

THE EUROPEAN ENVIRONMENT

STATE AND OUTLOOK 2005

European Environment Agency



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List of contents

Foreword	8
Introduction	10
Executive summary	16

PART A | Integrated assessment

Setting the scene	
1 Environment and quality of life	28
2 The changing face of Europe	36
Atmospheric environment	
3 Climate change	62
4 Air pollution and health	92
Aquatic environment	
5 Freshwaters	112
6 Marine and coastal environment	132
Terrestrial environment	
7 Soil	168
8 Biodiversity	182
Integration	
9 Environment and economic sectors	216
10 Looking ahead	232

PART B | Core set of indicators

Setting the scene	255
Air pollution and ozone depletion	
01 Emissions of acidifying substances	256
02 Emissions of ozone precursors	260
03 Emissions of primary particles and secondary particulate precursors	264
04 Exceedance of air quality limit values in urban areas	268
05 Exposure of ecosystems to acidification, eutrophication and ozone	272
06 Production and consumption of ozone depleting substances	276
Biodiversity	
07 Threatened and protected species	280
08 Designated areas	284
09 Species diversity	288
Climate change	
10 Greenhouse gas emissions and removals	292
11 Projections of greenhouse gas emissions and removals	296
12 Global and European temperature	300
13 Atmospheric greenhouse gas concentrations	304

Terrestrial	
14 Land take.....	308
15 Progress in management of contaminated sites.....	312
Waste	
16 Municipal waste generation.....	316
17 Generation and recycling of packaging waste.....	320
Water	
18 Use of freshwater resources.....	324
19 Oxygen consuming substances in rivers.....	328
20 Nutrients in freshwater.....	332
21 Nutrients in transitional, coastal and marine waters.....	336
22 Bathing water quality.....	340
23 Chlorophyll in transitional, coastal and marine waters.....	344
24 Urban wastewater treatment.....	348
Agriculture	
25 Gross nutrient balance.....	352
26 Area under organic farming.....	356
Energy	
27 Final energy consumption by sector.....	360
28 Total energy intensity.....	364
29 Total energy consumption by fuel.....	368
30 Renewable energy consumption.....	372
31 Renewable electricity.....	376
Fisheries	
32 Status of marine fish stocks.....	380
33 Aquaculture production.....	384
34 Fishing fleet capacity.....	388
Transport	
35 Passenger transport demand.....	392
36 Freight transport demand.....	396
37 Use of cleaner and alternative fuels.....	400

PART C | Country analysis

Setting the scene — main results	408
EEA scorecard	412
Thematic assessment	
Greenhouse gas emissions.....	414
Total energy consumption.....	416
Renewable electricity.....	418
Emissions of acidifying substances.....	420
Emissions of ozone precursors.....	422
Freight transport demand.....	424

PART C | Country analysis

Area under organic farming	426
Municipal waste generation	428
Use of freshwater resources	430
Country perspectives	432
Austria	434
Belgium	436
Bulgaria	438
Cyprus	440
Czech Republic	442
Denmark	444
Estonia	446
Finland	448
France	450
Germany	452
Greece	454
Hungary	456
Iceland	458
Ireland	460
Italy	462
Latvia	464
Liechtenstein	466
Lithuania	468
Luxembourg	470
Malta	472
The Netherlands	474
Norway	476
Poland	478
Portugal	480
Romania	482
Slovak Republic	484
Slovenia	486
Spain	488
Sweden	490
Switzerland	492
Turkey	494
United Kingdom	496
Methodology and main decision points	498
Ranking graphs	508

PART D | Bibliography

Introduction	529
Previous state-of-the-environment reports	530
Signals reports	531
Reports 2000–2005, by theme:	
Air pollution	532
Climate change	534
Terrestrial environment and biodiversity	536
Waste and material flows	537
Water	539
Agriculture	542
Energy	543
Transport	544
Other issues	546
Policy measures and instruments	549
Eionet development and information systems, by theme	552
Condensed list of reports 2000–2005, by series:	
Environmental assessment reports (2000–2003)	566
Environmental issue reports (2000–2004)	566
EEA reports (2004–2005)	567
EEA briefings (2003–2005)	567
Topic reports (2000–2003)	567
Technical reports (2000–2003)	568
EEA technical reports (2004–2005)	570

Foreword

This is the third state and outlook report on the European environment produced by the European Environment Agency (EEA) since 1994. Looking back, the last report, published in 1999 concluded that, despite 25 years of Community environmental policy, environmental quality in the European Union (EU) was mixed and that the unsustainable development of some key economic sectors was the major barrier to further improvements. That remains the EEA's key conclusion, despite significant progress on some issues demonstrating that environmental policy works. Were we to fast-forward to the year 2010, it would be my strong hope that in its next state and outlook report, the EEA would be able to report significant environmental improvements, not least as a result of reversing unsustainable trends in sectors such as energy, agriculture and transport.

Much has of course changed in Europe since 1999, most notably through the biggest ever enlargement of the EU. Despite this and other considerable successes, the EU now recognises that it has to do more to convey to Europeans that it understands their concerns and that it has credible strategies in place to address them. One response has been to reinvigorate the Lisbon agenda initially launched in 2000 with the target of creating new and better jobs through higher economic growth. The EU has set itself the deadline of 2010 for delivering on this agenda and against this backdrop environmental initiatives are being rigorously scrutinised. At the same time, opinion polls show that the European public believes that environment protection policies are an incentive for innovation and not an obstacle to economic performance. The evidence in this report shows that they are right.

