

Technical report No 47

# Questions to be answered by a state-of-the-environment report

The first list

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Project Manager:  
Peter Bosch  
European Environment Agency

Cover design: Rolf Kuchling, EEA

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### **Questions to be answered by a state-of-the-environment report, the first list**

This report has been prepared by Planistat Europe (Arnaud Camolet and Natacha Berlin) and the Finnish Environment Institute (Eeva Primmer and Leen Kopperoinen), with the support of the EEA expert group on guidelines and state-of-the-environment reporting. As this report is a working document, the text has not been edited with regard to proper use of the English language. The report can be downloaded from the EEA home page: <http://www.eea.eu.int>; search under the theme 'environmental reporting'.

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European Environment Agency  
Kongens Nytorv 6  
DK-1050 Copenhagen K  
Denmark  
Tel: +45 33 36 71 00  
Fax: +45 33 36 71 99  
E-mail: [eea@eea.eu.int](mailto:eea@eea.eu.int)  
<http://www.eea.eu.int>

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# 1. Introduction

The Expert Group on Guidelines and the State of the Environment Reporting (referred below as *the Group*)<sup>1</sup> was established by the European Environment Agency (EEA) in 1997 with a view to help the EEA and the European countries to develop common terminologies, frameworks and practices for (National) Reports on the State of the Environment (SoER). The idea behind the creation of this group is that there are issues of common concern to European countries and that consequently harmonising national approaches to SoER and environmental information would benefit both the EEA and the Member States (MS). In particular, it will contribute to a better comparability of national and regional state-of-the-environment reports and information on sustainable development, and help rationalise environmental reporting production process at all decision levels.

As a matter of fact, to date, each European country and many regions have their own SoER format and priority list of environmental issues (whether explicit or implicit), which hampers the comparison of national state-of-the-environment reports. To improve the harmonisation of national approaches, the Group has decided in its 1999-2000 programme to establish a core list of questions to be answered by SoER per environmental issue. Such a core list should help officials who are in charge of state-of-the-environment in their reporting work. Nevertheless, the objective of this list is not to give a strict format of what SoER should be, but rather to propose guidelines to help Member States to better design their next versions of SoER, bearing in mind that environmental reporting activities should be maintained flexible so as to adapt to national or regional needs and objectives.

This document is the final report of a study undertaken by the EEA in 1999-2000, of which intermediary outputs have been discussed with the Group in three meetings<sup>2</sup>. It should be seen as a 'living' document, i.e. one point in an evolving process which can be amended in the future through new versions, and certainly not as a definitive and universal one. Neither should existing SoER be compared to this Guidelines. Rather, it has been devised to help Member States and the EEA to improve their own reports, and to support future discussions on streamlining data requirements and dataflows for SoER.

## **The different approaches to SoER**

In the early phase of their development (1970s and 1980s), SoER were rather descriptive and mainly concerned by the current state of the environmental media and the depletion of natural resources, the past trends and conservation strategies<sup>3</sup>. The principal audience was made of environmentalists and public already aware of environmental problems. Since that time, SoER have considerably broadened their ambitions and scope. SoER are now positioned

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<sup>1</sup> The Group consists of experts from the 18 EEA member countries and from the 13 countries participating in the PHARE programme.

<sup>2</sup> Meetings of the Group of 23 April 1999, 22 October 1999 and March 24 2000.

<sup>3</sup> 'Traditionally, the concept of an SOE report has tended to be reserved for description of an authoritative and comprehensive document, recording status and (perhaps) trends in quality across the various environmental media', 'State of the environment reporting – Institutional and legal arrangements in Europe', Wyatt B.K. (ITE), Kristensen P. (NERI) and Denisov N. (UNEP/GRID-Arendal), EEA Technical report No 26, 1999, p. 9.

within the perspective of sustainable development and thus examine the relations between the environment and the socio-economic processes. Nowadays, SoER are considered much more as a tool for decision making<sup>4</sup>: the key aim of SoER is to provide a judgement on the state of the environment of a country or a region in relation to the performance of policies and the distance of the current situation to sustainable development.

In that context, measuring policy performances has become a priority for SoER. Agenda 21, for instance, sets out new requirements for environmental information:

- integrated and timely access to data and information from many different sources,
- analysis of environment-development interactions, and policy and management options, identification of cause and effect relationships as well as emerging issues of potential international importance,
- assessment of potential impacts and long-term sustainability of alternative development, policy or management scenarios<sup>4</sup>.

In the meantime, SoER have also enlarged their audience and are designed for a larger public. In this process, the range of outputs from the SoER process has also broadened encompassing, for example, a background report, a summary report, a web version, an educational package.

However, there are still various approaches that can be followed to produce a SoER, in particular as regards the target audience or the policy issues to be addressed. SoER still differ widely from one country to another. SoER structure and content depend on national environmental conditions, traditions, values, political, institutional systems. Hence, different types of SoER can be identified (see Table 1) and no single SoER model can be established for the time being.

As far as the audience of SoER is concerned, there are now four main groups of potential users: policy makers, media, the general public and environmental stakeholders. Each audience has its own requests in terms of both SoER content and presentation. A report that serves political decision-making covers different issues and has a distinct viewpoint from those of a report that is targeted to the public at large. For example, a general chapter on environmental conditions, examining the various durable features of the concerned area (Geography, Climate, etc.), is of no interest for the political target group, but can be interesting for a larger audience. Consequently, the precise target audience has to be defined before setting out the structure of the SoER.

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<sup>4</sup> 'Scanning the Global Environment: A framework and methodology for integrated environmental reporting assessment', R.J. Swart, J.A. Bakkes, L.W. Niessen, J. Rotmans, H.J.M. de Vries and R. Weterings, RIVM/UNEP, UNEP/EAP.TR/95-01, 1995 p. vi.

**Table 1: Typology of reports on the state-of-the-environment<sup>(.)</sup>**

<p><b>Purely statistical reports</b> Statistical Yearbook, Compendium, Fact Sheets... <b>Characteristics:</b> Tables with figures on main environmental issues and/or sectors, and few textual comments. <b>Audience :</b> All audiences</p>	<p><b>Examples:</b> <i>The UK Digest of Environmental Statistics; the Czech Statistical Yearbook; Environmental Statistics of the Netherlands</i></p>
<p><b>Traditional SoER</b> <b>Characteristics:</b> Description of the status of the environment and past trends. Identification of the main causes of the pressures, and policies to remedy the environment degradation. Mainly descriptive reports. <b>Audience:</b> Scientists, environmental professionals and stakeholders</p>	<p><b>Examples:</b> <i>The state of the environment in Poland, 1998; the State of the environment in Hungary, 1999</i></p>
<p><b>New generation of SoER</b> <b>Characteristics:</b> Comprehensive evaluative report scrutinising the status of the environment and past trends, and the relationships with socio-economic activities. Evaluation of the effectiveness of past environmental policies and examining future prospects <b>Audience:</b> Policy makers, general public, environmental stakeholders</p>	<p><b>Examples:</b> <i>The state of the environment in Denmark (1997); The environment in France (1999), Daten zur Umwelt (Germany)</i></p>
<p><b>National outlook</b> <b>Characteristics:</b> Report on the future trends of driving factors and consecutive impacts for the environment. Scenario analysis. <b>Audience:</b> Policy makers, general public</p>	<p><b>Example:</b> <i>The Dutch National Environmental Outlook (2000)</i></p>
<p><b>Policy report</b> <b>Characteristics:</b> Reports (white papers, report to the Parliament,...) prepared for policy makers on the performance of past policies and examining options for the future <b>Audience:</b> the government or the parliament</p>	<p><b>Examples:</b> <i>The Government's Environmental Policy and the State of the Environment of Norway (to be debated by the Parliament)</i> <i>Medio ambiente en españa , 1997 (Spanish SoER)</i></p>
<p><b>Non technical report for very large public</b> <b>Characteristics:</b> Non technical description of environment status, educational reports. Summary of comprehensive SoER <b>Audience:</b> General public</p>	<p><b>Examples:</b> <i>Environmental data. Germany (1998); The Environment in Denmark, selected Indicators (several years)</i></p>

(.) Excluding thematic reports, regional reports, reports on indicators.

In the same way, there are so many questions that a SoER can potentially address, either in terms of environmental topics (air, water, nature, etc.) or DPSIR chain (driving factors, pressures, state, impacts, responses), that there is a clear need to hierarchise and select them. In that respect, SoER should support prioritising environmental issues. Additionally, editorial restrictions are needed to focus on key issues and perspectives.

Nevertheless, depending on its target audience as well as its institutional and political context, the list of questions to be answered by a SoER may still vary a great deal. The main purpose of this Guidelines is to propose a core list of questions that SoER should answer reflecting the political priorities in a European perspective.

## The method

The list of questions presented below results from the combination of a bottom-up and a top down approach. The bottom-up approach has taken the form of a survey undertaken in the preliminary phase of the study with a view to identify the list of questions answered by a sample of 10 NRSoE<sup>5</sup>, and the classification of those questions according to the EEA typology of environmental issues. A list of 1,300 questions was drawn up from this survey of current reporting activities<sup>6</sup>.

The top-down approach has consisted in an analysis of policy maker needs in relation to SoER, and the structuring of the questions according to the key questions asked by policy makers.

Hence, the two approaches have been merged. The merging has been carried out in three steps, from the most aggregated information level related to broad environmental issues (level 1), to a rather detailed level, referring to more specific issues (level 3):



**Level 1** points out the key environmental issues in Europe and includes questions to be addressed by a SoER summary or regular SoER (e.g., *What have been the impacts of acid rain in the country?*).



**Level 2** subdivides each level 1 question into a group of more detailed ones, that are to be addressed by comprehensive SoER or reports on specific topics. (e.g., *What is the situation of ecosystems regarding acidification in the country?*).



**Level 3** is the full detail level. It subdivides each level 2 question into more detailed ones, which are to be taken into account by very comprehensive reports (scientific or thematic reports). (e.g., *What is the situation for soils, forests, aquatic ecosystems, etc. regarding the effects of acid rain in the country?*).

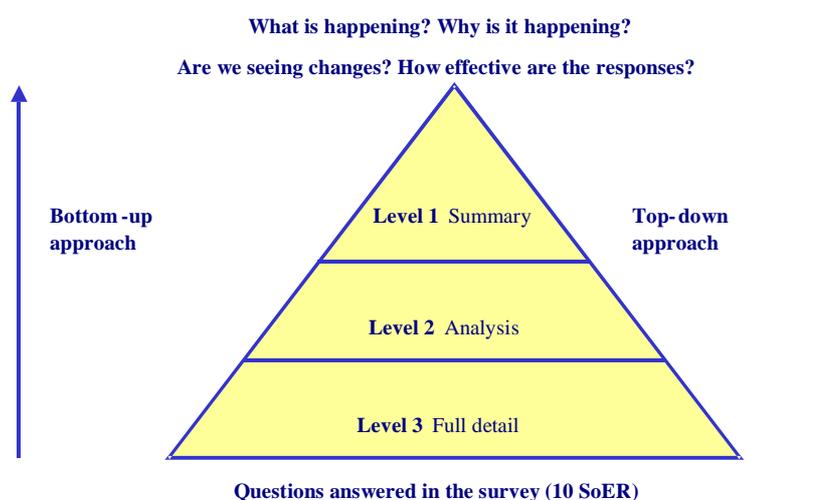
However, it is clear that in the absence of a clear hierarchy of environmental issues, the delimitations between the three levels are to some extent arbitrary.

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<sup>5</sup> The sample consisted of the following SoER: Austria, Denmark, Estonia, France, Finland, Germany, Hungary, Poland, Spain and United Kingdom.

<sup>6</sup> Berlin N., Comolet A., Kopperoinen L., Primmer E., 'List of questions answered by national reports on the state of the environment', Planistat/Finnish Environment Institute, April 16, 1999.

**Figure 1: The combination of top down and a bottom-up approaches**



In compiling the list of questions hereafter, it has been assumed that the State-of-the-Environment report is primarily directed at policy makers and that the purpose of the Guidelines is to support the policy decision process. In that perspective, the list does not include questions related to the description of environmental conditions which are relatively stable (relating to all kind of descriptive information on the general physical features of the natural environment, e.g. climate, geography, geology, hydrography,...), nor on the scientific background of environmental issues (state of the scientific understanding and potential scientific controversies on environmental phenomena at the time of SoER publication).

A crucial instrument of the conceptual framework that usually guides SoER in the European countries is the DPSIR model. According to Paul Rump<sup>7</sup>, for each environmental issue/topic there are four types of key questions to be asked, each of them referring to different phases of the DPSIR framework.

**What is happening?**  
**Why is it happening?**  
**Are the changes significant?**  
**What is or could be the response?**

For the purpose of this Guidelines, a different wording has been proposed for the last two questions, so as to concentrate more on policy effectiveness:

**What is happening?**  
**Why is it happening?**  
*Are we seeing changes?*  
*How effective are the responses?*

The first question, **What is happening?** refers to the trends in the environmental conditions and assesses and interprets the implications and impacts of these trends to human health, the economy and ecosystems. It thus includes an assessment of the significance of the trends.

<sup>7</sup> 'State of the environment reporting: Source Book of Methods and Approaches', Paul C. Rump, UNEP/DEIA/TR.96.1, 1996.

The question **Why is it happening?** provides indications on the causes, whether human or natural, direct or indirect, of the observed changes.

The third question, *Are we seeing changes?*, focuses specifically on current and future changes in pressures as it is the first level where one can see the results of a policy. Additionally, it examines early signs of changes in economic and social activities which may influence environmental conditions.

The last question, *How effective are the responses?*, relates to the societal responses and their environmental implications. Those responses are far from easy to evaluate as, among other things, there may be a considerable time delay before the ecosystem responds to new or additional measures.

Key questions	Relevant DPSIR phases
<i>What is happening?</i>	(S)tate, (I)mpact
<i>Why is it happening?</i>	(D)riving factor, (P)ressure
<i>Are we seeing changes?</i>	(P)ressure, (D)riving force
<i>How effective are the responses?</i>	(R)esponse

In practice, all those questions are closely linked together, and to separate them is sometimes difficult, or even somewhat arbitrary.

On the basis of these four key categories, a list of questions that are common for a number of European countries has been established for a selected and pilot set of environmental issues. Accordingly, purely specific national and local issues have been left out.

### How to use the list ?

Level 1 of the questions sets out a general framework reflecting the most crucial political issues of the moment, which is supported by levels 2 and 3 of questions. It establishes the minimum requirements for what a SoER should provide an answer for within the European context, while the two other levels serve as help for further detailing the level 1 overall questions.

As a general rule, SoERs should address at least levels 1 and 2, although this would depend on the national context. Although very detailed, the level 3 of questions can however be used for a general SoER that has selected certain cases for more developed treatment.

This methodology has been applied for 14 key environmental issues used in EEA reports, i.e:

- Climate change
- Ozone layer depletion
- Acidification
- Tropospheric ozone
- Air quality
- Inland waters
- Marine and coastal environment
- Soil degradation
- Waste
- Chemicals
- Noise
- Technological and natural hazards

- Nature and biodiversity
- Urban environment

The chapter clustering has been adapted to the geographical nature of environmental issues at stake and the interlinkages to be shown. They do not indicate a ranking of importance of the issues. The order chosen for the chapters ranges from the global to the local issues: global (climate change, ozone layer depletion), regional (acidification, tropospheric ozone) and national issues (air quality, inland waters etc.). Nevertheless, even with this type of classification overlapping is extremely difficult to avoid (e.g. CFC is at the same time a substance implicated in the depletion of the ozone layer and a greenhouse gas). As far as possible, the links have been established when the same question is related to two or several environmental issues. Major links between the various issues have also been indicated: e.g. many urban problems are closely linked with issues discussed in other sections, i.e. tropospheric ozone, air quality, water management, waste, etc.

While listing the questions, for each environmental issue consideration has been given to its place in the policy life cycle and observed path of changes in the way the issue is being addressed:

- Do we face an emerging or a completely new issue? (e.g., biosafety). In this case, each new version of SoER should reflect the increase in scientific understanding that has occurred in comparison to the previous versions of the report.
- Are we at the beginning of the public awareness process for the issue at stake? (e.g. persistent organic pollutants).
- Is it a problem for which policy makers are beginning to formulate a response? (e.g. water shortages and water pricing).
- Is it a problem for which policies are being implemented? (e.g. packaging waste).
- Is it a long recurrent problem, in the stage of control only? (e.g. air pollution by conventional power plants).

This document provides a common base, which should be regarded as adaptable to changes over time and in varying environmental as well as political contexts. Some questions are common to all environmental issues (e.g., *What are the European responses to address the problem?*), whereas most of them are specific to the examined issue. However, as the questions are structured according to the same framework (a combination of the four main categories of questions to be addressed with the DPSIR approach), this results in an unavoidable repetition of some of the questions.

The Guidelines, which focuses on European Environmental issues, will not be able to fit perfectly to each national, and even more local, situations which are very diverse. In addition, every country may have its own priority list of environmental issues. According to the national or regional requirements, the list of questions can be expanded or, even on level 1 and 2, made more focused. In most cases, level 3 should serve as reference to specialised publications. The list can then be used to set out the organisation of the data and information compilation in the preparation of a report. Of course, the list cannot provide precise guidelines, but it can be used to communicate to other institutions the scope and intention of data to be collected, or it can be the basis for the design of detailed guidelines for data collection.

Although it has been tried to bring a logical order in the list of questions, they do not provide a rigid guidelines for writing the report. The design of individual chapters and the order (and selection of) chapters in a report depends on the story lines and the main messages the responsible institution wants to include in the report. There are many ways to tell the story ranging from the systematic following of a Driving Force-Pressure-Impacts-Response chain, to starting with the Impacts because preventing those is what it is all about, and various variants in between. Similarly, depending on the type of reports (see Table 1) and the target group, the balance between a description of the state of the environment (What is happening? Why is it happening?) and an analysis of policy development can tipple completely to the one or to the other side. Reports that are indicator based sometimes spend only half a page on the description of the state of the environment while the rest of the chapter is devoted to analysing effectiveness of measures and future development of the driving forces.

Still, the questions to be answered remain the same. Whatever solution will be chosen for the design of a report, the intention of the list of questions is to provide some guidance and a checklist for the contents. As indicated above, this document is the first edition of a list which will have to be adapted regularly to adapt to the moving situation.

For each environmental issues addressed below, an introduction page lays out the main problems at stake using quotes from EEA-reports, followed by a figure replacing those problems within the DPSIR framework. Then, the questions are structured according to the three levels of aggregation as depicted above.

## 2. Greenhouse gases and climate change

Place of the issue in the policy cycle
Climate change is widely recognised as a serious potential threat to the world's environment. The problem is being addressed through the United Nations Framework Convention on Climate Change (UNFCCC) and has been identified by the EU as one of the key environmental themes to be tackled (EEA 2000).

What is happening?
The greenhouse effect is a natural phenomenon. However, over the past century atmospheric concentrations of anthropogenic greenhouse gases — carbon dioxide (CO <sub>2</sub> ), methane, nitrous oxide and halogenated compounds such as chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride — have risen, and a considerable increase, in historic terms, in global mean temperatures has been observed. There is increasing evidence that greenhouse gas emissions from human activities are causing an enhanced greenhouse effect. This takes the form of global warming, leading to climate change (IPCC, 1996). Climate change is expected to have widespread consequences, including: sea-level rise and possible flooding of low-lying areas; melting of glaciers and sea ice; changes in rainfall patterns with implications for floods and droughts; and more climatic extremes (especially high temperatures). These effects will have major impacts on ecosystems, health, water resources and key economic sectors such as agriculture (EEA 2000).

Why is it happening?
The dominant human activity or driving force for climate change is fossil-fuel combustion (due to its carbon dioxide emissions). Other activities that contribute to greenhouse gas emissions are agriculture, land-use changes (including deforestation), waste disposal to landfills and industrial processes such as cement production, refrigeration, foam blowing and solvent use (EEA 2000).

**Table: Sources and contribution to global warming of greenhouse gases (EEA 1998, p.42)**

Gas	Main anthropogenic sources	Contribution (%)
CO <sub>2</sub>	Energy use, deforestation and changing land-use, cement production	65
CH <sub>4</sub>	Energy production and use, animals, rice paddies, waste, landfills, biomass burning, domestic sewage	20
Halogenated compounds	Industrial, refrigeration, aerosols, foam blowing, solvents	10
N <sub>2</sub> O	Fertilised soils, land clearing, acid production, biomass burning, combustion of fossil fuels	5

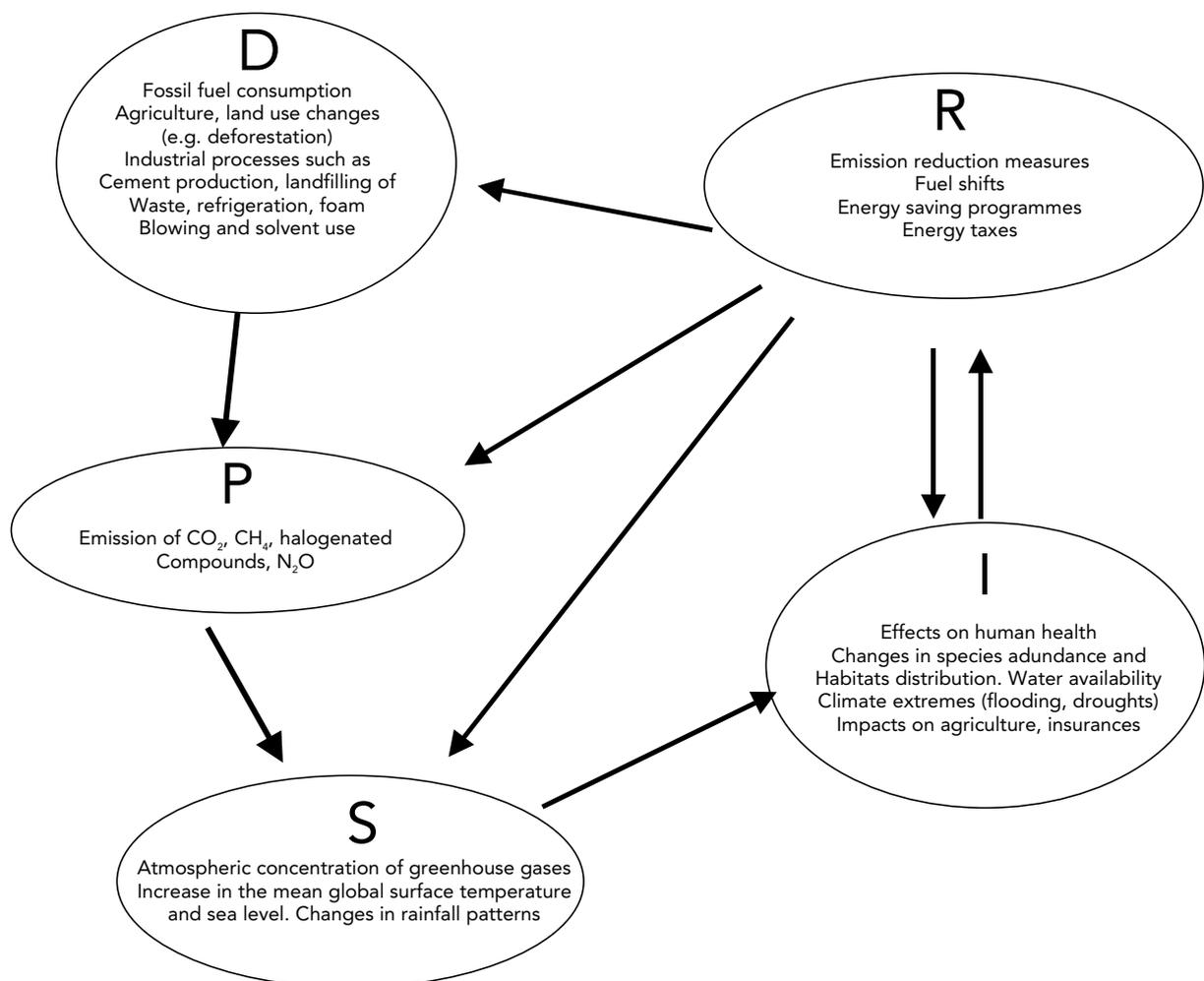
Are we seeing changes?
Total greenhouse gas emissions have increased since 1990 in most EEA member countries and are projected to increase in the EU, under a baseline scenario, by 6 % between 1990 and 2010 (EEA 2000). Global mean temperature has increased by about 0.3-0.6°C over the past 100 years (EEA 2000, p. 48). As a result of these trace gas trends, an effective doubling of greenhouse gas concentrations is expected around 2030 (EEA 1995, p. 513).

### How effective are the responses?

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the 1992 UN Conference on Environment and Development when developed countries made a commitment to return their emissions of greenhouse gases not controlled by the Montreal Protocol to 1990 levels by 2000'. At the third conference of parties of UNFCCC held in Kyoto in 1997, developed countries agreed to reduce their emission of six greenhouse gases by an overall 5 % from 1990 levels by 2008-2012. The Kyoto protocol introduced 'three flexibility mechanisms' to help reach the targets: emissions trading between developed countries, joint implementation among developed countries, and co-operation between developed and developing countries in a 'clean-development mechanism'. In 1998, a system of 'burden sharing' was agreed by EU Member States (EEA 2000, p. 42-43).

The EU and its Member States are committed to reducing emissions by 8 % below the 1990 level and the central and eastern European (CEE) countries to reductions of 0-8 % (EEA 2000).

### Greenhouse gases and climate change – DPSIR framework



## Greenhouse gases and climate change



### What is happening?

- What is the trend in the concentration of the greenhouse gases in the atmosphere?
- What have been the impacts of climate change in the country? In Europe? Worldwide?
- What is expected to happen in the country? In Europe? Worldwide?

### Why is it happening?

- Which sources and which pollutants are responsible?
- What are the reasons for the trend in pollutant emissions?

### Are we seeing changes?

- What is the trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?
- What is the expected trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?

### How effective are the responses?

- What are the responses to address the climate change problem?
- What are the national responses?
- Are the responses meaningful?
- Which responses have been the most successful to address the climate change problem?
- What are the responses in prospect at international, European and national levels regarding climate change?
- What are the different options at national level?

## Greenhouse gases and climate change



Level 2

### What is happening?

- **What is the trend in the concentration of the greenhouse gases in the atmosphere?**
  - What is the trend in the concentration of CO<sub>2</sub>? N<sub>2</sub>O? CH<sub>4</sub>? CFC? HCFC? PFC? SF<sub>6</sub>? HFC? (Worldwide)?
- **What have been the impacts of climate change in the country? In Europe? Worldwide?**
  - What have been the signs of changes in climate in the country? In Europe? Worldwide?
  - What have been the other changes, induced by the climate change in the country? In Europe? Worldwide?
- **What is expected to happen in the country? In Europe? Worldwide?**
  - What are the different IPCC scenarios?
  - What are the expected changes in climate?
  - What are the expected induced effects of climate change?

### Why is it happening?

- **Which sources and which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
- **What are the reasons for the trend in pollutant emissions?**
  - What are the reasons for the trend in CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, CFC, HCFC, PFC, SF<sub>6</sub>, HFC emissions?
  - How much of the changes are due to environmental protection measures? To structural changes?

### Are we seeing changes?

- **What is the trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?**
  - What is the trend in the emissions of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, CFC, HCFC, PFC, SF<sub>6</sub>, HFC? in the country? In Europe? Worldwide?
- **What is the expected trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?**
  - What is the expected trend in the emissions of CO<sub>2</sub>? N<sub>2</sub>O? CH<sub>4</sub>? CFC? HCFC? PFC? SF<sub>6</sub>? HFC? in the country? In Europe? Worldwide?

