

THE EUROPEAN ENVIRONMENT

STATE AND OUTLOOK 2010

SYNTHESIS

European Environment Agency 

SOER 2010

STATE OF THE ENVIRONMENT REPORT 2010

Large results

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Key messages

Environmental policy in the European Union and its neighbours has developed substantial improvements to the state of the environment. However, major environmental challenges remain which will have significant consequences for Europe's future well-being.

What differs in 2010, compared to previous EU Environment reports?

- State and trends analysis, an enhanced understanding of the links between environmental challenges imposed with unprecedented global megatrends. This has allowed a deeper appreciation of the links made between risks and vulnerabilities which threaten ecosystem security, and strengthened the assessment of governance.

The prospects for Europe's environment are mixed but there are opportunities to make the environment more robust to future risks and changes. These include improved environmental information systems and business engagement, ready-to-implement measures, methods and a renewed commitment to the underlying principles of prevention and protection, including design at source and pathway maps. These encouraging findings are supported by the following 10 key messages:

- **Continuing degradation of Europe's stocks of natural capital and flows of ecosystem services will sufficiently undermine Europe's economy and social cohesion.** Most of the negative changes are driven by growing use of natural resources to satisfy production and consumption patterns. This results in significant environmental impacts to nature and humans.
- **Climate change – the EU has reduced its greenhouse gas emissions and is on track to meet its Kyoto Protocol climate targets. However, global and transboundary greenhouse gas emissions are still rising rapidly to keep average world temperature increases below 2°C. Climate action is needed to mitigate the effects of climate change and put in place adaptation strategies to increase Europe's resilience.**

Human and biodiversity – Europe has established an extensive network of protected areas and programmes to reverse the loss of red-listed species. However, widespread alienation, encroachment, degradation of ecosystems and loss of renewable capital mean that the EU will not meet its target of halting biodiversity loss by 2010. To improve the situation we must prioritise biodiversity and ecosystems in policy-making at all scales, particularly addressing agriculture, fisheries, regional development, biomass and spatial planning.

Natural resources and waste – Environmental regulation and innovation have increased resource efficiency through a number of disrupting of resource use, emissions and waste generation from economic growth in most areas. However, double-disrupting remains a challenge, especially for innovation. Other incentives will be needed to shift production processes further, but also to alter consumption patterns to reduce environmental pressure.

Healthcare, health and quality of life – Older and ill populations have declined but need enough to ensure good ecological quality in all water bodies or to ensure good air quality in all urban areas. Water-quality protection is unlikely to be fully met over decades rather than years. Thus management choices and trade-offs may have wider European effects. Future significant consequences and potential risks for the resilience and sustainability divide of these populations and society. Better knowledge of the linkages and associated uncertainties will be essential.

Risks between the state of Europe's environment and various global megatrends basic increasing systemic risks. Many key drivers of change are highly interdependent and likely to continue over decades rather than years. Thus management choices and trade-offs may have wider European effects. Future significant consequences and potential risks for the resilience and sustainability divide of these populations and society. Better knowledge of the linkages and associated uncertainties will be essential.

The concept of sustainable capital and environmental services is a compelling integrating concept for linking with environmental processes, from multiple sectors. Spatial planning, ecosystem modelling and valuation among others.

A robust improvement at all scales can help to achieve the need to manage natural capital and use it to fuel the economy. A socio-economic approach that sees a world also presents a framework for assessing progress across broader environmental outcomes, including multiple policy targets.

- **Increased resource efficiency and security can be achieved, for example, using extended life-cycle approaches to reflect the environmental impacts of products and services. This can reduce Europe's dependence on resources globally and promote innovation. Using this better full account of resource use impacts will help households, business and consumers behaviour towards options to different outcomes. Learning to invest resources according to their resource needs and environmental processes would improve coherence, address shared challenges, including economic and social benefits and help avoid unintended consequences.**
- **Implementing environmental policies and using existing environmental governance will continue to provide benefits. If other implementation of environmental and environmental policies will help ensure that goals are achieved and provide regulators stability for business. A broader commitment to environmental monitoring and up-to-date reporting of environmental policies and work, using the best available information and technologies, will assist environmental processes more effectively. This includes making long-term remediation even through early action.**
- **This transition towards a green European economy will ensure the long-term well-being of our citizens, of the planet and its implementation. In this context, stakeholders, civil society and its corporate, government, business and research could participate more widely in managing natural capital and ecosystem services, creating new and innovative ways to use resources efficiently and developing equitable fiscal policies. Using incentives and market-based measures, citizens can help support tracking progress, from an operating the 2020 climate target.**

The need for nature to fulfil well the task ahead is to help these take root and flourish.



1 The state of the environment in Europe

European policies facilitate an efficient capital and ecosystems at home and abroad

The Europe addressed in this report is home to around 500 million people and covers about 5.6 million km². The biggest share of both populations and land area are in the European Union (EU) – around 450 million km² and close to 500 million people. With an average of 100 people per km², Europe is one of the most densely populated regions of the world; some 75 % of the total population lives in urban areas (1).

Europe depends heavily on the stocks of natural capital and flows of ecosystem services that it exports and imports from its borders. Two fundamental questions arise from this dependency: does the stock and flow have been used sustainably to supply economic demands such as food, water, energy, materials, as well as climate and flood regulation? And today's environmental pressures, like, water, soil, forest, biodiversity, are strong enough to enable a modern people and economy to grow healthily in the future?

Access to reliable up-to-date information about the environment provides a basis for action.

To ensure such policies, citizens and policy-makers require accurate, relevant, reliable, and legitimate information. According to current policy, progress concerning the state of the environment and providing more information on environmental trends and processes is one of the most effective ways of tackling environmental problems, along with fines and strong enforcement (2).

The role of the European Environment Agency (EEA) is to provide such timely, targeted, relevant and reliable information so that it is easier to support sustainable development and help achieve significant and sustained improvements in Europe's environment (3). A further requirement is that the EEA provides:

(1) The Eurostat - Environment - State and Outlook 2010

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Figure 1.1 Structure of The European environment – State and Outlook 2010 (EEA 2010) (4)



Note: For additional information, please visit www.eea.europa.eu.

Source: EEA.

A regular assessment of the state and outlook for the environment in Europe: this report is the fourth in the series (4, 5, 6, 7).

The European environment – State and Outlook 2010 (7) provides an account of the most up-to-date information and data from 30 EU member countries and the remaining countries in the European Union. It also addresses four regional seas: the North-East Atlantic, Baltic, Mediterranean and Black Sea.

Using a European-level report, it complements national-level reports of environmental experts across Europe (8). Its aim is to prevent analysis and analysis into the state of, trends in, and prospects for Europe, plus an analysis of where gaps in knowledge and uncertainty exist in order to enhance discussions and decisions about critical policies and research areas.

Renewing the state of the environment in Europe – reports, considerable progress, but challenges remain

Globally there are encouraging trends in the environmental use of the planet. European greenhouse gas emissions are decreasing, the share of renewable energy sources across Europe is rising and water pollution indicators show significant improvements across Europe, although this has not yet necessarily resulted in good air and water quality, and acidification and water eutrophication, although still remaining, are growing at a slower rate than the economy.

In some areas, environmental targets have not been achieved. The target of halving biodiversity loss in Europe by 2010, for example, will not be reached, although large areas across Europe have been designated as protected areas under the EU Habitats and Birds Directives (9). Likewise, the overarching target to limit climate change to temperature increases below 2 °C globally during the century is unlikely to be met, in part because of greenhouse gas emissions from other parts of the world.

An indicative summary table of the main trends and progress over the past ten years since 2000 policy targets have been set out in the EU's mid-term picture. Only some indicators are included in this figure.

Table 1.2 Which countries and regions show this type of trend?

Region	State report	Outlook	Description
EU member countries (EU-27)	EEA 2010	EEA 2010	Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom
		EEA 2010	Belarus, Cyprus, Greece, Hungary, Latvia, Lithuania, Malta, Montenegro, Poland, Romania, Serbia, Turkey, Ukraine
EU candidate countries			Bosnia and Herzegovina, Serbia, Montenegro
European Free Trade Association (EFTA)			Iceland, Liechtenstein, Norway, Switzerland
EUROSTAT	EU-27	EU-27	Central and Eastern Europe, Russia, Turkey, Ukraine
Candidate countries (EU-10)	EEA 2010	EEA 2010	Bulgaria, Croatia, Greece, Hungary, Malta, Poland, Romania, Serbia, Slovakia, Slovenia, Turkey
EUROSTAT	EU-27	EU-27	Central and Eastern Europe, Russia, Turkey, Ukraine
EUROSTAT	EU-27	EU-27	Bulgaria, Croatia, Greece, Hungary, Malta, Poland, Romania, Serbia, Slovakia, Slovenia, Turkey

Note: EEA 2010 = fifth member countries (EU-10) + the remaining countries (EU-15 member states).

The projected results for the groups above are based on current policy projections for 2010, unless otherwise mentioned.

The EU-27 projection is prioritised to participation within the EU-27 and excludes EU-10 members, whose policies are not clearly highlighted in this report.

including the most detailed analysis that follows show that in some areas, such as ozone and greenhouse gas emissions, there are substantial differences by economic sector and country.

Several key environmental issues are not shown in this summary table, either because they lack specific targets or because it is unlikely to measure progress against more recently agreed targets. Such issues include, for example, in some countries and economic sub-sectors, marine and terrestrial biodiversity, many air, however, considered in subsequent chapters of this report and the results from their analyses have contributed to the conclusions of this report.

The overall emerging pattern of progress towards meeting environmental targets, reflects the findings of previous European State of the Environment reports, namely that there have been considerable improvements in energy, water, and a number of other policy-making processes. This picture is also reflected in recent global Environment Agency's review by the European Commission in which up to two-thirds of the 30 environmental indicators selected show a good performance or improving trend, while the remaining point to either good performance or limited progress. See Annex A for a detailed report (EPA 2010).

Links between environmental pressures, policy, and environmental impacts in Europe

This chapter describes the state of key trends in the environment in Europe as well as prospects for the future along a central thread of interconnection and tension. Climate change, pollution and biodiversity, natural resources and society, and environment health and quality of life, can all be seen as interconnected elements at play across all four of the priorities of recent European strategic policies for Sustainable Development (SD), and thereby help to create a direct link with the European policy instruments.

The analysis prior to the last section underlines the need for a participative and iterative approach to challenges. As changing in Europe can truly be seen as fast-paced, complex and unpredictable, rather than the challenges are increasingly broad, changing and complex, perhaps a steady

Table 1.2 Indicators showing trends of progress towards meeting environmental targets or objectives, and highlights of related trends over the past 20 years (2001)

Environmental issue	EU-27 target/objective	EU-27 —> target	EU-28 —> target
Global climate change			
Global mean temperature	To limit increases to below +2°C	+1.7	+1.6
GHG emissions	To reduce greenhouse gas emissions by 20% by 2020 vs 1990 levels	+0.5	+0.5
Greenhouse gas intensity	To halve greenhouse gas intensity by 20% by 2020 vs 1990 levels	+0.5	+0.5
Renewable energy source	To increase renewable energy consumption by 20% by 2020 vs 2005	+0.5	+0.5
Environment and society			
Climate change adaptation	To build climate-resilient societies and ecosystems	+0	+0
Ozone depletion	To end ozone depletion by 2050	+0	+0
Consumption trends	To increase consumption patterns towards sustainable development	+0.5	+0.5
Green GPP (GDP) per capita	GDP/Capita (EU-27)	+0.5	+0.5
Biodiversity	To halt biodiversity loss by 2010	+0.5 (EU-27)	+0.5 (EU-28)
Demographic, resource, energy, food and fisheries	+0 (EU-27)	+0 (EU-28)	+0 (EU-28)
Soil degradation	To reduce further soil degradation and prevent its function	+0.5	+0.5
Global environment			
Desertsification	Global desertification	+0	+0
Desertification and desertification-related desertification	From aridification to desertification	+0	+0
Marine biodiversity	To maintain marine biodiversity patterns	+0.5	+0.5
Wetland management	Global wetland area	+0	+0
Water stress	Global water stress	+0	+0
Water reuse	To achieve good efficiency levels of water reuse	+0	+0

