/Public/irc/dsis/pip/library?l=/indicators\\_chemicals](http://forum.europa.eu.int/Public/irc/dsis/pip/library?l=/indicators_chemicals)

<sup>86</sup> [http://www.defra.gov.uk/environment/chemicals/csf/pdf/csf\\_perf-indics.pdf](http://www.defra.gov.uk/environment/chemicals/csf/pdf/csf_perf-indics.pdf)

The EEA core set do for the moment not cover direct environmental pressures related to households and consumption, however in the different sets there are a number of relevant indicators describing households and consumption trends (table 5.4.1).

**Table 5.4.1** Indicators related to households and consumption in the EEA core set.

<b>Indicator title &amp; sub-indicators</b>	<b>S/M/L</b>
APE1 Emissions acidifying pollutants (total & by sector)	ST
APE2 Emissions ozone precursors (total & by sector)	ST
APE5a Emissions SO <sub>2</sub> (total & by sector)	ST
APE6a Emissions NO <sub>x</sub> (total & by sector)	ST
APE7a Emissions NH <sub>3</sub> (total & by sector)	ST
APE8a Emissions NMVOC (total & by sector)	ST
APE9a Emissions primary and secondary PM <sub>10</sub> (total & by sector)	ST
APE10 Emissions Heavy metals and POPs (total & by sector)	MT
CC5 Emissions by pollutant and by sector	
CC5a Emissions of carbon dioxide (CO <sub>2</sub> ) and non-CO <sub>2</sub> (N <sub>2</sub> O, CH <sub>4</sub> , fluorinated gases)	ST ST
CC5b Emissions of key source sectors (energy, transport, industry, agriculture, waste) by country	
CC13b Projected emissions of key source sectors (energy, transport, industry, agriculture, waste)	
WQ2 Water use by sectors	
WQ2a Sectoral split of water use & water consumption	MT
WQ2d Water use by households	MT
WQ2e Water use by tourism	LT
WQ5 Water prices	MT
WQ6 Efficiency of water use	MT
WQ7 Water Leakage	MT
WEU7 Loads of nutrients to water	MT
WEU8 Emissions of organic matter	MT
WEU9 Emissions of nutrients	MT
WEU16 Urban waste water treatment	ST
WHS7 Sources of hazardous substances	MT
WHS9 Emissions of hazardous substances from industry	MT
WMF6 Municipal waste	
WMF6a Generation of municipal waste	ST
WMF6d Waste generated by tourism	LT
WMF9 Generation of packaging waste	ST/MT
WMF10 Generation of waste from electrical and electronic equipment	LT
AGRI14 Organic farming: market share	MT
Human consumption of fish	
FISH10a Fish consumption per capita	ST
FISH7 Quality of fish for human consumption (F & A)	ST
EE18 Final energy consumption by sectors	ST
EE20 Total energy intensity	ST
EE28 End-user (Final) energy prices (inclusive of taxes) by economic sector	ST
TERM12 Passenger transport demand by mode and purpose	ST
TERM29 Occupancy rates for passenger vehicles	MT
TERM14 Access to basic services (average passenger journey time and length per mode, purpose and location)	MT
Vehicle fleet	
TERM32 Size of the vehicle fleet	ST
TERM33 Average age of the vehicle fleet	ST
TERM34 Proportion vehicle fleet meeting certain emission standards ( )	ST
EE18 Final energy consumption by sectors	ST
EE20 Total energy intensity	ST
EE28 End-user (Final) energy prices (inclusive of taxes) by economic sector	ST

Cost of transport	
TERM20 Transport prices (real change in passenger and freight transport price by mode)	ST
TERM21 Fuel prices and taxes	ST
TERM22 Transport taxes and charges	ST
Expenditure on personal mobility by income group	
TOUR3 Tourism arrivals in Europe	ST
- Residents and non-residents breakdown	
- European geographical regions breakdown	
TOUR7 Overnights spent in tourism accommodations	ST
TOUR8 Economic value of tourism industry (GVA) as in % total GDP	ST
TOUR9 Household expenditure and tourism prices	ST
TOUR10 Tourism packages and ecotourism products (in % of total)	LT

Reference to OECD activities on indicators on household consumption patterns

## 5.5 Industry

The EEA core set do for the moment not cover direct environmental pressures related to industry, however in the different sets there are a number of relevant indicators describing pressures related to industry (table 5.5.1).

**Table 5.5.1** Indicators related to industry in the EEA core set.

Indicator title & sub-indicators	S/M/L
APE1 Emissions acidifying pollutants (total & by sector)	ST
APE2 Emissions ozone precursors (total & by sector)	ST
APE5a Emissions SO <sub>2</sub> (total & by sector)	ST
APE6a Emissions NO <sub>x</sub> (total & by sector)	ST
APE7a Emissions NH <sub>3</sub> (total & by sector)	ST
APE8a Emissions NMVOC (total & by sector)	ST
APE9a Emissions primary and secondary PM <sub>10</sub> (total & by sector)	ST
APE10 Emissions Heavy metals and POPs (total & by sector)	MT
OD2 Production of ODP	ST
OD3 Sales/Consumption of ODP	ST
CC5 Emissions by pollutant and by sector	
CC5a Emissions of carbon dioxide (CO <sub>2</sub> ) and non-CO <sub>2</sub> (N <sub>2</sub> O, CH <sub>4</sub> , fluorinated gases)	ST ST
CC5b Emissions of key source sectors (energy, transport, industry, agriculture, waste) by country	
CC13b Projected emissions of key source sectors (energy, transport, industry, agriculture, waste)	ST
WQ2 Water use by sectors	
WQ2a Sectoral split of water use & water consumption	MT
WQ2c Water use by industry	MT
WQ5 Water prices	MT
WQ6 Efficiency of water use	MT
WEU7 Loads of nutrients to water	MT
WEU8 Emissions of organic matter	MT
WEU9 Emissions of nutrients	MT
WEU16 Urban waste water treatment	ST
WHS7 Sources of hazardous substances	MT
WHS8 Emissions of hazardous substances from industry	MT
WMF5 Total waste	
WMF5a Total generation of waste, including sectoral split	MT
WMF5b Waste intensity (total waste generated per unit of GDP)	MT
WMF7 Generation of industrial waste	LT
TERM13 Freight transport demand by mode and group of goods (TERM 13)	ST
TERM30 Load factors for freight transport (TERM 30)	MT