The years since 1999 have also witnessed the adoption of the EU's sustainable development strategy. At the UN World Summit on Sustainable Development in the summer of 2002, the EU showed global leadership by setting out its broad, long-term vision for the future. But long-term objectives must not mean postponing action now. In formulating policy today, Europe has an obligation to look beyond 2010 and beyond its own borders. As this report shows, the international stakes are high. Europe cannot continue down

the path of achieving its short-term objectives by impacting disproportionately on the rest of the world's environment through its ecological footprint.

Tackling clearly unsustainable trends in Europe will require real integration of environmental objectives across policy areas such as energy, transport, agriculture, industry and spatial planning. Consumers must also be given the information and incentives to change the way in which their households and lifestyles impact upon their local – and global – environments. It is not easy to bring about such shifts in behaviour but many of the environmental improvements that we need in the coming years can only be brought about through such changes. At the same time, the EU must remain vigilant to ensure that the policy measures already in place are fully implemented and properly enforced.

The European public's intuitive understanding that environmental protection and economic growth can go hand in hand is confirmed by this report. The same applies to the widely held view that prevention works better than cure. Many environmental problems stem from incorrect pricing of what we consume at the time we consume it. The challenge for European policy-makers is to ensure that the real costs of pollution and resource inefficiency are internalised into the prices of products and services, as opposed to later on at the end of the chain in the form of a pollution clean-up bill, damaged health or diminished ecosystems. The tools of the market can provide incentives to bring about some of the very necessary behavioural changes. And as the EEA has shown in some of its earlier reports, the cost of inaction can be many times the cost of sensible preventive measures.

Some phenomena are more difficult to cost in conventional market terms. As societies we have come to rely on a range of ecosystem services upon which we have not traditionally placed monetary values. Healthy ecosystems deliver an abundance of free and life-sustaining services such as productive land and soil, forest products, or other, sometimes less well recognised services, such as watershed protection and water filtration, flood protection or carbon storage. Our economies – like our societies – are

dependent upon these often hidden services. The seas and coasts around Europe provide one example of a vital resource upon which many millions of people depend, both economically and culturally. And yet, the current deterioration of our marine ecosystems, as seen through the depletion of fish stocks, puts at risk the services they provide. Similarly, climate change is already altering ecosystems in such a way that we must ask ourselves about their capacity to adapt. While ecosystems are extremely resilient and typically only change rather slowly, there are growing signs from across the world that they can reach a critical point where they undergo 'greenlash' – or a sudden flip into a new structure.

We need to keep a strong time perspective uppermost in our minds when assessing Europe's changing environment. Changes can often be subtle and long-term and as such they may require sustained policy responses over a long period. At the same time, by taking the longer view, we may see that slow changes can be dramatic and that there is cause to sound the alarm now. For example, the Millennium Ecosystem Assessment has recently shown that humans have changed ecosystems more rapidly and extensively in the last 50 years than in any other period of human history.

For its part, the EEA is responding to the need for long-term, integrated analyses of environmental issues that take account of the global context. We are working with others on environmental accounting methods that link environmental pressures to economic sector activities in ways that are consistent with national economic accounts. In 2006 we will start to review with our partners, how we produce environmental outlooks with a view to making future modelling work more policy relevant. The EEA will also extend its work on scenarios

development to provide decision-makers with new tools and insights into possible environmental futures and their associated socio-economic developments. These could provide a more robust basis for longer-term policy considerations.

By the time of the fourth state and outlook report on the European environment in 2010, the EEA intends to have played its part in helping to reverse the unsustainable trends that have been consistently identified in our work since 1994. We hope that the present report can help show governments and the public what is at stake in needing to move towards the more eco-efficient and equitable economic activities upon which Europe's future growth depends.

In conclusion, I would like to take this opportunity to thank Agency staff, members of the European environment information and observation network (Eionet), other EEA stakeholders, and external consultants who contributed to the drafting, editing, review and production of the report. In addition, I would like to thank everyone who provided data and information, especially Eionet, the European Commission services, international organisations and the secretariats of international conventions.



Professor Jacqueline McGlade
Executive Director

Introduction

1 Mandate and purpose

The European Environment Agency (EEA) together with its European Environment Information and Observation Network (Eionet) began working in 1994 to provide the EU Member States, other EEA member countries, and the European Commission with objective, reliable and comparable information on the state, pressures and sensitivities of the environment in the European Union (EU) and its surroundings. Specifically, under its founding Regulation (EEC/1210/90), the EEA is required to 'publish a report on the state of, trends in and prospects for the environment every five years, supplemented by indicator reports focusing upon specific issues'.

The present report *The European environment – State and outlook 2005* is the third such report produced since the EEA was established. The reports are intended to support strategic environmental programming in the EU and beyond. Previous reports were *Environment in the European Union 1995: report for the review of the 5th environment action programme*, published in 1995 and *Environment in the European Union at the turn of the century*, published in 1999. The latter contributed to the global assessment of the 5th environment action programme, a process that acted as a prelude to the development of the 6th environment action programme (6th EAP), adopted in 2002. This 2005 state and outlook report provides timely input to strategic policy review processes, the most important of which is the mid-term review of the 6th EAP scheduled for completion in 2006.

According to its founding regulation, the EEA's five year reports are intended to describe past, present and future perspectives for the environment. The overall purpose is to provide an integrated assessment that forms the basis for understanding what are the main challenges facing Europe's environment today and in the future, within the context of changing economic and social dynamics both in Europe and across the world.