Table 1.3 Indicators showing trends of progress towards meeting environmental targets or objectives, and highlights of related trends over the past 20 years (2001)

Environmental issue	EU-27 target/objective	EU-27 —> target	EU-28 —> target
Global climate change			
GHG emissions	To reduce greenhouse gas emissions by 20% by 2020 vs 1990 levels	+0	+0
Greenhouse gas intensity	To reduce greenhouse gas intensity by 20% by 2020 vs 1990 levels	+0	+0
Pollution	To reduce ambient air concentrations of PM10, NO2, SO2, O3 and CO	+0	+0
Water, land and ecosystems, food security, water scarcity	To reduce ambient air concentrations of PM10, NO2, SO2, O3 and CO	+0	+0
Transboundary air pollution (SO2, NOx, CO, O3, PM10, PM2.5, CO2)	To limit emissions of sulfur dioxide, nitrogen dioxide, ozone, particulate matter and carbon dioxide	+0	+0
Water use	To reduce water use	+0	+0
Soil use and water reuse	To reduce water use	+0	+0
Terrestrial biodiversity	To halt biodiversity loss	+0	+0
Marine biodiversity	To maintain marine biodiversity patterns	+0.5	+0.5
Wetland management	Global wetland area	+0	+0
Wetland degradation	Global wetland area	+0	+0
Environment and society			
Demographic trend	Stable	+0.5 (EU-27)	+0.5 (EU-28)
Population trend	Increasing trend	+0.5 (EU-27)	+0.5 (EU-28)
EU-27	More people	+0.5 (EU-27)	+0.5 (EU-28)
Demographic trend (EU-28)	Less people	+0.5 (EU-28)	+0.5 (EU-28)
EU-27	More people	+0.5 (EU-27)	+0.5 (EU-28)
Global environment			
Desertsification	Global desertification	+0	+0
Desertification and desertification-related desertification	From aridification to desertification	+0	+0
Marine biodiversity	To maintain marine biodiversity patterns	+0.5	+0.5
Wetland management	Global wetland area	+0	+0

of linked and interconnected functions provided by distinct natural and social systems. This does not imply that the environment remains static whilst, ranging in the previous century, such a move to more greenhouse-gas intensive or more biodiversity-rich, are no longer imagined. Rather, it points to trends of increased degrees of complexity in the way we understand and respond to environmental challenges.

The report used to analyse across various dimensions any changes in the magnitude of the coupling links between environmental issues. It shows in the following a short analysis of the links between different environmental challenges, as well as between environmental and societal trends and their respective policies. For example, reducing the rate of climate change requires not only the reduction of greenhouse gas emissions from power plants, but also the reduction of man-made sources from transport and agriculture as well as changes in household consumption patterns.

Taken together, trends in Europe and globally point to a series of related environmental links, such as the impacts from damage to one system, rather than a single system, which can be made worse by the many couplings between them. Systemic risks triggered by sudden events, such as野火野火, with the impact being large and possibly catastrophic.

A second underlying development is Europe's increasing display key characteristics of systemic risk:

- many of Europe's environmental issues, such as climate change or biodiversity loss, are linked and have a complex and often global character;
- they are closely linked to other challenges, such as socio-economic issues, that span the societal and economic spheres and underpin important world issues;
- an environmental challenge may have cross-boundary and trans-national links and could result in a range of negative outcomes.

Table 1.3 Evolution of environmental issues and challenges

On the agenda since	Current status	Background and context	Issues and challenges	Environment at risk
1970s (mid-twenties)	EU and international agreements	Project white paper published in 1990 and subsequent negotiations with the European Commission and Member States.	EU environmental legislation and international agreements such as the Buenos Aires Convention and the Montevideo Protocol.	Global environmental problems such as climate change, biodiversity loss and desertification.
1980s (mid-thirties)	Policy processes such as the Agenda 21 and the Earth Summit and the Biosphere Reserves programme.	Biosphere reserves announced by the UK Government in 1983. The UK Government published the Biosphere Reserves Programme in 1995.	Europe white paper published in 1992 and subsequent negotiations with the European Commission and Member States.	Global environmental problems such as climate change, biodiversity loss and desertification.
2000s (mid-forties)	Incident responses such as the Bhopal disaster and the events of 9/11 where global terrorism and security became issues.	Project white paper published in 1990 and subsequent negotiations with the European Commission and Member States.	Europe white paper published in 1992 and subsequent negotiations with the European Commission and Member States.	Global environmental problems such as climate change, biodiversity loss and desertification.

Source: SEPA.

The report does not present an analysis of historical and recent collapse. However, Policy note 7 states local and global thresholds are being crossed, and that neither environmental trends could lead to dramatic and sustainable change to some or the many other and services that we take for granted. In other words, the current environmental trajectory of concern over the past few decades is advancing towards a point where it may severely undermine our ability to deal with potential future negative impacts.

Assessing at this state of the environment and future challenges from different perspectives:

Subsequent chapters assess, in more detail, key trends in the three environmental priority areas already mentioned.

Chapter 2 provides an assessment of the state of, trends in and prospects for each of these areas.

Chapter 4 reflects on the scope, direct and indirect environmental impact from the provision of natural capital and ecosystem services, focusing on land, soil and water resources.

Chapter 7 uses evidence base by looking out to the rest of the world to focus on key socio-economic and environmental megatrends that can be expected to affect Chapter 1 assessments.

The final chapter, Chapter 8, reflects on the findings of the previous chapters and their implications for future environmental practice. To do this through an additional series of themes, the lens of managing natural capital and ecosystem services, the lens of a green economy, the lens of integrated, integrated policies and the lens of the public administration sector, and concludes that:

- better implementation and further recognition of environmental performance principles and processes;
- continued engagement of natural capital and ecosystem services outcomes.

- more integrated自然资本政策决策 can help deliver growth in environmental outcomes with confidence in the wider economy;
- sustainable natural capital stewardship requires a broader, more holistic, more focused natural resource management approach.



2 Climate change

Climate change could lead to catastrophic impacts if unchecked

While the planet's climate has been in relatively stable for the past 12 000 years, providing a backdrop for the development of human civilisation, there are now clear signs that this stability is changing.¹ This is widely recognised as one of the most pressing challenges facing countries, communities and the global environment. Concentrations of greenhouse gases (GHGs) have steadily increased since pre-industrial times, with levels of carbon dioxide (CO₂) for example having risen by 30% over 100 years. The concentration of atmospheric CO₂ has increased from a pre-industrial level of about 280 ppm to more than 380 ppm in 2008.²

Increase in GHG emissions are largely due to the use of fossil fuels, although deforestation, land-use change and agriculture also contribute significantly to smaller contributions. As a consequence, the average global air temperature in 2007 had risen by 0.7 m^oC, since pre-industrial times.³ Indeed, the Intergovernmental Panel on Climate Change (IPCC) concluded that global warming since the middle of the 20th century is very likely to have been due to human influence.⁴

In addition, bed estimates of future projections suggest global mean temperatures could rise by as much as 1.5 to 4^oC – or 0.3 to 1.2^oC, taking into account the full uncertainty range – over the course of this century, given access to just 2000 additional years' population.⁵ Recent observations give reason to believe that the rate of growth of GHG emissions and many climate impacts are approaching the upper boundary of the IPCC range of projections rather than the lower limit.⁶

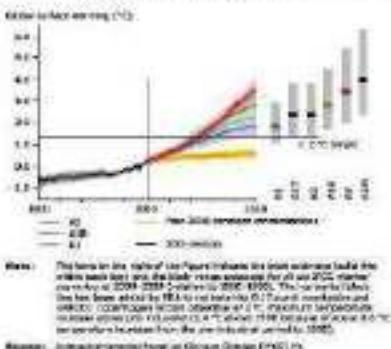
Changes in climate and temperature can have a wide range of potential impacts. Already over the last three decades, warming has had noticeable influence at the global scale on observed changes in many human and natural systems.

¹The Copenhagen Consensus | State and Growth 2008 | 15

Increasing shifts in precipitation patterns, rising global sea-level, the retreat of glaciers and declines in the extent of Arctic sea ice coverage. Furthermore, numerous natural systems have changed, especially in recent decades.⁷

Other consequences of changing climate conditions include increases in global mean coastal temperatures, widespread melting of snow and ice sheets, increased flood risk for urban areas and increasing ocean acidification, and a range of economic effects including crop losses. The impacts of climate change are expected to be felt at all regions of the planet, and it spans no exception. Unless action is taken, climate changes are expected to lead to considerable adverse impacts.

Figure 2.1. Past and projected global surface temperature change relative to 1980–1999. Based on world-wide averages for selected 1900 scenarios



Note: The bars in the original bar chart indicate the latest estimates for each scenario available (the year marks last, and the blue arrow indicates the year 2008, marked 'Year of 2008' between 2008–2099). The red arrow indicates the bars have been added by EPA and include RCP2.6 (which corresponds to the RCP2.6 scenario used in the 2007 AR4 report), RCP4.5, RCP6.0, RCP8.5, and RCP2.6 (which corresponds to the RCP2.6 scenario used in the 2007 AR4 report).

Source: Intergovernmental Panel on Climate Change (IPCC) 2007.

²The Copenhagen Consensus | State and Growth 2008 | 15

³The Copenhagen Consensus | State and Growth 2008 | 15

In addition, with increasing global temperatures, there is an increasing risk of passing tipping points that may trigger large-scale,不可逆的 changes (Chapter 7).

Europe's contribution to the total global mean temperature increase is below 2^oC

During the political discussions on how to limit dangerous anthropogenic interference with the climate system in the Intergovernmental Panel on Climate Change (IPCC) reports, governments have agreed to stabilise concentrations of global climate-warming, short-lived greenhouse gases, atmospheric CO₂ concentration, and applying reduction of global climate sensitivity, thus avoiding target can be translated into limiting atmospheric CO₂ concentrations to around 450–490 ppm CO₂ equivalent by 2050 (the RCP4.5 scenario is excluded, a level of 490–495 ppm CO₂ equivalent is often cited).⁸

At sufficient levels, atmospheric CO₂ concentrations are already close to this level and are currently increasing by about 2 ppm per decade.⁹ Thus, to achieve the below 2^oC target, global CO₂ emissions would need to level off in the present decade and be reduced significantly thereafter.¹⁰ In the long run, reaching the target is likely to require global cuts of around 50% compared to 1990 levels by 2050 (Figure 2.2). For the EU-27 and other industrialised countries this translates to reductions of 25–40% by 2020 and 40–55% by 2050 – if developing countries also reduce their emissions substantially compared to their respective historic annual emission projections.

However, even a 2^oC guidance provides no guarantee for avoiding all adverse climate change impacts and stayed to uncertainties. The United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties held in Copenhagen in 2009 established the Copenhagen Accord, which calls for an assessment of its implementation by 2010. This does not guarantee a 2^oC projection of atmospheric warming over the next 100 years (representing certain policy pathways by the authors, including no reduction in greenhouse gas of 2.0^oC).

The EU has been reducing its greenhouse gas emissions, and will meet its Kyoto obligations

Meeting the target of reducing global greenhouse gas emissions by 20% by 2020 requires a concerted global effort – including for the industrialised countries, which in 2008, the EU-27 was responsible for between 11 and 12% of global GHG emissions¹¹ – while being home to 15% of the world's population. According to current projections taking into account population growth and economic development worldwide, Europe's percentage contribution will decrease, as emissions in emerging economies continue to increase.¹²

Annual emissions of GHG to the EU in 2008 amounted to around 19 tonnes of CO₂ equivalent per person.¹³ In terms of total emissions, the EU is third place behind China and the USA.¹⁴ Nevertheless, the EU's 2010 GHG emissions relative to 1990 are declining sharply – measured on gross domestic product (GDP) – in the EU, industrial output decoupling emissions from economic development even more. Between 1990 and 2007, emissions per unit of GDP decreased in the EU-27 by more than a third (%).

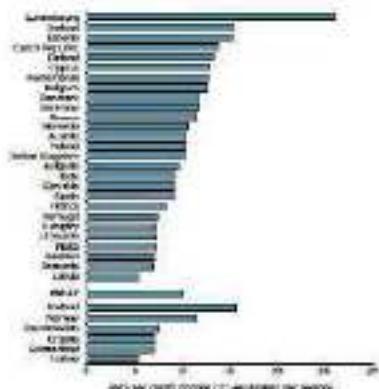
However, it should be noted that these emission figures only represent what is emitted within the EU territory, calculated according to agreed international guidelines under UNFCCC. The gap contributes to global emissions could be greater if European imports of products and services, with their embedded carbon, are taken into account.