### How effective are the responses?

- **What are the responses to address the climate change problem?**
  - Has a national strategy been developed?
  - Which measures have been taken for each of the sectors and each of the greenhouse gases?
- **What are the national responses?**
  - How have Kyoto mechanisms been implemented (joint implementation and other tradable emission mechanisms)?
  - What use has been made of the forest carbon sink measures?
  - What has been done to break the link between energy consumption and greenhouse gases emissions?

- **Are the responses meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which responses have been the most successful to address the climate change problem?**
  - Which kind of responses have been successful? (responses targeting energy efficiency, specific pollutants, etc.?)
  - In each category, which ones were the most successful?
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels regarding climate change?**
  - What is the future European energy/carbon tax?
  - What are its objectives?
- **What are the different options at national level?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

### What is happening?

- **What is the trend in the concentration of the greenhouse gases in the atmosphere?**
  - What is the trend in the concentration of CO<sub>2</sub>? N<sub>2</sub>O? CH<sub>4</sub>? CFC? HCFC? PFC? SF<sub>6</sub>? HFC? (Worldwide)?
- **What have been the impacts of climate change in the country? In Europe? Worldwide?**
  - What have been the signs of changes in climate in the country? In Europe? Worldwide?
    - *What have been the changes in temperature in the country? In Europe? Worldwide?*
    - *What have been the changes in precipitation in the country? In Europe? Worldwide?*
  - What have been the other changes, induced by the climate change in the country? In Europe? Worldwide?
    - *What have been the changes in sea level?*
    - *What have been the changes in the water cycle and in natural phenomena in the country? In Europe? Worldwide?*
- **What is expected to happen in the country? In Europe? Worldwide?**
  - What are the different IPCC scenarios?
  - What are the expected changes in climate?
- **What are the expected changes in temperature in the country? In Europe? Worldwide?**
  - *What are the expected changes in precipitation in the country? In Europe? Worldwide?*
  - *What are the other expected impacts on climate (droughts, flooding, cyclones, etc) in the country? In Europe? Worldwide?*
  - What are the expected induced effects of climate change?
    - *What are the expected changes in sea level?*
    - *What are the expected changes on ecosystems?*
    - *What are the expected economic impacts in the country (agriculture, insurance, etc.)? In Europe? Worldwide?*

### Why is it happening?

- **Which sources and which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
    - *How much does each anthropogenic source emit of each pollutant? Trend?*
    - *How much is the contribution of each sector to the greenhouse effect (percentage)? Trend?*
    - *How much is the contribution of each pollutant to the greenhouse effect (percentage)? Trend?*
- **What are the reasons for the trend in pollutant emissions?**
  - What are the reasons for the trend in CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, CFC, HCFC, PFC, SF<sub>6</sub>, HFC emissions?
  - How much of the changes are due to environmental protection measures? To structural changes?

### Are we seeing changes?

- **What is the trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?**
  - What is the trend in the emissions of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, CFC, HCFC, PFC, SF<sub>6</sub>, HFC? in the country? In Europe? Worldwide?
    - *What has been the trend before and after industrialisation in the emissions of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, etc.?*
    - *What is the trend in CO<sub>2</sub> emissions (and other gases) per capita in the country?*
    - *How does it compare to other countries? For what reasons?*
    - *What is the contribution of the country to the total CO<sub>2</sub> (or other GHG) emissions?*
    - *What are the main CO<sub>2</sub> sinks? How much can they absorb in the country? In Europe? Worldwide?*
    - *What is the distance to the targets of the Kyoto protocol?*
    - *Which European and national objectives have been set up? Have they been reached?*
- **What is the expected trend in the emissions of greenhouse gases in the country? In Europe? Worldwide?**
  - What is the expected trend in the emissions of CO<sub>2</sub>? N<sub>2</sub>O? CH<sub>4</sub>? CFC? HCFC? PFC? SF<sub>6</sub>? HFC? in the country? In Europe? Worldwide?
    - *What are the expected trends according to the IPCC scenarios?*
    - *Will the objectives set up in the various responses (at national, European and international levels) be reached in the future?*

### How effective are the responses?

- **What are the responses to address the climate change problem?**
  - Has a national strategy been developed?
  - Which measures have been taken for each of the sectors and each of the greenhouse gases?
    - *CO<sub>2</sub>: transport, industry, energy, households?*
    - *CH<sub>4</sub>: agriculture, waste, energy?*
    - *N<sub>2</sub>O: agriculture, industry, transport?*
- **What are the national responses?**
  - How have Kyoto mechanisms been implemented (joint implementation and other tradable emission mechanisms)?
  - What use has been made of the forest carbon sink measures?
  - What has been done to break the link between energy consumption and greenhouse gases emissions?
    - *What has been done to encourage energy efficiency?*
    - *What has been done to shift from fossil fuels to renewable energies?*
    - *What has been done to substitute fuels for less CO<sub>2</sub> emitting sources (gas)?*
- **Are the responses meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which responses have been the most successful to address the climate change problem?**
  - Which kind of responses have been successful? (responses targeting energy efficiency, specific pollutants, etc.?)
  - In each category, which ones were the most successful?
  - Which responses have not been successful?

- **What are the responses in prospect at international, European and national levels regarding climate change?**
  - What is the future European energy/carbon tax?
  - What are its objectives?
- **What are the different options at national level?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

### 3. Ozone layer depletion

#### Place of the issue in the policy cycle

International regulations have led to significant reductions in production, usage and emissions of ozone-depleting substances (ODSs), despite smuggling and illegal production, although large amounts of CFCs and halons are still in use. There is now a challenge to assist developing countries in meeting their commitments to phase out ODSs (EEA 1999, p 99).

#### What is happening?

Stratospheric ozone protects the earth's surface from damaging short-wave ultraviolet (UV) radiation. Anthropogenic emissions of inert compounds containing chlorine and bromine affect this balance.

Damage to the ozone layer started in approximately 1980, and was initially observed in the polar regions. Satellite measurements show several years with very low total ozone values in the 1990s, but the rate of decline has slowed in recent years (EEA 1999, p 99).

The thickness of the ozone layer above Europe has decreased significantly since the beginning of the 1980s and is declining at a rate of up to 8 % per decade (EEA 2000).

#### Why is it happening?

Compounds causing significant ozone depletion include chlorofluorocarbons (CFCs), carbon tetrachloride, methyl chloroform, halons, hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs) and methylbromide. They are used as solvents, refrigerants, foam blowing agents, degreasing agents and aerosol propellants, fire extinguishers (halons) and as agricultural pesticides (methyl bromide). Other factors that affect the ozone layer include natural emissions, large volcanic eruptions, climate change and the greenhouse gases, methane and nitrous oxide (EEA 2000).

#### Are we seeing changes?

Production and sales of ozone-depleting substances in EEA member countries have fallen significantly since 1989. The gradual fall in chlorine concentrations in the troposphere shows that international policies to control ozone-depleting substances are having success. However, the long life of these substances in the atmosphere means that recovery of the ozone layer may not be complete until after 2050 (EEA 2000).

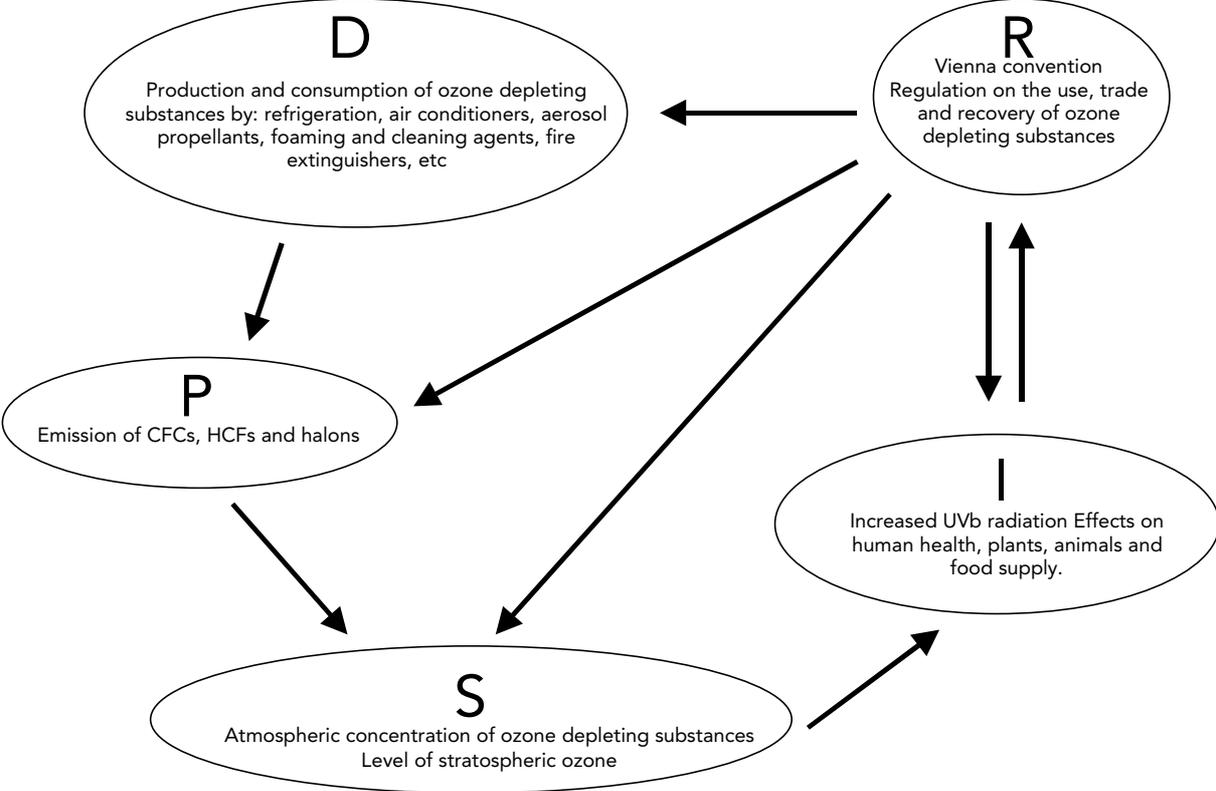
The potential 'chlorine plus bromide' concentration peaked in 1994 and is now decreasing. The use of ODSs has decreased sharply, faster than required by the international measures, but atmospheric concentration of halons is still increasing against expectations (EEA 1999, p 24).

#### How effective are the responses?

The first international agreement aimed at protecting the ozone layer was the 1985 Vienna Convention. The Montreal Protocol of 1987 (and subsequent amendments and adjustments) aims to eliminate the production and use of ozone depleting substances world-wide. EU measures and policies to protect the ozone layer include Council Regulation 3093/94/EC which is in the process of being revised and strengthened (EEA 2000, p.54).

The remaining policy challenges for European countries are to tighten control measures, to reduce the production and use of HCFCs and methyl bromide, to manage banks of existing ozone-depleting substances, and to support developing countries in their efforts to reduce their use and subsequent emissions of ozone-depleting substances (EEA 2000).

Ozone layer depletion – DPSIR framework



## Ozone layer depletion



### What is happening?

- What have been the impacts of the depletion of stratospheric ozone in the country? In Europe? Worldwide?
- What is expected to happen in the country? In Europe? Worldwide?
- What is the trend in the concentration of the gases depleting the ozone layer?

### Why is it happening?

- Which human activities are responsible for the ozone layer depletion and how?
- Which pollutants are responsible?
- What are the reasons for the trend in pollutant emissions?

### Are we seeing changes?

- What is the trend in the production and consumption of gases depleting the ozone layer in the country? (in Europe? Worldwide?)
- What is the expected trend in the production and consumption of gases depleting the ozone layer in the country?

### How effective are the responses?

- What is the international response to address ozone layer depletion?
- What is the European response?
- What is the national response?
- Are the responses meaningful?
- Which responses have been the most successful?
- What has been done to reduce production/use of ozone depleting substances in the rest of the world?
- What can be done to further reduce the emissions at international, European and national levels?

## Ozone layer depletion



Level 2

### What is happening?

- **What have been the impacts of the depletion of stratospheric ozone in the country? In Europe? Worldwide?**
  - What happened to the ozone layer?
  - What is induced by the depletion of the ozone layer?
- **What is expected to happen in the country? In Europe? Worldwide?**
  - How and when will the ozone layer recover?
  - What will that mean for the occurrence of effects?
- **What is the trend in the concentration of the gases depleting the ozone layer?**
  - What is the trend in the concentration of chlorine and bromine compounds?
  - What is expected in the atmospheric concentration of chlorine and bromine compounds with the implementation of the Montreal protocol?
  - What has been the influence of the international protocols on the concentration trends?

### Why is it happening?

- **Which human activities are responsible for the ozone layer depletion and how?**
  - How does climate change influence stratospheric ozone depletion?
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutant?
- **What are the reasons for the trend in pollutant emissions?**
  - What have been the most successful measures for reducing the emissions of ozone depleting substances?

### Are we seeing changes?

- **What is the trend in the production and consumption of gases depleting the ozone layer in the country? (in Europe? Worldwide?)**
  - What is the trend in the production and consumption of chlorine and bromine compounds?
  - What is the trend in the emissions of chlorine and bromine compounds?
  - Have the objectives of the Vienna convention and derived targets been reached?
- **What is the expected trend in the production and consumption of gases depleting the ozone layer in the country?**
  - What is the expected trend in the emissions of chlorine and bromine compounds?
  - Will the objectives of the different responses (national, European and international) be reached?
  - If not, what will be the reasons?

### How effective are the responses?

- **What is the international response to address ozone layer depletion?**
  - How are the Vienna convention and its protocols implemented?
- **What is the European response?**
  - What are the implications of the European responses for the country?

- **What is the national response?**
  - What have been the results of recovery/recycling strategies for ODS substances?
  - What has been done to discourage the use of HCFC as replacements for CFCs?
  - What has been done to prevent the production and marketing of new ODSs?
- **Are the responses meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What has been done to reduce production/use of ozone depleting substances in the rest of the world?**
  - What has been done to tackle CFC and halons smuggling? With what results?
  - What has been done to facilitate access of 3<sup>rd</sup> world countries and eastern countries to new ozone friendly technologies?
- **What can be done to further reduce the emissions at international, European and national levels?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

## Ozone layer depletion



Level 3

### What is happening?

- **What have been the impacts of the depletion of stratospheric ozone in the country? In Europe? Worldwide?**
  - What happened to the ozone layer?
  - What is induced by the depletion of the ozone layer?
    - *What are the changes in UV radiation on earth?*
    - *What are the impacts on health (human as well as animals)?*
- **What is expected to happen in the country? In Europe? Worldwide?**
  - How and when will the ozone layer recover?
  - What will that mean for the occurrence of effects?
    - *How and when will the expected impacts on human health occur?*
    - *How and when will the expected impacts on ecosystem occur?*
- **What is the trend in the concentration of the gases depleting the ozone layer?**
  - What is the trend in the concentration of chlorine and bromine compounds?
  - What is expected in the atmospheric concentration of chlorine and bromine compounds with the implementation of the Montreal protocol?
  - What has been the influence of the international protocols on the concentration trends?

### Why is it happening?

- **Which human activities are responsible for the ozone layer depletion and how?**
  - How does climate change influence stratospheric ozone depletion?
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutant?
    - *How much does each anthropogenic source emit of each pollutant? Trend?*
    - *How much is the contribution of each sector to the ozone layer depletion? Trend?*
    - *What has been the contribution of various sectors in reducing the emissions of ozone depleting substances?*
    - *What is the trend in the use of HCFCs by the various sectors?*
    - *What is the trend in the use of methyl bromide by agriculture?*
    - *How much is the contribution of each pollutant to the ozone layer depletion? Trend?*
- **What are the reasons for the trend in pollutant emissions?**
  - What have been the most successful measures for reducing the emissions of ozone depleting substances?

### Are we seeing changes?

- **What is the trend in the production and consumption of gases depleting the ozone layer in the country? (in Europe? Worldwide?)**
  - What is the trend in the production and consumption of chlorine and bromine compounds?
  - What is the trend in the emissions of chlorine and bromine compounds?
  - Have the objectives of the Vienna convention and derived targets been reached?
    - *Have the objectives of the Vienna convention and its protocols been reached?*

- *Have the objectives of the European directives, resolutions, etc. been reached?*
- *Have the national objectives been reached?*
- *If the objectives have not been reached, what are the reasons?*
- **What is the expected trend in the production and consumption of gases depleting the ozone layer in the country?**
  - What is the expected trend in the emissions of chlorine and bromine compounds?
  - Will the objectives of the different responses (national, European and international) be reached?
  - If not, what will be the reasons?

#### **How effective are the responses?**

- **What is the international response to address ozone layer depletion?**
  - How are the Vienna convention and its protocols implemented?
    - *How do policies to combat climate change and ozone depletion interact? Are there any positive joint policies?*
- **What is the European response?**
  - What are the implications of the European responses for the country?
- **What is the national response?**
  - What have been the results of recovery/recycling strategies for ODS substances?
    - *What measures have been taken to reduce emissions of halons and CFCs from existing equipment?*
  - What has been done to discourage the use of HCFC as replacements for CFCs?
  - What has been done to prevent the production and marketing of new ODSs?
- **Are the responses meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What has been done to reduce production/use of ozone depleting substances in the rest of the world?**
  - What has been done to tackle CFC and halons smuggling? With what results?
  - What has been done to facilitate access of 3<sup>rd</sup> world countries and eastern countries to new ozone friendly technologies?
    - *What measures have been taken to prevent those countries from producing and marketing ODSs? Dumping ODSs?*
- **What can be done to further reduce the emissions at international, European and national levels?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

## 4. Acidification

### Place of the issue in the policy cycle

The first multilateral instrument to combat acidification (CLTRAP-see below) dates from 1979. To date, policy measures adopted under the CLTRAP and EU legislation to combat acidification have been only partly successful. The control of transport emissions will now be a key component of strategies to combat the problem of acidification in Europe.

### What is happening?

Atmospheric emissions of acidifying substances such as sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) can persist in the air and thus be transported over thousands of kilometres, when they undergo chemical conversion into acids (sulphuric and nitric). The primary pollutants sulphur dioxide, nitrogen dioxide and ammonia (NH<sub>3</sub>), together with their reaction products, lead after their deposition to changes in the chemical composition of the soil and surface water. This process interferes with ecosystems leading to what is called acidification (EEA 1995, p. 541). Acidification can cause extensive damage to forests, soils, freshwater, buildings and constructions, and health. Since 1985, there has been about a 40 % reduction in the area where critical loads for acidity are exceeded (EEA, 2000).

### Why is it happening?

Anthropogenic sulphur dioxide emissions are due largely to the combustion of sulphur-containing fuels (oil and coal) used in power stations, other stationary combustion activities and process industries (refineries). Nitrogen oxides are emitted by combustion processes, transport, power generation and heating are the most important sources. Most of the ammonia in the atmosphere is due to the production and spreading of animal manure (EEA 1995, p. 541). Sulphur emissions are dominated by the energy sector, NO<sub>x</sub> by the transport sector and NH<sub>3</sub> by agriculture (EEA, 1998, p.81).

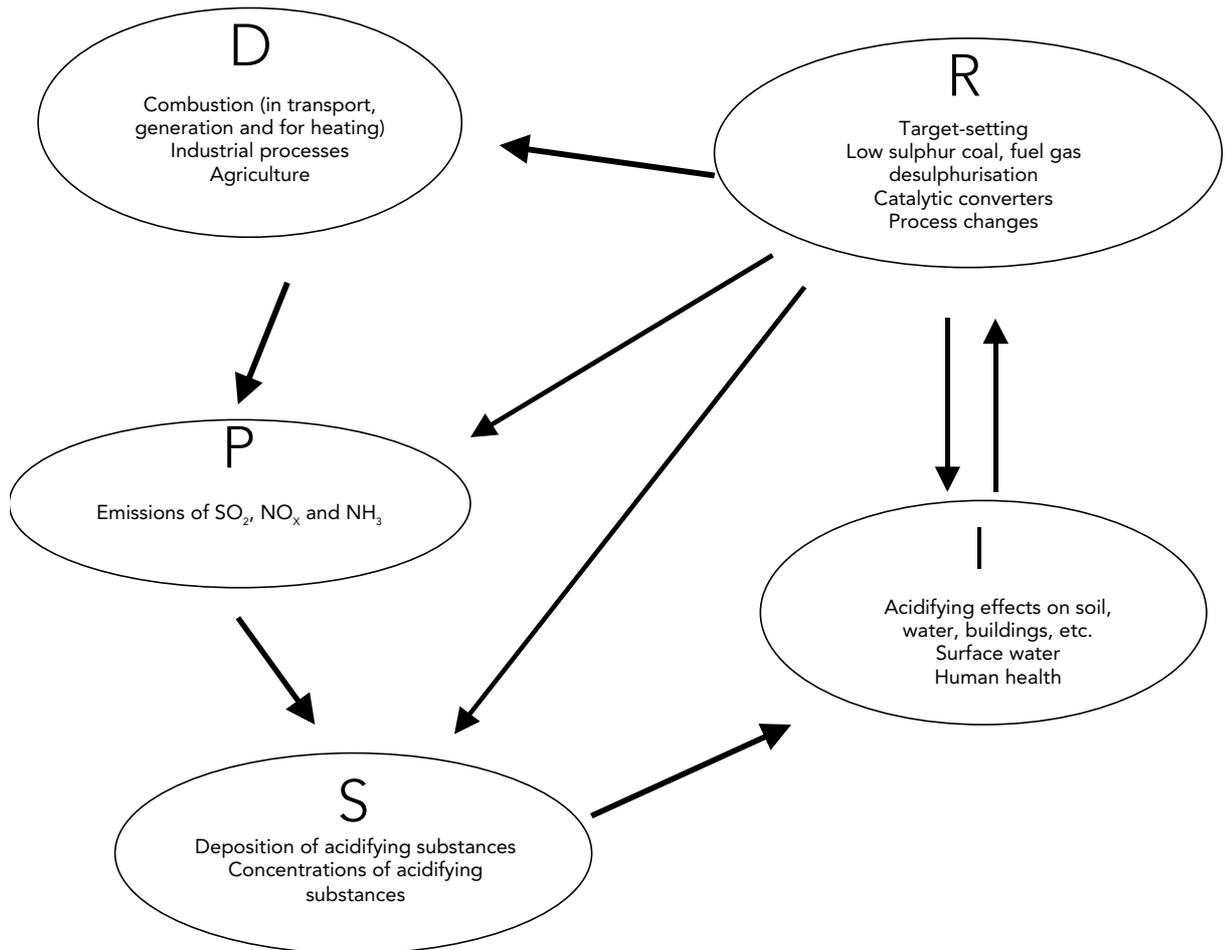
### Are we seeing changes?

Emissions of acidifying gases in EU Member States have decreased significantly, showing a clear de-coupling from GDP growth. This decrease was mainly due to reductions in sulphur dioxide emissions. Further reductions in nitrogen oxide and ammonia emissions will be necessary to achieve the targets for 2010 (EEA, 2000). The substantial fall in acidifying gases is mainly due to a reduction of over 60 % in sulphur dioxide emissions from industry and the energy sector since 1980. However, nitrogen oxide emissions decreased much less and are unlikely to meet the fifth environment action programme target for 2000. Ammonia emissions are stabilising. The slower reduction in nitrogen oxide and ammonia emissions is reflected in a less significant reduction in deposited nitrogen and in the area in which the critical load for eutrophication is exceeded (EEA, 2000). Ecosystems in the EU still receive 7 % acid deposition and 39 % nitrogen deposition above their critical loads (EEA, 1999, p. 133). There has been some reductions in the effects of acid deposition in freshwater [...] with invertebrates fauna at many sites showing a partial recovery' (EEA 1998, p. 72).

### How effective are the responses?

The first international agreement with strategies for reducing transboundary air pollution was the UNECE convention on Long Range Transboundary Air Pollution (CLRTAP) (See AIR Quality). The 5 EAP also sets emission targets up to the end of the century for reduction of acidifying compounds and ozone precursors. Further targets, up to 2010, were proposed in the 1997 Community Strategy to combat acidification (EEA 1999, p. 135). In May 1999, the European Commission presented a proposal for a directive on national emission ceilings (NECD) for the same pollutants as CLRTAP. Substantial further reductions of emissions of acidifying pollutants (nitrogen oxide and ammonia) are needed to achieve the proposed NECD targets or even the less strict CLRTAP targets for 2010 agreed on 1 December 1999 (EEA, 2000)

## Acidification – DPSIR-framework



## Acidification



Level 1

### What is happening?

- What have been the impacts of acid rain in the country? In Europe?
- What are the expected impacts of acid deposition in the country? In Europe?
- What is the trend in the acidifying depositions in the country? In Europe?
- What is the expected trend in the acidifying depositions in the country? In Europe?

### Why is it happening?

- Which human activities are responsible for acidification and how?
- Which pollutants are responsible?
- What are the reasons for the trend in the pollutant emissions?
- What are the impacts of the neighbouring countries?

### Are we seeing changes?

- What is the trend in the emissions of gases responsible for the acidifying depositions?
- What is the expected trend in the emissions of gases responsible for the acidifying depositions?

### How effective are the responses?

- What is the response to acidification?
- Are the responses addressing acidification meaningful?
- Which response has been the most successful to address the acidification problem?
- What are the responses in prospect at international, European and national levels for acidification?
- What are the different options at international, European and national levels to reach targets?

## Acidification



### What is happening?

- **What have been the impacts of acid rain in the country? In Europe?**
  - What is the situation of ecosystems regarding acidification in the country? In Europe?
  - What is the situation of buildings regarding acidification in the country? In Europe?
  - What are the impacts of acidification on human health?
- **What are the expected impacts of acid deposition in the country? In Europe?**
  - What are the expected impacts on ecosystems?
  - What are the expected economic impacts?
  - What are the other expected impacts?
- **What is the trend in the acidifying depositions in the country? In Europe?**
  - What is the trend in the sulphur and nitrogen depositions in the country? In Europe?
- **What is the expected trend in the acidifying depositions in the country? In Europe?**

### Why is it happening?

- **Which human activities are responsible for acidification and how?**
  - To what extent transport is responsible of acidification?
  - To what extent the energy sector is responsible of acidification?
  - To what extent agriculture is responsible of acidification?
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
- **What are the reasons for the trend in the pollutant emissions?**
  - What are the reasons for the trend in SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub> emissions?
  - How much of the changes are due to environmental protection measures? To structural changes?
- **What are the impacts of the neighbouring countries?**
  - How much are the imports-exports of sulphur and nitrogen in the country?

### Are we seeing changes?

- **What is the trend in the emissions of gases responsible for the acidifying depositions?**
  - What is the trend in the emissions of SO<sub>2</sub>, NO<sub>x</sub> and NH<sub>3</sub>?
  - What is the distance to the different political targets (CLRTAP, national emission ceilings, national action programmes)?
  - Have previous targets been reached?
  - If not, what were the reasons?
- **What is the expected trend in the emissions of gases responsible for the acidifying depositions?**
  - What are the expected trends in the emissions of acidifying substances?
  - Will the various targets (international, European and national) be reached?
  - If not, what would be needed for that?

### How effective are the responses?

- **What is the response to acidification?**
  - How are the convention on long-range transboundary air pollution and its protocols implemented?
  - How are the directive on national emission ceilings (still a proposal) and other Community legislation implemented?
  - What is the national response?
- **Are the responses addressing acidification meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which response has been the most successful to address the acidification problem?**
  - Which response has not been successful?
- **What are the responses in prospect at international, European and national levels for acidification?**
  - What is the EU strategy under preparation?
- **What are the different options at international, European and national levels to reach targets?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?