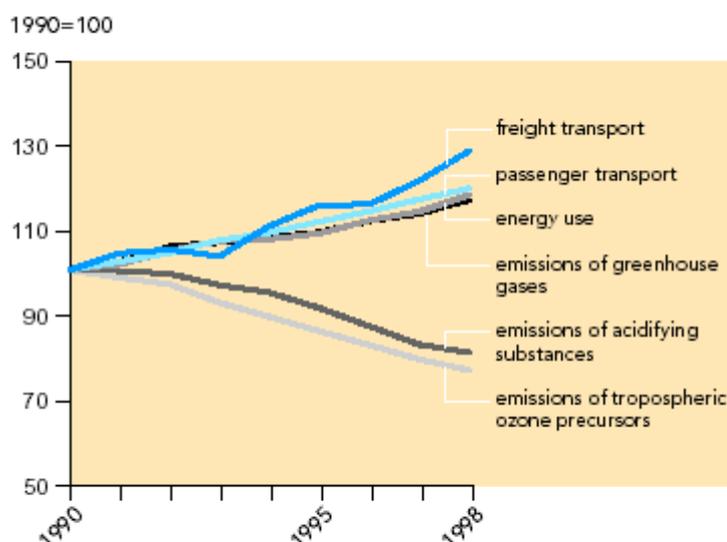
EE18 Final energy consumption by sectors	ST
EE20 Total energy intensity	ST
EE28 End-user (Final) energy prices (inclusive of taxes) by economic sector	ST

The European Commission DG Enterprise has in line with the Cardiff process worked on establishing indicators that describe environmental pressures from industry<sup>87</sup>. The proposed indicators are focused on eco-efficiency and decoupling and covering aspects of emissions of greenhouse gases (CC4), acidifying substances (APE1) and ozone precursors (APE2); production of ozone depleting gases (OD1); energy consumptions and use of raw material (WMF1).

## 5.6 Eco-efficiency

Eco-efficiency is the relationship between economic activity and the associated negative environmental effects. It is a combination of indicators illustrating trends in activities (gross value added, household expenditure etc.) and indicators on pressures such as air emissions, water use etc. EEA has used sector eco-efficiency in the Environmental Signals reports (see example diagram). Table X provide an overview of the eco-efficiency indicators and its relationship to the EEA core set.

Some indicators of eco-efficiency of transport, EU15 Figure 5.1.



Note: Passenger transport includes travel by motorbike, car, bus, tram / metro, rail, water and air. Freight transport includes freight by road, rail, inland waterways, short sea shipping, oil pipelines and air.

Source: EEA, Eurostat

**Table 5.6.1:** Overview of EEA sector eco-efficiency indicators used in the Environmental Signal reports (2000-2002) and the code relating to the indicator in the EEA core set.

Sector		Indicator	Code
Households (Env. Signals 2002)	Production – activity	Total household expenditure Number of households	
	Pressures (including proxy indicators)	Number of cars Household energy use CO2 emissions Municipal waste generation	TERM32 EE18 CC5 WMF6
Transport (Env. Signals 2002)	Production – activity	Passenger transport Freight transport	TERM12 TERM13
	Pressures (including proxy indicators)	Energy use GHG Emissions Emission of acidifying substances Emissions of ozone precursors	TERM01 CC5h APE1 APE2
Energy Supply (Env. Signals 2002)	Production – activity	Gross value added Transformation output	
	Pressures (including proxy indicators)	GHG Emissions Emission of acidifying substances Emissions of ozone precursors	CC5c APE1 APE2
Agriculture (Env. Signals 2002)	Production – activity	Gross value added Agricultural land	
	Pressures (including proxy indicators)	Energy use GHG Emissions Emission of acidifying substances Emissions of ozone precursors Irrigated land Consumption of fertilisers Consumption of pesticides	EE18 CC5i APE1 APE2 AGRI1 AGRI7 AGRI8
Industry (Env. Signals 2000)	Production – activity	Index of production	
	Pressures (including proxy indicators)	CO2 emissions NOx emissions SO2 emissions	CC5 APE6 APE5

Several member countries and OECD<sup>88</sup> have during the last five years worked on establishing eco-efficiency/decoupling indicators. In particular for sectors but activities on environmental issues also have been started. These activities are important input to EEA work on eco-efficiency/decoupling indicators.

## 5.7 General background datasets/indicators

In addition to the proposed EEA core set of indicators there is a need of general background information such as

- Development in population
- Economic development (e.g. GDP or gross value added)
- Land areas and administrative boundaries
- Others

This information is regularly stored and updated in the EEA data service and in general based on existing international data collections. The agreed set of background data will ensure all the EEA indicators normalised to per capita, per unit of GDP or per hectare of land area will be done in a consistent way.

<sup>88</sup> OECD 2002: Indicators to Measure Decoupling of Environmental Pressure from Economic Growth [http://www.oilis.oecd.org/olis/2002doc.nsf/LinkTo/sg-sd\(2002\)1-final](http://www.oilis.oecd.org/olis/2002doc.nsf/LinkTo/sg-sd(2002)1-final)

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