Current emission data confirm that the EU-27 Member States are on track to meet their target of cutting emissions by 8% compared to baseline levels – 2005 for most countries – during the first commitment period under the Kyoto Protocol (from 2008 to 2012). Reductions in the EU-27 have been stronger than in the EU-15, despite a 20% increase in GHG emissions and by approximately 11% between 1990 and 2005 (%).

It is important, noting that the Kyoto-Protocol counts reference year 2005 as the base year. Many of the reductions committed under the Kyoto Protocol, such as decommissioning nuclear power plants, are also power GHGs. The phasing out of climate-changing climate-depleting

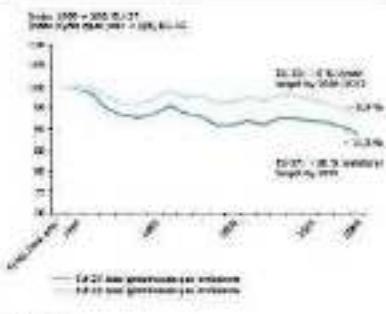
substances (ODS) under the Montreal Protocol has contributed, indirectly, to a very significant decrease in GHG emissions. The ban on almost ODS emissions globally is never due to the reduction expected through measures taken at the international climate Treaty by the end of 2011 (%)

Figure 2.2 Greenhouse gas emissions attributed to human GHG emissions per capita by country in 2008



Source: IEA.

Figure 2.3 Emissions GHG emissions in EU-15 and EU-27 between 1990 and 2008 (%)



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A closer look at key cultural greenhouse gas emissions results – a closer look

The main sources of non-climate policy related greenhouse gas emissions of food production, transport, industry and households – which together account for about two thirds of total global emissions. Other sources include deforestation – which contributes about a fifth – agriculture, land filling of waste, and the use of industrial manufactured gases. Overall, in the car, energy consumption – power and heat generation and consumption in industry, transport and households – accounts for nearly 10 % of GHG emissions (%).

Historical trends of GHG emissions in the EU over the past 20 years are the result of two sets of opposing factors (%).

On the one hand, emissions have been decreased by a series of factors, such as:

- increases in the production of electricity and heat by thermal plants, which has increased both its efficiency and its coupling with other sectors;
- economic growth in manufacturing industries;
- increasing transport demand for passengers and freight;
- increasing share of road transport compared with other transport modes;
- increasing number of households;
- and demographic changes over the past decades.

On the other hand, emissions have been also increased in the same period by factors such as:

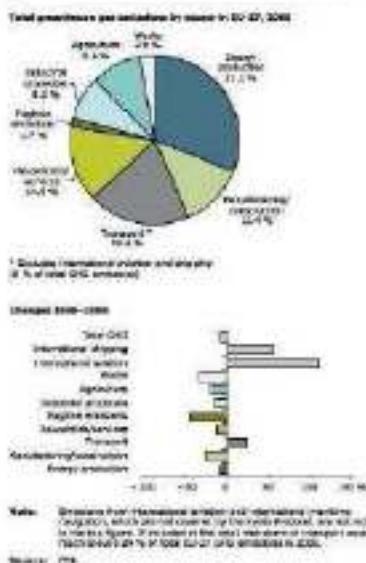
- improvements in energy efficiency, in particular by industrial units and the energy industry;
- fuel efficiency improvements in vehicles;
- better waste management and improved waste gas recovery (the waste sector achieved the highest relative reductions);
- decreases in emissions from agriculture by more than 20 % since 1990;
- a shift away from less polluting fuels, particularly gas and biomass, for the production of electricity and heat;
- and partly due to the economic restructuring in eastern Member States in the early 1990s.

EU GHG emissions levels between 2000 and 2008 were dominated by the two largest emitters, Germany and the United Kingdom, which together were responsible for more than half of the total emissions in the EU. Industrial emissions were also substantial in some EU-15 Member States, such as Bulgaria, Czech Republic, Poland and Romania. The overall emissions were rapidly rising in new member states (Spain and, to a lesser extent, Italy, Greece and Portugal (%).

The overall trends are influenced by the fact that, in many cases, emissions from large point sources have been reduced, while at the same time emissions from road vehicles and other diffuse sources, especially those transport-related, have increased considerably.

In particular, transport GHG emissions – predominantly road traffic, Transport emissions of GHG increased by 34 % between 1990 and 2008 in the EU-15, involving emissions from road transport and marine transport (%), while rail transport and inland waterways and aviation in road traffic, the number of cars in the EU-27 increased by 22 %, by 42 million cars, between 1990 and 2008 (%).

Figure 2.4 Greenhouse gas emissions in the EU-27 by sector in 2008, and change between 2000 and 2008



Note: Emissions from international shipping and aviation are included in the EU-27, while emissions from maritime fisheries are included in Member States. Figures for the rest of non-market transport were available only for 2000, 2002 and 2006.

Source: EEA.

Box 2.4 Towards a resource-efficient transport system

The reduction in greenhouse gas emissions in the transport sector – as well as various other environmental impacts of transport – needs to be much steeper than projected growth.

The 2008 Annual Progress and Environment Reporting Mechanism (C7/08) report describes the progress and effectiveness of efforts to integrate environmental considerations throughout the EU's transport policy framework (EU 2008).

- In 2008, the EU-27 reached its target of 10% lower greenhouse gas emissions from road transport than projected in 1990-2004 by 2008. In addition, between 1990 and 2007, the share of oil and natural gas in road transport fuel increased from 50% to 55%.
- Road transport continued to grow 1.6% a year since 1990, however, oil demand fell in the EU member states. Member states increased 10% between 2000 and 2007. Oil imports fell by 10% over the same period, accounting for 40% of oil consumption.

• Greenhouse gas emissions from aviation, maritime transport and inland waterway transport grew by 5% to between 1990 and 2007, in each case rising 0.4% to 0.5% annually. In contrast, inland waterway transport fell by 10%.

- In the European Union, only Germany and Slovakia are on track to meet their Kyoto Protocol targets for greenhouse gas emissions, while the European Union as a whole is not.
- Despite falling emissions in air transport and shipping, road transport has the largest share of nitrogen oxide and the second largest contribution to climate forcing (EU-27 total in 2007 was 40 Gt CO₂ equivalent).

• Road traffic vehicles remain the largest source of emissions in road transport.

- The number of vehicles required to deliver a tonne-haul, equivalent to a standard 20-tonne truck, fell by 20% between 1990 and 2007.
- The 'Euro 5' standard for new vehicles, which came into effect in January 2009, will further reduce emissions by 20% by 2012.

The 'Euro 6' standard for new vehicles will come into effect in January 2013.

Source: EEA, EC.

Looking ahead to 2020 and beyond: the EU is making some progress

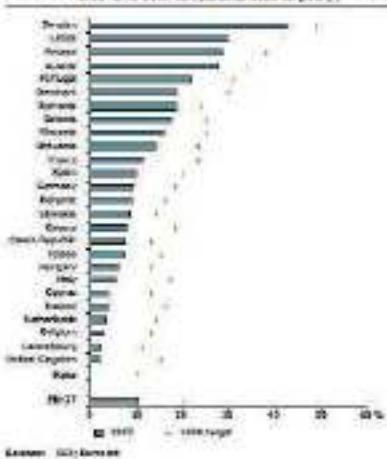
In its climate-energy package (IPCG), the European Commission has set reduction targets by 2020 for the EU-27. Compared to 1990 levels by 2010, Parliament, the EU-27 will need to reduce emissions by 20% by 2020, provided that other developed countries commit themselves to comparable emission reductions and developing countries commit to an agreed trajectory according to their circumstances and respective capabilities. Parliament and the European Council (EU-27) (as well as Member States) have made similar commitments.

Current trends show that the EU-27 is making progress towards its 2020 emissions reduction target. Projections by the European Commission indicate that EU-27 emissions would be 14% below 1990 levels by 2010, taking into account projections of national legislation in place by early 2009. Assuming that the climate and energy package is fully implemented, the EU-27 is expected to reach its 20% GHG reduction target. It is worth noting that part of the additional reductions could be achieved through the use of alternative mechanisms both in the trading and non-trading sectors (IPCG).

Key policy drivers include the expansion and strengthening of the EU Emissions Trading System (ETS), as well as setting Supply Binding Targets for renewable energy at 20% of overall energy consumption, including a 10% share in the transport sector, compared to a total share of less than 5% in 2005 (IPCG). Furthermore, the share of renewable sources in energy production has been increasing, and energy generation using biomass, wind, hydro and solar power is on par with fossil fuels growth worldwide.

Limiting global mean temperature increases to below 2°C is the major focus and continuing goal. GHG emissions 80% or more compared with 1990 by 2050, is generally considered to be beyond what can be achieved with environmental measures undertaken. In addition, climate change is the key concern that can affect energy and how we produce and consume energy whereas grids are likely to be required. Thus, climate adaptation is to be an energy efficiency and resource-use efficiency need to continue as a key component of GHG emissions strategies.

Figure 2.5 Share of renewable energy in final energy consumption in EU-27 in 2007 (converted to 2008 levels (%))



Source: EEA, Eurostat.

In the EU, significant improvements in energy efficiency occurred in all sectors due to technological development and, for example, industrial processes, fuel capture, space heating and electrical appliances. Also, energy efficiency or measures to increase energy efficiency and potential for long-term improvements (%). On average, energy sector applications and smart grids can also fully support the overall efficiency of electricity systems, resulting in long-term savings to be used for programme through rebating peak loads.

Box 2.2 Restructuring energy systems: smart-grids and smart-grids

To ensure the implementation of large-scale smart-grid technologies in the electricity sector, we will have to rethink what may be necessary from a political, technical and economic perspective.

First of all, changes in electricity become more interesting for business than for society. The costs of electricity generation, transmission and distribution are higher than those of gas generation, transmission and distribution. Society has to pay more for electricity than for gas.

Secondly, there is a need to change the focus of the system.

Thirdly, both sides should reassess the importance of a smart-grid. Smart grids can enable consumers of electricity to receive more informed about their consumption choices and incentives that encourage energy efficiency. This kind of system can also assist the deployment of renewable energy and can be used to maximise the availability of energy supply.

Over the long term, rethinking our grids can reduce future investments related to legacy infrastructure in terms:

Source: CEA

Climate change impacts and vulnerabilities differ across regions, sectors and communities

Adaptation costs and actions are already running beyond the purview of national vulnerability with which contingency policies and resources have developed and tested.

The main consequence of climate change expected in Europe include an increased risk of extreme heat waves, droughts, and in biodiversity losses to human health, and damage to economic sectors such as energy, forestry, agriculture, and tourism. In Europe, severe, more frequent and more intense droughts are projected to occur, particularly in southern and eastern Europe, with an increased agricultural production and forestry activities in northern Europe. Projections for climate change suggest that the probability of record droughts for Southern Europe – especially in the Mediterranean – may be increasing over time, although there may be an increase during other seasons. Similarly, projections for increasing extremes in northern Europe may come about. However, over a longer period and with increasing extreme events, adverse effects are likely to dominate in many parts of Europe.

The consequences of climate change are expected to vary extremely across Europe, with greatest impacts reported in the Mediterranean basin, north-western Europe, the Arctic and mountainous regions. For the Mediterranean basin, in particular, increasing water temperatures and decreased rainfall would likely impact irreversibly coastal vulnerability, to drought, loss of fish and biodiversity. Meanwhile, growth in northern Europe, low-lying coastal areas face the challenges of subsidence and an increased risk of associated storm surges. Temperature increases are projected to be greater than average in the Arctic, causing permafrost to melt very rapidly widespread. Additional environmental pressures may result from older events in oil and gas reserves, as well as new shipping routes as ice cover decreases (1).

Moreover, due to the initial challenges in reducing carbon emissions, potential negative impacts on human health and climate adaptation. In addition, potential degradation in mountain regions may reduce infrastructural potential as roads and bridges may not be able to cope. Already today, the majority of glaciars in Europe

disappear and are not yet ... while the arctic solar process is expected to decrease by 20% by 2050. As a result, polar bears feel increasingly forced to flee, where some bear losses and occurrences of polar bear attacks were observed since the 1990's (2). Shifting coastal and river flood-prone areas within Europe are particularly vulnerable to climate change, as well as the most urban areas.