The rapidly changing economic and demographic landscapes of Europe and the world, together with

the shift in the source of environmental problems in Europe from production to consumption patterns in the last decades are two of the main socio-economic changes that underpin the environmental assessment presented in this report. In addition, the increasing relevance of international trade, as well as the growing competition for resources between developed economies such as Europe, and emerging economies such as China, India and Brazil, are two key developments that influence both European and global environments as a result of the external footprint of Europe's activities.

It is in the context of these main socio-economic changes that the report addresses the resulting environmental and human health impacts from increasing urbanisation and rural land abandonment, climate change, air pollution and other chemical exposures, depletion of natural resources such as water, soil and biodiversity and the disturbance caused to land-based and marine ecosystems.

These past and future trends for the environment and society are considered alongside the wide range of policy measures adopted at the national, EU and global levels. The report describes the range and role of policy instruments available and shows, in a more limited way, how effective these policies have been in meeting their objectives. Regulations and market measures are given particular attention in view of their roles in reducing environmental pressures through encouraging developments in environmental technologies and behavioural change.

The EEA uses its driving forces – pressures – state – impact – responses (DPSIR) assessment framework to guide its work on integrated assessment. The DPSIR framework provides a basis for analysing the interrelated factors that impact the environment, including societal driving forces such as production and consumption patterns, their pressures on the environment, the resulting changes in the state of the environment, its impacts on ecosystems and health, and the role and effectiveness of policy measures in managing these interlinked dynamics.

Data and information used in the report for assessing past trends have been gathered through Eionet, a partnership of the EEA and its member and participating countries. It consists of the EEA itself, five European Topic Centres, and a network of around 1 000 experts from 31 member countries and 6 collaborating countries, representing over 300 national environment agencies and other bodies dealing with environmental information. Other key data sources used in the report include the European Commission services, especially DG Environment, DG Eurostat and DG Joint Research Centre, and the secretariats of international conventions. The EEA has also worked in cooperation with these and other partners to produce information on outlooks for the environment using established modelling and scenarios tools to assure consistency with other processes.

2 Report structure and target audiences

This report is divided into four parts: Part A: an integrated assessment; Part B: core set of indicators; Part C: country analysis; and, Part D: bibliography of EEA publications since 2000.

Part A

Part A provides an integrated assessment at the European level across the main environmental challenges that Europe faces and how these are influenced by socio-economic activities at home and more widely across the world. It considers both past trends and future prospects. It is structured in five main sections, each containing two chapters.

The first section, called 'setting the scene', has chapters addressing environment's contribution to our quality of life and how the face of Europe has changed in recent times through its changing landscape patterns. The first chapter looks at how citizens perceive the role of the environment alongside social and economic aspects in improving their overall welfare. The chapter on landscapes combines an assessment of the potential of Europe's land area to continue providing ecological goods and services in the face of changing pressures,

and an explanation of the main policy instruments at the European level that are influencing change.

The section on atmospheric environment addresses climate change, the foremost environmental challenge facing Europe and the world today, and air pollution and its impacts on people's health. In both chapters, particular attention is given to the challenges posed by pollution from households, energy supply and transport, and the sensitivities in dealing with these through policy responses aimed at behavioural change. Particular attention is also given to the future challenges and the costs of action/inaction in the face of uncertainty.

The section on aquatic environment has chapters covering freshwater, and marine and coastal environments. The freshwater chapter focuses on the main pollution sources and trends — with less focus on ecological and ecosystem aspects because of lack of data — and on how managing freshwaters will continue to be a long-term and costly endeavour for Europe. The marine and coastal chapter focuses much more on ecosystem aspects and especially on the important and fragile nature of coasts and oceans in the context of climate change.

The terrestrial environment section includes chapters on soil and biodiversity. The soil chapter reflects the present paucity of data and analysis for this area. Nevertheless, it provides some useful insights as well as a clear basis for understanding the challenges ahead for Europe on soil monitoring and modelling. The biodiversity chapter provides a comprehensive analysis of terrestrial ecosystems and species and of how Europe influences the use of natural resources globally as shown by its ecological footprint.

The final section of chapters on integration assesses the environmental impacts of main economic sectors — agriculture, transport, energy and households — in the context of improving eco-efficiency. It concludes with some reflections on where priorities could lie for future action through improved policy design and coherence, better governance structures and investments in eco-innovation that could together deliver cost-effective

improvements to Europe's environment, economy and overall quality of life in the face of changing demographics.

The assessment for Part A is written in a more accessible style and as such is targeted to an informed political and public audience working mainly outside the environment sphere but for whom environmental concerns play a role in their day-to-day activities and decision-making. Examples include politicians and policy-makers working in the economic sectors that have most influence on the environment — agriculture, transport, industry, tourism and trade; the financial community, where environmental issues are of increasing relevance to decisions around insurance risk and investment choices; the research and development community, which would be the source of many of the innovations that could contribute to reducing future environmental pressures and impacts; and the informed public. All of these groups have an interest in how Europe's environment is developing, from the local through to the global level, and in how environmentally motivated integrated approaches can help improve European environments, economies and societies.

Part B

Part B of the report presents a first detailed assessment at the European level that uses the 37 EEA/Eionet core set of indicators which were agreed with EEA's stakeholders in March 2004. The core set was selected to provide a stable basis for indicator-based reporting by EEA and others in Europe (e.g. the European Commission) and to provide a focus for prioritising improvements in data quality.

The core set includes selected indicators relevant to the main environmental problems — air pollution and ozone depletion, climate change, biodiversity, waste, terrestrial environment and water — as well as main economic sectors — agriculture, transport, energy and fisheries. Other relevant priority areas (chemicals, noise, material flows, industry and household sectors) have not yet been included in the core set, which reflects the lack of sufficient data and methodological development. These areas will be the main focus for future work on the core set.