### What is happening?

- **What have been the impacts of acid rain in the country? In Europe?**
  - What is the situation of ecosystems regarding acidification in the country? In Europe?
    - *What is the situation of soils, forests, aquatic ecosystems, etc. regarding the effects of acid rain in the country? In Europe?*
    - *What is the sensitivity of the various ecosystems regarding acidification?*
    - *What is the geographical distribution of critical load exceeding for soils, forests, aquatic ecosystems, etc. in the country? In Europe?*
  - What is the situation of buildings regarding acidification in the country? In Europe?
  - What are the impacts of acidification on human health?
- **What are the expected impacts of acid deposition in the country? In Europe?**
  - What are the expected impacts on ecosystems?
  - What are the expected economic impacts?
  - What are the other expected impacts?
- **What is the trend in the acidifying depositions in the country? In Europe?**
  - What is the trend in the sulphur and nitrogen depositions in the country? In Europe?
    - *What is the geographical distribution of sulphur and nitrogen deposition in the country? In Europe?*
    - *What is the situation (status and trend) regarding the exceeding of the critical load for sulphur and nitrogen in the country? In Europe?*
- **What is the expected trend in the acidifying depositions in the country? In Europe?**

### Why is it happening?

- **Which human activities are responsible for acidification and how?**
  - To what extent transport is responsible of acidification?
  - To what extent the energy sector is responsible of acidification?
  - To what extent agriculture is responsible of acidification?
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
    - *How much does each anthropogenic source emit of each pollutant? Trend?*
    - *How much is the contribution of each sector to the acidification process (percentage)?*
    - *How much is the contribution of each pollutant to the acidification process (percentage)?*
- **What are the reasons for the trend in the pollutant emissions?**
  - What are the reasons for the trend in SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub> emissions?
    - *What has been the trend in the emission of pollutants by the transport sector?*
    - *How much is attributable to the transport of passengers?*
  - How much of the changes are due to environmental protection measures? To structural changes?
- **What are the impacts of the neighbouring countries?**
  - How much are the imports-exports of sulphur and nitrogen in the country?

### Are we seeing changes?

- **What is the trend in the emissions of gases responsible for the acidifying depositions?**
  - What is the trend in the emissions of SO<sub>2</sub>, NO<sub>x</sub> and NH<sub>3</sub>?
  - What is the distance to the different political targets (CLRTAP, national emission ceilings, national action programmes)?
  - Have previous targets been reached?
  - If not, what were the reasons?
- **What is the expected trend in the emissions of gases responsible for the acidifying depositions?**
  - What are the expected trends in the emissions of acidifying substances?
  - Will the various targets (international, European and national) be reached?
  - If not, what would be needed for that?

### How effective are the responses?

- **What is the response to acidification?**
  - How are the convention on long-range transboundary air pollution and its protocols implemented?
  - How are the directive on national emission ceilings (still a proposal) and other Community legislation implemented?
    - *What has been the impact of the introduction of exhaust catalysts?*
  - What is the national response?
    - *What measures have been taken?*
    - *Has any incentive fiscal policy been introduced?*
    - *Are there gaps in the monitoring of acidification?*
- **Are the responses addressing acidification meaningful?**
  - Do the responses have the desired impact?
  - Do the responses serve in reaching the desired targets?
- **Which response has been the most successful to address the acidification problem?**
  - Which response has not been successful?
- **What are the responses in prospect at international, European and national levels for acidification?**
  - What is the EU strategy under preparation?
- **What are the different options at international, European and national levels to reach targets?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

## 5. Tropospheric ozone

### Place of the issue in the policy cycle

Photochemical smog has been causing respiratory problems in the European population for several decades. Policy measures have been taken for many years under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the EU Ozone Directive (92/72/EC). However, the trend of increasing activity in the main sectors causing ozone formation (i.e. transport and the petrochemical industry) means that this prominent environmental problem may worsen and could be around for a long time (EEA 1995, p. 547). Moreover, despite reductions in precursor emissions, smog will remain a health threat due to increases in ozone worldwide. This calls for action on a global scale to reduce emissions of nitrogen oxides and volatile organic carbon compounds (EEA 1999, p. 133).

### What is happening?

In the lower troposphere, ozone is a strong oxidant that at elevated concentrations is harmful to health, plants and materials (EEA 1995, p. 547). Ozone is the most important photochemical oxidant and the main component of photochemical smog. Epidemiological and toxicological evidence indicates that exceedances of threshold values during summer smog episodes have led to associated health problems, particularly inflammatory responses and impaired lung function. Multiannual exposure to high concentrations of ozone may lead to decrements in the lung function of young children. Exposure to ozone can induce foliar injury in plants and thus reduce crop and forest yields (EEA 2000).

### Why is it happening?

The main substances with a role in ground-level ozone formation (i.e. ozone precursors) are nitrogen oxides, non-methane volatile organic compounds (NMVOCs), carbon monoxide and methane (EEA, 2000). Many human activities give rise to these pollutants, including the combustion of fossil fuels, mainly for transport, and the use of products containing organic solvents. The transport sector is the main contributor of nitrogen oxides. Transport is also the main contributor to emissions of NMVOC in Western Europe (EEA 1998, p. 94).

### Are we seeing changes?

Emissions of gases that can lead to ground-level ozone fell in most EU Member States and by 15 % in the EU as a whole between 1990 and 1996. These results were achieved despite an increase in gross domestic product. The reduction is mainly due to lower VOC emissions, which fell by 13 % between 1990 and 1996 mainly due to limits on industrial emissions and measures to reduce emissions from road vehicles. Although these reductions appear to have decreased peak concentrations of ozone, they have not been enough to limit human health and ecosystem risks significantly. Increased background concentrations – caused by emissions in the whole northern hemisphere – are partially responsible for continued high concentrations in EEA member countries.

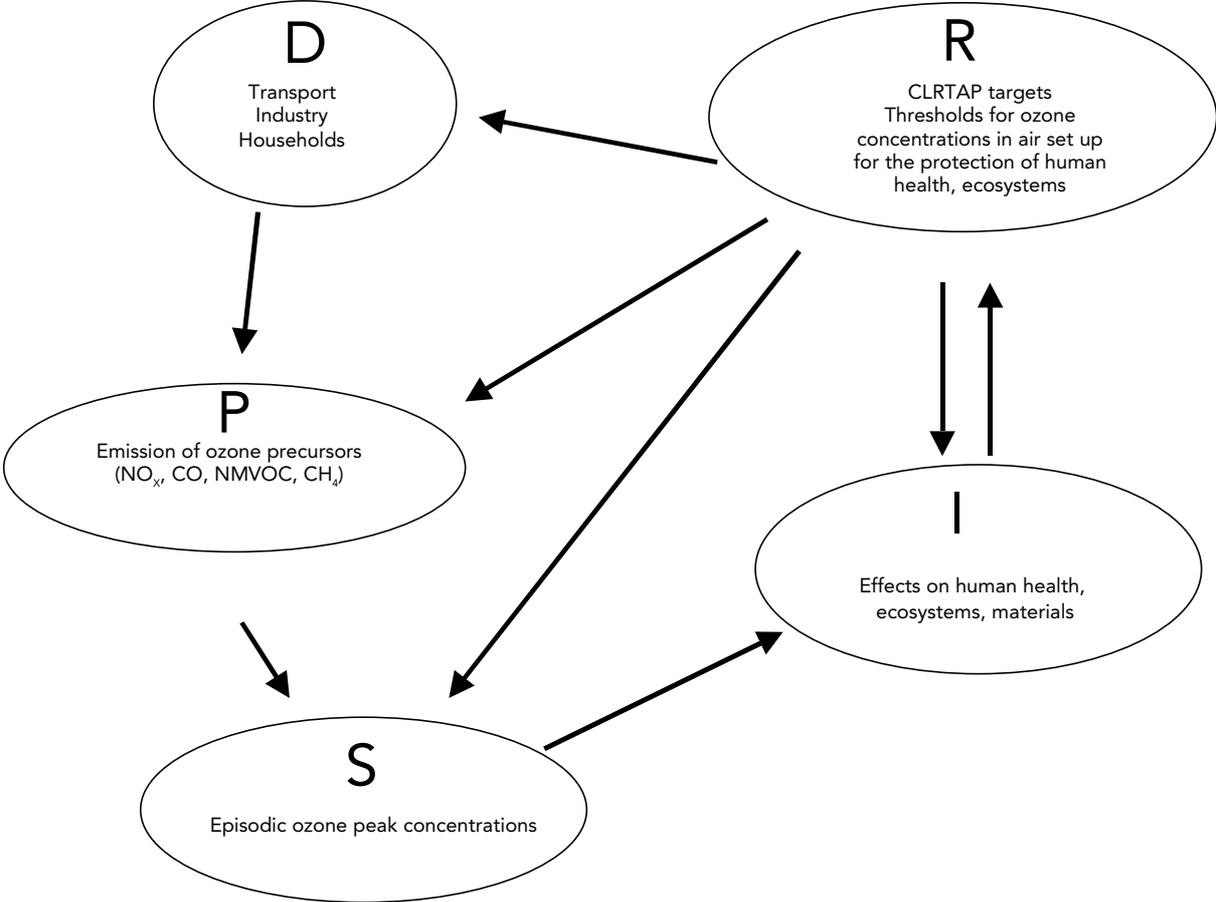
Despite the expected reductions in the emissions of ozone precursors following the implementation of the CLRTAP protocol and EU legislation, ozone concentrations are forecast to remain well above the critical levels for the next decade. By 2010, the gap between current concentrations and critical values is expected to have halved (EEA 2000).

### How effective are the responses?

EU limit, guide or target values for air quality concentration levels of pollutants including ozone are now being revised through so-called 'daughter directives' to the Air Quality Framework Directive. More specific measures for abating precursor emissions are defined in a number of EU directives (Large Combustion Plants Directive, IPPC, etc.). The Commission is currently developing an ozone-abatement strategy (EEA 1999, p. 135).

In May 1999, the European Commission presented a proposal for a Directive on national emission ceilings (NECD). The proposed Directive uses a similar approach as the second Sulphur Protocol, but extends it to include reduction in exceedance of critical limit values for ozone for human health and ecosystems. The targets in the NECD proposal are much stricter than currently agreed targets. In a parallel process, on 1<sup>st</sup> December 1999 the CLRTAP agreed on national emission ceilings for many European countries in a new multi-pollutant protocol (EEA 2000, p. 60). Substantial further reductions of emissions of ozone precursor pollutants are required to achieve the proposed NECD targets or even the less strict CLRTAP targets for 2010 (EEA 2000).

Tropospheric ozone – DPSIR framework



## Tropospheric ozone



Level 1

### What is happening?

- What have been the impacts of episodes of high ozone concentration?
- What impacts are expected if current emission trends continue?
- What is the trend in the concentration of ozone and in the occurrence of high concentration episodes?
- What is the expected trend in ozone concentration?

### Why is it happening?

- Which human activities are responsible for ozone pollution and how?
- Which pollutants are responsible?
- What are the reasons for the trend in pollutant emissions?
- What are the impacts of the neighbouring countries?

### Are we seeing changes?

- What is the status and trend in the emissions of ozone precursors?
- What are the expected trends in emissions of ozone precursors?

### How effective are the responses?

- What have been the responses aimed at mobile sources and how effective have they been?
- What have been the responses aimed at stationary sources and how effective have they been?
- What have been the responses to reduce the use of solvents?
- What are the responses in prospect at international, European and national levels?
- What are the different options for reducing emissions of ozone precursors?

## Tropospheric ozone



### What is happening?

- **What have been the impacts of episodes of high ozone concentration?**
  - What have been the impacts on ecosystems?
  - What have been the impacts on human health?
  - What have been the economic impacts?
  - What have been the other impacts?
- **What impacts are expected if current emission trends continue?**
- **What is the trend in the concentration of ozone and in the occurrence of high concentration episodes?**
  - What is the trend in the exceedance of the normal value of ozone concentration (clean air, ground level)?
  - Where are the highest concentrations found and why?
  - What is the status concerning the exceeding of the thresholds for human health (WHO air quality guidelines and EEC thresholds)? Trend?
  - What is the status concerning the exceeding of the thresholds for vegetation? Trend?
- **What is the expected trend in ozone concentration?**
  - What are the expected trends in ozone peak concentrations?

### Why is it happening?

- **Which human activities are responsible for ozone pollution and how?**
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
- **What are the reasons for the trend in pollutant emissions?**
  - What are the reasons for the trend in NO<sub>x</sub>, NMVOC, CO, CH<sub>4</sub> emissions?
  - How much of the changes are due to environmental protection measures? To structural changes?
- **What are the impacts of the neighbouring countries?**

### Are we seeing changes?

- **What is the status and trend in the emissions of ozone precursors?**
  - What is the status and trend in the emissions of NO<sub>x</sub>, NMVOC, CO and CH<sub>4</sub> compared to the objectives of the CLRTAP and the EU proposal for a National Emissions Ceilings directive?
  - Have the objectives for NO<sub>x</sub>, NMVOC, CO and CH<sub>4</sub> been met?
- **What are the expected trends in emissions of ozone precursors?**
  - Will the different objectives set up in the national, European and international responses be reached?

### How effective are the responses?

- **What have been the responses aimed at mobile sources and how effective have they been?**
  - What have been the responses aimed at reducing transport emissions?
- **What have been the responses aimed at stationary sources and how effective have they been?**

- What have been the responses aimed at reducing emissions from combustion processes, industries, etc?
- What have been responses to limit emissions of volatile compounds (energy sector, industry, households)?
- **What have been the responses to reduce the use of solvents?**
- **What are the responses in prospect at international, European and national levels?**
  - What will be needed to reach the targets of the future National Emissions Ceilings directive?
- **What are the different options for reducing emissions of ozone precursors?**
  - What are the economic options, technical options?
  - What will be the beneficial effects on other air related problems?

## Tropospheric ozone



### What is happening?

- **What have been the impacts of episodes of high ozone concentration?**
  - What have been the impacts on ecosystems?
    - *How much forest land is affected?*
  - What have been the impacts on human health?
  - What have been the economic impacts?
    - *How much cultivated land is affected?*
  - What have been the other impacts?
- **What impacts are expected if current emission trends continue?**
- **What is the trend in the concentration of ozone and in the occurrence of high concentration episodes?**
  - What is the trend in the exceedance of the normal value of ozone concentration (clean air, ground level)?
  - Where are the highest concentrations found and why?
  - What is the status concerning the exceeding of the thresholds for human health (WHO air quality guidelines and EEC thresholds)? Trend?
    - *During how many days and where were the pre-warning/warning level (national thresholds) for human health exceeded?*
    - *During how many days and where was the European threshold for human health exceeded?*
    - *In how many monitoring sites were pre-warning/warning level (national thresholds) for human health exceeded?*
    - *In how many monitoring sites was the European threshold for human health exceeded?*
  - What is the status concerning the exceeding of the thresholds for vegetation? Trend?
    - *During how many days were the national/European thresholds for vegetation exceeded?*
    - *In how many monitoring sites were national/European thresholds for vegetation exceeded?*
    - *Where were the national/European thresholds for vegetation exceeded?*
- **What is the expected trend in ozone concentration?**
  - What are the expected trends in ozone peak concentrations?

### Why is it happening?

- **Which human activities are responsible for ozone pollution and how?**
- **Which pollutants are responsible?**
  - Which anthropogenic sources emit which pollutants?
    - *How much does each anthropogenic source emit of each pollutant?*
    - *How much is the contribution of each sector to the tropospheric ozone pollution?*
    - *How much is the contribution of each pollutant to the tropospheric ozone pollution?*
- **What are the reasons for the trend in pollutant emissions?**
  - What are the reasons for the trend in NO<sub>x</sub>, NMVOC, CO, CH<sub>4</sub> emissions?
  - How much of the changes are due to environmental protection measures?  
To structural changes?
- **What are the impacts of the neighbouring countries?**

### **Are we seeing changes?**

- **What is the status and trend in the emissions of ozone precursors?**
  - What is the status and trend in the emissions of NO<sub>x</sub>, NMVOC, CO and CH<sub>4</sub> compared to the objectives of the CLRTAP and the EU proposal for a National Emissions Ceilings directive?
  - Have the objectives for NO<sub>x</sub>, NMVOC, CO and CH<sub>4</sub> been met?
- **What are the expected trends in emissions of ozone precursors?**
  - Will the different objectives set up in the national, European and international responses be reached?

### **How effective are the responses?**

- **What have been the responses aimed at mobile sources and how effective have they been?**
  - What have been the responses aimed at reducing transport emissions?
    - *What are the responses concerning the reduction of emissions by transport?*
    - *What are the responses concerning traffic?*
- **What have been the responses aimed at stationary sources and how effective have they been?**
  - What have been the responses aimed at reducing emissions from combustion processes, industries, etc?
    - *What have been the responses concerning power plants, residential heating, etc.?*
  - What have been responses to limit emissions of volatile compounds (energy sector, industry)?
- **What have been the responses to reduce the use of solvents?**
- **What are the responses in prospect at international, European and national levels?**
  - What will be needed to reach the targets of the future National Emissions Ceilings Directive?
- **What are the different options for reducing emissions of ozone precursors?**
  - What are the economic options, technical options?
  - What will be the beneficial effects on other air related problems?

## 6. Air quality

<b>Place of the issue in the policy cycle</b>
<p>The 5<sup>th</sup> Programme period has seen improvements in reducing acidification and the levels of some air pollutants, particularly SO<sub>2</sub> and lead. The levels of NO<sub>2</sub> and particulates remain high and the levels of ground ozone continue to be regularly exceeded in around major cities during the summer (EC Global Assessment of the 5 EAP 1999).</p> <p>Policies to reduce emissions are increasingly considering various pollution problems together in a multi-pollutant, multi-effect approach (EEA 2000).</p>

<b>What is happening?</b>
<p>The main pollutants affecting air quality are SO<sub>2</sub>, NO<sub>x</sub>, VOC, particulates, CO and benzene (Environment in the EU 1995, p. 62).</p> <p>The main environmental problems associated with air emissions are harm to human health, the acidification and eutrophication of water and soils, and damage to natural ecosystems, cultural heritage and crops. Often these are transboundary effects, as pollutants in the air can travel a considerable distance away from their source. In addition, emissions from sources in urban areas can have a significant local impact on human health (EEA 2000).</p>

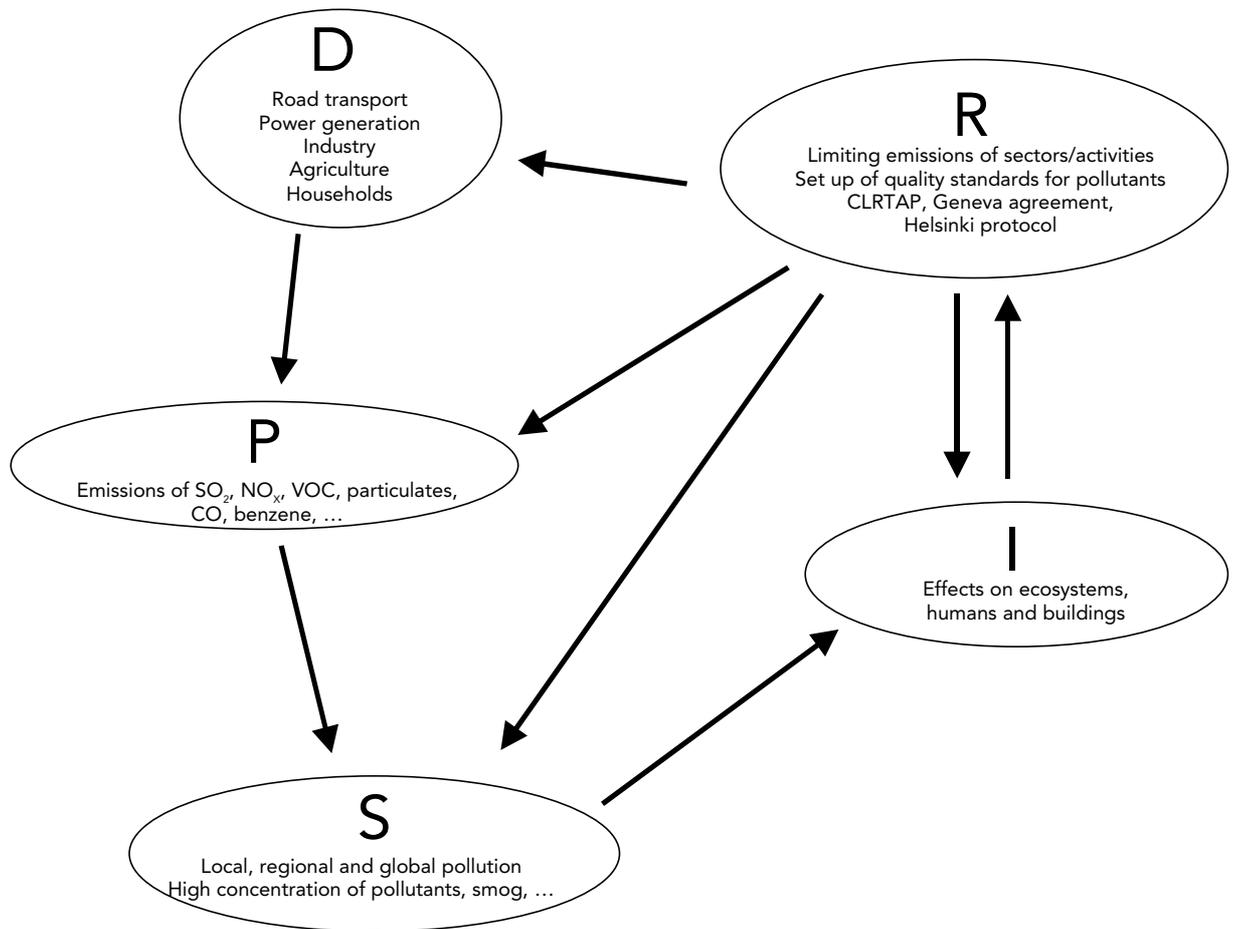
<b>Why is it happening?</b>
<p>The main sources of transboundary air pollution in Europe are energy use and transport in which shipping is of growing importance (EEA, 1999, p. 133)</p>

<b>Are we seeing changes?</b>
<p>Success in abating emissions from stationary sources was almost counterbalanced by increased emissions due to rapid transport growth ; emissions from international shipping are expanding their share (EEA 1999, p.24).</p> <p>The Fifth environmental action programme emission reduction targets for 2000 will be achieved for sulphur dioxide, but are unlikely to be met for nitrogen oxides and volatile organic compounds (VOCs). The proposed EU and national 2010 targets for sulphur dioxide appear achievable, but reaching those for nitrogen oxide, ammonia and VOC emissions will require substantial further reductions and additional policies and measures in most Member States (EEA 2000).</p> <p>Despite a decline in emissions of general air pollutants, the ultimate goal of avoiding all harmful effects on health, vegetation, water and soil has still to be achieved (EEA 2000).</p>

<b>How effective are the responses?</b>
<p>The first international agreement with strategies for reducing transboundary air pollution was the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP). Several CLRTAP protocols are in force for its European parties. The Second Sulphur Protocol (UNECE, 1994) used the approach, for the first time, of setting emission targets to reduce the exceedance of critical deposition levels for ecosystems ('gap closure'). This Protocol thus resulted in national emission-reduction commitments that varied according to the ecosystems' sensitivity. In May 1999, the European Commission presented a proposal for a Directive on national emission ceilings for the same pollutants as CLRTAP, and, for the first time, for ammonia (EEA 2000, p.59).</p> <p>EU limit, guide or target values for air quality concentration levels of pollutants including SO<sub>2</sub>, NO<sub>2</sub> and ozone are now being revised through so-called 'daughter directives' to the Air Quality Framework Directive (EEA 1999, p.135). Current European Community legislation aimed at reducing air pollutants includes a Directive on the reduction of emissions from large combustion plants and various recent Directives on vehicle emissions, the quality of petrol and diesel fuels and the sulphur content of certain liquid fuels. A Directive on the storage and distribution of petrol and the Solvents Directive on the reduction of emissions from the industrial use of organic solvents both aim to limit emissions of volatile organic compounds (VOCs). By the end of 1999, new proposals are expected from the second Auto-Oil Programme for emission limits on new cars, other technical measures and non-technical measures to encourage more environmental-friendly modes of transport (EEA 2000, p.60).</p>

**NB: See also: Acidification, chemicals, climate change, ozone layer depletion, tropospheric ozone, urban environment**

## Air quality – DPSIR framework



### What is happening?

- How is air quality developing?
- What are the impacts of air pollution?
- What is the trend in the concentration of the pollutants in the air?
- What is the expected trend in air quality?
- What are the expected impacts of air pollution?

### Why is it happening?

- Which anthropogenic sources emit which air pollutants?
- What are the reasons for the trend in air polluting emissions?
- What are the impacts of the neighbouring countries?

### Are we seeing changes?

- What is the trend in the emissions of air pollutants?
- What is the expected trend in the emissions of air pollutants?

### How effective are the responses?

- What are the responses to address air quality problems?
- Do the responses serve in reaching the desired targets?
- What are the responses in prospect at international, European and national levels concerning air pollution?
- What are the different options at international, European and national levels?



### What is happening?

- **How is air quality developing?**
  - What is the trend in concentrations of sulphur dioxide (SO<sub>2</sub>), of nitrogen oxides (NO<sub>x</sub>), particulate matter, carbon monoxide (CO), volatile organic compounds (VOC), ammonia (NH<sub>3</sub>), lead, other pollutants?
  - What are the 'new' pollutants and are they more important than the conventional ones?
- **What are the impacts of air pollution?**
  - What are the impacts of air pollution on health, ecosystems, the economy?
- **What is the trend in the concentration of the pollutants in the air?**
- **What is the expected trend in air quality?**
  - What are the expected trends in SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, lead, other pollutants concentrations?
- **What are the expected impacts of air pollution?**
  - What are the expected impacts of air pollution on health, ecosystems, ecosystems, the economy?

### Why is it happening?

- **Which anthropogenic sources emit which air pollutants?**
  - How much does each anthropogenic source emit of each pollutant?  
Trend?
- **What are the reasons for the trend in air polluting emissions?**
  - What are the reasons for the trend in SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, heavy metals, benzo(a)pyrene, phenol, fluorine, formaldehyde, etc emissions?
  - How much of the changes are due to environmental protection measures?  
To structural changes?
- **What are the impacts of the neighbouring countries?**
  - How much is exported and imported from the neighbouring countries for each pollutant?

### Are we seeing changes?

- **What is the trend in the emissions of air pollutants?**
  - What is the trend in emissions of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter, carbon monoxide (CO), volatile organic compounds (VOC), ammonia (NH<sub>3</sub>), heavy metals (lead, zinc, nickel, copper, chromium, selenium, cadmium, arsenic, mercury, etc.), other pollutants?
  - Have the targets of the various conventions, protocols and action programmes been reached?
  - If the targets have not be reached, what are the reasons?
- **What is the expected trend in the emissions of air pollutants?**
  - What is the expected trend in emissions of SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, heavy metals, etc.?
  - Will the objectives of the various policies (national, European and international) be reached in the future?
  - If not what will be the reasons?