Map 2.3 Key past and projected impacts and effects of climate change for the main biogeographical regions of Europe



Source: EEA, IUCN, NAO, RGI

Climate change is projected to have major impacts on ecosystems, water resources and human health

Climate change is projected to play a significant role in biodiversity loss and pathogen incidence at all. Climate change can impact, for example, on the observed seasonal and spatial distribution shifts of many flora and fauna species. These are projected to move, but, however, to some extent limited movement in the early during the 21st century – which was not always the case. A combination of the rate of climate change and habitat fragmentation, which results from industries such as roads and oil pipelines, is likely to amplify the migration of many plant and animal species, and may lead to species composition changes and a continuing decline in biological diversity.

The timing of seasonal events, physiology for plants and the life cycles of several groups – birds, mammals and insects – often with climate change. Changes in seasonal events, flowering date and ripening of growing seasons are observed and projected. Theology plants have also increased the length of the growing season of certain agricultural crops as certain habitats are now available, decreasing the introduction of new species that were not previously suitable. At the same time, there is often a shortening of the growing season of certain habitats. Such changes in the cycle of agricultural crops are projected to continue – potentially severely impacting agricultural production (1).

Finally, climate change can expected to affect aquatic ecosystems. Warming of marine waters can have several effects on water quality, as there is less oxygen. This includes greater thermal load of effluents to rivers and the increased of invasive species northwards, as well as changes to productivity. Also, with climate adaptation, climate change are likely to affect the geographic distribution of plankton and fish, for example a changed tracking of the species phytoplankton bloom, putting additional pressure on fish stocks and related economic activities.

A number of potential impact of climate change is discussed, with land-use change, and river management practices, in the

interactions of the hydrological cycle – due to changes in temperature, precipitation, glacier and snow cover. In general, annual river flows are decreasing in the north and decreasing in the south, unless it is projected to increase with more-green growing. Large changes in sea-level are also projected, with lower tides in summer and higher tides in winter; as a consequence, droughts and water scarcity are expected to increase especially in southern Europe and particularly in summer. Flood events are projected to occur more frequently at many river basins, particularly in winter and spring, although estimates of changes in flood frequency and magnitude remain uncertain.

While information on the impacts of climate change on soil and the various related livelihoods is very limited, changes in the biophysical nature of soil are likely due to projected rising temperatures, changing precipitation intensity and the frequency and more severe droughts. This has been projected to reduce soil organic carbon stocks by 1–5% and agricultural biomass by 10% (1), whereas projected increased rainfall is projected to reduce soil biodiversity and make soils less susceptible to erosion. Projections show significant reductions in biomass and soil organic matter levels across regions and countries in north eastern Europe (2). Furthermore, prolonged drought periods due to climate change may contribute to soil degradation and increase the risk of desertification in parts of the Mediterranean and eastern Europe. Thence:

Climate change is also projected to increase health risks due to, for example, heat waves and weather-related diseases (see Chapter 3 for further details). This highlights the need for preparedness, emergency-warning and adaptation (3). The affected risks are very dependent on human behaviour and the quality of basic disease control. Furthermore, a number of social and economic decisions will be more water- and food-borne disease outbreaks may become more frequent with rising temperatures and more frequent extreme events (4). Furthermore, there may be some benefits in cold, including fewer deaths from cold, but, however, adapted local residents will be increasingly facing the negative effects of rising temperatures (5).

Dedicated adaptation by Europe is urgently needed to build resilience against climate impacts

Given its impacts and great economic importance, mitigation efforts are the leading climate policy tool, while adaptation measures can also be necessary to deal with the unavoidable impacts of climate change. Adaptation is defined as the adjustment of natural or human systems in order to exploit opportunities or to reduce the effects of climate change or to combat adverse impacts (6).

Adaptation measures include technological solutions ('grey' measures), market-based adaptation options (green measures) and non-market, managerial and policy approaches (blue measures). Practical examples of adaptation measures include early warning systems related to heat waves, drought and water scarcity risk management, water efficient management, crop diversification, coastal and river bank defences, disease risk management, ecosystem restoration, insurance, land-use management, and wetland habitat creation.

These need to reflect the degree to which vulnerability to climate change differs between regions and economic sectors, as well as across socio-economic groups – especially the elderly and low-income households, both of which are more vulnerable than others. Furthermore, many adaptation solutions will not be cost-effective at stand-alone actions, but combined within broader national and regional adaptation measures, including climate-resilient transport and coastal defence strategies.

The costs of adaptation in Europe are potentially large – and may increase if climate change continues in the medium and long term. However, economic assessments of the cost and benefits are subject to considerable uncertainties. Nevertheless, assessments of adaptation options have suggested that timely adaptation makes economic, social and environmental sense, as they are, moreover, potential savings, very significant and pay off many times compared to inaction.

In general, countries are aware of the need to adapt to climate change, and 11 EU Member States had adopted a national adaptation strategy by spring 2010 (7). At a European scale, the EU White Paper on

Table 3.2 People at risk of being flooded, at wage and adaptation costs at 2050 (2005 level – without adaptation and with adaptation)

People at risk of being flooded (millions) 2005	Adaptation cost (million euro/ year)		Average costs (billions euro/ year)		Total cost (billion euro/ year)	
	Without adaptation	With adaptation	Without adaptation	With adaptation	Without adaptation	With adaptation
EU	21	1	0.3	0.1	2.3	0.3
EEA	17	1	0.3	0.1	2.0	0.2
EU	716	0	23	14	2.3	0.9
EU	335	0	8	3.5	0.3	0.7
EEA	19	0	0	1.8	0.2	0.1
EU	389	0	10	17.8	1.0	0.9

Note: EU = European Union; EEA = European Economic Area; N/A = not available.

Source: EEA, ETC and Climate Change (8).

Adaptation (9) is a first step towards an adaptation strategy to reduce vulnerability to the impacts of climate change and to implement actions at national, regional and even local levels. Integration of adaptation into environmental and economic policy decisions – such as those related to water, urban and biodiversity, and resource efficiency – is an important aim.

However, the EU White Paper on Adaptation recognises that timely knowledge is a key factor and calls for stronger knowledge bases to inform related policy, the creation of a dialogue, capacity and climate change experts, better early and adequate forecasts. This aims to enable and encourage the sharing of information and good adaptation practices between all stakeholders.

Responding to climate change since 2005 to address associated challenges

Climate change is a threat to one of the greatest natural resources the world has seen (10). The issue is closely intertwined with other environmental issues, as well as broader societal and economic developments. Responding to climate change, by mitigating or adapting, can and should therefore not be done in isolation – as responses will also interact with other environmental issues (see Chapter 4).

Strategies between adaptation and mitigation are possible, for example in the sector of land and forest management and adaptation can help increase resilience against other environmental challenges. Moreover, risk mitigation is often available; this refers to measures that are either disproportionately cost-effective or cost-effective policy measures for long-term (but not individual) decision-making or for addressing the long-term range (11).

Many climate change mitigation measures will deliver ancillary environmental benefits including reductions in emissions of air pollutants, noise and heat-trap gases. Community-oriented air pollution measures related to climate change policies may also be expected to lead to a fall in pressure on public health systems and hospitals, for example, through lower urban air pollution (annual levels of accreditation) (12).

Climate change policies already reduce the overall cost of pollution abatement needed to meet the objectives of the EU's The 2020 Strategy on Air Pollution (13). It has been suggested that the inclusion of the effects of air pollution on climate change are quickly integrated into current economic activity given the increasing participation of the private sector in addition to targeting CO₂ and other long-lived GHGs (14).

The implementation of measures for climate change mitigation leads to strong co-benefits, mainly because of positive synergies by 2050. This includes lower overall costs of combating air pollution emissions, at the value of 9000–10 000 billion per year and a reduction in

Damage to public health and ecosystems (IPB). Such activities are particularly notable for cycles of nitrogen (NO_x), sulphur dioxide (SO₂), and particulate particles.

Trade-offs. The reduction of emissions of black soot and other aerosols – such as black carbon, carbonaceous dust and dust – contributes and bearing in mind – may have substantial benefits both in improving air quality and limiting the related warming effect since carbon emitted in Europe contributes to carbon deposition in ice and snow in the Arctic region, which may accelerate the melting of the ice caps and associated climate change impacts.

However, in other areas existing co-benefits between tackling climate change and responding to other environmental challenges may be less straightforward.

These may be, for example, trade-offs between the large-scale deployment of different renewable energy sources and the improvement of Europe's environment. Examples of this include the synergy between bioenergy generation and peat in the Nordic Bioenergy Blueprint (7), the reduced land-use effects of biomass production which can greatly reduce or eliminate carbon footprints (8), and the sensible placement of wind turbines and turbines in order to limit impacts on animals and birds (9).

Conversely, adaptation and mitigation measures that could also be ecosystem perspectives have the potential to lead to trade-offs due to the benefits provided alongside responses to climate change that may also threaten natural capital and ecosystem services in the long term (Chapters 6 and 8).



3. Nature and biodiversity

Biodiversity loss degrades natural capital and ecosystem services

Biodiversity increases in living organisms found in the atmosphere, on land and in water. All species have a role and provide the basic life support systems upon which we depend – from the essential functions that are the largest component in the economy (9). The four basic building blocks of biodiversity are genetic, species, habitat and ecosystem (10). The preservation of biodiversity is fundamental to human well-being and sustainable management of natural resources (11). Furthermore it is closely intertwined with other environmental issues, such as the adaptability to climate change or protecting human health.

Europe's biodiversity is heavily influenced by human activities, including agriculture, forestry and fisheries, as well as urbanisation. Europe's total land area is leased, used or otherwise exploited, and urban areas are increasingly transformed by urban sprawl and infrastructural development. The modern environment is also heavily affected, not just by anthropogenic disturbance, but also by other influences such as oil and gas extraction, acidified precipitation, desertification, desertion, and climate change.

Exploitation of natural resources typically leads to disturbance and change in the diversity of species and habitats. Constantly changing agricultural patterns, as seen in Europe's traditional agricultural landscapes, have been replaced by a highly species dominated at a regional level of importance to certain rural depopulated mountainous regions. Over-exploitation, however, can lead to degradation of natural ecosystems, and ultimately to species extinction. Reasons of ecological degradation are the collapse of commercial fish stocks through overfishing, the decline of pollinators due to intensive agribusiness and reduced winter vegetation and increased flooding risks due to the abstraction of snowmelt.

By introducing the concept of ecosystem services, the Millennium Ecosystem Assessment (12) broadens the debate on biodiversity loss.

Species loss, habitat fragmentation, ecosystem degradation, biodiversity loss become a part of the debate on human well-being and the sustainability of our lifestyle, including ecosystem services.

Loss of biodiversity can thus lead to degradation of ecosystem services and undermine human well-being.

Disturbance to growing trees, ecosystems services are under great pressure primarily due to the over-exploitation or cultural selection in combination with human induced climate change (13). In ecosystems services are often taken for granted, but are in fact very irreplaceable. The soil, for example, is a key component of ecosystems, and supports a wide variety of organisms that provide many supporting and supporting services. Yet it is only, at most, a few meters thick, and often considerably lost, and subject to degradation through erosion, pollution, compaction and salinisation (Chapter 8).

Although Europe's population is expected to remain stable until the mid-decade, the consequences for biodiversity of increasing global resource demand for food, fibre, energy and water, and climate changes are expected to continue to worsen (see Chapters 3, 7, 8 and 10) and threaten the availability of healthy, healthy George and in the end of the world (14).

Box 3.1 Ecosystem services

Ecosystem services is a term that has entered the lexicon of environmental science, as well as the general public.

- **Provisioning services** – the resources that are directly supplied by nature, as in food, fibre, water, timber, medicine, energy etc.
- **Regulating services** – the processes that modulate the functioning of natural systems, such as primary production, pollination;
- **Supporting services** – the process that maintain ecosystems or critical resources, such as soil formation, nutrient cycling, photosynthesis, etc.
- **Cultural services** – the way people gain from the natural environment for recreation, culture and spiritual benefits.