All of the indicators in the core set are relevant to the assessments presented in Part A of the report. The bibliography section at the end of each chapter in Part A provides a check-list of relevant indicators. While there is some repetition in the use of analysis and graphs from Part B into Part A, in the vast majority of cases every effort has been made to avoid such overlaps. The main exception concerns the soil chapter which has drawn extensively on the core set because of the relative paucity of good quality data and analysis for this issue.

Each indicator is presented in a standard four-page template that includes information on policy questions and messages, trends assessment, data quality and methodological developments. The four pages are summaries of more detailed indicator profiles that are available on the EEA website.

The assessments for each indicator are written in a more technical language and as such are targeted at a more informed audience working on, or interested in, environmental issues, or for those who want to have more in-depth information about these issues after reading relevant chapters of Part A.

Part C

Part C of the report provides a more detailed country level analysis of progress on environmental issues using a scorecard based on nine indicators from the 37 in the core set. Since the scorecard aims to give insights into progress with environmental performance, the nine indicators relate to points that policy can affect and on which policy is targeted. Thus, most of the indicators either have specific policy targets associated with them that allow analysis of progress towards these targets, or aspirational targets that allow for a similar though less definitive analysis. These indicators also have data available at the country level with trends covering a sufficient number of years to enable robust analysis of change.

The nine indicators are relevant to main policy priorities in the environment and in the economic sectors that have most impact. They are: greenhouse gas emissions and removals, total energy consumption

(energy intensity), share of renewables in electricity, emissions of acidifying substances, emissions of ozone precursors, freight transport demand, share of organic farming, municipal waste generation and use of freshwater resources.

Part C goes beyond a standard indicator-by-indicator assessment by providing a composite scorecard of results across the nine indicators. The scorecard also acts as a communication tool by bringing together information in one relatively easy-to-understand format and presentation.

The methodology underpinning the scorecard distinguishes between those indicators that have targets that facilitate distance to target analysis and those that do not; and between assessing progress over a given time period (usually 10 years from the early 1990s) and the status of countries' environmental performance for the latest year for which data are available. Both measures (progress and status) are used to distinguish between countries who have had policies in place for a long time and those who are relative newcomers to the implementation of EU policies.

For the first time ever in an EEA report, Part C also includes more detailed information on the situation in each country across the nine indicators, including the different types of actions and challenges each country faces. This analysis is based on contributions provided by the countries that have been subsequently edited by the EEA. The EEA takes full responsibility for the final result. This unique feature of the report is very much a first step towards what the EEA and Eionet hope will be a long-term process of building into European reports information from countries on the state of their environments and actions which reflect their often diverse social, environmental and economic conditions.

Part D

This part of the report provides an overview of the reports that the EEA has published since the previous five-year report *Environment in the European Union at the turn of the century*. It includes, in the electronic version, hyperlinks to all environmental reports published in the period from January 2000 to

November 2005. Corporate documents, such as annual reports and work programmes, are excluded, as are promotional brochures.

3 Supporting activities

This report represents the culmination of a process started in 2003 from which a number of other specific published products and working documents have emerged. The most important of these is a series of sub-reports that have been developed in line with the priorities of the 6th environment action programme and the EU sustainable development strategy, and other reports that have been prepared to strengthen the EEA's information in the area of policy analysis, in particular ex-post policy effectiveness analysis and economic analysis.

Sub-reports

The EEA has worked on sub-reports across eight areas of relevance to strategic policy processes, plus a ninth area, environmental outlooks, which provides an integrated assessment of future prospects for the environment.

The eight areas relevant to the main policy processes are: household consumption and the environment; an enlarged European Union; halting biodiversity loss; sustainable use and management of natural resources; environmental policy integration; climate change and a European low carbon energy system; Europe and the global environment; and, environment and health. The EEA is presently engaged in a process of publishing reports in each of these areas

Other reports

This report also draws extensively on a range of other reports produced by the EEA in recent years and especially since 2003. The most notable of these are the 2004 climate change impacts report, the 2004 EEA signals report, the 2004 transport and environment reporting mechanism (TERM) report, the 2003 Kiev report *Europe's environment: the third assessment*, and the 2003 water indicator report. More information on these and other reports published by the EEA since 2003 can be found in the Bibliography in Part D.

More recently, the EEA has analysed extensively the use of market-based instruments in environmental policy making across Europe. These cover environmental taxes, charges, subsidies and trading permits, amongst others. The analysis has been used extensively in Part A and especially in the final chapter on how the use of market measures in environmental policy could be expanded in future years. Two reports on market-based instruments are in the publication process.

4 Policy context

Since the previous five year state and outlook report in 1999 there have been a wide range of policy developments that provide, to differing degrees, relevant contexts for the assessments presented in this report. Four developments merit particular consideration: the enlargement of the European Union to 25 Member States in May 2004, the 6th environment action programme adopted in July 2002, the EU sustainable development strategy adopted in June 2001; and the Lisbon strategy adopted in March 2000.

The enlargement of the EU has brought a unique set of new environmental assets — including rich biodiversity and landscapes and vast areas of relative wilderness — but also represents an important challenge for EU environmental policy given the capacity building and financing needs required to support implementation of the *acquis communautaire*. The report does not deal with the implications of enlargement as a separate issue. The main challenges are instead addressed across the chapters in Part A. The progressive adoption by the EU-10 Member States of the environment *acquis* has already contributed to an enhanced environment in many places and where there are opportunities for mutual learning about better policy design and implementation.