### How effective are the responses?

- **What are the responses to address air quality problems?**
  - What has been done to meet the targets of the CLRTAP, the national emission ceilings directive (proposal still) and national strategies?
  - Does the national response cover all pollutants equally?
- **Do the responses serve in reaching the desired targets?**
- **What are the responses in prospect at international, European and national levels concerning air pollution?**
  - To what extent could measures to reduce greenhouse gas emissions (particularly carbon dioxide) as a side effect reduce acidifying substances and ozone precursors (e.g. fuel switching)?
- **What are the different options at international, European and national levels?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

### What is happening?

- **How is air quality developing?**
  - What is the trend in concentrations of sulphur dioxide (SO<sub>2</sub>), of nitrogen oxides (NO<sub>x</sub>), particulate matter, carbon monoxide (CO), volatile organic compounds (VOC), ammonia (NH<sub>3</sub>), lead, other pollutants?
    - *Where and how much are air quality standards (national, European, WHO and others) exceeded? Trend?*
  - What are the 'new' pollutants and are they more important than the conventional ones?
- **What are the impacts of air pollution?**
  - What are the impacts of air pollution on health, ecosystems, the economy?
    - *How many inhabitants or how much land area are exposed to air quality levels above health standards for a certain number of days per years?*
- **What is the trend in the concentration of the pollutants in the air?**
- **What is the expected trend in air quality?**
  - What are the expected trends in SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, lead, other pollutants concentrations?
    - *How much will standards (national, European, international) be exceeded in the future?*
- **What are the expected impacts of air pollution?**
  - What are the expected impacts of air pollution on health, ecosystems, ecosystems, the economy?

### Why is it happening?

- **Which anthropogenic sources emit which air pollutants?**
  - How much does each anthropogenic source emit of each pollutant?  
Trend?
- **What are the reasons for the trend in air polluting emissions?**
  - What are the reasons for the trend in SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, heavy metals, benzoapyrene, phenol, fluorine, formaldehyde, etc emissions?
  - How much of the changes are due to environmental protection measures?  
To structural changes?
- **What are the impacts of the neighbouring countries?**
  - How much is exported and imported from the neighbouring countries for each pollutant?

### Are we seeing changes?

- **What is the trend in the emissions of air pollutants?**
  - What is the trend in emissions of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter, carbon monoxide (CO), volatile organic compounds (VOC), ammonia (NH<sub>3</sub>), heavy metals (lead, zinc, nickel, copper, chromium, selenium, cadmium, arsenic, mercury, etc.), other pollutants?
  - Have the targets of the various conventions, protocols and action programmes been reached?
    - *Have the targets of the CLRTAP been reached?*

- *Have the targets of the various European directives been reached? (directives aiming at limiting emissions of a sector or an activity, directives setting up air quality standards for pollutants)*
- *Have the national targets for the different pollutants' emissions been reached?*
- If the targets have not be reached, what are the reasons?
  - *Was there any shift in the structure of the economy or in the energy consumption pattern (e.g. from natural gas to oil) and what were the impacts on the emissions?*
- **What is the expected trend in the emissions of air pollutants?**
  - What is the expected trend in emissions of SO<sub>2</sub>, NO<sub>x</sub>, particulate matter, CO, VOC, NH<sub>3</sub>, heavy metals, etc.?
  - Will the objectives of the various policies (national, European and international) be reached in the future?
  - If not what will be the reasons?

### How effective are the responses?

- **What are the responses to address air quality problems?**
  - What has been done to meet the targets of the CLRTAP, the national emission ceilings directive (proposal still) and national strategies?
    - *Which measures have been responsible for the big part of the decrease in emissions?*
  - Does the national response cover all pollutants equally?
    - *Which are not covered?*
    - *Does the national response address all important sources/activities? Which were not covered?*
    - *Are appropriate responses in place in case thresholds are exceeded (alert procedure, etc.)?*
    - *Is the information provided by the national monitoring system sufficient for the decision making process?*
- **Do the responses serve in reaching the desired targets?**
  - *Which responses have been most successful in addressing air pollution?*
  - *Has any incentive fiscal policy been implemented, and with what effect?*
  - *Which responses have not been successful?*
- **What are the responses in prospect at international, European and national levels concerning air pollution?**
  - To what extent could measures to reduce greenhouse gas emissions (particularly carbon dioxide) as a side effect reduce acidifying substances and ozone precursors (e.g. fuel switching)?
- **What are the different options at international, European and national levels?**
  - What are the economic options, technical options?
    - *What lessons can be drawn from the Auto-oil and similar programmes?*
  - What are the costs-benefits of the various options?

## 7. Inland waters

### Place of the issue in the policy cycle

Sustainable use of water is among the key objectives of the Fifth Environment Action Programme. Water stress, i.e. pressure on the quantity and quality of water resources, is caused by activities in two sectors identified as priorities under the Fifth Environment Action Programme namely, agriculture and industry, and also by the household sector. At European level, the Water Framework Directive pursues a generic approach to water management and provides a framework for the protection of water resources (EEA 1999, p. 155).

### What is happening?

Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use (EEA 1999, p. 155). There are two main threats to ground and surface water resources : pollution and over-exploitation. Pollution of water (e.g. nitrate, phosphate, pesticides and heavy metals) arises from point and diffuse sources, and also accidental releases. Water can also be polluted by deposition from air pollution. [...] Over- exploitation of groundwater and surface water reserves can lead to the drying of wetland habitats, deterioration of terrestrial ecosystems, low flow in rivers, salt water intrusion into aquifers and restrictions on legitimate use. [...]. Both pollution and over-abstraction lead to a loss of habitats and biodiversity, threats to human health and limits to economic and social development' (Environment in the EU 1995, p. 79). The sharing of water resources between upstream and downstream countries and through transboundary aquifers is becoming an increasing problem with regard to quantity and quality of the resource (Environment in the EU 1995, p. 79).

### Why is it happening?

Water stress frequently occurs in areas with low rainfall and high population density or in areas where agricultural or industrial activities are intense (EEA 1999, p. 155). Water resources and water quality in Europe are affected mainly by three sectors: agriculture, industry, and households. It is also affected by sectoral policies notably the Common Agricultural Policy (EEA 1999, p. 155).

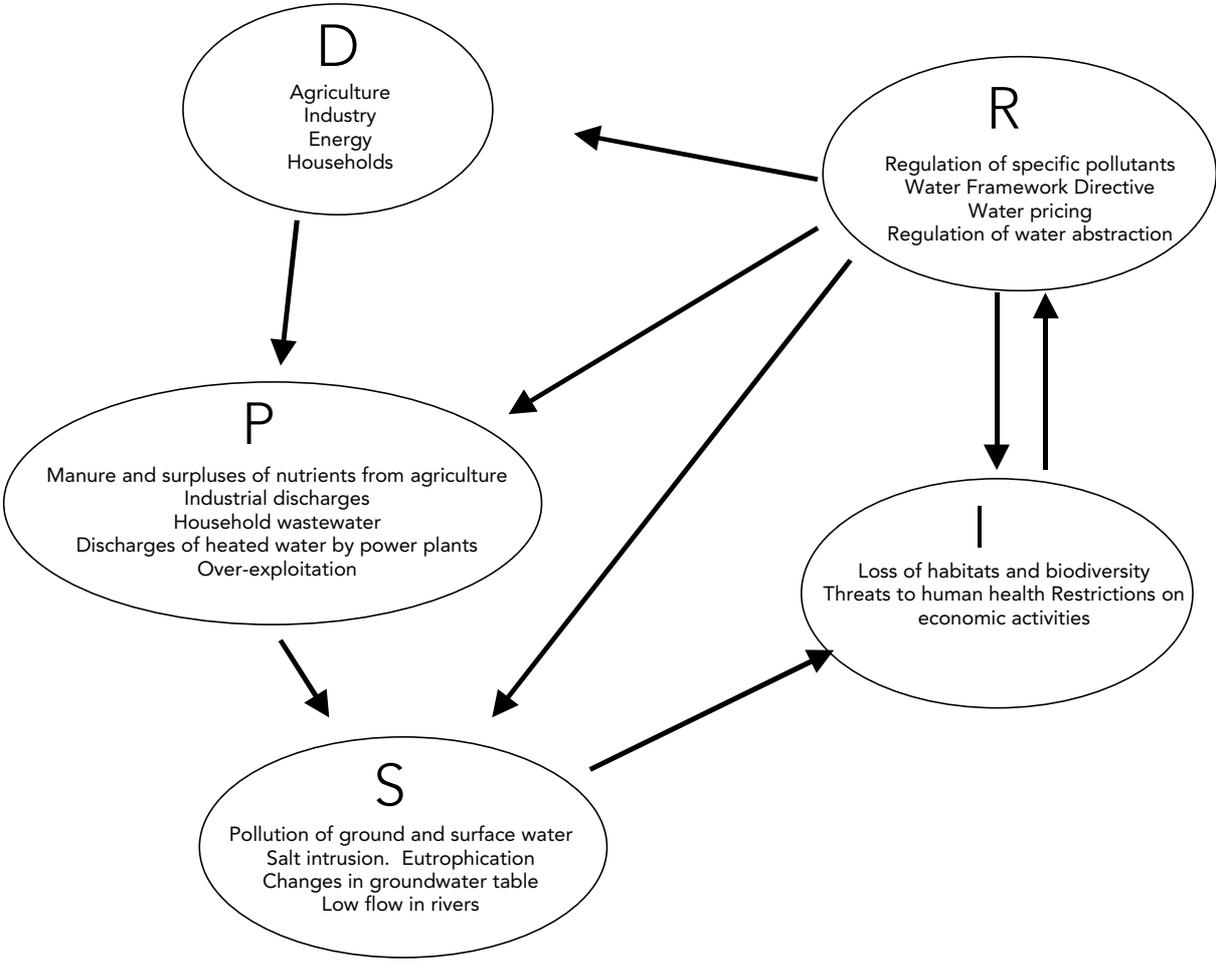
### Are we seeing changes?

Most progress has been achieved in the industrial sector, with some improvement for households, but little progress has been made by the agricultural sector (EEA 1999, p. 155). Current levels of water abstraction are regarded as sustainable, although significant water loss occurs in southern countries. Water abstraction will increase very slowly in the EU (EEA 1999, p. 155). There are fewer heavily-polluted rivers due to reductions in organic matter discharges, phosphate-free detergent and improved waste-water treatment; implementation of the wastewater treatment directive and upgrading of discharge can achieve further reductions of phosphorus and organic matter discharges but the quantity of contaminated sludge will increase accordingly. The concentration of nitrate in EU rivers has been approximately constant since 1980 leading to eutrophication in coastal areas. Nitrate contamination of aquifers also remains a problem, due to diffuse nutrient loads from agriculture (EEA 1999, p. 155).

### How effective are the responses?

Over the past 25 years, the EU has developed and adopted a number of directives concerning water quality, aimed at specific processes or industries, specific substances or specific uses of water. The majority of these directives have been transferred to national law [...]. In contrast to the many initiatives on water quality in the EU, there has been much less activity concerning water quantity and until recently there has been no policy in place which integrated water quality and quantity. The future Water Framework Directive (COM(97)49, adoption 2000) seeks to address these deficiencies by an integrated approach covering all aspects of water management under one framework document (EEA 1999, p.177). Water pricing to promote conservation, re-use and leakage control is now an important consideration in the development of water policy (EEA 1999, p. 155).

**Inland waters – DPSIR framework**



### What is happening?

#### Quantity

- What is the balance between available water resources and sectoral demands?
- What is the trend in floods and droughts? Low flow rivers? Drying out of natural areas?

#### Quality

- What is the situation of groundwater quality?
- What is the situation of river water quality?
- What is the situation of water quality in lakes and reservoirs?
- What is the quality of drinking water? Trend?
- What is the quality of bathing waters? Trend?
- How is flora and fauna affected by changes in quality and quantity?

### Why is it happening?

#### Quantity

- What is the trend in total water abstraction?
- What are the causes of droughts? Low flow rivers? Drying out of natural areas?

#### Quality

- Which human activities affect the quality of water?
- What are the causes of poor aesthetic quality?
- What are the major uses of rivers, lakes and reservoirs?
- What is the progress in wastewater treatment?

### Are we seeing changes?

- How are the main issues related to water management in the country developing?

### How effective are the responses?

- What have been policy responses on water shortage problems? How effective were these?
- What have been policy responses on water quality problems? How effective were these?
- What have been integrated policy responses? How effective were these?
- Which responses have been most successful?
- What are the options for the future for integrated water management?

### What is happening?

#### Quantity

- **What is the balance between available water resources and sectoral demands?**
  - How abundant is the available resource?
- **What is the trend in floods and droughts? Low flow rivers? Drying out of natural areas?**
  - Which rivers are more likely to have an unacceptable high or low flow?
  - How much natural area shows signs of drying out?

#### Quality

- **What is the situation of groundwater quality?**
  - What is the situation concerning groundwater pollution? Trend?
  - What is expected to happen?
- **What is the situation of river water quality?**
  - What is the situation concerning surface water pollution? Trend?
  - What are the problems as regards pollution in the biggest transboundary rivers?
  - What is the situation concerning the aesthetic quality of rivers?
  - What is expected to happen?
- **What is the situation of water quality in lakes and reservoirs?**
  - What is the situation concerning the pollution of lakes and reservoirs? Trend?
  - What is expected to happen?
- **What is the quality of drinking water? Trend?**
  - Is the drinking water meeting the national/international standards?
  - What proportion of wells meet the health protection requirements?
  - What is the technical state of the drinking water supply system?
  - Have there been occurrences of water related diseases?
- **What is the quality of bathing waters? Trend?**
  - Are the bathing water meeting the European/national standards? Trend?
- **How is flora and fauna affected by changes in quality and quantity?**
  - What are the impacts on plants and animals of eutrophication, acidification?
  - What have been the concentrations of pollutants (pesticides, heavy metals, etc.) found in animals (fishes, etc.), plants, sediments? (see also Chemicals)

### Why is it happening?

#### Quantity

- **What is the trend in total water abstraction?**
  - How is water abstraction per sector developing (agriculture, public water supply, energy and industry)?
  - What are the causes of the trend?
  - What is the water abstraction by source (groundwater, surface water)? Trend?

- **What are the causes of floods and droughts? Low flow rivers? Drying out of natural areas?**

### Quality

- **Which human activities affect the quality of water?**
  - How much of each pollutant/nutrients does each sector discharge? Trend (organic matters, hazardous substances, nutrients, etc.)?
  - How much wastewater treatment plants treat nitrogen? Phosphorus?
  - What are the impacts of hydraulic engineering projects?
  - How has the maintenance practice in major watercourses changed?
- **What are the causes of poor aesthetic quality?**
- **What are the major uses of river, lakes and reservoirs?**
  - What harm do regulation works cause to aquatic life and fisheries?
- **What is the progress in wastewater treatment?**
  - How much wastewater is discharged? Trend?
  - How is wastewater collected?
  - Is enough wastewater treated sufficiently?
  - What kind of environmental impacts does wastewater management have?

### Are we seeing changes?

- **How are the main issues related to water management in the country developing?**

### Quantity

- What is the expected trend as regards water availability and the water exploitation index?
- What are the foreseen impacts of climate change by 2050?

### Quality

- How is the quality of groundwater expected to change?
- How will eutrophication develop?
- How will acidification of lakes and rivers develop? (see Acidification)
- How will the ecological quality of rivers develop?

### How effective are the responses?

- **What have been policy responses on water shortage problems? How effective were these?**
  - What have been the national responses?
  - What is the pricing policy for various water uses?
  - How successful have water saving campaigns been?
- **What have been policy responses on water quality problems? How effective were these?**
  - How do international responses to address inland water quality problems affect the national policy?
  - How do the European responses/directives relate to national water quality policy?
  - How are the European directives implemented?
  - What have been specific national responses to water quality problems?
- **What have been integrated policy responses? How effective were these?**
  - Has there been a water pricing policy and what have been the results?
- **Which responses have been most successful?**
  - Which responses have not been successful?

- **What are the options for the future for integrated water management?**
  - What are the economic options, technical options?

### What is happening?

#### Quantity

- **What is the balance between available water resources and sectoral demands?**
  - How abundant is the available resource?
    - *How much is the available resource per origin (rainfall, transboundary rivers, etc.)?*
    - *What is the reservoir capacity?*
    - *What is the variability of the water resources over time?*
- **What is the trend in floods and droughts? Low flow rivers? Drying out of natural areas?**
  - Which rivers are more likely to have an unacceptable high or low flow?
  - How much natural area shows signs of drying out?

#### Quality

- **What is the situation of groundwater quality?**
  - What is the situation concerning groundwater pollution? Trend?
    - *What is the trend in concentrations of nitrogen compounds, phosphorus, hazardous substances, oxygen etc. in groundwater?*
    - *How many sites exceed the European/national limits? Of how much? Trend?*
    - *Where is the nitrate content a current or future problem for the drinking water supply?*
  - What is expected to happen?
- **What is the situation of river water quality?**
  - What is the situation concerning surface water pollution? Trend?
    - *What is the trend in concentrations of organic matter, nitrogen compounds, phosphorus, hazardous substances, oxygen, etc. in surface waters?*
    - *How many sites exceed the European/national limits? Of how much? Trend?*
    - *Where is the nitrate content a current or future problem for the drinking water supply?*
    - *What is the situation of rivers considering salinity? Trend?*
    - *How are the different running water stretches classified regarding biological quality classes? Trend?*
  - What are the problems as regards pollution in the biggest transboundary rivers?
  - What is the situation concerning the aesthetic quality of rivers?
  - What is expected to happen?
- **What is the situation of water quality in lakes and reservoirs?**
  - What is the situation concerning the pollution of lakes and reservoirs? Trend?
    - *What is the trend in concentrations of organic matter, nitrogen compounds, phosphorus, hazardous substances, oxygen etc. in lakes and reservoirs?*
    - *How much sites exceed the European/national limits? Of how much? Trend?*
    - *Where are the nitrate and phosphorus contents a current or future problem?*
    - *How are the different lakes and reservoirs classified regarding biological quality classes? Trend?*
  - What is expected to happen?
- **What is the quality of drinking water? Trend?**

- Is the drinking water meeting the national/international standards?
  - *How many people have received drinking water not matching the standards?*
  - *For how long?*
  - *For which parameters? (bacteriology, pesticides, nitrate, etc.)*
- What proportion of wells meet the health protection requirements?
- What is the technical state of the drinking water supply system?
- Have there been occurrences of water related diseases?
  - *Development in outbreaks of acute intestinal infections (related to drinking water)?*
  - *Development in infant mortality from gastro-intestinal infection diseases?*
- **What is the quality of bathing waters? Trend?**
  - Are the bathing water meeting the European/national standards? Trend?
- **How is flora and fauna affected by changes in quality and quantity?**
  - What are the impacts on plants and animals of eutrophication, acidification?
  - What have been the concentrations of pollutants (pesticides, heavy metals, etc.) found in animals (fishes, etc.), plants, sediments? (see also Chemicals)

## Why is it happening?

### Quantity

- **What is the trend in total water abstraction?**
  - How is water abstraction per sector developing (agriculture, public water supply, energy and industry)?
  - What are the causes of the trend?
    - *How much is abstracted for irrigation?*
    - *How big are water losses in the water supply system?*
    - *What is the development of water use efficiency in industry?*
    - *How many industries have closed circuits?*
  - What is the water abstraction by source (groundwater, surface water)? Trend?
- **What are the causes of floods and droughts? Low flow rivers? Drying out of natural areas?**
  - *What are the main problems with regard to water stress phenomena and where do they occur?*

### Quality

- **Which human activities affect the quality of water?**
  - How much of each pollutant/nutrients do each sector discharge? Trend (organic matter, hazardous substances, nutrients, etc.)?
    - *What is the trend in the discharges of nitrate? What are the causes (agriculture, industry)?*
    - *What is the estimate production of the gross pollution of major towns?*
    - *What is the trend in the discharges of phosphorus (detergent/other human discharges)?*
    - *What is the trend in water pollution incidents?*
  - How much wastewater treatment plants treat nitrogen? Phosphorus?
  - What are the impacts of hydraulic engineering projects?
  - How has the maintenance practice in major watercourses changed?
- **What are the causes of poor aesthetic quality?**

- **What are the major uses of rivers, lakes and reservoirs?**
  - What harm do regulation works cause to aquatic life and fisheries?
- **What is the progress in wastewater treatment?**
  - How much wastewater is discharged? Trend?
    - *How much wastewater is discharged per sector? Trend?*
    - *How much organic matter, nitrogen and phosphorus is contained in the discharges? Trend?*
  - How is wastewater collected?
    - *How much of the population is connected to a public wastewater collection system? To an individual wastewater collection system? Trend?*
    - *How much of the population is not connected? Trend?*
    - *How big were the annual discharges of organic matter, nitrogen and phosphorus from dwellings and industries outside the sewage system?*
  - Is enough wastewater treated sufficiently?
    - *What is the capacity of municipal wastewater treatment plants?*
    - *What is the degree of treatment for organic matter, nitrogen and phosphorus in wastewater?*
    - *What is the trend in the discharges of organic matter, nitrogen and phosphorus from wastewater?*
    - *How much wastewater is treated properly?*
    - *How many/which cities are still discharging their wastewater without treatment?*
    - *How much of the population is connected to a wastewater treatment plant? Trend?*
    - *What share of wastewater does not require any treatment?*
  - What kind of environmental impacts does wastewater management have?
    - *What is the development in the production of sewage sludge? (see Waste)*

### Are we seeing changes?

- **How are the main issues related to water management in the country developing?**

#### Quantity

- What is the expected trend as regards water availability and the water exploitation index?
  - *How will water resources develop?*
  - *How will water use by sectors develop? In particular, as regards irrigation and cooling?*
  - *Will the use of water be sustainable? Are any water shortages foreseen?*
- What are the foreseen impacts of climate change by 2050?

#### Quality

- How is the quality of groundwater expected to change?
  - *How many contaminated groundwater should be restored?*
- How will eutrophication develop?
- How will acidification of lakes and rivers develop? (see Acidification)
- How will the ecological quality of rivers develop?
  - *How will the quality of rivers develop as regards pesticides? Organic pollution? Nitrates? Heavy metals?*
  - *What is the expected trend as regards river biodiversity (see Nature and Biodiversity)?*

## How effective are the responses?

- **What have been policy responses on water shortage problems? How effective were these?**
  - What have been the national responses?
    - *What is the policy response regarding the loss of water in the water systems?*
    - *Are water consumption meters installed? What are the effects?*
  - What is the pricing policy for various water uses?
  - How successful have water saving campaigns been?
- **What have been policy responses on water quality problems? How effective were these?**
  - How do international responses to address inland water quality problems affect the national policy?
    - *What are the objectives of the action plans (in international conventions)? (Danube action plan, Rhine action plan, Elbe action plan, Oder convention, convention on the protection and use of transboundary watercourses and international lakes, Black Sea action plan, Helsinki convention, OSPAR commission, Mediterranean action plan). How are they implemented?*
    - *What is the policy response regarding transboundary pollution?*
  - How do the European responses/directives relate to national water quality policy?
  - How are the European directives implemented?
    - *What is the policy response to the excess of nitrate? How is the 91/676/EEC directive on nitrate implemented in the country?*
    - *What is the policy concerning wastewater? How is the 91/271/EEC directive on urban wastewater treatment implemented in the country?*
  - What have been specific national responses to water quality problems?
- **What have been integrated policy responses? How effective were these?**
  - Has there been a water pricing policy and what have been the results?
    - *Are hidden subsidies in place for water use?*
    - *Is wastewater treatment financed in the most efficient way?*
- **Which responses have been most successful?**
  - Which responses have not been successful?
    - *What are the obstacles for policy implementation in the field of water protection?*
    - *What is the cost of water policy?*
- **What are the options for the future for integrated water management?**
  - What are the economic options, technical options?
    - *What are the costs-benefits of the various options?*

## 8. Marine and coastal environment

### Place of the issue in the policy cycle

In many coastal zones in Europe, the fragile ecosystem continues to degrade. This evolution is taking place despite the political recognition of the problem and the existence of policy instruments: legislative (water legislation, Water Framework Directive), financial (structural and cohesion funds), planning (Integrated Coastal Zone Management) (Towards sustainability 1997 and EEA 1999).

### What is happening?

The EU coastal zones contain irreplaceable ecological, cultural and economic resources. Maintenance of these resources depends on protection of the fragile equilibrium among the dynamic systems (human and natural) of the coastal zones (EEA 1999, p. 357-358). The main threats to European coastal areas are: loss of habitats and species diversity, water pollution, coastal erosion, eutrophication, land use and landscape deterioration, hot spots (industrial discharges) and abandoned sites (Towards sustainability 1997 and EEA 1999). Europe has 86 % of its coasts at either high or moderate risk of unsustainable development. 25 % of the coast are subject to erosion and 15 % are aggravating (EEA 1999, p. 357).

### Why is it happening?

Coastal zones face pressure from development, since they are areas where people want to live and work and where recreational activities also feature in a major way (EEA 1999, p. 358). The main causes of the continuing degradation of coastal zones are: urbanisation, shipping, agriculture, industry and energy, oil and gas exploitation, fisheries and aquaculture, transport, and mass tourism. An estimated 200 millions Europeans live in coastal zone areas. This figure which is set to increase renders the present environmental problems all the more urgent (Towards sustainability 1997).

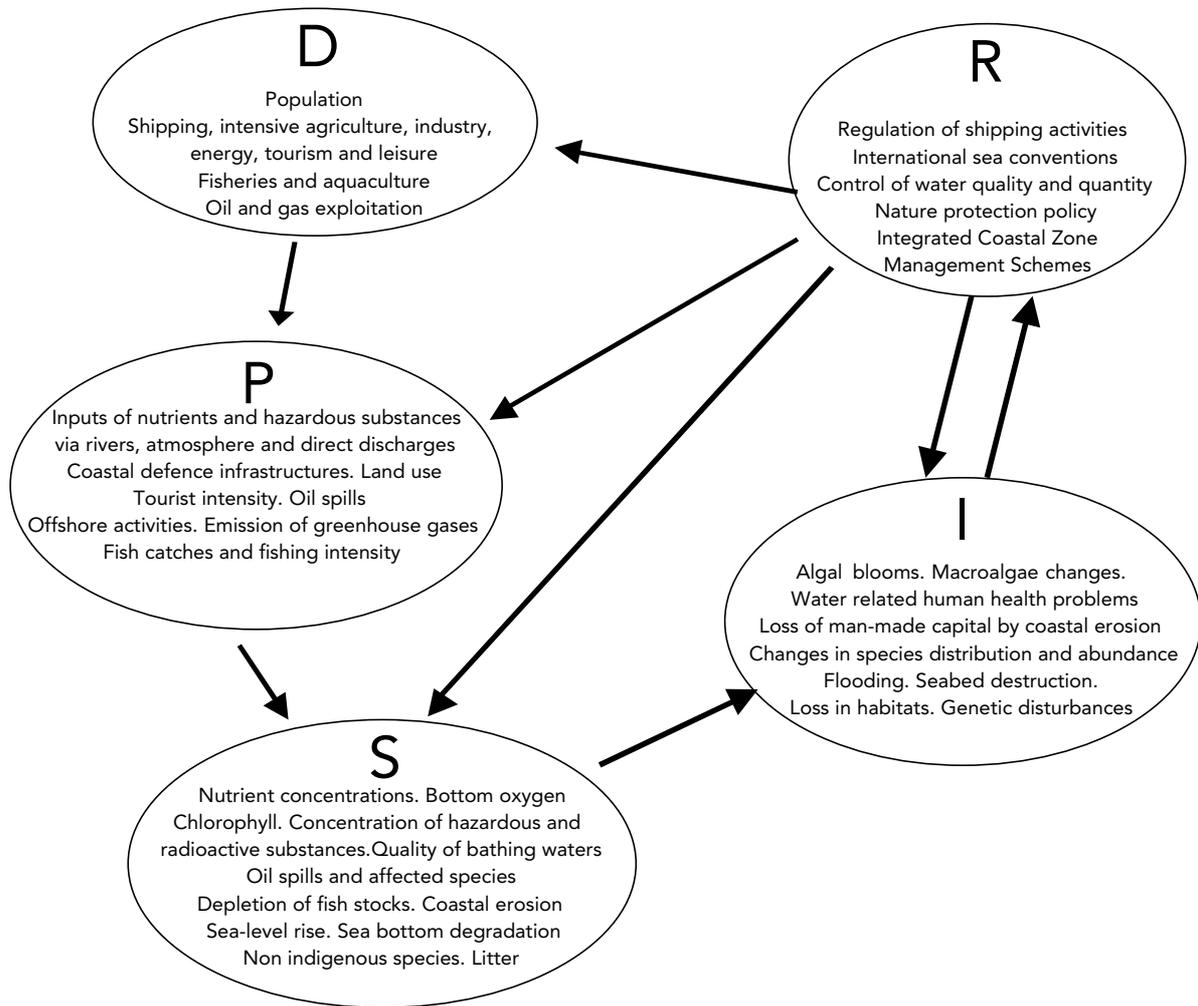
### Are we seeing changes?