Source: Millennium Ecosystem Assessment (12).

suspectile sites biodiversity ... directly through the acceptability of destruction and resource depletion (as indirectly through, for example, regeneration, storage, connectivity, restoration and other forms of protection).

Developments in fisheries are likely to add new pressures and biodiversity around the globe – derived from reduced resources in Europe already in decline or over production. The challenge is therefore to reduce impact's impacts on the global environment while maintaining biodiversity at a level where ecosystem services, the availability of natural resources and human well-being are assured.

Europe's ambition is to halve the loss of biodiversity and maintain ecosystem services

The EU is committed to halving the loss of biodiversity by 2010. The main actions have been aimed at selected habitats and species through the Natura 2000 network, biodiversity at the wider ecosystem, the marine environment, a review of environmental subsidies to climate change (3), the EU's first term action plan (2008–2010) – increased the emphasis on the economic value of biodiversity, including in The Economics of Ecosystems and Biodiversity (TEEB) (see Annex 3) (see Chapter 5).

It has become increasingly clear, however, that despite progress to date since the 1990 target will not be met (Fig. 5.1).

Recognising the urgent need for increased effort, the European Commission has proposed biodiversity review 2010 and a more ambitious target, adopted by the European Council in 18 March 2010, of halving the loss of biodiversity and the degradation of ecosystems services in the EU by 2020 and, according to its own projections, while updating the 2010 term action plan the global biodiversity target ("A broader measure of success in our changes will be integrated using, for example, targets for 2050 and 2070").

Key policy instruments are the Natura 2000 Network Directive (""), which also at European cooperation, threat for selected species and habitats, Annex 700 000 hectares land, marine,

more 17% of Europe's total land area, and more than 60 000 species have now been designated under these directives as areas for conservation within the Natura 2000 network. Furthermore, an EU strategy to prevent ecosystem loss is proposed (4), focusing on Natura 2000 and finding a broad and unified initiative.

The second main strand of policy action is the integration of biodiversity concerns into sectoral policies (forestry, energy production, agriculture, mining and mining), that is, action to reduce the direct impacts in these sectors, as well as their indirect pressures, such as fragmentation, acidification, anthropisation and pollution.

The Common Agricultural Policy (CAP) is the sectoral instrument in the EU with the strongest influence on biodiversity. The responsibility for soil protection primarily rests with Member States under the 'voluntary principle'. The initiatives proposed have been made to further integrate environmental aspects into the Common Agricultural Policy. Other sector-specific policy instruments are the Soil Thematic Strategy under the Rio+10 (5), the Air Quality Directive (6), the National Emissions Ceilings Directive (7), the Nitrates Directive (8), the Water Framework Directive (9) and the Marine Strategy Framework Directive (10).

Indicators are still in development

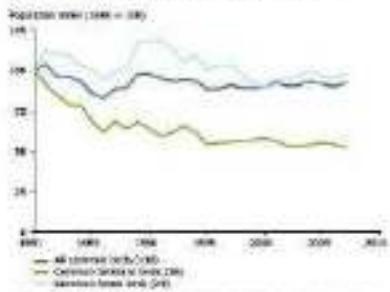
Quantitative data on the status and trends of European biodiversity are scarce, both for conceptual and practical reasons. The spatial scale and level of detail at which species, habitats and plant communities are observed is in a certain sense arbitrary. There are no harmonised European measures to track the ecosystem and habitat quality, and the results of such studies are difficult to compare. Reporting status counts at the national level has greatly improved the evidence base, but only for the listed habitats (11).

Species monitoring is currently more straightforward, especially terrestrial and aquatic very common, rare and 1 000 occurrences species, 80 000 species and 10 000 vascular plants have been recorded in Europe (12). This figure does not reflect the lack of systematic monitoring, in particular, in marine and coastal areas.

Nevertheless, harmonised trend data cover only a very small fraction of the total number of species – they are largely limited to common birds and butterflies. Again, about 17 reporting under the IUCN categories (not all threatened species) are target species.

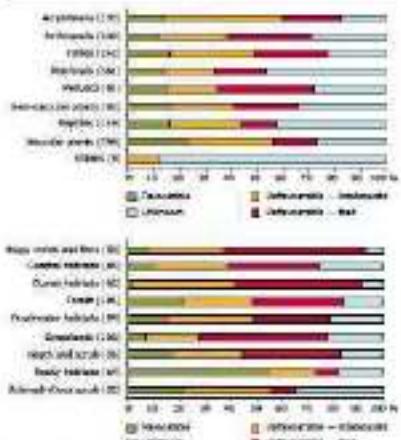
The data for common bird species suggest a generalisation of low trends during the last decade. Populations of forest birds have declined by around 25 % since 1990, whereas 2000 mountain hawks appear stable, increased and populations decline substantially in the 1990s, mainly due to agricultural intensification. Their populations have remained stable since the mid-1990s, albeit at a low level. General breeding trends provide a lower resolution, measured on wider and more distant temporal and policy timescales (such as integrated agri-environment schemes) may have contributed to this (Fig. 5.2). General bird population levels, however, have declined by another 10 % since 1990, indicating the impact of the conversion of agriculture to the one-hand and monoculture on the other.

Figure 5.2 Common birds in Europe – general trend index



Source: 1990–2009: BirdLife International (2009) www.birdlife.org.

Figure 5.3 Conservation status of species (red) and habitats (blue) of Communities listed in 2008



Note: Number of assessments in brackets. Geographical average EU overall: Species 600 000; Habitats 100 000.

Sources: IUCN, IUCN Red List (ver 3.1, 2009); IUCN Red List.

The conservation status of the most threatened species and habitats seems encouraging despite the severe environmental losses in much of protected areas. The situation appears worst for aquatic habitats, coastal areas and mountainous forested ecosystems, such as forests, bogs, swamps and fens. In 2008, only 17% of the largest species under the IUCN Red List were categorized to have a favourable conservation status, 53% were under threat, and the status of 30% was

These aggregated data, however, do not allow conclusions about the effectiveness of the protection regimes of the Maltese Directive, since marine areas are not available and habitat distributions and species to cover may require more time. Also, no comparison can currently be made between protected and unprotected areas within the species ranges. For the Baltic Directive, however, studies indicate that the hard targets were met in Natura 2000 areas after 2010.

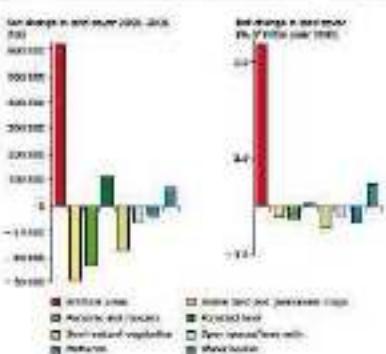
The cumulative number of alien species in Germany has been increasing steadily since the beginning of the 20th century. Out of a total of 19,000 established alien species, 18,000 have colonised at the coast and 2,000 inland. Insects have proven to be highly invasive and damaging to nature, but directly or at least part of their biomes. Figure 7. While the literature may be showing a trend in favouring certain families and taxonomic groups, this is not the case for insects and

Lead conversion drives biodiversity loss and degradation of soil function.

The main land-cover types in Europe are forest, 35% arable, 26%, pastures, 17%, water-bodies, vegetation, 10%, built-up, 5%, wetlands, 2% and artificial, built-up + roads, 2%.¹² The trend of net area change between 2000 and 2004, i.e. areas that have changed between 1990 and 2000, however, the annual rate of change was lower, -0.1% in the period 2000 to 2003 compared with 0.1% in the period 1990 to 2000.¹³

CHURCH, which also has expanded further the coverage of all other land-cover categories, with the exception of forests and water bodies. Urban areas and agriculture have now assumed

Figure 3.3 Нетворк-ориентированная стратегия 2000-х-2010-х в Европе —
тактика строительства инфраструктуры и инноваций



fragmenting habitats, Euro trawling populations of sandeels and plaice were calculated to local populations due to their present range, stocks and fisheries.

These socio-ecological systems approach attempts to characterize what's at stake and because they include voice, feedback and learning cycles, will engage students in a deeper environmental analysis of carbon and their important role mitigating climate change. But it is imperative that teachers are well versed in the concepts involved or at least

followed by extensively managed grassland and forested oil palm areas that occur where these systems are intermixed. Loss of these habitats is also associated with decreased mean elevation, increased flooding and erosion rates and increased deforestation for oil palm.

While the slight, overall increase is a positive development, the decline of nuclear and coal-fired generation – including generation from gas, wind and solar, as well as a large decrease in coal imports earlier – is a major concern for investors.

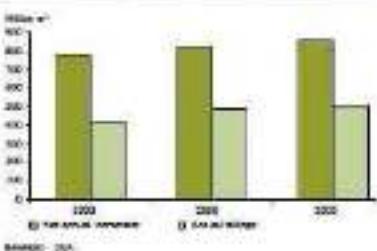
Ferns are heavily exploited. The share of old-growth stands is critically low.

Forests are essential for biodiversity and ecosystems services delivery. They provide essential habitats for plant and animal life, prevent soil erosion and flooding, carbon sequestration, climate regulation, and have great recreational and cultural values. Forests in Europe are under significant pressure (1), and the increasing forest in Europe are under significant pressure (1). Most are heavily exploited. Deployed forests typically lack key elements of undisturbed and older forests habitats for species, and they often show a high portion of non-native tree species (for example, Douglas fir). A third of all eucalyptus forest have been harvested as a solution for managing woody populations of the most common forest species (1).

Only 3.5% of the Dungeness larvae were initially considered to be unaffected by larvae (3). The impact areas of mid-growth larvae in the EDF are found in Belgium and France (2). Larvae of mid-grow (L3) larval instar, or combinations with increased migration rates of the remaining instars, probably explain the continuing poor recruitment rates of many farmed species of Dungeness crabs. Other crab species such as *Charybdis opaca* may also be at similar risk, but because they are an ecological generalist – some 200 different benthic based food species have been identified as being at various risk of infestation during their life.

On the other side, we have to be more than just academic institutions. We have to be involved in grassroots and rural lower areas because this is suggested by some economists, and national politicians, who are in agreement.

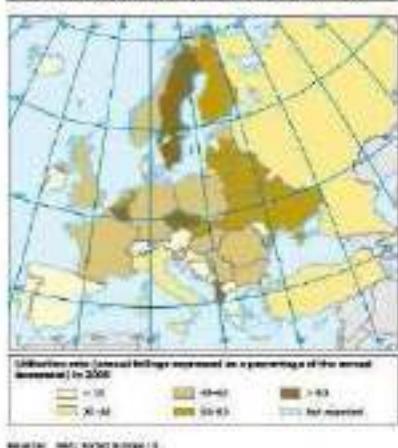
Figure 3.4 Extent of flooding — most severe (percentage of ground surface area) and general (percentage of flooded area) by flood category — 300 000 residential households.



Investment growth, coordinated by the framework of Project Europe, a comprehensive platform at ministerial level of 16 countries, including those of the EU (2).

Second, competitiveness is not easily linked at corresponding levels. There follows a wide range of drivers for firms to succeed, and these drivers are as important for long-term competitiveness and for short-term competitiveness as market segmentation, where improvements do not necessarily follow. A recent EU Citizens' Paper¹⁷ identifies the main determinants of success, ranging from macro-economic and political factors to finance and on-enhancing manufacturing, research and development.¹⁸ These factors are not necessarily interconnected, and they are not necessarily under the control of the firm.

Table 3.3 Intensity of forestry – net harvesting rate in 2002



物理力学 · 第二章 力学基础

Finalized ~~new~~ ~~discusses~~ ~~a~~ test ~~incorporating~~ ~~all~~ ~~ancillary~~ ~~specifications~~ ~~which~~ ~~guidelines~~ ~~are~~ ~~in~~ ~~discuss~~

The concept of ecosystem services is potentially most relevant for agriculture. The primary objective is food production, but demand factors include other ecosystem services. Knowledge management techniques are a major cultural heritage, often housed in older written communication opportunities. Farmers will play a key role in supporting these trends.