The 6th EAP sets out the EU's environmental roadmap for the 10 years to 2012. It is the main vehicle by which to achieve the environmental goals of the sustainable development strategy. It sets ambitious, long-term goals for environmental protection and in so doing provides a stable framework within which public

and private sector actors in Europe and the rest of the world can take action. The programme focuses on four priority areas: climate change, nature and biodiversity, environment and health and quality of life, and natural resources and waste. It is underpinned by the preparation of seven thematic strategies covering: soil protection; protection of the marine environment; sustainable use of pesticides; air pollution; urban environment; sustainable use and management of resources; and, waste prevention and recycling.

Two of the four priority areas — climate change and nature and biodiversity — are covered by separate chapters in Part A of this report. The other priority areas are addressed in several chapters, reflecting the more cross-cutting character of these issues. Part A also includes chapters on some of the thematic strategy areas, notably air pollution, marine environment and soils. Aspects relevant to the remaining thematic strategies areas are included in other chapters.

The EU sustainable development strategy requires environmental objectives to be considered alongside their economic and social impacts (and vice-versa) so that integrated policies can be implemented for the benefit of the economy, employment and the environment. The sustainable development strategy provides a longer term perspective than either the 6th EAP or the Lisbon strategy. Part A of this report considers issues relevant to the strategy, namely sustainable production and consumption patterns in the EU and global perspectives.

The Lisbon strategy adopted in 2000 seeks to make the EU 'the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010'. The strategy was reviewed in 2004 and relaunched in 2005 with a strengthened focus on economic growth and employment and 'win-win environmental economic strategies through the development and use of eco-efficient technologies'. This new policy direction offers new opportunities to take forward the development of cleaner environmental technologies.

The final chapter in Part A considers how to contribute to these objectives, while at the same time ensuring that environmental concerns are taken into account. This can be achieved through a combination of increased integration between environmental concerns and sectoral policies, the wider use of market based measures to internalise external costs and improvements in resource productivity supported by eco-efficient technologies.

5 Environmental data: situation and prospects

The quality of this report relies heavily on the quality of the underlying data and information. Since the previous report in 1999, there have been a wide range of initiatives that have improved the quality of environmental data. The EEA has been working with Eionet on a select number of priority data flows across greenhouse gas and air pollution emissions, air quality, water quality, land cover and contaminated soils. Two particularly noteworthy developments are the update of the Corine land cover data set (used extensively in Part A) which was completed in 2005, and the processes underlying the implementation of the EU water framework directive which are driven by the data needs explicitly linked to policy support over the next 10–15 years.

Despite improvements, the quality of environmental data does not match the relatively high quality of

socio-economic data. The reasons for this are several but include the fact that socio-economic data are longer established, they are collected from easier to manage administrative sources, and are often linked to explicit monetary policy decisions, so giving data providers every incentive to report accurately and on time. Environmental data on the other hand are, for the most part, only recently established, based on scientific sources that are often less stable and where funding is uncertain from year to year, and collected often for a purpose — compliance with EU legislation — which differs from that of producing the type of integrated assessment in this report.

Looking ahead there are some key developments in Europe — notably on the development of spatial data and analysis linked to the Infrastructure for Spatial Information in Europe (Inspire) and the Global Monitoring of Environment and Security (GMES) initiatives. If fully and coherently implemented these could deliver substantial improvements in the coverage and quality of environmental data and provide a link to socio-economic developments. GMES also offers the opportunity to improve European scale modelling of environmental phenomena not easily captured by conventional data collection methods.

The EEA will continue to work with Eionet and other partners to improve the quality of environmental data and their integration with socio-economic data sources with the aim of providing a better underlying basis for its next five-year state and outlook report due in 2010.



Executive summary

European improvements, local choices, global impacts

Europeans value their environment — Eurobarometer polls show that a large majority (over 70 %) want decision-makers to give equal weight to environmental, economic and social policies. As individuals, Europeans are prepared to take some environmental action, though they would do more if they had better information on environmental choices that cost little or nothing. They would also do more if they felt confident that their fellow citizens were doing the same.

Over the past 30 years, much has been done to improve Europe's environment. Lead has been eliminated from most petrol. Ozone depleting chlorofluorocarbons (CFCs) have been phased out. Nitrogen oxide emissions from road transport have been reduced by around 90 % compared to what they would have been had catalytic converters not been introduced.

Increasing treatment of urban wastewater is allowing Europe's rivers, lakes and estuaries to recover from pollution. Designation of protected natural areas in the European Union now amounts to 18 % of all the territory, helping to maintain ecosystems and preserve biological diversity. Forests are slightly increasing and in some regions are regenerating at a faster rate than before. These and many other advances translate into benefits for people's health and for their quality of life.

But major challenges remain for the future. The most pressing is climate change whose impacts are already thought to be evident in ever more frequent extreme weather events, regional water shortages and melting polar ice. Other environmental priorities are: air pollution and regulation of chemicals so as to reduce impacts on health and on the environment; the preservation of land as a productive resource and as a reservoir for biodiversity; improving the quality and quantity of freshwater; and ensuring the health of the oceans. Oceans, in particular, are key ecosystems that sustain many of the ecological goods and services on which we depend.

Answers to some of these challenges can be found in increased use of renewable energy resources such as wind and solar power to replace some of the finite non-renewable resources that both developed and emerging economies are competing to exploit.

Many of the environmental problems we currently face are rooted in the way Europe uses its land, and in its economic structure and our ways of life. These are difficult to change. Most notably, there has been a shift in environmental emphasis from production to consumption issues. Better awareness about environmental and health effects would positively impact our daily choices on what to buy, where to live and work, and where and how to travel.