The lack of an effective integrated catchment and coastal zone management (CZM) has been recognised to be responsible of the degradation of coastal and marine environment. The integrated approach to CZM is still missing from most of the legislation at National level where a sectoral approach still dominates (EEA 1999, p. 371). Urbanisation claims large expanses of coastline, and while stabilising in northern Europe it continues to increase in the southern countries. Overall, the annual growth rate for tourism in Europe is 3.7 % per year, projected to continue through 2000. A decline of fisheries has been reported in almost all regional seas.(EEA 1999, p. 359-361).

### How effective are the responses?

The EU has recognised the importance of environmental resources in coastal areas and the need for protective measures (EEA 1999, p.358). Many of the policy developments in recent decades have been focused on the quality of the marine environment rather than on the factors influencing coastal zones. The transboundary characteristics of most of the environmental problems and the need for international co-operation, have fostered the establishment of Regional Conventions, which now cover all the seas that are of direct concern to EU countries. At the EU level, environmental legislation deals primarily with marine water quality and inputs of contaminants, and to a lesser degree with the protection of marine and coastal habitats (EEA 1999, p.370). In 1992, the Council of Ministers called on the Commission to develop an integrated strategy for coastal zones management. Key areas of action for Integrated Coastal Zone Management (ICZM) are environmental impact assessment, coastal land planning, habitat management and pollution control (EEA 1999, p.357). The results of the ICZM Demonstration Programme of the Commission and the initiative of the Water Framework Directive should provide concrete examples on how to tackle the coastal zone management issues (EEA 1999, p.372).

## Marine and coastal environment – DPSIR framework



### What is happening?

- What is the situation concerning marine and terrestrial habitats?
- What is the trend in the pollution and quality of marine waters, sediments and habitats?
- What is the situation concerning fish stocks and species diversity?
- What is the trend in the biological quality of marine waters?
- What is the trend in the quality of bathing water?
- What is the trend in the coastal erosion?
- What changes have taken place in the coastal zones?
- What are other detrimental impacts on the marine and coastal environment of human activities (salinity intrusion in groundwater, loss of amenity, etc.)?

### Why is it happening?

- How many people live in coastal areas? Trend?
- What is the trend in activities influencing the coastal zone? What are their impacts?
- What are the causes of erosion?
- What are the causes of good/poor quality in bathing water?

### Are we seeing changes?

- What is the trend concerning the discharge of pollutants and oil spills?

### How effective are the responses?

- What are the international responses to address problems in coastal and marine zones?
- What are the European responses?
- What concrete progress has been made on Integrated coastal zone management?
- What are the national responses?
- How is marine water pollution monitored?
- Which responses have been the most successful?
- What are the responses in prospect at international, European and national levels?
- What are the different options at international, European and national levels to improve the quality of marine waters and to protect coastal zones?



### What is happening?

- **What is the situation concerning marine and terrestrial habitats?**
  - How are marine habitats developing?
  - How are terrestrial habitats developing?
- **What is the trend in the pollution and quality of marine waters, sediments and habitats?**
  - What is the situation concerning the concentration of heavy metals and POPs, in marine waters, coastal sediments and organisms?
  - Are (national and international) standards exceeded?
  - What is the trend concerning radioactive contamination?
  - What is the situation concerning eutrophication?
  - What is the situation concerning waste on the coast and sea-bottom?
  - What is the trend in the number of oil spills from ships, offshore installations, and land-based sources? In the amount spilled?
- **What is the situation concerning fish stocks and species diversity?**
  - What is the trend in species richness?
  - What is the situation concerning rare and endangered species?
- **What is the trend in the biological quality of marine waters?**
  - What is the status concerning oxygen concentration?
  - What is the situation concerning the introduction of alien species?
  - What is the trend in marine algal blooms?
  - What is the trend in the occurrence of toxic phytoplankton?
  - What is the status concerning macro-algae, mesozooplankton, phytobenthos, macrozoobenthos?
- **What is the trend in the quality of bathing water?**
  - Are the bathing water meeting the European standards/ national standards?
- **What is the trend in the coastal erosion?**
- What changes have taken place in the coastal zones?
  - What have been the changes in land-use in coastal zones (littoralisation)?
  - What have been the changes in the intensity of these uses?
- **What are other detrimental impacts on the marine and coastal environment of human activities (salinity intrusion in groundwater, loss of amenity, etc.)?**

### Why is it happening?

- **How many people live in coastal areas? Trend?**
  - What are the impacts of the population?
  - What are the impacts of the seasonal variation of the population?
- **What is the trend in activities influencing the coastal zone? What are their impacts?**
  - How is land-use developing in coastal areas?
  - What are the causes for overfishing?
  - What is the trend in the impacts of industry, energy, tourism, etc.?
  - To what extent have agri-environmental practices limited nutrient discharges?
  - What are the activities off-shore and what are their impacts? Trend?
- **What are the causes of erosion?**

- Are there signs of changes in sea 'level'
- **What are the causes of good/poor quality in bathing water?**

#### **Are we seeing changes?**

- **What is the trend concerning the discharge of pollutants and oil spills?**
  - What is the amount of oil spilled by ships, offshore installations, and discharged via rivers?
  - What is the trend in the discharge of nutrients?
  - What is the amount of other pollutants (heavy metals, POPs, radionuclides, etc.) discharged?
  - How much pollutants are deposited from the atmosphere to the sea?

#### **How effective are the responses?**

- **What are the international responses to address problems in coastal and marine zones?**
  - What has been done to implement the marine conventions, the bathing water quality directive, the urban waste water treatment directive, regarding integrated coastal zone management?
  - Will the objectives of the international marine conventions be met?
  - What obstacles need to be removed to make Integrated Coastal Zone Management successful?
- **What are the European responses?**
  - What have been the effects of EU policies regarding bathing water quality? Urban waste water treatment? Integrated coastal zone management?
  - What are the impacts of the Common Fishery Policy on marine and coastal environment?
- **What concrete progress has been made on Integrated coastal zone management?**
  - What are the main obstacles to be removed to make Integrated coastal zone management successful?
- **What are the national responses?**
- **How is marine water pollution monitored?**
  - Are there gaps in the monitoring? If so, how can they be addressed?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
  - What will be the effects of the future Water Framework Directive?
- **What are the different options at international, European and national levels to improve the quality of marine waters and to protect coastal zones?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?



### What is happening?

- **What is the situation concerning marine and terrestrial habitats?**
  - How are marine habitats developing?
    - *What is the state of the sea bottom?*
  - How are terrestrial habitats developing?
- **What is the trend in the pollution and quality of marine waters, sediments and habitats?**
  - What is the situation concerning the concentration of heavy metals and POPs, in marine waters, coastal sediments and organisms?
  - Are national and international standards exceeded?
    - *How has the concentration of hazardous substances in fishes/in shellfishes developed?*
  - What is the trend concerning radioactive contamination?
  - What is the situation concerning eutrophication?
    - *What is the situation concerning the nutrient concentration in marine water?*
    - *How many areas were designated as eutrophic sensitive areas?*
  - What is the situation concerning waste on the coast and sea-bottom?
  - What is the trend in the number of oil spills from ships, offshore installations, and land-based sources? In the amount spilled?
    - *How has the amount of oil polluted birds among stranded sea birds developed?*
- **What is the situation concerning fish stocks and species diversity?**
  - What is the trend in species richness?
    - *What is the state of fish stocks?*
  - What is the situation concerning rare and endangered species?
- **What is the trend in the biological quality of marine waters?**
  - What is the status concerning oxygen concentration?
    - *What is the classification of coastal waters according to the relative frequency of oxygen deficit?*
    - *In which locations were oxygen deficit observed?*
  - What is the situation concerning the introduction of alien species?
    - *Which species are invading?*
    - *What are the impacts?*
  - What is the trend in marine algal blooms?
    - *What is the size and frequency of toxic blooms?*
    - *What are the impacts of algal blooms?*
  - What is the trend in the occurrence of toxic phytoplankton?
    - *What are the impacts of toxic phytoplankton?*
  - What is the status concerning macro-algae, mesozooplankton, phytobenthos, macrozoobenthos?
- **What is the trend in the quality of bathing water?**
  - Are the bathing water meeting the European standards/ national standards?
- **What is the trend in the coastal erosion?**
- **What changes have taken place in the coastal zones?**
  - What have been the changes in land-use in coastal zones (littoralisation)?
  - What have been the changes in the intensity of these uses?
- **What are other detrimental impacts on the marine and coastal environment of human activities (salinity intrusion in groundwater, loss of amenity, etc.)?**

### Why is it happening?

- **How many people live in coastal areas? Trend?**
  - What are the impacts of the population?
    - *How much organic matter is produced by coastal towns?*
    - *What is the purification/collection rate of coastal towns?*
  - What are the impacts of the seasonal variation of the population?
- **What is the trend in activities influencing the coastal zone? What are their impacts?**
  - How is land-use developing in coastal areas?
    - *What is the trend in nature conservation areas?*
  - What are the causes for over-fishing?
    - *Has pelagic fishing progressed over the recent years?*
  - What is the trend in the impacts of industry, energy, tourism, etc.?
    - *What is the trend in urbanisation?*
    - *What is the trend in tourism?*
  - To what extent have agri-environmental practices limited nutrient discharges?
  - What are the activities off-shore and what are their impacts? Trend?
    - *What are the impacts of aquaculture, fisheries?*
    - *What are the impacts of maritime transport?*
    - *How much raw material is extracted off-shore? Impacts?*
    - *What is the trend in the evolution of these activities in maritime areas?*
- **What are the causes of erosion?**
- **What are the causes of good/poor quality in bathing water?**

### Are we seeing changes?

- **What is the trend concerning the discharge of pollutants and oil spills?**
  - What is the amount of oil spilled by ships, offshore installations, and discharged via rivers?
  - What is the trend in the discharge of nutrients?
    - *Which activities produce the nutrients discharged into the sea?*
  - What is the amount of other pollutants (heavy metals, POPs, radionuclides, etc.) discharged?
    - *What is the situation regarding radioactive contamination?*
    - *What is the situation regarding pollutants?*
  - How much pollutants are deposited from the atmosphere to the sea?
    - *How much nitrogen is deposited from the atmosphere to the sea?*

### How effective are the responses?

- **What are the international responses to address problems in coastal and marine zones?**
  - What has been done to implement the marine conventions, the bathing water quality directive, the urban waste water treatment directive, regarding integrated coastal zone management?
  - Will the objectives of the international marine conventions be met?
  - What obstacles need to be removed to make Integrated Coastal Zone Management successful?
- **What are the European responses?**

- What have been the effects of EU policies regarding bathing water quality? Urban waste water treatment? Integrated coastal zone management?
- What are the impacts of the Common Fishery Policy on marine and coastal environment?
- **What concrete progress has been made on Integrated coastal zone management?**
  - What are the main obstacles to be removed to make Integrated coastal zone management successful?
- **What are the national responses?**
- **How is marine water pollution monitored?**
  - Are there gaps in the monitoring? If so, how can they be addressed?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
  - What will be the effects of the future Water Framework Directive?
- **What are the different options at international, European and national levels to improve the quality of marine waters and to protect coastal zones?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

## 9. Soil degradation

### Place of the issue in the policy cycle

Strategies for soil protection, and systems for monitoring of soil, are not adequately developed at European or national level. A policy framework is needed which recognises the environmental importance of soil, takes account of problems arising from the competition among its concurrent uses and is aimed at maintaining its multiple functions (EEA 1999, p 183).

### What is happening?

The main problems for soils in the EU are irreversible losses due to increasing soil sealing and soil erosion, and continuing deterioration due to local contamination and diffuse contamination (acidification and heavy metals) (EEA 1999, p 183).

Over 300,000 potentially contaminated sites have been identified in Western Europe. About 115 million hectares are suffering from water erosion and 42 million hectares from wind erosion. The problem is greatest in the Mediterranean region because of its fragile environmental conditions. Soil salinisation is affecting nearly four million hectares, mainly in Mediterranean and Eastern European countries (EEA 1998, p. 231).

### Why is it happening?

Soil degradation is mainly caused by urbanisation and infrastructure development (in western and northern Europe) and erosion (in the Mediterranean region). There is a significant risk of water erosion mainly in southern and central Europe and the Caucasus region (EEA 1999, p 183).

The enormous increase in waste and the widespread use of chemicals during the past 40 years have resulted in a variety of problems of soil contamination (EEA 1998, p. 232). Soil is lost through sealing under construction such as industrial premises and transport infrastructures. Soil erosion is intensified by land abandonment and forest fires. The main causes of soil salinisation are over-exploitation of water resources as a result of irrigation for agriculture, population increase, industrial and urban development and the expansion of tourism in coastal areas. Soil erosion and salinisation have increased the risk of desertification in the most vulnerable areas, particularly the Mediterranean region (EEA 1998, p. 231).

### Are we seeing changes?

Degradation and loss of soil in particular through erosion, contamination, sealing (building, roads, etc.) and changes in its structure is worryingly high (EC Global Assessment of the 5 EAP 1999).

Diffuse contamination is particularly significant in areas with intensive agriculture. Southern Europe is increasingly affected due to increased industrial activity, urban expansion, tourism and agriculture intensification, while soils in northern Europe are prone to the effects of acid deposition (EEA 1999, p 183).

The incremental loss and deterioration of Europe's soil resource will continue, and will probably increase as a result of climate change, land-use changes and other human activities (EEA 1999, p 183).

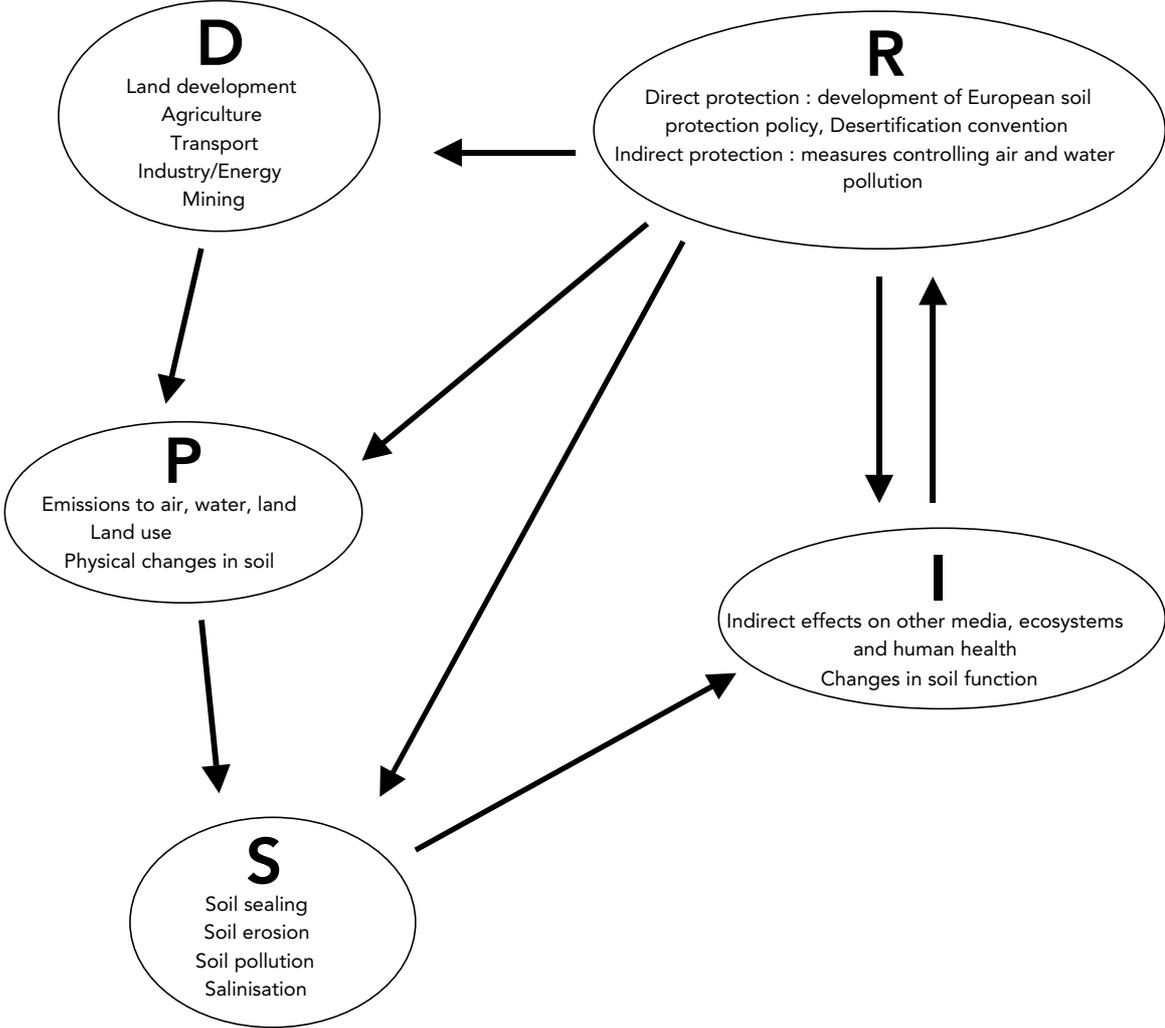
### How effective are the responses?

With little direct legislation for controlling the impact of human activity and land-use on soils, some limited protection is being achieved indirectly through measures controlling water and air pollution. Any strategy to improve the situation should take into consideration that soil needs to be tackled individually as a medium, receiving the same attention as air and water ; co-ordination and co-operation are required at European and international levels ; harmonised soil monitoring programmes need to be established similar to those for air and water, and geared to assessments of the state of the soil over large areas, covering a number of parameters (EEA 1998, p. 245).

Most Western European countries have established regulatory frameworks aimed at preventing future incidents and cleaning up existing contamination. Strategies to combat soil salinisation and accelerated soil erosion are lacking (EEA 1998, p. 231).

There is a need to identify the relationship between Community policies and intervention and soil problems to enable a decision on the development of a coherent approach at Community level. It is also necessary to integrate soil management objectives, in particular objectives of the UN Convention to Combat Desertification (EC Global Assessment of the 5 EAP 1999).

Soil degradation – DPSIR framework



## Soil degradation



### What is happening?

- What is the situation concerning physical and biological degradation of soils?
- What is the situation concerning soil pollution?

### Why is it happening?

- What are the causes of the different types of soil degradation?

### Are we seeing changes?

- What is the trend concerning soil erosion, soil compaction, other physical degradation of the soil (soil sealing, peat excavation, deep ploughing, etc.)?
- What is the trend concerning salinisation?
- How is abstraction of groundwater in coastal areas developing?
- How is the use of irrigation water developing?
- What is the trend concerning the pollution of soils?
- What is the trend concerning acidification? (see Acidification)

### How effective are the responses?

- What is the response/policy response to soil erosion?
- What is the response/policy response to other physical degradation of soils?
- What is the response/policy response to salinisation?
- What is the response/policy response to loss of organic matter in soils?
- What is the response/policy response to loss of biological quality of soils?
- What is the response/policy response to pollution of soils?
- For each category of soil degradation, which responses have been successful?
- What are the responses in prospect for each type of soil degradation?

## Soil degradation



Level 2

### What is happening?

- **What is the situation concerning physical and biological degradation of soils?**
  - What is the situation concerning soil erosion?
  - How is the area affected by soil compaction developing?
  - How is the area affected by salinisation developing?
  - How is the area affected by other physical degradation developing (soil sealing, peat excavation, deep ploughing, etc.)?
  - What are the impacts of the loss of soil and physical degradation?
  - How is the average content of organic matters developing?
  - What is the situation concerning the loss of biological quality of soils?
  - What are the impacts of soil compaction, of the loss of organic matter in soils, of the loss of biological quality of the soil, of salinisation?
- **What is the situation concerning soil pollution?**
  - What is the situation concerning contaminated sites?
  - What is the situation concerning the diffuse pollution of soils by hazardous substances? (lead, cadmium, arsenic, zinc, copper, nickel, mercury, organic pollutants, etc.)?
  - What are the impacts of the pollution of soils?
  - In the future, what will be the main environmental issues concerning soils?

### Why is it happening?

- **What are the causes of the different types of soil degradation?**
  - What have been the developments in agriculture that encourage soil degradation?
  - What are the impacts of soil degradation on agriculture?
  - How is the area of built-up land developing (soil sealing)?
  - What are the causes of wind and water erosion, soil compaction, salinisation?
  - What are the causes of the loss of organic matter in soils, loss of biological quality?
  - How is the amount and heavy metal content of sewage sludge applied on agricultural land developing?
  - What is the development in heavy metal content of animal manure?
  - What are the causes of contaminated sites?
  - What are the causes of soil acidification? (see Acidification)

### Are we seeing changes?

- **What is the trend concerning soil erosion, soil compaction, other physical degradation of the soil (soil sealing, peat excavation, deep ploughing, etc.)?**
- **What is the trend concerning salinisation?**
- **How is abstraction of groundwater in coastal areas developing?**
- **How is the use of irrigation water developing?**
- **What is the trend concerning the pollution of soils?**
  - What is the trend concerning the pollution of soils by heavy metals? (lead, cadmium, arsenic, zinc, copper, nickel, mercury, etc.)

- What is the trend concerning the pollution of soils by persistent organic substances?
- What is the trend concerning the discharges of sewage sludge?
- What is the trend concerning contaminated sites?
- **What is the trend concerning acidification? (see Acidification)**

#### **How effective are the responses?**

- **What is the response/policy response to soil erosion?**
- **What is the response/policy response to other physical degradation of soils?**
- **What is the response/policy response to salinisation?**
- **What is the response/policy response to loss of organic matter in soils?**
  - What have been the impacts of the CAP and other agricultural policies on the loss of organic matter in soils?
- **What is the response/policy response to loss of biological quality of soils?**
- **What is the response/policy response to pollution of soils?**
  - What is the response/policy response to contaminated sites?
  - What is the legislation concerning the accumulation of toxic elements in soils following the application of sewage sludge?
- **For each category of soil degradation, which response have been successful?**
  - Which responses have not been successful?
- **What are the responses in prospect for each type of soil degradation?**
  - What are the different options (technical, economic) for each type of soil degradation?

### What is happening?

- **What is the situation concerning physical and biological degradation of soils?**
  - What is the situation concerning soil erosion?
    - *How is the area affected by wind erosion developing?*
    - *How is the area affected by water erosion developing?*
  - How is the area affected by soil compaction developing?
  - How is the area affected by salinisation developing?
  - How is the area affected by other physical degradation developing (soil sealing, peat excavation, deep ploughing, etc.)?
  - What are the impacts of the loss of soil and physical degradation?
    - *What are the impacts of soil sealing?*
    - *What are the impacts of soil eroded by wind?*
    - *What are the impacts of soil eroded by water?*
    - *What are the impacts of the loss of peatlands?*
  - How is the average content of organic matters developing?
  - What is the situation concerning the loss of biological quality of soils?
  - What are the impacts of soil compaction, of the loss of organic matter in soils, of the loss of biological quality of the soil, of salinisation?
- **What is the situation concerning soil pollution?**
  - What is the situation concerning contaminated sites?
    - *How many contaminated sites are registered?*
    - *How many potential contaminated sites are expected to be?*
  - What is the situation concerning the diffuse pollution of soils by hazardous substances? (lead, cadmium, arsenic, zinc, copper, nickel, mercury, organic pollutants, etc.)?
    - *Where are soils exceeding the natural content of heavy metals?*
    - *Where are soils exceeding the standards for heavy metals?*
    - *What is the situation concerning the pollution of soils by persistent organic substances?*
  - What are the impacts of the pollution of soils?
    - *What are the impacts of contaminated/derelict sites?*
    - *What are the impacts of the application of sewage sludge?*
    - *What are the impacts of acidification? (see ACIDIFICATION)*
  - In the future, what will be the main environmental issues concerning soils?

### Why is it happening?

- **What are the causes of the different types of soil degradation?**
  - What have been the developments in agriculture that encourage soil degradation?
  - What are the impacts of soil degradation on agriculture?
  - How is the area of built-up land developing (soil sealing)?
    - *Which land use categories are mainly responsible for soil sealing and how are they developing?*
  - What are the causes of wind and water erosion, soil compaction, salinisation?
  - What are the causes of the loss of organic matter in soils, loss of biological quality?

- How is the amount and heavy metal content of sewage sludge applied on agricultural land developing?
  - *What are the impacts of the directive on urban wastewater treatment?*
- What is the development in heavy metal content of animal manure?
- What are the causes of contaminated sites?
- What are the causes of soil acidification? (see Acidification)

#### Are we seeing changes?

- **What is the trend concerning soil erosion, soil compaction, other physical degradation of the soil (soil sealing, peat excavation, deep ploughing, etc.)?**
- **What is the trend concerning salinisation?**
- **How is abstraction of groundwater in coastal areas developing?**
- **How is the use of irrigation water developing?**
- **What is the trend concerning the pollution of soils?**
  - What is the trend concerning the pollution of soils by heavy metals? (lead, cadmium, arsenic, zinc, copper, nickel, mercury, etc.)
  - What is the trend concerning the pollution of soils by persistent organic substances?
  - What is the trend concerning the discharges of sewage sludge?
  - What is the trend concerning contaminated sites?
- **What is the trend concerning acidification? (see ACIDIFICATION)**

#### How effective are the responses?

- **What is the response/policy response to soil erosion?**
  - *Has a national strategy been made?*
  - *Do the measures taken cover most of the area with severe erosion?*
  - *Do the measures address all forms of erosion?*
- **What is the response/policy response to other physical degradation of soils?**
- **What is the response/policy response to salinisation?**
- **What is the response/policy response to loss of organic matter in soils?**
  - What have been the impacts of the CAP and other agricultural policies on the loss of organic matter in soils?
- **What is the response/policy response to loss of biological quality of soils?**
- **What is the response/policy response to pollution of soils?**
  - What is the response/policy response to contaminated sites?
    - *What are the different sources of grant to finance the treatment of contaminated sites?*
    - *How much money was spent on soil clean-up?*
    - *How many contaminated sites have to be reclaimed?*
    - *How many contaminated sites have been reclaimed?*
    - *How many contaminated sites are under treatment?*
  - What is the legislation concerning the accumulation of toxic elements in soils following the application of sewage sludge?
- **For each category of soil degradation, which response have been successful?**
  - Which responses have not been successful?
- **What are the responses in prospect for each type of soil degradation?**
  - What are the different options (technical, economic) for each type of soil degradation?
    - *What are the most cost-effective options?*

# 10. Waste

## Place of the issue in the policy cycle

The problems of waste in the EU are still growing faster, due to consumption patterns, than the implementation of measures to control and prevent them. The overall aim and priority of European waste-management policy is waste prevention and recycling (EC Global Assessment of the 5 EAP 1999).