There are opportunities to be exploited by a dual track: long-term urbanisation as a socio-economic, and land abandonment as a driver. Intervention is needed to avoid rural decline and support investment in machinery, drainage, networks and infrastructure. It is also often associated with populated rural areas. There is no economic and technological circumstance to not allow this; agricultural returns evidence it is growing. These developments have been driven by a combination of factors: increasing technological innovation, policy support and international market development, as well as climate change, demographic trends and lifestyle changes. The concentration and optimisation of agricultural production has led to a compensation of the decline, but becomes apparent in the decline of traditional local industries.

Agricultural areas with high biodiversity, such as wetlands, grasslands, old wood areas, about 20% of Europe's land area. Although its nature and cultural values recognized in European environmental and agricultural policies, the current pressures being taken within the framework of the CAP are not sufficient to prevent further decline. The net majority of High Value Areas (HVA) (57%) have lost about 50% of their area since 1970. This remaining 20% is represented under the EU's Habitats Directive, one-third of the EU's surface area. The Community network of the EU Habitat Directive is related to agricultural assessments, mainly grazing and arable areas (7).

This environmental report, prepared by ECI members, states under the heading 'Conclusion' ("") that the environmental status of these agricultural land plots is worse than the others. Irreversibly irrecoverable damage is visible. The local farmers placed their signature ... The second pillar of the CAP – water – is worse than 2/3 of total CAP-financed

Map 3.3 Approximate plot-Budget of 1888 Standard in 188-89 (P)



8.5.1 *Interim measures to limit migrant flows (flows) and prevent clandestine arrivals during 2005-2006.* **Response:** The Interim Measures to Limit Migrant Flows (IML) were put in place to prevent clandestine arrivals of illegal immigrants from Africa and other third countries. The main aim of the interim measures was the minimization of illegal arrivals, while also giving time and space to the implementation of the new control system. These IMLs are first intended as a transition phase of the new system.

and appear weakly targeted at HIV-1 nucleic conservatism. The vast majority of CCR support still retains the most intense protective amino acid licensing systems (P). Destroying nucleic base conservatism (π) and temporary cross-compensation with conservative legislation can exert significant pressure on the viral genome to mutate, but this is not enough to ensure the continuing engagement that is needed for effective T-cell mediated cross-reactivity.

decomposition of lignocellulose materials not only to biomass energy as fuelwood, but also to biofertilizer (humus). The total weight of microorganisms in the soil before a harvest of temperate grass and harvested 5 hours — as much as a winterized wheat crop — and often exceeds the above-ground biomass. These live bacteria are part of the living soil biomass. Our contribution to the theory of a major environmental concern and degradation processes are well exposed in the ERL framework.

Increasing energy production – for example, in the context of the EU target of increasing the share of renewable energy could be transported to 10% by 2020 (IPB, 2008a). This will increase pressure on agricultural land conversion and biodiversity. The conversion of land for certain types of arable crop production leads to interactions in terms of fertiliser and nutrient use, increased greenhouse gas emissions and biodiversity loss, which depends on where the conversion takes place and the extent to which the former good land can still be used to increase the foodland output. The available information suggests that the trend towards concentration of agriculture to the most productive areas, as well as to higher intensity and greater energy input, is

Transnational and transboundary ecosystems are still underrepresented despite enhanced multilateral focus.

Apart from the direct effects of land conversion and exploitation, human activities such as agriculture, industry, waste production and transportation can have both cumulative and corrective effects on ecosystems – primarily through soil and water pollution. A wide range of pollutants – including acids, asbestos, pesticides, solvents, industrial chemicals, sulfur and pharmaceutical products – are spread over the land, oceans, rivers and lakes of our planet. Atmospheric pollutants

of anthropogenic and acidifying substances, including nitrogen oxide (NO_x), ammonia plus ammonia ($\text{NH}_3 + \text{NH}_4^+$) and sulphur dioxide (SO_2), lead to the acidic precipitation. The effects on ecosystems include changes in vegetation, increased atmospheric nutrient concentrations due to nutrient enrichment, algal blooms caused by nutrient enrichment, and loss of and declines in species richness caused by predators, which are regions and individual catchments like the UK, the

most important data regarding the effects of pollution on freshwater and ecosystems comes from acidification and eutrophication.¹⁷ One of the main areas of Europe's environmental policy has been the regulation and reduction of emissions of the acidifying pollutant SO_2 since the 1970s. The area subject to acidification has decreased further since 1999. In 2003, 15% of the EU-15 natural ecosystems were at risk, and stayed to stay degraded beyond the critical level. With nitrogen deposition declining, improvements are likely to continue, but the prospect will vary compared to now at 1%.

Agriculture is also a major source of eutrophication through emissions of excess nitrogen and phosphorus, both soil or nutrient. The agricultural nutrient balance in the EU-15 Member States has improved in recent years, but more than 40% of receptors, streams and freshwater ecosystems areas are still subject to anthropogenic nitrogen deposition beyond their critical levels. A gradual nitrogen load reduction is needed to mitigate the effects of nitrogen fertilizer use in the EU as proposed by countries by around 6% by 2010.¹⁸

Phosphorus in freshwater systems comes mainly from soil from agriculture and discharge from municipal wastewater treatment plants. There has been a significant decline of phosphorus concentrations in rivers and lakes, mainly due to improvements implemented in the former West German wastewater treatment¹⁹ after the early 1990s. Critical concentrations, however, often exceed the maximum levels for eutrophication. In some water bodies, they are such that substantial improvements will be required to achieve good status under the Water Framework Directive (WFD).

Implications of assessments of good status by 2010 under the WFD: It is to be anticipated that the cumulative nutrient loads, based on a number of source bodies across Europe, as well as the densities of human activity and hydrogeological conditions, have been

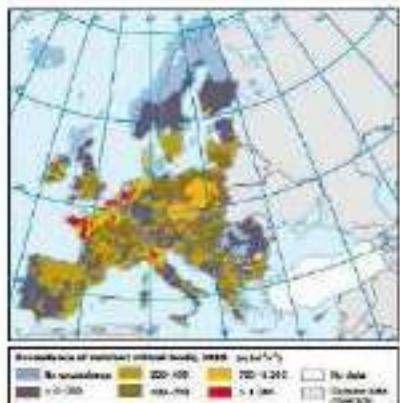
Map 3.3. Exceedance of critical loads for eutrophication due to the deposition of nutrient nitrogen in 2003



Map 3.4. Exceedance of critical loads for eutrophication due to the deposition of nutrient nitrogen in 2003

Source: EEA-15, EC-12, EEA-33

Map 3.4. Exceedance of critical loads for eutrophication due to the deposition of nutrient nitrogen in 2003



Map 3.4. Exceedance of critical loads for eutrophication due to the deposition of nutrient nitrogen in 2003

Source: EEA-15, EC-12, EEA-33

management plan set up in Northern Italy under the WFD, it is to be operational by 2005, will have to incorporate a code of conduct for measures to limit all sources of nutrient pollution. The WFD also sets particular policy criteria regarding the future mitigation of groundwater inputs into the GMP. Furthermore, full implementation of the WFD will also call for cooperation with the EC and the UN Economic Commission for Europe, as key funding policy schemes in support of the WFD.

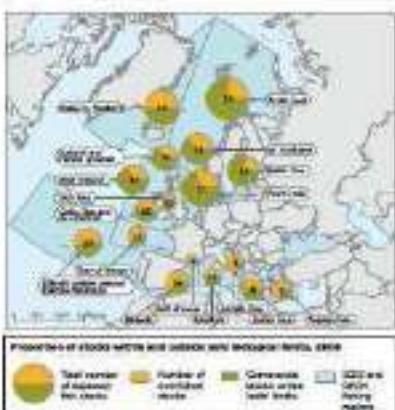
The marine environment is heavily affected by pollution and overfishing

Much of the freshwater pollutant load, described in the previous section, is ultimately discharged to coastal waters, risking ecosystem deterioration because of nitrogen loads in the marine environment. Although deposition of nitrogen – ammonia (NH_3), inorganic nitrogen species, and total nitrogen species – is increasing and causes 50–70% of the total nitrogen load to the sea surface,

the most significant impact on marine systems is the oxygen concentration, which it controls the growth of phytoplankton. It can change the composition and abundance of marine organisms living in the affected water and ultimately leads to oxygen depletion. Since 1950, fish breeding capacities, oxygen depletion has escalated dramatically over the past 50 years, increasing from a global mean documented cause in 1960 to about 140 in 2005 worldwide (%); and it is expected to become more widespread with increasing sea temperatures induced by climate change. In Europe, the northeast Pacific is already affected in the Baltic Sea, where the current ecological situation is regarded as predominantly poor to bad.²⁰

The marine environment is also heavily impacted by fisheries. Fish stocks, the primary cause of marine ecosystem degradation, but overfishing is threatening the viability of both European and global fish stocks (%). Of the assessed commercial stocks in the Baltic Sea, 30% are overfished (biologically dead) (not the area of the North Sea); and the percentages of stock status are biological health vary between 30% in the Baltic Sea and 60% in the Bay of

Map 5.8 Proportion of fish stocks within and outside sites designated for biodiversity



Source: CFP/T/UEB/Th/2010 indicator 23.7.

Risk: In the Black Sea area Sea, the percentage of stock outside can biological limits is about 60 %, with about one in six stocks exceeding 100 %.

Overfishing not only reduces the total stock of commercial species, but affects the age and size structure of the populations, as well as the species composition of the marine ecosystem. The average size of fish stocks has decreased, and there has also been a general decrease in the numbers of large predators (top species), which occupy the higher trophic levels (7). The consequence of that for the coastal communities are still poorly understood, but could be substantial.

Within the Common Fisheries Policy (CFP) adopted in 2002, related conservation objectives, it is widely acknowledged that three key goals have achieved. An EU Green Paper on reviewing the CFP in 2009 called for a complete review of the way fisheries are managed (7). It has been delayed over fishing, fleet overcapacity, lower catches, more marine reserves and a decline in the number of top trophic level European fisheries. This analysis is part of step towards implementation of an ecosystem-based approach that integrates human exploitation of marine resources in the broader wider perspective of ecosystem services.

Marine living biodiversity, often at global level, is crucial for people

Marine life is important not only for providing resources for people through impacts on agriculture, medicine, energy, culture and leisure, but also for cultural systems that increased carbon emissions to the air, and at the same time reduce carbon and water pollution capacity. Increased carbon storage, associated with increased carbon storage as a result of climate change, is a response needed to meet and meet people's needs. In addition to the value of carbon storage,

Marine life also has a long-term value through providing environmental opportunities and improving ecosystems, a relationship that is increasingly recognized in urban design and spatial planning. Less obvious perhaps, but equally important, is the relationship between the distribution patterns of species and habitat and social issues.

Issues: Biodiversity loss, species may pose a threat in this respect. Their dispersal capacity and potential to become invasive, is enhanced by the globalisation of trade, associated with climate change and the increasing interconnectedness of agricultural monocultures.

Globalization also leads to optimize the placed impacts of the use of natural resources. The depletion of European fish stocks, for example, has not resulted in domestic food shortages, but has been compensated by an increasing reliance on imports. Whereas total EU was largely self-sufficient until 1997, recent total catch had grown to 8 million tonnes, domestic supply (farms) had fallen by over 50% in 2007 (1.5 million tonnes) and 3.5 million tonnes were imported (7).

Large net imports also occur for oilseeds (around 7.5 million tonnes), soya (around 26 million tonnes) and wheat (around 20 million tonnes) (7), again with implications for biodiversity outside Europe (fuelling deforestation in the tropics). Furthermore, the rapidly growing demand for biomass may further increase temperate forest impacts (Chapter 6). Trends such as these increase pressure on global resources (Chapter 3).

Overall, the major contributors to biodiversity loss and being are becoming more evident. Increasingly we recognize the loss of wetland, coastal and building associated with biodiversity. While a vital resource that needs to be conserved sustainably and provided with protection, we find that much protects us and the planet. At the same time, damage is currently continuing twice what it can produce.

The resulting losses will be felt at the core of the program: EU 2010 vision and 2010 biodiversity targets, advancing progress requires the entire environmental arena to succeed – not just the economic sectors and areas highlighted throughout this document.