Household expenditure increased by a third in the EU-15 between 1990 and 2002. It is projected to double across the EU-25 by 2030, with major differences between income groups and regions. In an increasingly globalised economy, consumer choices everywhere increasingly impact not just Europe's environment but also many other parts of the world. Better understanding of potential impacts through keener research is needed to help reverse some of the current and future downward trends.

At around five 'global hectares' per person, the 'ecological footprint' of the EU-25 — the estimated land area required to produce the resources we consume and to absorb the wastes we generate — is approximately half that of the United States, but bigger than that of Japan. It is more than double the average for countries like Brazil, China or India. Already, the total global use of natural resources is some 20 % higher than the rate of replacement each year. This has been called, 'living off the capital rather than off the interest'.

Increasing urbanisation, abandoning land

Almost three-quarters of Europe's population live in urban and suburban areas which account for some 10 percent of the total EU land area. This seems manageable, yet the intensity and conflicts over the



multiple uses of land can have repercussions on valuable portions of Europe's territory, far away from where the initial land use is actually taking place.

Recent analysis shows that more than 800 000 additional hectares of naturally productive land were converted into artificial surfaces for homes, offices, shops, factories, and roads, adding 6 % to the continent's urban areas between 1990 and 2000. This is equivalent to three times the area of Luxembourg and represents a significant shrinking of natural capital. The low price of good agricultural land compared with that of already urbanised land is among the key factors influencing this urban expansion.

Tourism, too, keeps growing rapidly, driven in part by cheap prices for air travel and by Europe's increasingly affluent and ageing population. Tourism also contributes to urban sprawl, particularly in the hinterland of coastal agglomerations, such as along the heavily developed Mediterranean coast. Poorly planned tourism development can also increase pressures on areas already experiencing water stress.

As urban areas grow, so their use of land and water from surrounding areas intensifies. This growth impacts key 'services' assumed to be provided free by nature, such as the natural filtration of groundwaters into drinking water aquifers, the preservation of wetlands and of the genetic diversity found in areas of small-scale extensive agriculture. The removal of woodland cover can radically alter rainwater run-off, provoking mudslides and other problems, while increasing the areas at risk from flooding.

Climate change is here

Climate change is underway. Average European temperatures have risen over the past 100 years by 0.95 °C, and are expected to rise by 2–6 °C in this century. In some places, agriculture is likely to benefit from longer growing seasons, but in others, severe water shortages and more severe (and less predictable) weather events will make farming more risky.

Rising sea temperatures and increased nutrients levels bring a greater probability of algal blooms — toxic phytoplankton, harmful both to marine life and humans. Zooplankton — at the bottom of the food-chain — and the fish that rely on them as a main food source tend to follow temperature trends. In fact, some species have already migrated a thousand kilometres north. Land-based animal and plant species are also on the move. For some species migration is unfortunately not an option. Alpine species living at the highest altitudes are running out of options for where to go next.

In response, EU Ministers have agreed to a target to limit the long-term global increase in average temperature to no more than 2 °C above pre-industrial levels. They have also indicated that stabilisation of CO₂ concentrations well below 550 ppm may be needed to achieve this target, requiring cuts in greenhouse gas emissions in developed countries of some 60–80 % by 2050 compared to 1990 levels. In the short term, the EU is broadly on track to meet its Kyoto targets as a result of the EU emissions trading scheme and other measures including the European climate change programme. However, its mid-term goal for 2020 — a 15 to 30 % reduction in greenhouse gas emissions from 1990 levels — will be more difficult to achieve.

EEA scenario studies conclude that the key to a low carbon emissions economy lies primarily with three measures: reducing energy consumption, increasing the share of renewable energy, and improving energy efficiency in power generation and use, notably through further energy conservation measures. The use of renewables for power generation is increasing gradually, while the possibility of increased nuclear power remains an open — and hotly debated — issue in most countries.

Slow progress on energy demand management

Since 2000, improved efficiency in energy generation and declining energy demand from industry have been

offset by rising energy consumption by consumers and the service sector. More electrical appliances are being used in increasing numbers of households. Studies indicate that electrical appliances left on stand-by mode, for example, now account for 3–13 % of household electricity consumption.

By 2030, the demand for energy across Europe is expected to rise by close to 20 %, a much slower rate than foreseen for gross domestic product (GDP), but nonetheless in the wrong direction vis-à-vis the requirements to combat climate change. Cost-effective measures for improving energy efficiency remain underused. More efficient combined heat and power stations could improve energy supply efficiencies. Carbon capture and storage could serve as a transition technology. Efficiency measures for buildings, vehicles and consumer goods stimulated by market-based instruments and regulations would help reduce demand.

In the medium term, sustained investment in renewable energies, energy efficiency and in hydrogen as an energy source could help reduce European dependency on fossil fuels. The latter would especially help the transport sector which is the fastest growing contributor to Europe's growing energy demand and CO₂ emissions. Worryingly, this trend is expected to continue in coming decades. Air travel in particular is expected to double its share of overall transport between 2000 and 2030.

The EU has shown committed leadership by setting ambitious targets and goals for greenhouse gas reductions. It has also accepted that inaction poses too great a risk. Shifting to low-carbon energy sources, as suggested by EEA scenarios, will entail higher energy bills for the consumer. But doing nothing also has a cost, as several studies looking at this issue are beginning to show. One suggests that the 'social costs of carbon' — the costs to global society of every tonne of carbon emitted to the atmosphere — are around EUR 60 per tonne. Other studies suggest much higher costs. Different estimates depend on how long-term impacts on climate, agriculture, air quality, pests, water supplies and diseases are given a monetary value.