## What is happening?

Managing waste causes a number of pressures on the environment : leaching of nutrients, heavy metals and other toxic compounds from landfills, use of land for landfills, emission of greenhouse gases from landfills and treatment of organic waste, air pollution and toxic by-products from incinerators, air and water pollution and secondary waste streams from recycling plants, increased transport with heavy lorries (EEA 1999, p. 204).

The environmental pressures caused by the transport of waste are likely to increase in the future as waste is separated into more fractions for different treatment (EEA 2000).

A significant amount of hazardous waste is exported from and transferred within Europe (Environment in the EU, 1995, p. 69). Some of the increasing amounts of waste give rise to new problems, such as sewage sludge and residues from cleaning of flue gases (EEA 1999, p. 203).

## Why is it happening?

Economic development involving increased production and consumption has caused increased production of waste (EEA 1995, p. 342). Waste is often the result of inefficient energy and materials management by producers and consumers in all sectors of activity [...] but also the result of the production and consumption of goods that last less time (EEA 1995, p. 578). Waste is also produced as a result of society's attempt to solve other environmental problems such as water and air pollution (EEA 1999, p. 203).

Half the waste comes from the manufacturing industry and construction and demolition activities, while municipal waste, mining waste and waste from other sources each contribute about one sixth of the total (EEA 1999, p. 203).

## Are we seeing changes?

Waste quantities are increasing, but de-linking of waste from economic activity has been achieved for some waste streams and countries. The amount of municipal waste generated is considerably higher than the target for 2000 in the EU's Fifth environmental action programme target, and a large proportion of biodegradable waste is still disposed of in landfills. However, recycling initiatives are increasing. The use of waste taxes is increasing in Member States, but they are not yet fully integrated into waste-management strategies. Some EEA member countries have achieved higher recovery and recycling rates for packaging wastes than target values (EEA 2000). In most EU countries landfilling is still the most common treatment route for waste and there is no general improvement in this trend. Recycling of paper and glass has been only a partial success, because the total amount of waste generation has also increased in the same period (EEA 1999, p. 203).

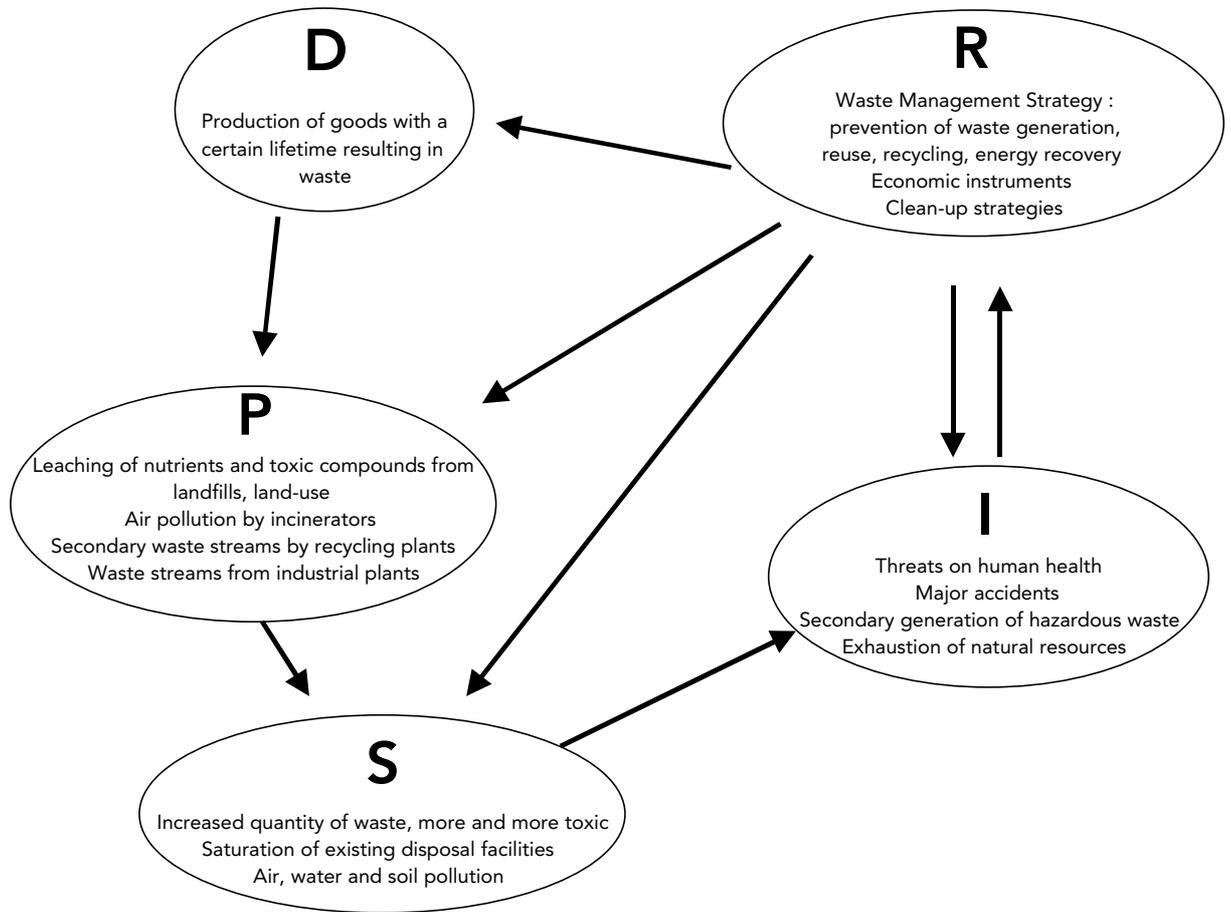
Most waste streams will probably increase over the next decade. Sewage sludge and end-of-life vehicles are waste streams where substantial increases in quantities can be expected (EEA 1999, p. 203).

## How effective are the responses?

The policies adopted at Community level are guided by the Community Waste Management Strategy which aims to establish an integrated waste management policy. Thus, the Strategy sets up a hierarchy of principles, giving top priority to the prevention of waste generation, followed by re-use and recycling of waste materials, energy recovery and final disposal of waste. The legal response to the Strategy is in particular the Waste Framework Directive, the Directive on hazardous waste and the Regulation in the supervision and control of transfrontier waste shipments (EEA 1999, p. 206).

In addition, specific Directives impose common rules for the separate collection and treatment of certain waste streams, such as packaging, batteries and accumulators, waste oils, sewage sludge and polychlorinated biphenyls (PCBs) (EEA 2000).

**Waste – DPSIR framework**



## Waste



### Level 1

The structure ‘What is happening? / Why is it happening? / Are the changes significant? / How effective are the responses?’ is not really relevant in this case. Therefore a different structure is used, based on: the generation of waste, the management of waste and the responses to the problems caused by generation and management.

#### Generation of waste

- Which types of waste are generated? How much?
- Which are the main sources of waste generation?
- What are the expected amounts of waste generated?
- How much waste is imported/exported?

#### Management of waste

- What have been the developments in the prevention of waste?
- How is the collection of waste developing?
- How is the treatment of waste developing?
- What is the situation concerning the recycling/re-use of waste?
- What is the situation concerning incineration?
- What is the situation concerning the disposal of waste in landfills?
- What is the situation concerning the transport of waste?
- What are the impacts of waste/waste management on the environment and on economical resources?

#### How effective are the responses?

- What is the international response?
- What is the European response?
- What is the national response?
- Which responses have been the most successful?
- What are the options for additional measures?

### Generation of waste

- **Which types of waste are generated? How much?**
  - What is the trend in the generation of municipal waste?
  - What is the trend in the generation of industrial waste?
  - What is the trend in the generation of hazardous waste?
  - What is the trend in the generation of waste generated by agriculture, mining and construction?
  - What is the trend in the generation of radioactive waste, sewage sludge, packaging waste, end-of-life vehicles/car wrecks? Other type of waste?
- **Which are the main sources of waste generation?**
- **What are the expected amounts of waste generated?**
  - What are the expected amounts for the different kinds of waste?
- **How much waste is imported/exported?**
  - How much household / other waste are imported/exported?
  - How much hazardous waste are imported/exported?

### Management of waste

- **What have been the developments in the prevention of waste?**
- **How is the collection of waste developing?**
  - How much waste is collected per type of waste (household/municipal, hazardous/industrial)?
  - How much of the population has its waste collected?
  - How much waste are collected separately? Which types?
- **How is the treatment of waste developing?**
  - What is the trend per treatment type?
  - What is the trend in recovering energy from waste?
  - Is the capacity of the treatment plants enough to deal with expected amounts of waste?
- **What is the situation concerning the recycling/re-use of waste?**
  - What is the trend in recycling or re-use compared with the amount available for recycling or re-use?
  - Are targets reached for each type of waste?
  - Which materials and how much is saved through recycling?
- **What is the situation concerning incineration?**
  - How much is sent to incineration plants?
  - What is the incineration capacity? For how long will the capacity of incineration plants meet the disposal/treatment requirements?
  - What are the environmental impacts of incineration?
- **What is the situation concerning the disposal of waste in landfills?**
  - What is the trend in the amount of waste land-filled?
  - What is the landfill capacity? / For how long will the capacity of landfills meet the disposal requirements?
  - What share of the landfills meet the environmental standards?
  - How many illegal landfills are there? / What share of the landfills meet the environmental standards?
- **What is the situation concerning the transport of waste?**
  - What is the main type of waste transported?

- How is the waste transported?
- What are the prospects in view of bans, policies and changes in national treatment capacities?
- **What are the impacts of waste/waste management on the environment and on economical resources?**
  - What are the environmental impacts of landfills? Incinerators? Treatments of organic waste? Recycling plants? Transport with heavy lorries?

#### How effective are the responses?

- **What is the international response?**
  - Is the Basel convention implemented effectively in the country?
- **What is the European response?**
  - Are the European directives/regulations/strategies implemented effectively?
- **What is the national response?**
  - Has a waste management plan been developed? Which objectives and targets have been included?
  - What actions/measures have been planned to reach the objectives of the plan?
  - Have/will the objectives be(en) reached?
  - If not, what are/will be the reasons?
  - What kind of financial incentives and disincentives are used to influence individuals' actions with regard to waste?
  - What are the different taxes concerning waste? How much money is collected and for which purpose spent?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the options for additional measures?**
  - What are the legal, economic, technical options?
  - What are the costs-benefits of the various options?



### Generation of waste

- **Which types of waste are generated? How much?**
  - What is the trend in the generation of municipal waste?
    - *Distance to targets? Decoupling?*
  - What is the trend in the generation of industrial waste?
    - *How much waste do the different industrial sectors produce? Trend?*
  - What is the trend in the generation of hazardous waste?
    - *How much hazardous waste are produced by the different sources? Trend?*
  - What is the trend in the generation of waste generated by agriculture, mining and construction?
  - What is the trend in the generation of radioactive waste, sewage sludge, packaging waste, end-of-life vehicles/car wrecks? Other type of waste?
- **Which are the main sources of waste generation?**
- **What are the expected amounts of waste generated?**
  - What are the expected amounts for the different kinds of waste?
- **How much waste is imported/exported?**
  - How much household / other waste are imported/exported?
  - How much hazardous waste are imported/exported?

### Management of waste

- **What have been the developments in the prevention of waste?**
- **How is the collection of waste developing?**
  - How much waste is collected per type of waste (household/municipal, hazardous/industrial)?
  - How much of the population has its waste collected?
  - How much waste are collected separately? Which types?
    - *What is the composition of municipal waste?*
    - *Which fractions (and what quantity) are collected separately per selective collection type (door to door, waste collection centres)?*
- **How is the treatment of waste developing?**
  - What is the trend per treatment type?
    - *How much waste are treated per treatment type and per type of waste?*
  - What is the trend in recovering energy from waste?
  - Is the capacity of the treatment plants enough to deal with expected amounts of waste?
    - *What is the treatment capacity of incinerators, composting sites, physicochemical treatment sites, biogas producing sites?*
- **What is the situation concerning the recycling/re-use of waste?**
  - What is the trend in recycling or re-use compared with the amount available for recycling or re-use?
    - *How much glass, paper and cardboard, metal (steel, tin, etc.), plastic, packaging waste is recycled/ re-used? Trend? How much could be recycled (amount available)?*
    - *How much other waste are recycled/ re-used? Trend? (medical waste, fabrics, solvent, pallets, used tyres, scrapped cars, waste produced by computing, etc.) How much of other waste could be recycled / re-used (amount available)?*
  - Are targets reached for each type of waste?

- *If not, what are the reasons (technical, financial problems, etc.)?*
- Which materials and how much is saved through recycling?
- **What is the situation concerning incineration?**
  - How much is sent to incineration plants?
  - What is the incineration capacity? For how long will the capacity of incineration plants meet the disposal/treatment requirements?
  - What are the environmental impacts of incineration?
- **What is the situation concerning the disposal of waste in landfills?**
  - What is the trend in the amount of waste land-filled?
    - *What is the share of biodegradable waste?*
  - What is the landfill capacity? / For how long will the capacity of landfills meet the disposal requirements?
  - What share of the landfills meet the environmental standards?
  - How many illegal landfills are there? / What share of the landfills meet the environmental standards?
- **What is the situation concerning the transport of waste?**
  - What is the main type of waste transported?
  - How is the waste transported?
  - What are the prospects in view of bans, policies and changes in national treatment capacities?
- **What are the impacts of waste/waste management on the environment and on economical resources?**
  - What are the environmental impacts of landfills? Incinerators? Treatments of organic waste? Recycling plants? Transport with heavy lorries?
    - *What are the costs of waste management and how are they financed?*

#### How effective are the responses?

- **What is the international response?**
  - Is the Basel convention implemented effectively in the country?
- **What is the European response?**
  - Are the European directives/regulations/strategies implemented effectively?
    - *Have priority waste streams action plans been developed?*
    - *What actions have been planned/implemented to meet the objectives of the directives/regulations, etc concerning the treatment/elimination of waste be reached?*
    - *What actions have been planned/implemented to meet the objectives of the directive on packaging waste be reached?*
    - *What actions have been planned/implemented to meet the objectives of the other kind of directives/regulations, etc be reached?*
    - *If the objectives are not met, what are/will be the reasons?*
- **What is the national response?**
  - Has a waste management plan been developed? Which objectives and targets have been included?
  - What actions/measures have been planned to reach the objectives of the plan?
  - Have/will the objectives be(en) reached?
  - If not, what are/will be the reasons?
  - What kind of financial incentives and disincentives are used to influence individuals' actions with regard to waste?

- What are the different taxes concerning waste? How much money is collected and for which purpose spent?
  - *Are there landfill taxes, waste disposal charges? How much is collected? How is the budget gathered used?*
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the options for additional measures?**
  - What are the legal, economic, technical options?
  - What are the costs-benefits of the various options?

# 11. Chemicals

## Place of the issue in the policy cycle

The chemical industry in Western Europe has continued to grow, with production since 1993 growing faster than GDP. The net result is that the flows of chemicals through the economy throughout Europe have increased. Over the last years, there have been some new national and international initiatives for reducing the possible impacts of chemicals on the environment, including voluntary programmes, taxation of particular chemicals and providing public access to data, as for example under the Integrated Pollution Prevention and Control Directive (IPPC). There is scope for a wider application of such instruments in all parts of Europe (EEA 1998, p. 109).

## What is happening?

Europe is one of the largest chemical-producing regions in the world, supplying 38 % of global turnover (EEA 1999, p. 111). Data on emissions is scarce, but chemicals are widespread in all environmental media, including animal and human tissues (EEA 1998, p.109). The European Inventory of Existing Chemical Substances lists over 100,000 chemical compounds. The threat posed by many of these chemicals remains uncertain because of the lack of knowledge about their concentrations and the ways in which they move through and accumulate in the environment and then impact on humans and other life forms. Some information, however, is available for example on heavy metals and persistent organic pollutants (POPs) (EEA 1998, p.109).

## Why is it happening?

The most important industrial uses of chemicals are in the processing of paper products, primary metals and food products, petroleum refining and the manufacture of textiles, transport machinery, electrical machinery and equipment, rubber and plastics (5EAP, p. 60).

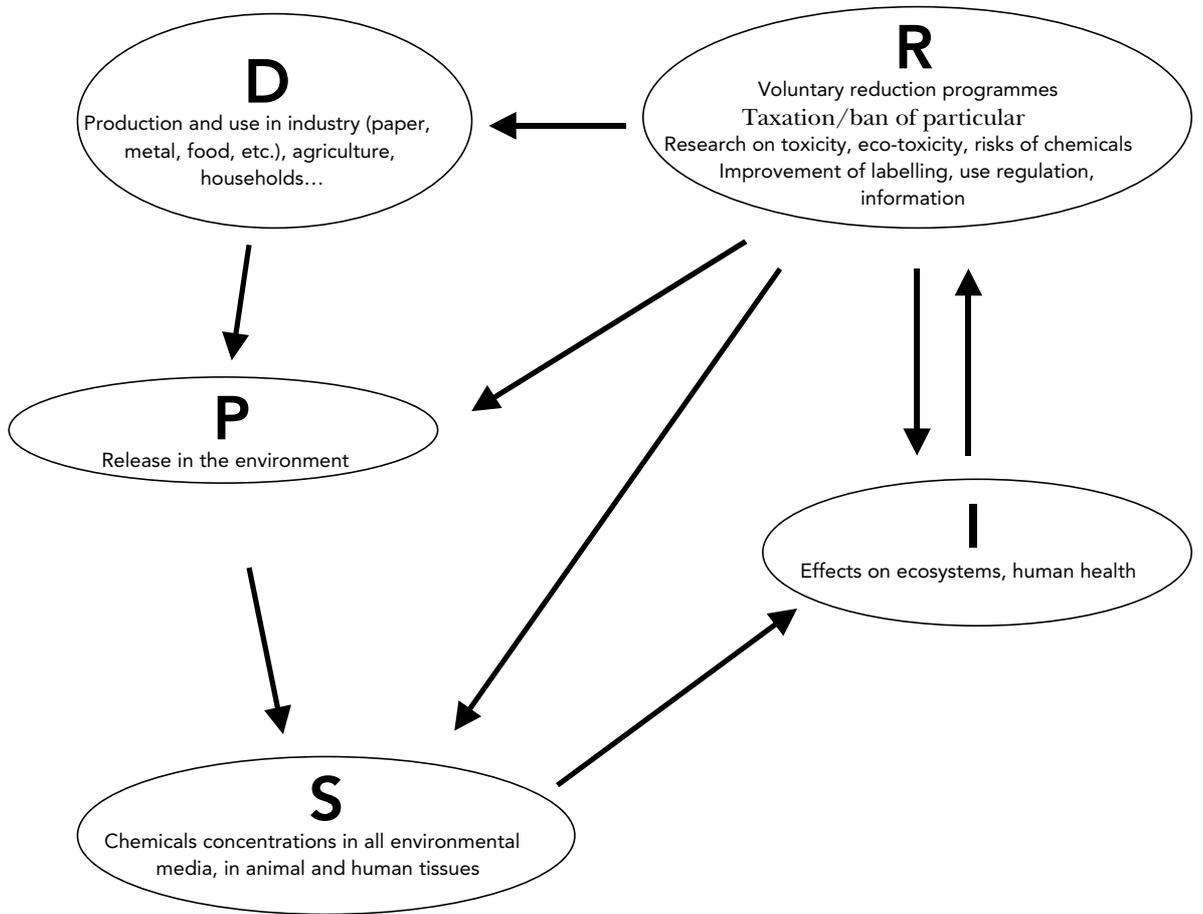
## Are we seeing changes?

Various control measures have reduced chemical risk and some emissions, and environmental concentrations of POPs and heavy metals are declining. However, for 75 % of the large volume chemicals on the market, there is insufficient analysis of toxicity and eco-toxicity available to support minimal risk assessment (EEA 1999, p. 24). Concentrations in the environment remain of concern, particularly in some highly contaminated areas and sinks like the Arctic and Baltic Sea. Concerns have recently been raised about so-called 'endocrine disrupting substances', as a possible cause of reproductive disturbances in wildlife and humans (EEA 1998, p. 109). If current trends and policies continue, there could be a growth of 30 % to 50 % in chemicals output for most of the EU countries by 2010 as a result of increasing economic activity, including road transport and agricultural production. However, the impact of some emerging trends in the management of chemicals such as: eco-efficiency improvements, the internalisation of external environmental costs, via taxes etc., increased information to the public, increased evidence on low-dose effects, greater use of the precautionary principle, and implementation of the OSPAR/Sintra agreement, IPPC directive and other international policies, etc.) could lead to marked reductions in the chemical intensity of European GDP (EEA 1999, p. 111-112).

## How effective are the responses?

Because of the difficulty and cost of assessing the toxicity of the large numbers of potentially hazardous chemicals in use, some current control strategies (e.g. OSPAR) are now aimed at reducing the 'load' of chemicals in the environment through the elimination or reduction of their use and emissions. The UNECE is expected to finalise two new protocols on emissions to air of three heavy metals and sixteen POPs under the CLRTAP Convention (EEA 1998, p. 109). There are over a dozen key EU directives on chemicals control (i.e. Marketing and Use Regulation, EINECS, Pesticides, etc.), but compliance with, and enforcement of many of these regulations is uneven. In addition, the IPPC Directive encourages the focus on 'upstream' prevention (EEA 1998, p. 124). The Commission intends to present a strategy to speed up the system for reviewing the ever-growing quantities of chemicals, and to look at whether and how there could be control over the volumes and toxicity of chemicals, particularly where there are recognised harmful effects (EC Global Assessment of the 5 EAP 1999). There is an urgent need to fill the gaps information about chemicals dispersion, fate, concentration and associated exposure to wildlife, ecosystems and humans (EEA 1999, p.112).

## Chemicals – DPSIR framework



## Chemicals



Level 1

### What is happening?

- What are the impacts of the use of chemicals?
- What is the trend in the concentrations of chemicals in the country?

### Why is it happening?

- How much chemical substances were reported to be on the market in the country? Trend?
- What has been progress in risk assessment of these substances?
- Which sectors/activities use chemicals and for what purposes?
- Which sectors/activities produce and emit chemicals? Trend?

### Are we seeing changes?

- What is the trend in human exposure to chemicals? Of ecosystems?

### How effective are the responses?

- What are the responses on the chemicals-in-the-environment problem?
- Are the responses meaningful?
- Which responses have been the most successful to address problems concerning chemicals?
- What are the responses in prospect at international, European and national levels?
- What are the different options at international, European and national levels for diminishing the release of chemicals into the environment?



### What is happening?

- **What are the impacts of the use of chemicals?**
  - What are the impacts of chemicals of concern (chemicals of concern can be: POPs, heavy metals, organo metal compounds, chlorine, asbestos)
- **What is the trend in the concentrations of chemicals in the country?**
  - What is the trend in the concentrations found in the different media?
  - What is the trend in the concentrations found in the different organisms?

### Why is it happening?

- **How much chemical substances were reported to be on the market in the country? Trend?**
- **What has been progress in risk assessment of these substances?**
- **Which sectors/activities use chemicals and for what purposes?**
  - Which sectors use chemicals of concern in what quantity and for what purpose? Trend?
- **Which sectors/activities produce and emit chemicals? Trend?**
  - What are the sources of dioxins? Trend?
  - What are the sources of heavy metals? And what are the pathways into the environment?
  - What are the sources of other chemicals of concern? And what are the pathways into the environment? Trend?
  - How are chemicals transported?

### Are we seeing changes?

- **What is the trend in human exposure to chemicals? Of ecosystems?**
  - What is the trend in the uses/emissions of chemicals?
  - Have the various targets (CLRTAP and marine conventions, in particular and national programmes) been reached?
  - If not, what are the reasons?
  - What are the expected trends?
  - Will the targets of the various responses be reached in the future?
  - If not, what will be the reasons?

### How effective are the responses?

- **What are the responses on the chemicals-in-the-environment problem?**
  - Have lists of 'chemicals of concern' been made in the country?
  - Has a related chemicals policy been developed?
  - What concrete measures have been taken?
- **Are the responses meaningful?**
  - Do the responses have the desired impact?
- **Which responses have been the most successful to address problems concerning chemicals?**
  - Which kind of responses have been successful? (responses targeting labelling, specific pollutants, media, etc?)
  - In each category, which ones were the most successful?

- Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
  - Which products are planned to be banned or restricted at national, European or international levels?
- **What are the different options at international, European and national levels for diminishing the release of chemicals into the environment?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?



### What is happening?

- **What are the impacts of the use of chemicals?**
  - What are the impacts of chemicals of concern (chemicals of concern can be: POPs, heavy metals, organo metal compounds, chlorine, asbestos)
    - *What have been the impacts on the environment of chemicals of concern ?*
    - *What have been the impacts on human health?*
- **What is the trend in the concentrations of chemicals in the country?**
  - What is the trend in the concentrations found in the different media?
    - *What is the trend in dioxin concentrations found in various sites?*
    - *What is the trend in heavy metals concentrations found in lake sediments, soils, etc.?*
    - *What is the trend in concentrations of other chemicals found in various media?*
  - What is the trend in the concentrations found in the different organisms?
    - *What is the trend in the dioxin and PCB concentrations found in cow milk, human milk?*
    - *What is the trend in heavy metals concentrations found in mosses, sea, animals, humans, food products?*
    - *What is the trend in the concentrations of other chemicals found in various organisms?*

### Why is it happening?

- **How much chemical substances were reported to be on the market in the country? Trend?**
- **What has been progress in risk assessment of these substances?**
- **Which sectors/activities use chemicals and for what purposes?**
  - Which sectors use chemicals of concern in what quantity and for what purpose? Trend?
- **Which sectors/activities produce and emit chemicals? Trend?**
  - What are the sources of dioxins? Trend?
    - *How much is emitted by incinerators and by other sources?*
  - What are the sources of heavy metals? And what are the pathways into the environment?
    - *What are the sources of lead, cadmium, nickel, mercury, etc. and how much do they each emit?*
    - *How many batteries are sold each year?*
  - What are the sources of other chemicals of concern? And what are the pathways into the environment? Trend?
  - How are chemicals transported?
    - *How much chemicals are transported? Trend?*
    - *How are they transported? (train, boat, road)? Trend?*
    - *How many accidents occurred? Trend?*
    - *What were their impacts? Trend?*

### Are we seeing changes?

- **What is the trend in human exposure to chemicals? Of ecosystems?**
  - What is the trend in the uses/emissions of chemicals?

- *Heavy metals?*
- *POPs?*
- *Other chemicals of concern?*
- Have the various targets (CLRTAP and marine conventions, in particular and national programmes) been reached?
- If not, what are the reasons?
- What are the expected trends?
- Will the targets of the various responses be reached in the future?
- If not, what will be the reasons?