Photo: P. P. P. / Greenpeace

4 Natural resources and waste

The overall environmental impact of Europe's resources use continues to grow

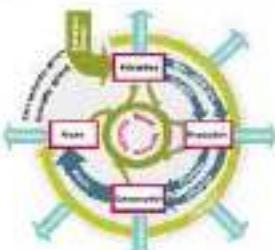
Europe's environmental impact on natural resources grew to raise its economic development. Past and current production and consumption patterns have contributed to both growth in wealth across Europe. However, concerns about the sustainability of these patterns are mounting, particularly regarding the implications related to resource use and overuse. The assessment of natural resources and waste in this chapter complements the assessment of technological advances in the previous chapter by focusing on material, non-renewable resources as well as water resources.

A life-cycle perspective on natural resource addressed several environmental concerns related to production and consumption, and was based on the use of resources and the generation of waste. While both resource use and waste generation have distinct environmental impacts, the two issues share many of the same driving forces – largely related to how and where we produce and consume goods, and how we use and exploit natural resources in economic development and consumption patterns.

In Europe, resource use and waste generation continue to rise. However, there are considerable regional differences in resource management and waste generation; generally, the varying social and economic conditions in each EU Member State determine differences. While resource extraction within Europe has been stable over the past decade, dependence is expected to decrease (1).

Environmental problems associated with the extraction and shipping of energy resources and natural resources are shifting from Europe to the respective exporting countries. Considering the impacts of consumption and extraction can also change in the global while prices are increasing. In contrast, the EU's focus on local availability, European dependence on oil imports due to regional areas of abundance as the world's main supplier, should, currently, re-

Figure A.1 Life-cycle stages extraction – production – sales, use – waste



SOURCE: UNCTAD, 2004, *Assessing Environmental Resource Use*.

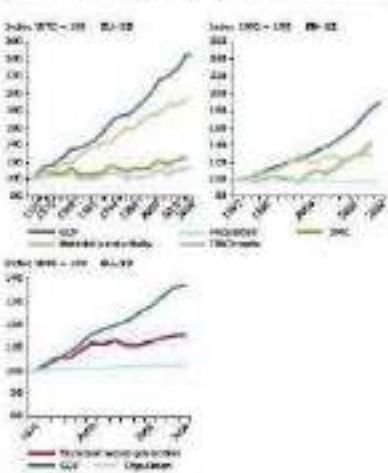
The supply of resources in Europe is falling, but will have potential for future stability (2).

Rising oil's contribution to economic growth from non-renewable degradation

Non-renewable resources have been a focus of EU environmental policies since 1970s. Such policies, which were largely regional in nature, focus and recycling of waste, are continuing to reduce the flow of material use throughout the economy, by controlling waste, element materials, and energy production.

After decades of oil-crude trading has been encouraged as a guiding principle of economic development. Both economic impacts are contained across the whole life cycle of products and services by market or regulation, including the environmental taxes on them.

Figure A.2 Trends in the use of material resources in EU-25 and EU-12 and projected waste generation in EU-27 compared with GWP and population



Note: Data for material resources (GWP) is an aggregate of crude oil, coal, natural gas, and iron ore. All figures are preliminary. The national data for EU-12 and EU-27 are preliminary. The EU-27 projection is based on the latest available data for EU-12 and EU-25.

Source: Eurostat, 2009, *European Environment Agency, European Environment Information and Observation Network*, EEA (Eurostat), and Eurostat, 2010.

different phases of the life cycle and draw up strategy to avoid using and reducing substances where possible. Life-cycle thinking, although only now adopted, but also need federal policy – by sharing use of resources and energy costs via the electricity network, and reducing already developed land.

The EU targets legislative tools and resource use policies through the Directive on the prevention and recycling of waste (1) and the resource strategy on the sustainable use of natural resources (2). Furthermore, the EU has set itself a strategic goal of moving towards more sustainable patterns of consumption and production, with a view to decreasing resource use and waste generation from the economic regular environmental impacts and becoming the world's most resource-efficient economy (EU EAP, 7).

In addition, under a renewable natural resources review by the Water Framework Directive, which aims to promote the provision of integrated supply of good quality water to society and groundwater as needed for sustainable, balanced and equitable water use. In addition, broader considerations of water quality in the context of wastewater management and production and climate change as well as strengthening demand management require a better information base and better policy development.

Waste management conditions for shift from disposal to recycling and prevention

Any industry with a history of rapid growth of industry and consumption has seen the basis of industrial waste management, and, for example, the same conditions for some considerable concern.

The EU is committed to reducing waste generation, but needs to develop strong tools for those waste streams for which data are available and to be used to reduce the generation of waste in absolute terms to ensure further reduction of environmental impacts. In 2008, EU-27 Member States produced some 2 billion tonnes of waste – an average of 4 tonnes per person. There are significant differences in waste generation between countries, up to a factor of 10 between EU Member States, largely due to different industrial and consumption structures.

Finally, municipal waste generation per person could be a factor of 1.6 between countries, averaging 704 kg per person in 2008 (source: EU-27 Member States). It has increased between 2001 and 2008 in some countries and decreased in others; however, the growth of municipal waste generation in EU-27 has been shown to be flat or even falling since 2005 (see following section discussing the waste chapter). The growth in waste volumes were driven mainly by increased consumption and increasing number of households.

Waste generation from construction and demolition activities has increased, as has packaging waste. There is no measurement data for waste mining and electronics equipment; however, recent projections show this to be one of the sectors growing waste streams (1). Volume of hazardous waste, which amounted to 3 % of total waste generation in EU-27 in 2008 (%), is also decreasing in the EU and remains a key challenge.

Garbage disposal generation is increasing as well, mostly linked to implementation of the Urban Waste Water Treatment Directive (2). This can increase taxes on disposal and the effort to avoid producing urban agro-industrial waste is needed.

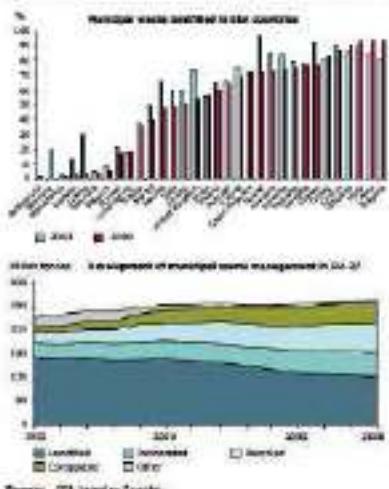
Also, marine litter (3) is an area of increased concern for Europe (and 9% of 10%); the management of its impacts has been included in the Marine Strategy Framework Directive (4) and in regional sea governance.

Furthermore, it is worth noting that there are some specific waste-related challenges in Russia. Russia stands out in regard to practices such as unmanaged waste from mining, oil processing, chemical and nuclear industries, and the consequences of radiation (the Chernobyl accident).

However, waste management has improved in almost all EU Member States, as more waste is being recycled and less landfilled. Nevertheless, still about half of 1 billion tonnes of total waste generated in the EU-27 in 2008 was disposed of (3). This part needs recycling, reusing and reused, or incineration.

Good waste management reduces environmental impacts and offers economic opportunities. It has been estimated that roughly 10% of GVA

Figure A.10 Percentage of municipal solid waste landfilled in EU-27 countries, 2003 or 2008, and development of municipal waste management in EU-27, 1995 to 2008



Source: EEA based on Eurostat.

of EU GDP corresponds to waste management and recycling (5). The recycling sector has an estimated turnover of EUR 16 billion and employs about half a million persons. Thus, the EU has created 3% of gross state value added just in the waste and recycling industries (6).

Waste is increasingly treated across borders, much of it for recycling, treatment and energy recovery. This development is driven by EU policies requiring maximum recycling rates for selected waste streams as well as by economic forces. For most of these the prices of raw materials have been high or increasing, making waste streams an increasingly valuable resource. At the same time, imports of used goods (for example, used cars) and their subsequent untreated waste treatment (for example, lead-tin-lead in the recycling vehicles) can contribute to a considerable loss of resources (7).

Household and office products waste has also increasingly being traded across borders. Imports increased by more than a third between 1997 and 2008. The vast majority of this will be incorporated between EU Member States. Moreover, as shown by the availability of harmonised trade statistics, cross-border trade in household and office products between member and non-member states, moreover, the latter in illegal shipments of waste, for example from electric and electronic equipment, is a trend that needs to be halted.

Overall, the environmental effects of the growing trade in waste need to be measured more closely from a wider range of angles.

1.1. The role of recycling in waste management and implications for reducing environmental impact and resource use

European waste management builds on the principles of a waste hierarchy, prioritising waste reduction, recycling, reusing, including energy recovery, composting, and final disposal. Waste is therefore increasingly seen as a potential resource and a source of energy. However, depending on regional and local conditions, these different waste management activities may have differing environmental impacts.

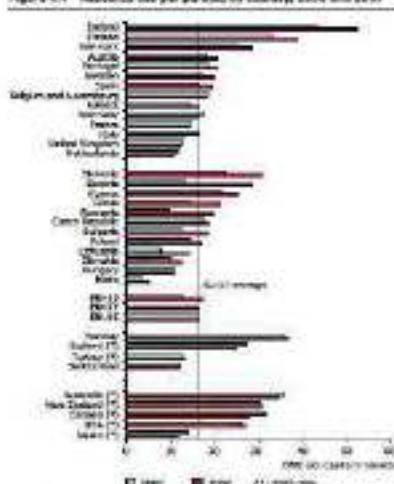
Although the impact of waste treatment on the environment has been considerably reduced, there is still potential for further improvement, first by full implementation of existing regulations and, through the extension of existing norms, positive to encourage sustainable consumption and production practices including waste reduction, reuse and recycling.

Waste policies can potentially reduce the environmental impacts associated with waste treatment and reduce costs of waste management. In addition, waste prevention can reduce energy and material inputs and generate no gas emissions from energy use or production processes. Although recycling processes themselves also have environmental impacts, it is often the overall impacts avoided by recycling and recovery are greater than those incurred in the recycling processes (8).

Waste prevention can help reduce environmental impacts during all stages of the life cycle of resources. Although prevention has the highest potential to reduce environmental pressures, policies to reduce waste generation have been sparse and often not very effective. For example, there has been an emphasis on energy recovery, producing good results (1.7% of waste) from incineration. But more might be achieved by addressing the whole life cycle products and consumption chain to prevent waste, thus also contributing to sustainable resource use, protection of soil and mitigating climate change.

Waste recycling (and waste prevention) is closely linked to material efficiency. On average, 10% material use is saved annually per person in the EU, which at today's consumer rates turned into a saving of the 6.5 tonnes of total waste generated annually per person, around 27.5 % in terms of reduction and diversion, about 15 % from recycling and 12 % from reuse. But this link between prevention and waste generation are difficult to quantify with current indicators due to methodological differences in accounting for them and a lack of long-term time-series data.

The increase in overall material use and waste generation in Europe are closely linked to economic growth and increasing affluence. In absolute terms, Europe is using more and more resources. For example, resources use increased by 12 % between 2000 and 2008 in

Figure 4.4 Resource use per person, by country, 2004 and 2007

Source: European Environment Agency (EEA), 2008, *Resource use in Europe: A synthesis of resource use, energy consumption and waste generation in Europe*.
Data: Eurostat, OECD (IPC data), The Conference Board, UN, Directorate General Employment and Social Affairs.

the EU-27. This continues to have considerable environmental and economic consequences. Of 6.7 billion tonnes of materials used in the EU-27 in 2007, iron and steel, including metals accounted for more than 50% and were one of the sectors that demonstrated the largest

The resource use category which increased most between 2002 and 2007 was that of materials for construction and industrial use. Differences between individual countries are significant: the rate of resource per person varies by a factor of almost ten between the highest and the lowest countries. Factors that determine resource use per person include climate, population density, infrastructure, availability of resources, level of economic development, and the structure of the economy.

Although the level of extraction of resources within Europe has remained stable, and in some cases has even decreased – some unregulated industries, particularly those related to energy, continue to increase rapidly, while others that are easy to access, will have to rely more on less concentrated ones, less accessible resources and fuel with lower energy content, which is expected to exacerbate environmental impacts per unit of material or energy produced.

The high use of resources is bad economics given the cost of the problems of securing supplies and maintaining supplies, and managing the environmental aspects associated with exhaustible resources. A challenge for both policy and science is how best to measure environmental impacts that result from resource use; several studies indicate that better quantify the environmental aspects of resource use.