These costs can be put into perspective when considering that greenhouse gas emissions in the EU-25 range

from 5 tonnes to 25 tonnes of carbon per person depending on which country you live in (equivalent to EUR 300/person to EUR 1500/person in social costs). This compares with the estimated additional costs of EUR 45/person in 2030 for a low carbon economy: the latter is considerably less expensive.

We are healthier, but exposure to pollutants remain

Europe has made great strides in reducing many forms of air pollution. In particular, it has eliminated smog in many areas and reduced acid rain. However, high concentrations of fine particulates, and ground-level ozone in particular, are still causing health problems in many cities and surrounding areas. Ground-level ozone is also damaging for ecosystem health and for crops across large areas of rural Europe.

Despite reductions in emissions, concentrations of these pollutants remain high, often above existing targets. Exposure to concentrations leads to reduced life expectancy and causes premature death and widespread aggravation to health. The increasing volume of transport, 30 % for freight and 20 % for passengers over the past 10 years, has meant that significant technological improvements have not resulted in much overall reduction in emissions.

Europe loses 200 million working days a year to air pollution-related illness. Moreover, the OECD estimates that 6.4 % of deaths and illnesses in young European children are caused by outdoor pollution. This figure is disproportionately more in the new EU Member States. Analysis underpinning the Thematic Strategy for air pollution published in September 2005 has shown that substantial impacts on people's health and ecosystems will persist even with full implementation of existing legislation.

Improvements in transport technologies, from hybrids to hydrogen fuelled vehicles, all have their parts to play in reducing the exposure. So, too, does urban planning, which could offer integrated transport

approaches as real alternatives to car transport in many urban areas.

Europe's citizens are also exposed to a growing cocktail of chemical pollutants generated from food and modern consumer goods, including furniture, clothing, and household products. Links between chemicals and rising trends in cancers in reproductive organs (testes, prostate and breast cancer) and in childhood leukaemia are being increasingly highlighted. Strong evidence is lacking, but the ubiquitous presence of chemical traces in people's blood samples and in the environment is an obvious cause for concern. Less use of hazardous chemicals in farming and lower residues in consumer products would help reduce the impacts of such chemical mixtures.

Pollution prevention pays off

Great efforts have been made to clean up Europe's wastewater and to reduce water polluting wastes from industry. However, there is still some way to go before the urban wastewater treatment directive is fully implemented. Progress so far has been achieved through capital investments and advanced forms of treatment.

Future trends show that further reductions in wastewater pollution will be achieved especially in the EU-10 Member States, supported by the EU structural and cohesion funds from 2007. Experience of wastewater treatment policies over the past 20 years shows that investments in treatment capacities, combined with realistic economic incentives to reduce pollution at source offers the most cost-effective way to reduce such pollution.

The EU, through such policies as the nitrates directive, has sought to reduce pollution from agriculture. Investments by the water industry continue to ensure the quality of drinking water. However, leaching into Europe's rivers and groundwater continues from the use of organic and mineral fertilisers and pesticides. While it is expected that the use of such chemicals will diminish in the EU-15, the use of mineral fertilisers is expected

to rise by 35 % by 2020 in the EU-10 as agriculture intensifies.

Problems with the quality of Europe's groundwater will remain in many areas as it can take decades for pollutants entering the ground to reach our rivers,



lakes and water supplies. Prevention, through changing farming practices, is more cost-effective than cleaning up, especially in the longer term.

Depleting our natural resources

The state of the world's fish stocks illustrates the dangers of over-using natural resources and damaging the functions of ecosystems. Fish are the last major wild food source. The Food and Agriculture Organization of the United Nations (FAO) estimates that 75 % of the world's fish stocks are over-fished and top level predators such as tuna and sharks are becoming scarcer.

With many of Europe's stocks depleted, the European fishing fleet has moved further afield supported through bilateral agreements and subsidies. These fleets have played a role in 'fishing down the food chain' by removing significant tonnages of top-level species. This has left many commercially important species at risk and the ecosystem structure under threat.

On land, the designation of 18 % of Europe's land area as protected areas under the Natura 2000 network will contribute to securing the health and diversity of its ecosystems. Nevertheless, Europe's landscapes, which are a critical part of its cultural heritage and essential homes for biodiversity, are undergoing widespread and potentially irreversible changes. These changes impact both on species and ecosystem functioning.

The largest losses of habitats and ecosystems for biodiversity across the continent during the 1990s were in heath, scrub and tundra, and wetland mires, bogs and fens. Many of remaining wetlands have been lost to coastal development, mountain reservoirs and river engineering works. Similarly, although more of Europe is tree-covered today than in the recent past, many forests are harvested more intensively than before.

These losses are having an impact on individual species. Despite protection policies as part of the European strategy to conserve its critical wildlife

habitats, many species remain threatened, including 42 % of native mammals, 15 % of birds, 45 % of butterflies, 30 % of amphibians, 45 % of reptiles and 52 % of freshwater fish.

Europe's soil is uniquely varied, with more than 300 major soil types found across the continent. Lost soil may eventually be replaced through natural processes but it can take as much as 50 years to produce just a few centimetres of new soil. Soil should be regarded as a non-renewable resource. There are many threats to soil – erosion, sealing, contamination, salinisation. These have proven difficult to tackle up to now and are expected to continue to be a challenge in line with expected future developments in Europe in urbanisation, intensive agriculture and industrialisation/deindustrialisation.