### How effective are the responses?

- **What are the responses on the chemicals-in-the-environment problem?**
  - Have lists of 'chemicals of concern' been made in the country?
  - Has a related chemicals policy been developed?
    - *Does it address all chemicals or only part?*
    - *Does it address the full production chain or only releases in the environment?*
  - What concrete measures have been taken?
    - *Bans on chemicals? Are products which are banned on the international level still being used or produced in the country?*
    - *Risk assessments?*
    - *Phase-out programmes and measures?*
    - *Consumer information, labelling?*
- **Are the responses meaningful?**
  - Do the responses have the desired impact?
- **Which responses have been the most successful to address problems concerning chemicals?**
  - Which kind of responses have been successful? (responses targeting labelling, specific pollutants, media, etc?)
  - In each category, which ones were the most successful?
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
  - Which products are planned to be banned or restricted at national, European or international levels?
- **What are the different options at international, European and national levels for diminishing the release of chemicals into the environment?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

# 12. Noise

## Place of the issue in the policy cycle

Noise remains a serious environmental problem. A collective effort and a comprehensive approach at EU level to take action on noise abatement is required. It would need to address the introduction of general noise quality standards, and information to the public. Land-use planning is also important in this respect (Towards sustainability 1997, p.81).

## What is happening?

In large cities, the proportion of the population exposed to unacceptable levels of noise is two to three times higher than the national average (OECD/EECT, 1993). It is estimated that about 32 % of the EU population (about 120 million people) is exposed to road noise levels over 55 Ldn dB(A) on house facades; this is despite reductions in vehicle noise limits by 85 % for cars and 90 % for lorries since 1970. Estimates of noise related costs range from 0.2 % to 2.0 % of GDP. It is estimated that approximately 3 million people in Europe are exposed to aircraft noise over Ldn 55 Ldn dB(A) (EEA 1999, p.328).

## Why is it happening?

The major sources of noise are road, air and train traffic, industry and recreational activities (EEA 1995, p.362). The cost of mitigating existing noise problems can be very high, although it should not be underestimated the noise reduction potential through traffic management, traffic calming, parking policies and other low-cost measures that can shift mobility from private car to walking, biking and public transport (EEA 1999, p.328).

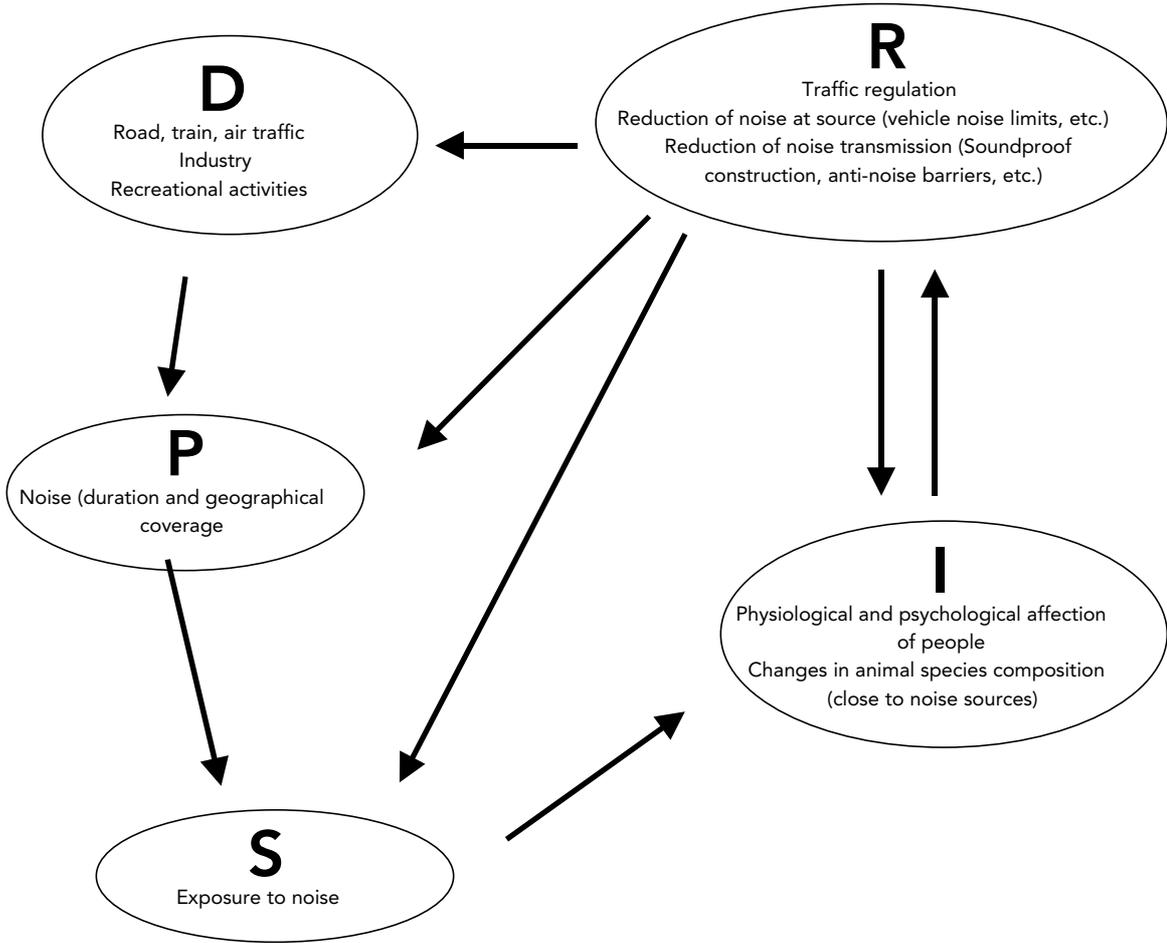
## Are we seeing changes?

Little progress has been made so far to improve the state of the urban acoustical environment. A contemporary trend in urban planning is to direct through traffic to ring roads and away from already congested urban areas (EEA 1999, p.328). Noise exposure is forecast to worsen in certain situations, e.g. along ring roads and motorways, at regional airports, because of the growth in transportation, especially freight and air traffic (EEA 1999, p. 26). Aircraft noise exposure at major European airports is unlikely to increase up to 2010 mainly due to phasing out of noisier aircraft, scheduled fleet renewal and noise optimisation of flight procedures and air strip geometry (EEA 1999, p.328).

## How effective are the responses?

A number of amendments to the various pieces of EU legislation governing sound levels from vehicles and machinery have either come into force, been adopted by the Council or proposed by the Commissions. These cover motor vehicles, two and three wheelers, aircraft and construction machinery (Towards sustainability 1997, p. 79). The Green Paper on Noise [COM(96)540] outlines a possible step-by-step approach to the development of a new framework for Community noise policy. However, it recognises that the actual effect of tightening of EU-type testing limits on noise emission by motor vehicles were negligible. Anti-noise measures are hampered by a lack of harmonisation at European level: indices, methodologies and limit values (EEA 1999, p.328-329). Incentives are needed to motivate manufacturers to develop vehicles and aircraft with even lower noise emissions, and -importantly- for local administrations to promote anti-noise resurfacing of roads (EEA 1999, p.328).

Noise – DPSIR framework



## Noise



### What is happening?

- What is the situation concerning noise disturbance?
- What is expected to happen concerning noise?

### Why is it happening?

- Which human activities are responsible of noise disturbance?

### Are we seeing changes?

- What is the trend concerning noise disturbance?

### How effective are the responses?

- What have been the responses to air traffic noise?
- What have been the responses to road traffic noise?
- What have been the responses to other types of noise?
- What are the responses in prospect at international, European and national levels for each category of noise?
- What are the different options at international, European and national levels for each category of noise?



### What is happening?

- **What is the situation concerning noise disturbance?**
  - How many households are exposed to high levels of noise?
  - What is the trend/situation concerning complaints about noise?
  - What are the effects on health?
  - How much does noise cost the economy?
- **What is expected to happen concerning noise?**
  - What is expected to happen concerning road traffic, rail traffic, air traffic noises? Other noises?

### Why is it happening?

- **Which human activities are responsible of noise disturbance?**
  - What is the responsibility of each human activity?

### Are we seeing changes?

- **What is the trend concerning noise disturbance?**
  - What is the trend in the number of households exposed to high levels of noise?
  - What is the trend concerning complaints about noise?
  - What is the trend in the effects on health?
  - What is the trend in the economical costs of noise?

### How effective are the responses?

- **What have been the responses to air traffic noise?**
  - What have been the responses concerning the traffic?
  - What have been the responses concerning the neighbouring habitations?
  - Which responses have been successful? Not successful?
- **What have been the responses to road traffic noise?**
  - What have been the responses concerning the traffic?
  - What have been the responses concerning roads?
  - What have been the responses concerning the neighbouring habitations?
  - Which responses have been successful? Not successful?
- **What have been the responses to other types of noise?**
- **What are the responses in prospect at international, European and national levels for each category of noise?**
- **What are the different options at international, European and national levels for each category of noise?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

## What is happening?

- **What is the situation concerning noise disturbance?**
  - How many households are exposed to high levels of noise?
    - *What is the situation concerning road traffic, air traffic and train traffic noises? Trend?*
    - *What is the situation concerning industrial and service activities noises, neighbourhood noises? Trend?*
  - What is the trend/situation concerning complaints about noise?
    - *For the population, what rank has noise disturbance as an environmental problem?*
    - *What share of the population would spend more money to avoid noise pollution?*
  - What are the effects on health?
    - *What is the trend in the number of persons developing hearing impairment?*
  - How much does noise cost the economy?
    - *How much does hearing impairment and other health effects due to noise cost? Cost of specific constructions? Cost of the reduction of activities to lower noise? Etc.*
- **What is expected to happen concerning noise?**
  - What is expected to happen concerning road traffic, rail traffic, air traffic noises? Other noises?

## Why is it happening?

- **Which human activities are responsible of noise disturbance?**
  - What is the responsibility of each human activity?

## Are we seeing changes?

- **What is the trend concerning noise disturbance?**
  - What is the trend in the number of households exposed to high levels of noise?
    - *What is the trend concerning road traffic, air traffic and train traffic noises?*
    - *What is the trend concerning industrial and service activities noises, neighbourhood noises?*
  - What is the trend concerning complaints about noise?
  - What is the trend in the effects on health?
    - *What is the trend in the number of persons developing hearing impairment?*
  - What is the trend in the economical costs of noise?

## How effective are the responses?

- **What have been the responses to air traffic noise?**
  - What have been the responses concerning the traffic?
    - *Have overall targets been set?*
    - *Which restrictions have been taken concerning night takeoffs and landings?*
    - *What are the new requirements for airplanes? New landing permissions?*
  - What have been the responses concerning the neighbouring habitations?
    - *Which adjustments have been made in living quarters?*
    - *How are people are compensated? How much has it cost?*

- Which responses have been successful? Not successful?
- **What have been the responses to road traffic noise?**
  - What have been the responses concerning the traffic?
    - *Have overall targets been set?*
    - *What is the evolution of noise standards for vehicles?*
    - *What measures have been taken concerning noise zoning, speed limit?*
  - What have been the responses concerning roads?
    - *What length of roads have been built with low noise road surface? Have been recovered with low noise road surface after construction? What length of roads have antinoise barriers?*
  - What have been the responses concerning the neighbouring habitations?
    - *How many homes/households benefit of soundproof buildings? Other measures?*
    - *How are people compensated? How much has it cost?*
  - Which responses have been successful? Not successful?
- **What have been the responses to other types of noise?**
- **What are the responses in prospect at international, European and national levels for each category of noise?**
- **What are the different options at international, European and national levels for each category of noise?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

# 13. Technological and natural hazards

## Place of the issue in the policy cycle

Our society and the environment as a whole are sensitive to the threat of accidents and, in the longer term, an integrated approach to assuring protection of persons, environment and property, including cultural heritage, would be desirable (EC Global Assessment of the 5 EAP 1999).

## What is happening?

Technological and natural hazards are of particular concern because of the potential scale of their effects, their unpredictability and the uncertainties over their consequences (EEA 1998, p. 268). Accidents, whether natural or technological, can lead to environmental damages and death or injury of people. The different types of such events: 1) Accidents at industrial installations, 2) Inland transport accidents, 3) Marine transport and offshore installation accidents, 4) Accidents at nuclear installations and during transport of radioactive material, 5) Natural hazards.

## Why is it happening?

There is a continuing increase in the intensity of many activities that can give rise to major accidents and a growing vulnerability of some of the activities and infrastructures to natural hazardous events (EEA 1998, p. 268). Human activity, such as unsuitable land use that causes flooding and landslides, is both increasing risk and making people more vulnerable to natural disasters (EC Global Assessment of the 5 EAP 1999).

Most incidents that have occurred at nuclear power plants in Western Europe have resulted from human errors during operations (Environment in the EU 1995, p.94).

Recent detailed analyses of major (industrial) accidents indicate that component failure and operator error were the two most common immediate causes of major accidents, but the dominant underlying causes identified (for 67 % of the accidents) were due to poor safety and environmental management resulting in a lack of control (EEA 1999, p.229).

## Are we seeing changes?

Since the late 1980s, natural hazards have had a bigger impact on the environment. Between 1990 and 1996, economic losses due to floods and landslides were four times those in the whole of the preceding decade (EEA 1999, p. 227).

In the EU, the number of major industrial accidents reported each year has been roughly constant since 1984 (EEA 1998, p. 268). Over 300 accidents have been reported since 1984 in EU. There is indication that many of the often seemingly trivial 'lessons learned' from accidents have not yet been sufficiently evaluated and/or implemented in industry's practices and standards. On the other hand, the risk of major accidents per unit of activity seems to show a slight downward trend (EEA 1999, p. 227). There has been a significant worldwide reduction of large oil spills, but the few very large spills that did occur were responsible for a high percentage of the oil spilt (EEA 1998, p. 268).

There have been no major nuclear accidents in the recent past years. Most of the reported events are 'anomalies', with a few 'incidents' (EEA 1998, p. 268). Lack of sufficiently detailed, comparable information on the risks posed by certain types of nuclear facilities, means that the overall risk to the European environment from accidental releases of radionuclides, even if small, cannot be quantified (EEA 1999, p. 227).

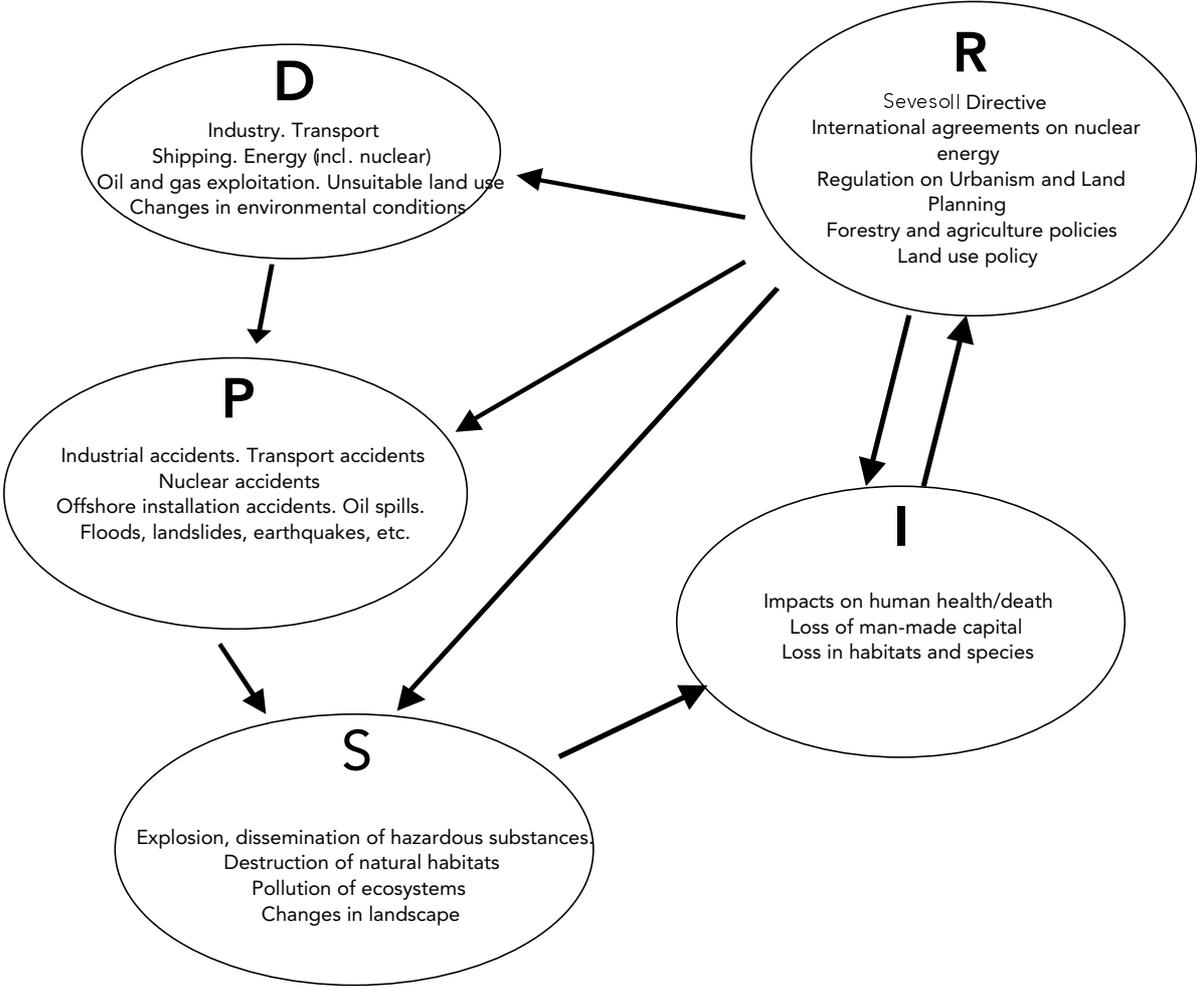
## How effective are the responses?

The most significant EU Directive to help protect people and environment from major accident hazards is the Seveso II Directive. With its wide coverage and comprehensive nature and its focus on accident prevention, it provides much of the framework necessary for better risk management. This now needs to be implemented by industries and regulatory and planning authorities (EEA 1999, p. 228 and EEA 1998, p. 268).

There is no unifying legislation for radiation accidents, but due to the work of ICPR, UNSCEAR and others, there is a widely accepted philosophy of radiation protection and unifying recommendations by international scientific organisations, which find their way in national legislation (EEA 1999, p. 228).

As yet, there is no targeted policy to reduce natural hazards. The Community's role in preparing for natural disasters is largely subsidiary to that of the Member States. However, the Community supports the co-operation between national bodies on civil protection and marine pollution (EEA 1999, p. 24 and EC Global Assessment of the 5 EAP 1999).

Technological and natural hazard - DPSIR framework



## Technological and natural hazards



### What is happening?

#### Natural hazards

- What is the exposure of the country to natural disasters?
- How much is the cost of natural disasters?

#### Technological hazards

- What is the exposure of the country to technological risks like?

### Why is it happening?

#### Natural hazards

- What are the causes of natural disasters?

#### Technological hazards

- What are the causes of technological hazards?

### Are we seeing changes?

#### Natural hazards

- What is the trend in the occurrence of natural disaster?
- What is the trend in the cost of natural disasters?

#### Technological hazards

- What is the trend in the occurrence of technological accidents?

### How effective are the responses?

#### Natural hazards

- What are the responses to natural disasters?
- Which responses have been the most successful?
- What are the responses in prospect at international, European and national levels?
- What would be the options for limiting damages in case of future events?

#### Technological hazards

- What are the responses to technological risks?
- For each type of technological risk, which responses have been the most successful?
- What are the responses in prospect at international, European and national levels for each category of technological risk?
- What are the different options to reduce the risks in each category?

## Technological and natural hazards



### What is happening?

#### Natural hazards

- **What is the exposure of the country to natural disasters?**
  - What is the situation regarding floods?
  - What is the situation regarding storms and hurricanes?
  - What is the situation regarding seisms?
  - What is the situation regarding undulations?
  - What is the situation regarding avalanches?
  - What is the situation regarding forest fires?
- **How much is the cost of natural disasters?**

#### Technological hazards

- **What is the exposure of the country to technological risks like?**
  - What is the situation regarding industrial accidents?
  - What is the situation regarding nuclear accidents/incidents?
  - What is the situation regarding oil spills?
    - *How many oil spills has there been and how much did they spilt?*
  - What is the situation regarding accidents in transport?

### Why is it happening?

#### Natural hazards

- **What are the causes of natural disasters?**
  - What are the impacts of human activities on the occurrence of natural disasters?
  - What are the supposed impact of climate change?
  - What are the impacts of changes in the water cycle?

#### Technological hazards

- **What are the causes of technological hazards?**
  - What have been the causes of industrial accidents?
  - What have been the causes of nuclear accidents/incidents?
  - What have been the causes of oil spills?
  - What have been the causes of accidents in transport?

### Are we seeing changes?

#### Natural hazards

- **What is the trend in the occurrence of natural disaster?**
  - What is the trend in floods, storms and hurricanes, seisms, undulations, avalanches, forest fires?
- **What is the trend in the cost of natural disasters?**

#### Technological hazards

- **What is the trend in the occurrence of technological accidents?**
  - What is the trend regarding industrial accidents, nuclear accidents/incidents, oil spills, accidents in transport?

## How effective are the responses?

### Natural hazards

- **What are the responses to natural disasters?**
  - What is the prevention policy? information policy? compensation policy?
  - How much is spent? Trend?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
- **What would be the options for limiting damages in case of future events?**
  - What would that mean economically?

### Technological hazards

- **What are the responses to technological risks?**
  - What are the responses to industrial accidents?
  - What are the responses to nuclear incidents?
  - What are the responses to oil spills?
  - What are the responses to transport accidents?
  - What is the information policy concerning the different types of technological hazards?
  - Are emergency plans in operation?
- **For each type of technological risk, which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels for each category of technological risk?**
- **What are the different options to reduce the risks in each category?**
  - What are the economic options, technical options?

## Technological and natural hazards



### What is happening?

#### Natural hazards

- **What is the exposure of the country to natural disasters?**
  - What is the situation regarding floods?
  - What is the situation regarding storms and hurricanes?
  - What is the situation regarding seisms?
  - What is the situation regarding undulations?
  - What is the situation regarding avalanches?
  - What is the situation regarding forest fires?
    - *How much surface of forest has been burnt by how many fires?*
- **How much is the cost of natural disasters?**

#### Technological hazards

- **What is the exposure of the country to technological risks like?**
  - What is the situation regarding industrial accidents?
    - *How many industrial accidents have there been?*
    - *How many accidents per activity?*
    - *How many accidents per seriousness?*
    - *What have been the impacts on the environment?*
    - *What have been the impacts on human lives?*
  - What is the situation regarding nuclear accidents/incidents?
    - *How many incidents have there been and how were they classified (INES)?*
    - *How much material is transported, per type of material and type of transportation?*
    - *How many transport incidents have there been, of what type?*
  - What is the situation regarding oil spills?
    - *How many oil spills have there been and how much did they spill?*
  - What is the situation regarding accidents in transport?
    - *How much chemicals and oil are transported by road, train, boat (inland waters/marine waters)?*
    - *How many accidents have there been by road? Train? Boat (marine/inland water)?*
    - *How many injuries/deaths of people have there been?*
    - *What have been the environmental consequences?*

### Why is it happening?

#### Natural hazards

- **What are the causes of natural disasters?**
  - What are the impacts of human activities on the occurrence of natural disasters?
    - *What are the impacts of the growth of urban areas?*
  - What are the supposed impact of climate change?
  - What are the impacts of changes in the water cycle?

#### Technological hazards

- **What are the causes of technological hazards?**
  - What have been the causes of industrial accidents?

- What have been the causes of nuclear accidents/incidents?
- What have been the causes of oil spills?
- What have been the causes of accidents in transport?

### Are we seeing changes?

#### Natural hazards

- **What is the trend in the occurrence of natural disaster?**
  - What is the trend in floods, storms and hurricanes, seisms, undulations, avalanches, forest fires?
- **What is the trend in the cost of natural disasters?**

#### Technological hazards

- **What is the trend in the occurrence of technological accidents?**
  - What is the trend regarding industrial accidents, nuclear accidents/incidents, oil spills, accidents in transport?

### How effective are the responses?

#### Natural hazards

- **What are the responses to natural disasters?**
  - What is the prevention policy? information policy? compensation policy?
  - How much is spent? Trend?
- **Which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels?**
- **What would be the options for limiting damages in case of future events?**
  - What would that mean economically?

#### Technological hazards

- **What are the responses to technological risks?**
  - What are the responses to industrial accidents?
    - *How is the directive Seveso II implemented in the country?*
    - *Are the objectives met? If not, what are the reasons?*
    - *How have safety standards be enforced?*
  - What are the responses to nuclear incidents?
    - *What is the evolution of international/European co-operation?*
  - What are the responses to oil spills?
    - *How are they surveyed? Enforcement of the surveillance?*
  - What are the responses to transport accidents?
    - *How have safety regulations be enforced?*
  - What is the information policy concerning the different types of technological hazards?
  - Are emergency plans in operation?
- **For each type of technological risk, which responses have been the most successful?**
  - Which responses have not been successful?
- **What are the responses in prospect at international, European and national levels for each category of technological risk?**
- **What are the different options to reduce the risks in each category?**
  - What are the economic options, technical options?

# 14. Nature and biodiversity

## Place of the issue in the policy cycle?

A wide range of initiatives and legal instruments for the protection of species and habitats has been introduced internationally and nationally since the global Convention on Biological Diversity was signed in 1992. All these have succeeded in protecting considerable land and sea areas and saving a number of species and habitats, but implementation is often difficult and slow and has not been able to counteract the general decline. Overall, the conservation of biodiversity (species, habitats and gene pools) is often regarded as less important than the shorter-term economic or social interests of the sectors influencing it most heavily. A major obstacle to securing conservation goals remains the need to incorporate biodiversity concerns into other policy areas (EEA 1998, p. 144-145).

## What is happening?

Up until the last century, biological diversity in terms of habitat types as well as number of species has in general been on the increase in Europe. Now the trend is reversed: natural habitats are becoming smaller, more fragmented and less able to support wildlife. Hence, the number of endangered species of fauna and flora has increased in many European regions' (EEA 1995, p. 190).

The population of a number of animal species associated with human activities are increasing and some plant species tolerant to high nutrient levels or acidity are spreading. The introduction of alien species is causing problems in marine, inland water and terrestrial habitats (EEA 1998, p. 144).

## Why is it happening?

Human intervention has resulted in a profound modification of the original landscape, through deforestation, agriculture, drainage of wetlands, coastline and river course modifications, mining, road constructions, urbanisation and so on (EEA 1995, p. 190).

Biodiversity is mostly affected not only by one single pressure, but by a combination of pressures derived from all main societal sectors: agriculture, forestry, fisheries, as well as from urbanisation, industry, transport, tourism and recreation, energy use, chemicals and minerals (EEA 1999, p. 285).

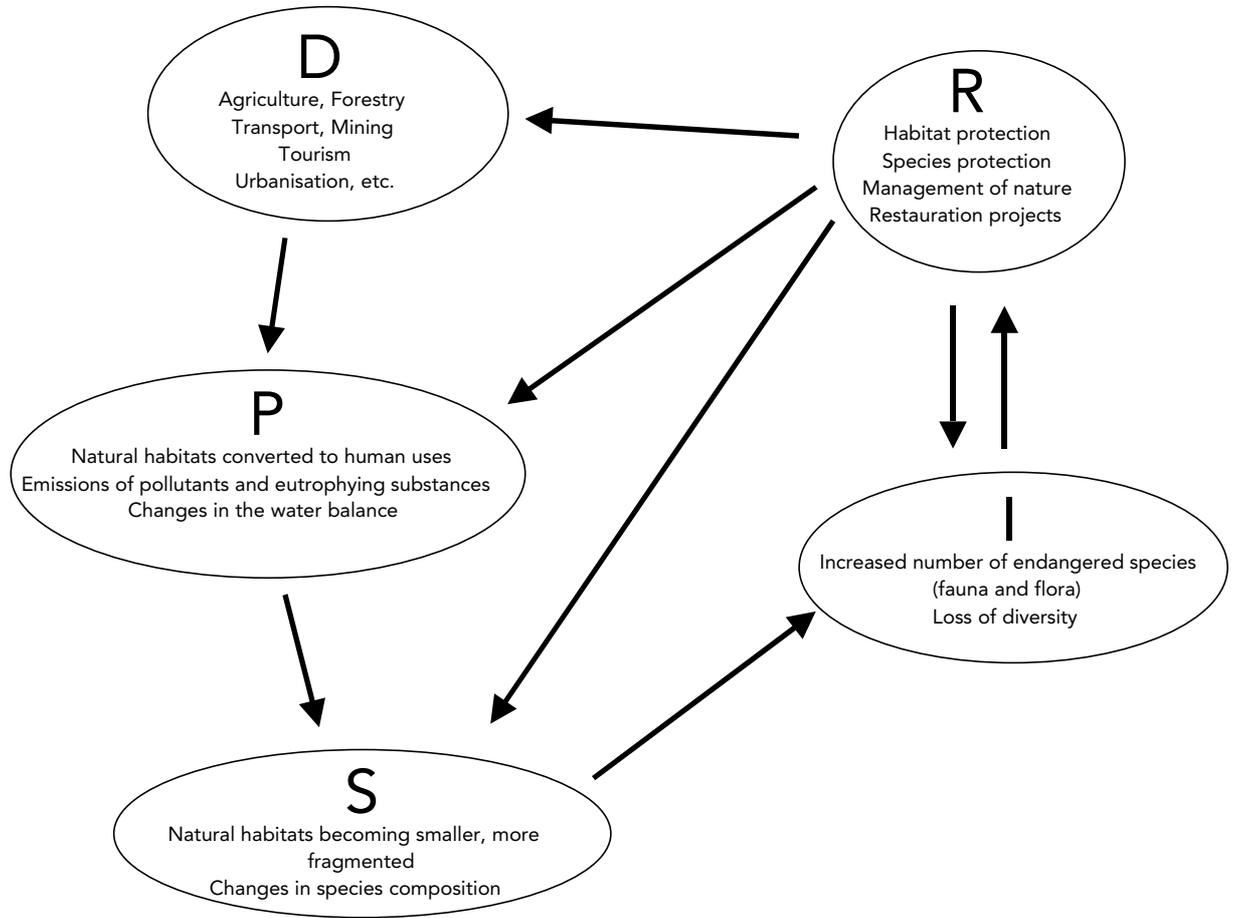
## Are we seeing changes?

Biodiversity of genes, species, ecosystems and habitats will remain under threat in the EU. Habitats will be decreased and fragmented, endangering many indigenous, rare, endemic and specialist species populations and ecosystem functions, although generalist and invasive species will continue to spread. A continuation in the recovery of a small number of endangered species and habitats can be foreseen. Negative impacts on biodiversity are expected to continue from agricultural intensification, land abandonment, monospecific forestry, urban and transport infrastructure development, climate change and the introduction of alien species. Reductions are foreseen in acidification and eutrophication, enabling species and habitats to show some recovery (EEA 1999, p. 285).

## How effective are the responses?

The Biodiversity Convention provides a general global framework for conserving biodiversity, mainly by setting out policy goals that parties should follow. In Europe, national strategies have been prepared by several countries and are under preparation in nearly all others, but the process has been slow. A European Community Biodiversity Strategy was adopted early in 1998. The results of the implementation of the plans remain to be seen (EEA 1998, p. 169-170). At European level, the implementation of the NATURA 2000 network of designated sites in the EU, and the upcoming EMERALD network under the Bern Convention in the rest of Europe are currently the most important international initiatives (EEA 1998, p. 144). Over the next decade upwards of 10 % of EU territory is expected to be designated for nature protection as part of the NATURA 2000 Network and provisions taken for protection of the most threatened species in the EU (EEA 1999, p. 285).

## Nature and biodiversity – DPSIR framework



## Nature and biodiversity



### What is happening?

- What is the ‘natural capital’ of the country? How diversified and numerous are species and habitats in the country?
- What are the trends in nature and biodiversity?
- What is expected to happen?

### Why is it happening?

- What are the most important anthropogenic pressures affecting nature and biodiversity?
- Which sectors/activities affect nature?
- What are the impacts of pollution generated by economic activities (eutrophication, acidification, pesticides loads, etc.)?
- How has land use developed?

### Are we seeing changes?

- What is the trend in the emission of pollutants generating an effect on ecosystems?
- What is the trend in factors steering land use?
- What is the trend in factors influencing the water cycle?

### How effective are the responses?

- How many areas have been brought under some kind of protection? How much surface?
- In how many areas/on which surface area has a restoration activity taken place?
- How are species protected?
- Which other biodiversity conservation measures have been applied?
- Which other measures indirectly influence nature and biodiversity?
- Which of these responses have been successful?
- What are the factors limiting the effectiveness of measures/instruments mentioned above?
- What future legal, institutional or managerial measures would be possible and feasible for nature and biodiversity conservation?



### What is happening?

- **What is the ‘natural capital’ of the country? How diversified and numerous are species and habitats in the country?**
- **What are the trends in nature and biodiversity?**
  - What is the trend concerning fauna?
  - What is the trend concerning flora?
  - What is the trend concerning the different habitats?
  - How is the balance between cultivated and natural gene pools changing?
  - What is the trend regarding other aspects of biodiversity?
- **What is expected to happen?**
  - Which functions of nature and biodiversity are or will be at stake?
  - Will the ‘natural capital’ pattern of the country change?
  - What will be the impact of global warming on biodiversity in the country?

### Why is it happening?

- **What are the most important anthropogenic pressures affecting nature and biodiversity?**
- **Which sectors/activities affect nature?**
  - What are the impacts of agriculture, forestry, aquaculture, tourism and recreation, urbanisation, industry, transport, other sectors?
- **What are the impacts of pollution generated by economic activities (eutrophication, acidification, pesticides loads, etc.)?**
- **How has land use developed?**
  - What is the development of built up land and infrastructures?

### Are we seeing changes?

- **What is the trend in the emission of pollutants generating an effect on ecosystems?**
  - What is the trend in nutrient emissions? (see INLAND WATERS)
  - What is the trend in the emission of acidifying substances? (see ACIDIFICATION)
  - What is the trend in emission of some chemicals of concern (e.g. pesticides, PCBs, heavy metals, etc.)? (see CHEMICALS)
- **What is the trend in factors steering land use?**
  - What is the trend in investment for infrastructure?
  - What is the trend in the division urban/rural population?
  - What is the trend in outdoor tourism?
  - What is the trend in the amount and management of agriculture and forest land?
- **What is the trend in factors influencing the water cycle?**
  - What is the trend in water abstraction (total and for irrigation)? (see INLAND WATERS)
  - What is the trend in development of wetlands and peat areas?

### **How effective are the responses?**

- **How many areas have been brought under some kind of protection? How much surface?**
  - How many areas (and how much surface) are protected following international conventions?
  - How many areas (and how much surface) are protected following European directives (Wild birds, Natural habitats)?
  - How many areas (how much surface, location) are protected as national parks, national reserves, etc?
  - Do protected areas include examples of the major habitats? Are important habitats not or to a lesser degree protected?
- **In how many areas/on which surface area has a restoration activity taken place?**
  - How does it compare with the area of the habitat that is naturally present?
  - Do restoration activities compensate habitat losses that occurred during the past decades?
- **How are species protected?**
  - Which group of species are legally protected?
  - What are the different protection types? Has it resulted in a better status for species concerned?
- **Which other biodiversity conservation measures have been applied?**
  - To what extent LIFE-Nature contributed to nature and biodiversity protection in the country?
  - How is the CITES convention and the regulation EC 338/97 for the protection of species of fauna and flora via the control of their trade implemented?
  - How is the Convention on Biological Diversity implemented in the country?
  - How is the Bern Convention implemented?
- **Which other measures indirectly influence nature and biodiversity?**
  - What is the influence of the Common Agriculture Policy (set aside and subsidies) and agri-environmental measures?
  - How do afforestation programmes initiated under the Common Agriculture Policy impact on biodiversity?
  - What is the influence of the water protection legislation (Nitrates Directive)? Air protection legislation? Etc.
  - What measures are or will be taken to control dissemination of OGMs in the environment?
- **Which of these responses have been successful?**
  - Which have not been successful?
- **What are the factors limiting the effectiveness of measures/instruments mentioned above?**
- **What future legal, institutional or managerial measures would be possible and feasible for nature and biodiversity conservation?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

### What is happening?

- **What is the ‘natural capital’ of the country? How diversified and numerous are species and habitats in the country?**
- **What are the trends in nature and biodiversity?**
  - What is the trend concerning fauna?
    - *Do wild species decline?*
    - *What proportion of mammals, birds, amphibians, reptiles, fishes, invertebrates are extinct? Highly endangered? Endangered? Etc.?*
    - *Are animals associated with human activities increasing?*
    - *Are species tolerant to high nutrient levels or acidity spreading?*
    - *What are the impacts of alien species introduction?*
  - What is the trend concerning flora?
    - *What proportion of species of flora are extinct? Highly endangered? Endangered?*
  - What is the trend concerning the different habitats?
    - *Are semi-natural agricultural areas (e.g. meadows) still in decline?*
    - *Do wetland losses still occur?*
    - *How much wetland has been transformed into agricultural land?*
    - *How is the total area of forest developing?*
    - *Are old natural and semi-natural woodlands declining?*
    - *Are monospecific or fast growing managed forests expanding?*
    - *To what extent small biotopes (strips of meadows, hedges, etc.) are affected?*
    - *What is the trend of other habitats: coastal and marine habitats, sand dunes, mountains, deserts, tundra, urban habitats?*
  - How is the balance between cultivated and natural gene pools changing?
    - *To what extent are GMOs expanding?*
    - *Have GMOs passed into natural populations?*
  - What is the trend regarding other aspects of biodiversity?
    - *What is the development in the number of species used in agriculture?*
    - *To what extent are exotic species used in forestry?*
    - *How are other non wild species developing?*
- **What is expected to happen?**
  - Which functions of nature and biodiversity are or will be at stake?
  - Will the ‘natural capital’ pattern of the country change?
  - What will be the impact of global warming on biodiversity in the country?

### Why is it happening?

- **What are the most important anthropogenic pressures affecting nature and biodiversity?**
- **Which sectors/activities affect nature?**
  - What are the impacts of agriculture, forestry, aquaculture, tourism and recreation, urbanisation, industry, transport, other sectors?
    - *Which activities are the most damaging to natural and semi-natural habitats: land reclamation, pollution, agriculture or forestry, drainage, infrastructure, etc.?*
    - *To what extent intensification/specialisation of agriculture and forestry are affecting habitats and species?*

- *Which activities are responsible of habitats fragmentation?*
- *Does abandonment of land by agriculture impact on biodiversity?*
- *How do fisheries impact on stock fishes and marine ecosystems?*
- *What are the impacts of tourism on nature and biodiversity?*
- *To what extent is the 'natural capital' used as a tourist resource?*
- *What are the expected impacts of infrastructure development and urbanisation on nature and biodiversity (fragmentation, habitat losses)?*
- **What are the impacts of pollution generated by economic activities (eutrophication, acidification, pesticides loads, etc.)?**
- **How has land use developed?**
  - What is the development of built up land and infrastructures?
    - *What have been the impacts of built up land and infrastructure development on fragmentation and isolation of habitats?*

### Are we seeing changes?

- **What is the trend in the emission of pollutants generating an effect on ecosystems?**
  - What is the trend in nutrient emissions? (see Inland waters)
  - What is the trend in the emission of acidifying substances? (see Acidification)
  - What is the trend in emission of some chemicals of concern (e.g. pesticides, PCBs, heavy metals, etc.)? (see Chemicals)
- **What is the trend in factors steering land use?**
  - What is the trend in investment for infrastructure?
  - What is the trend in the division urban/rural population?
  - What is the trend in outdoor tourism?
  - What is the trend in the amount and management of agriculture and forest land?
    - *To what extent environment friendly farming methods will contribute to the recovery of species?*
    - *Will abandonment of agricultural land continue?*
    - *Will the introduction of new species and GMOs continue?*
    - *What is expected to be the proportion of sustainable forestry?*
- **What is the trend in factors influencing the water cycle?**
  - What is the trend in water abstraction (total and for irrigation)? (see Inland waters)
    - *Are irrigated lands expanding?*
    - *What are the impacts on species of changes in water cycle?*
  - What is the trend in development of wetlands and peat areas?

### How effective are the responses?

- **How many areas have been brought under some kind of protection? How much surface area?**
  - How many areas (and how much surface) are protected following international conventions?
  - How many areas (and how much surface) are protected following European directives (Wild birds, Natural habitats)?
  - How many areas (how much surface, location) are protected as national parks, national reserves, etc?
  - Do protected areas include examples of all major habitats? Are certain important habitats not or to a lesser degree protected?

- **In how many areas/on which surface area has a restoration activity taken place?**
  - How does it compare with the area of the habitat that is naturally present?
  - Do restoration activities compensate habitat losses that occurred during the past decades?
- **How are species protected?**
  - Which group of species are legally protected?
  - What are the different protection types? Has it resulted in a better status for species concerned?
- **Which other biodiversity conservation measures have been applied?**
  - To what extent has LIFE-Nature contributed to nature and biodiversity protection in the country?
  - How is the CITES convention and the regulation EC 338/97 for the protection of species of fauna and flora via the control of their trade implemented?
  - How is the Convention on Biological Diversity implemented in the country?
  - How is the Bern Convention implemented?
- **Which other measures indirectly influence nature and biodiversity?**
  - What is the influence of the Common Agriculture Policy (set aside and subsidies) and agri-environmental measures?
  - How do afforestation programmes initiated under the Common Agriculture Policy impact on biodiversity?
  - What is the influence of the water protection legislation (Nitrates Directive)? Air protection legislation? Etc.
  - What measures are or will be taken to control dissemination of OGMs in the environment?
- **Which of these responses have been successful?**
  - Which have not been successful?
- **What are the factors limiting the effectiveness of measures/instruments mentioned above?**
- **What future legal, institutional or managerial measures would be possible and feasible for nature and biodiversity conservation?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

# 15. Urban environment

## Place of the issue in the policy cycle

It can be said that the EU has had several urban policies, as numerous European Commission services have attempted to address urban issues in their individual programmes. But the need to consolidate efforts into a single framework for strategic action for urban policy is now underlined (EEA 1999, p.334).

## What is happening?

Some 70 % of the European population live in urban areas, which take up some 25 % of land in the EU. The rapid increase in private transport and resource-intensive consumption are major threats to the urban environment and consequently to human health and welfare. In many cities, cars now provide over 80 % of mechanised transport.[...] A majority of cities providing data report exceedances of WHO guideline values for sulphur dioxide, carbon monoxide, nitrogen oxides and particulate matter. [...] Exceedance of WHO air quality guideline values for benzene seems common (EEA 1998, p.247).

Noise is a great problem in urban areas. Many cities are over-exploiting their groundwater resources and water availability. Urban problems are not confined to the cities themselves. Growing areas of land are needed to provide the populations of large cities with all the resources they need and to absorb the emissions and waste they produce (EEA 1998, p.247).

## Why is it happening?

More than two thirds of Europe's population lives in urban areas and the influence of cities extends far beyond their boundaries, causing significant regional and global impacts through their demands for natural resources, their wastes and their emissions to soil, water and the atmosphere (EEA 1998, p.248). The effects of policies are overshadowed by the size of the phenomena. Initiatives currently in place are in general insufficient to curb the pressures derived from noise and energy consumption. Furthermore, they are insufficient to tackle the growing threats arising from sprawls (i.e. land use stresses and social inequities), growth in consumption (i.e. waste generation and water consumption), and transport (i.e. congestion, air pollution and noise) (EEA 1999, p.331-332).

## Are we seeing changes?

Urbanisation is continuing. Ambient pollutant concentrations in cities have fallen over the last decade, contributing to some improvement in urban air quality. But the evidence on particulates is mixed – the general trend is down, but concentrations still exceed World Health Organisation guidelines in a majority of cities (EEA 1999, p.25). Annual lead concentrations dropped sharply in the 1990s because of the reduction in the content of petrol. Ozone remains a major problem in some cities (EEA 1998, p. 247).

The dominant sources of air pollution -previously industrial processes and the combustion of coal and high-sulphur fuels- are now motor vehicles and the combustion of gaseous fuels. Water consumption in a number of European cities has increased (EEA 1998, p.247).

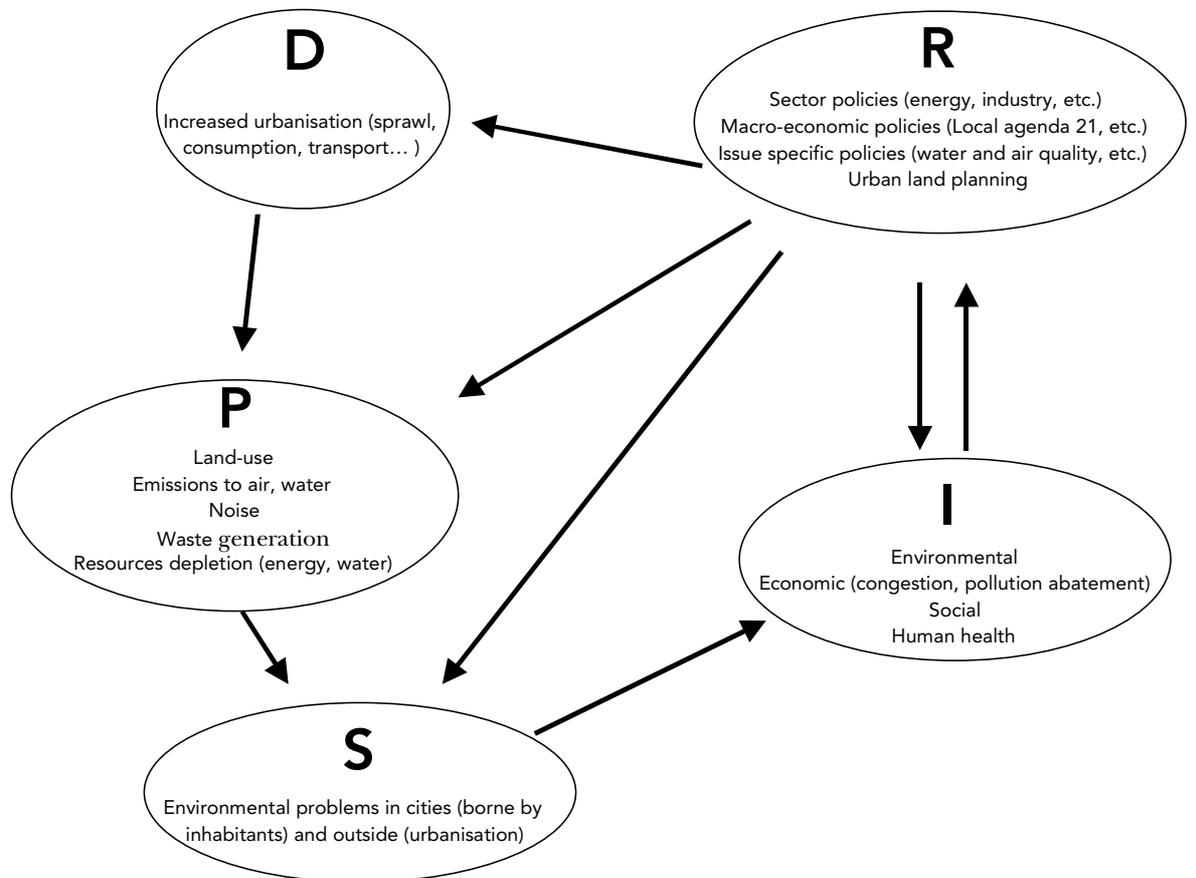
Forecasts of transport growth in Western Europe indicate that road transport demands for passengers and freight could nearly double between 1990 and 2010, with the number of cars increasing by 25-30 % and annual kilometres per car increasing by 25 %. (EEA 1998, p. 247).

## How effective are the responses?

The 5 EAP recognised that in addition to the indirect effects of specific environmental legislation, the role of Community policy in this area is to encourage local authorities to tackle the problems and to assist them in working towards sustainability. However, no specific targets or monitoring mechanisms were defined. The European Sustainable Cities & Towns Campaign was established in 1994 to support local authorities and it has operated constructively since. In 1998, the Commission published the Communication 'Sustainable Urban Development in the EU – A Framework for Action'. The adoption of this communication, which includes concrete commitments on the part of the European Commission, represents an important progress towards a more integrated and strategic approach to urban issues (EC Global Assessment of the 5 EAP 1999).

**NB: See also: Noise, air, tropospheric ozone, waste, inland water**

## Urban environment – DPSIR framework



## Urban environment



Level 1

### What is happening?

#### Cities

- How many people live in towns? Trends?
- What are the environmental problems encountered in cities?

#### Urbanisation

- What are the environmental problems caused by urbanisation?
- What is the ecological footprint of the cities?
- What is the creation rate of urban areas?

### Why is it happening?

- What are the causes of problems in urban areas?
- What are the causes of urbanisation?

### How effective are the responses?

- How many cities have implemented local Agenda 21 or other environmental strategies?
- How much are the investments of cities for the environment?
- What are the responses in prospect to improve the environmental quality in cities?
- What are the responses in prospect to lower the impacts of urbanisation?
- What are the different options (environmental quality in cities and impacts of urbanisation)?

### What is happening?

#### Cities

- **How many people live in towns? Trends?**
- **What are the environmental problems encountered in cities?**
  - What is the trend concerning traffic?
  - What is the trend in water supply? (see INLAND WATER)
  - What is the trend in noise disturbances? (see NOISE)
  - What is the development in the urban emissions of SO<sub>2</sub>, NO<sub>x</sub>, VOCs, CO, Pb and PM? (see AIR, TROPOSPHERIC OZONE)
  - What is the surface of green areas?
  - What are the developments in land-use in cities?

#### Urbanisation

- **What are the environmental problems caused by urbanisation?**
  - What is the trend in wastes? (see WASTE)
  - What is the trend in wastewater treatment? (see INLAND WATER)
  - What is the trend in energy flows?
- **What is the ecological footprint of the cities?**
- **What is the creation rate of urban areas?**
  - What is the trend in the construction of flats? Of houses?
  - What is the trend in the size of towns?

### Why is it happening?

- **What are the causes of problems in urban areas?**
  - Why is the supply of goods and freight to towns a special problem?
  - What are the sources of noise? Air pollution?
  - What are the 'costs-benefits' of the spatial concentration of people?
- **What are the causes of urbanisation?**
  - How have developments in the urban population been influenced by policies (physical planning, traffic, agriculture) in the past?
  - How have developments in the urban population been influenced by 'autonomous' changes in society (changes in employment types, women's emancipation, car ownership and mobility, etc.)?

### How effective are the responses?

- **How many cities have implemented local Agenda 21 or other environmental strategies?**
  - What are the different kind of projects/solutions addressing environmental problems as a whole?
  - On which scale specific traffic measures have been implemented? How successful were they?
  - What measures have been taken to reduce sulphur and particulate emissions from home heating? How successful were they?
  - What measures have been taken to reduce energy consumption in cities? How successful were they?
  - What measures have been taken to reduce noise (traffic, commercial activities, neighbours, etc.)? How successful were they?

- What measures have been taken to improve the city landscape (green areas, pedestrian zones, etc.)? How successful were they?
- What measures have been taken to decrease the urban flow (waste, water consumption, etc.)? How successful were they?
- **How much are the investments of cities for the environment?**
  - How much are the investments to address air pollution, wastewater problems, noise, to enlarge green areas, etc?
- **What are the responses in prospect to improve the environmental quality in cities?**
- **What are the responses in prospect to lower the impacts of urbanisation?**
- **What are the different options (environmental quality in cities and impacts of urbanisation)?**
  - What are the economic options, technical options?
  - What are the costs-benefits of the various options?

### What is happening?

#### Cities

- **How many people live in towns? Trends?**
- **What are the environmental problems encountered in cities?**
  - What is the trend concerning traffic?
    - *What kind of environmental problems is car traffic the main source of?*
    - *How many private cars are there?*
    - *What is the trend in passenger transport overall?*
    - *What is the trend in public transportation frequenting?*
    - *How many cities have developed network for bicycles? Length of the network?*
    - *How many kilometres are done by bike?*
  - What is the trend in water supply? (see INLAND WATER)
    - *How many people have received a water not matching the standards?*
  - What is the trend in noise disturbances? (see NOISE)
    - *How many people are affected by noise?*
    - *What are the different kinds of noise disturbances?*
  - What is the development in the urban concentrations of ozone, particulate matter, SO<sub>2</sub>, NO<sub>2</sub>, CO and Pb? (see AIR, TROPOSPHERIC OZONE)
    - *Which thresholds/standards are exceeded (for which pollutants)?*
    - *How many people are (and how long) exposed to above thresholds concentrations?*
  - What is the surface of green areas?
    - *How much 'green areas' are available per inhabitant in towns?*
    - *What are the kinds of green areas available in the city (or just outside): parks, forests, agricultural lands, etc.?*
  - What are the developments in land-use in cities?
    - *How much surface is occupied by buildings, the old town, commercial areas, industrial areas, derelict land, etc.?*

#### Urbanisation

- **What are the environmental problems caused by urbanisation?**
  - What is the trend in wastes? (see WASTE)
    - *How much household waste are produced? Household-like waste?*
    - *What is the capacity of waste treatment facilities?*
  - What is the trend in wastewater treatment? (see INLAND WATER)
    - *How much waste water is produced?*
    - *What is the capacity of waste water treatment facilities?*
    - *What is the efficiency rate for organic matter in the main cities?*
  - What is the trend in energy flows?
    - *What is the trend in electricity use and where does it come from?*
    - *How much does the transport sector consumes? Residential sector?*
- **What is the ecological footprint of the cities?**
- **What is the creation rate of urban areas?**
  - What is the trend in the construction of flats? Of houses?
    - *What is the trend in the occupation rate of flats/houses?*
  - What is the trend in the size of towns?

### Why is it happening?

- **What are the causes of problems in urban areas?**
  - Why is the supply of goods and freight to towns a special problem?
  - What are the sources of noise? Air pollution?
    - *What is the development in urban emissions of major air pollutants?*
  - What are the 'costs-benefits' of the spatial concentration of people?
- **What are the causes of urbanisation?**
  - How have developments in the urban population been influenced by policies (physical planning, traffic, agriculture) in the past?
  - How have developments in the urban population been influenced by 'autonomous' changes in society (changes in employment types, women's emancipation, car ownership and mobility, etc.)?

### How effective are the responses?

- **How many cities have implemented local Agenda 21 or other environmental strategies?**
  - What are the different kind of projects/solutions addressing environmental problems as a whole?
  - On which scale specific traffic measures have been implemented? How successful were they?
    - *How many cities have adopted noise zoning, speed limits, pedestrian zones, etc.? On which scale? Where?*
  - What measures have been taken to reduce sulphur and particulate emissions from home heating? How successful were they?
  - What measures have been taken to reduce energy consumption in cities? How successful were they?
    - *What measures have been taken to improve energy efficiency?*
  - What measures have been taken to reduce noise (traffic, commercial activities, neighbours, etc.)? How successful were they?
  - What measures have been taken to improve the city landscape (green areas, pedestrian zones, etc.)? How successful were they?
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