Across the continent demand for water continues to increase, particularly in the household sector. In the new Member States household water use is expected to rise by 70 % in the coming decade. More water is also being used for the irrigation of food crops, particularly in southern Europe where there are already signs of water stress. Climate change is expected to extend and intensify this problem. The long-term availability of abundant, reliable and clean water supplies will become more important in the context of future land-use planning, especially around the Mediterranean.

During the past decade, Europe has achieved a relative decoupling of economic growth from materials and energy use. Absolute resource use, however, has remained steady. There are large differences between EU countries with materials intensity varying from around 11 kg/euro of GDP to less than 1 kg/euro. These differences can in part be explained by the balance of economic activity between industry and services. Nonetheless, resource and energy productivity in western Europe is, on average, four times higher than in the new EU Member States. This provides substantial opportunities to achieve greater balance in resource productivity between the EU-15 and EU-10 through technology transfer and other measures.



Integration, innovation and market reform

The EU's successful environmental policies over the past 30 years have largely concentrated on easily visible point sources. These problems have been dealt with mainly by regulation and technological innovations. The challenge now is to develop and implement long-term policies for those economic sectors that contribute most to diffuse sources of pollution.

Significant progress is likely to take several decades of coherent, long-term yet flexible, policy-making that has the broad support of citizens. This means that public information-provision and awareness-raising measures will be increasingly essential for effective policy-making.

Effective policies will also need to encourage behavioural changes amongst Europe's consumers as well as to focus, in particular, the transport, energy and agricultural sectors on less environmentally damaging activities. Long-term institutional reform and financial planning that encourages greater eco-efficiency can help promote such activities. These could be supplemented by the use of market-based instruments. For example, a move away from environmentally damaging subsidies towards supporting the development and use of eco-innovations in manufacturing, energy transport and agriculture could greatly help the transition towards more sustainable economic activities.

Many EU policies already include environmental objectives and substantial budgets are being deployed to encourage actions and behaviour in line with environmental goals, for example under the Common Agricultural Policy. Nevertheless, given the broad nature of changes arising from land use, Europe could benefit from increased cooperation across sectors to tackle a balanced territorial cohesion, for example between regional urban and transport planning and the use of EU structural and cohesion funds.

The transport sector provides a good test case for underlining the benefits of more integrated approaches.

For this sector, we see a myriad of inter-linked driving forces and pressures that impact the environment. On the one hand, the sector has achieved substantial reductions in emissions of air pollutants such as ozone precursors and acidifying substances. On the other hand, however, emissions of greenhouse gases continue to rise as the demands for transport (freight and passenger) outstrip improvements made in energy-related emissions through technological improvements and stricter regulations.

In line with urban development, transport infrastructure has a threefold impact on land. It contributes to the consumption of good agricultural land, the sealing of soil at increasing rates and the fragmentation of habitats across the European Union. Furthermore, it exposes an extensive part of the population to high noise-levels.

Our increased appetite for mobility by road and by air has resulted in transport issues rising to the top of the environmental/sustainability agenda from city level to world governance. This reflects the wide range of challenges surrounding transport from local concerns (urban planning and design) to global ones (greenhouse gases and climate change).

More integrated long-term actions have delivered substantial benefits. Taxation on petrol illustrates the effectiveness of long-term shifts in economic incentives via market-based instruments. American and European vehicle technologies are basically the same. Nevertheless, European fuel taxes of around 50 % have stimulated changes in consumer behaviour.

Together with political pressure to use technologies, these factors have made new European cars almost twice as fuel-efficient in recent decades as their American counterparts, where fuel taxation is much lower. Studies suggest that considerable savings in energy intensity could be made by similar approaches to energy pricing.

What we can do

Tax reform can contribute to a more sustainable, healthy environment. A gradual shift of the tax base away from taxing 'good resources' such as investment and labour, towards taxing 'bad resources' such as pollution and inefficient use, would also help to internalise environmental costs into service and product prices. This would in turn create more realistic market price signals.

Policy-makers could also design flanking measures to ensure that environmental taxes are not socially inequitable. Poorer members of society generally spend a greater proportion of their income on basic needs such as food, water and energy. Studies have found that particularly taxes on electricity fall on the poor, while transport taxes are relatively benign for the poor who have less access to private transport. Pollution taxes are generally neutral in their impact across social groups.

Policies that derive more revenues from consumption, and less from labour, can also provide a wider and expanding tax-base as a response to both the declining workforce and an ageing society.

The seven thematic strategies being developed under the 6th environment action programme, along with sector integration policies, and the EU's sustainable development strategy, all encourage long-term planning.

Long-term coherent policies can encourage the re-structuring of incentives from financial instruments such as market prices and taxes that will be necessary to reduce the rising and increasingly evident costs of using the planet's natural resources. The resulting gains in eco-efficiency could also help improve the competitiveness of the European economy. Better energy and resource productivity in Europe could also help partly offset other competitive advantages enjoyed by the emerging economies of Asia and South America.

Nevertheless, there are substantial barriers to effective and efficient implementation of policies at all levels of governance in the EU. EEA studies indicate that the institutional set-up can be as important as the design of the policy itself.

Public support for the environmental gains achieved over the past decades is reflected in the findings of the Eurobarometer 2005 survey, which also suggests that European citizens are prepared to do more. This report demonstrates that more does indeed need to be done by both governments and citizens in order to bring economic development into line with the Earth's carrying capacities.

Europe is well placed to lead the way by creating a smarter, cleaner, more competitive and more secure European society. Such advances would encourage improvements in global eco-efficiency and equity that ultimately secure Europe's quality of life.