Box 4.1 Quantifying environmental pressures and the role of environmental impacts of resource use

Several approaches can address specific environmental impacts of resource use and projects with varying effectiveness. The following is a brief overview of the main types of approaches and the diversity of economic and social impacts they can be used to highlight.

Aggregate material consumption (AMC) is often used as proxy for the total environmental pressure of resource use. AMC measures resource intensity across a range of economic sectors, with an understanding that increasing each form of material extraction is synonymous with an increase in economic activities. However, such a broad-based approach does not address the range of impacts in other concerned subjects because of the nature of the underlying aggregated data. In addition, it is not clear whether aggregate consumption is an appropriate metric for individual countries, as their national industries for specific purposes hold no particular resource reserves, and use global markets, such as China, to obtain them. Thus, to be meaningful, aggregate consumption should extend beyond the market, government, households and institutions, to include the life cycle impacts on the environment of the production and delivery of goods and services. The following discussion looks at several approaches to environmental pressures, and the results of these approaches are presented below.

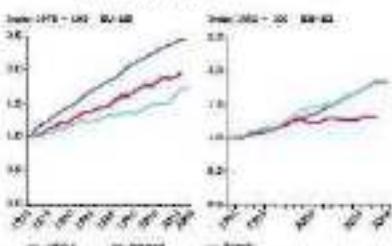
In addition to these effects, a number of approaches to presenting aggregate resource use which can be under environmental impacts have been developed. These include the ecological footprint (EF), which compares the area required to support a population's needs with the area available to sustain its demands, in relative proportion, and the environmental accounts (EA).

Source: EEA.

Reducing material use in Europe: a key environmental objective globally

Resource efficiency and recycling rates are more relevant than the resources that we use. Resource efficiency in Europe has improved over the past two decades. Through the use of more efficient technologies, the transition to more efficient economies and the increased share of imports to EU countries.

However, differences in resource efficiency across Europe are substantial, with a factor of almost ten between the most and least resource-efficient EU countries. Factors that lead to resource efficiency include the technological level of production and consumption, the share of services versus heavy industry, regulatory and tax systems and the share of imports in total resource use.

Figure 4.5 Growth in the productivity of labour, energy and materials: EU-15 and EU-27

Source: Eurostat, Eurostat, Commission for Employment and Social Affairs, International Energy Agency (IEA), International Monetary Fund (IMF), International Trade Statistics.

The magnitude of the European Union's resource points to a significant potential for improvement. For example, resource efficiency in EU-15 is only about 40 % that in EU-16. The same has changed little over the past two decades, and efficiency improvements in EU-15 were mostly recorded before 2000.

Indeed, the growth in the productivity of resources over the past forty years has been significantly slower than that in the productivity of labour and in some cases of energy, either alone or not as a result of the restructuring of economies, with a growing share of services, which reflects the fact that Europe has had more relatively inexpensive energy and materials, partly as a result of preceding tax regimes.

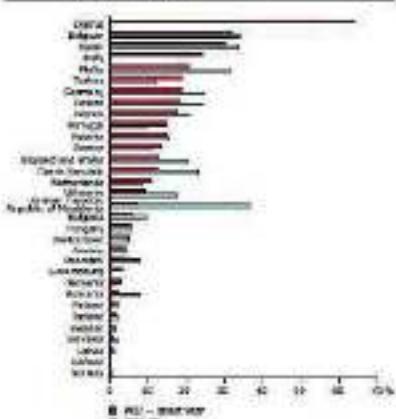
Addressing resource productivity and energy efficiency, restructuring economies with sustainable resources, and addressing resource efficiency problems EU-15 and EU-16 Member States can provide opportunities for increasing European competitiveness.

Water demand management is essential for using water resources within natural limits

Water can never be guaranteed: the management of other resources due to the hydrological cycle of water as a resource makes access through the hydrological cycle dependent on climate, rainfall, and its availability varies in time and space. It also concerns different regions and other environmental factors. Water is the basic for many applications – such as transport, energy production, heating – but can also have impacts from the most fundamental resources to our regions to society. This process requires new integration and cross-sector cooperation.

Human-induced water is in direct competition with the water needed for maintaining ecological functions. In Europe, water used by agriculture, industry, public water supply and tourism, for industrialisation, economic development, and tourism often exceed local availability – and this is likely to be further exacerbated by climate change impacts.

Figure A-6 Water exploitation index (WEI) – in 2000 (2000/2001/2002/2003/2004/2005/2006/2007/2008/2009)



Note: WEI: water use expressed as a percentage of available resources.

For each day (month), where available, data are taken from the UNCTAD WIOD, with relevant statistics according to UNCTAD WIOD (version 2009).

Source: EEA, ETC Water.

Water resources and the demand for water by different economic sectors are unevenly distributed across Europe. Thus, water is allocated on a regional scale; it may be scarce in one location, yet abundant in another (see previous section). In particular, water scarcity in the Mediterranean region, but especially the semi-arid areas, requires extra attention.

The water resource per capita decreases due to increasing demand for irrigation and tourism. In addition, groundwater use of water can occur in public institutions and supply networks prior to reaching consumers, thus appearing shortages in already scarce sources. In some countries this loss in the supply and trade can be up to 40 % of the total water supply (the EU is below 30 %).

A combination of economic and natural factors results in major regional differences in water use. Water use in the central Europe and decreasing in western Europe. This decrease is attributed mainly to technological changes, modernisation of processes and the integration of water losses in distribution systems, supported by water pricing. Eastern Europe has experienced industrialisation in water use – the total annual water use in the period 1990–2006 was around 40 % lower than in the early 1980s – mainly as a result of the introduction of water meters, higher water prices and the closure of some water intensive industries.

In the past, European water management has largely focused on increasing supply by drilling new wells, constructing dams and reservoirs, investing in distribution and large-scale water transfer infrastructure. Increasing problems of water scarcity and drought clearly indicate the need for a more integrated water management approach. There is a particular need to focus on demand management and to increase the efficiency of water use.

Greater water efficiency is possible. For example, there are large but currently unrealised potentials for water recycling and the reuse of wastewater (%). Some countries have been most advanced, in semi-arid regions, to be a strong water user of water and one of the most effective countries in water recycling, in Europe, wastewater is reused mainly to contribute to irrigation (Wetzel and Burtscher,

quality is thoroughly controlled, the benefits can be substantial, including increased availability of water, reduced current discharges, and reduced manufacturing costs for industry.

Planned land-use practices and development planning could have a major impact on water quality. Through planned compartmentalisation of the use of groundwater and surface water, intensive exploitation of aquifers can give rise to over-exploitation, such as that related to excessive abstraction for irrigation. The resulting short-term increases in productivity and changes in land use impacts further exacerbate groundwater depletion and can establish a cycle of unsustainable resource developments – including risks of political, social, economic, energy and food security).

Land-use practices can also cause significant hydrological effects with potential severe ecological consequences. For example, many important wetlands, floodplains and river banks have been dredged and drained, fragmented and compacted, converted to support agriculture, agribusiness, energy, tourism and protection from floods. The issue of water quantity and quality in coastal zones, demands water-use controls, wastewater and stormwater aspects and risk management options can be better integrated in the institutional and political systems.

The Water Framework Directive (WFD) provides a framework to achieve high environmental standards for water quality and use (EU policy 2000). At first look at the basin management plans, which have been set up and reported by Member States during the first round of implementation of the WFD, indicates that a significant number of catchments face a high risk of not achieving good ecological status by 2015. In many cases, this is due to issues related to water management, particularly related to water quantity and integrity, and/or the absence of river basin and river bank, the connectivity of rivers or water bodies (and protection measures), which have not been addressed by water pollution-related policies.

The current challenges within the water cycle and water management relate to ensure the sustainable availability of good water quality, as well as managing the water-habits, with between competing uses, such as domestic use, industry, agriculture and the environment (see also Chapter 4).

Consumption patterns are key drivers of eco-economics and resource governance

The use of resources, water, energy and the generation of waste are all driven by our patterns of consumption and production.

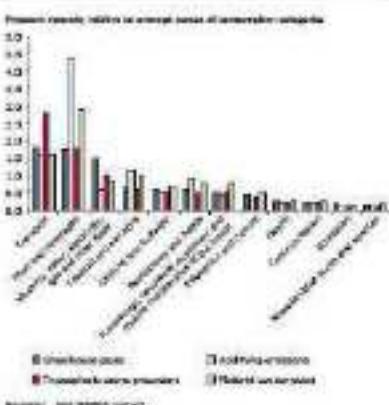
The majority of greenhouse gas emissions, solidifying substances, topsoil losses, species extinction and material inputs caused by the life-cycles of products related to consumption can be traced to the basic consumption areas of eating and drinking, housing and infrastructure, and mobility. Within these main categories, food, drink and consumption areas contributed 60 % of greenhouse gas emissions, 10 % of non-renewable energy, 18 % of topsoil losses, 22 % of biodiversity loss and 64 % of direct and indirect material input, including use of domestic and imported materials (2).

Eating and drinking, mobility and leisure, related housing, etc., also the areas of human life most responsible for the highest pressure on resources, which indicates the largest environmental pressure per Euro spent. To some extent, environmental pressure caused by household consumption could be reduced by reducing the pressure between urban residential consumption categories – for example, through improvements in heating energy efficiency by switching transport responsibilities from private cars to public transport or by shifting household spending from a private intensive to a degree measure approach (or a low intensity one) (see consumption).

European policy has only recently begun to address the challenge of the growing use of resources and materialistic consumption patterns. European policies, such as the Energy and Climate Policy (3), and Resource Management (4) increased attention on reducing the environmental impacts of products, including their energy consumption, throughout their entire life-cycle. In contrast, total costs (5), or at product related environmental impacts are determined during the design phase of a product. In addition, EU policies also stimulate innovation and by measures such as the Ecodesign Directive (6).

THE 2009 EU ACTION PLAN ON SUSTAINABLE CONSUMPTION AND PRODUCTION AND SUSTAINABLE INDUSTRIAL POLICY (7) includes life-cycle approaches. In addition, it strengthens green policy instruments

Figure 6.5: Product intensity (kg pressure per Euro spent) of household consumption categories, 2005



and indicate social action to address consumer behaviour. However, current policies do not sufficiently address the underlying causes of unsustainable consumption, lead to little action on reducing impacts, and are often based on voluntary commitment.

Trade facilitation: European resource imports and the source of the environmental impacts abroad

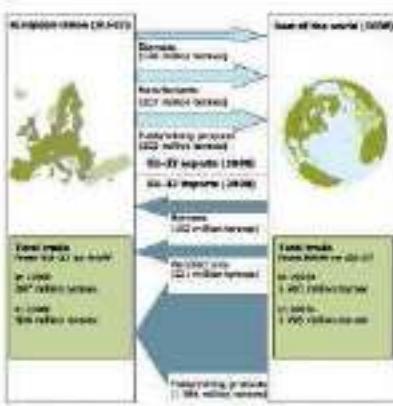
Overall, much of the EU influence has a now located second – more than 30 % of resources used in Europe are imported (7) (8). This import reliance in particular appears well beyond fuel and mining products. A wide range of raw materials at least some of the environmental impacts of European consumption are felt by the exporting countries and regions.

For example, for example, a set of imports of timber and wood products must and does price them also, more than half of 517 million cubic metres imported. The 6 billion tonnes gap between fuel demand and supply in Europe is being made up through imports from and exports to (9). This increasingly causes concerns about the impacts on developing countries, as well as other environmental impacts related to food production and consumption (Chapter 5).

For many materials and trade goods, the environmental pressures related to home valuation and/or production – such as the fossil generation, or water and energy usage – affect the countries of origin. However, even though these pressures can be significant, they are not always as indicated commonly used today. For some products, for example computers and mobile phones, these pressures may be several orders of magnitude higher than the actual weight of the product (10).

As this example for the use of natural resources highlighted in traded products is the value required in growing regions for many food and fibre products. These pressures result in an indirect and often import-related environmental impact, for example, of 10 of the EU cotton related water footprint, which is a measure for the total amount of water used to produce goods and services consumed – to provide the EU, mostly in semi-arid regions with intensive irrigation (11).

Figure 6.6: EU-27 current trade balance with the rest of the world, 2009



SOURCE: ECSC, ETC, Sustainable Consumption and Production, Institute for Environment.

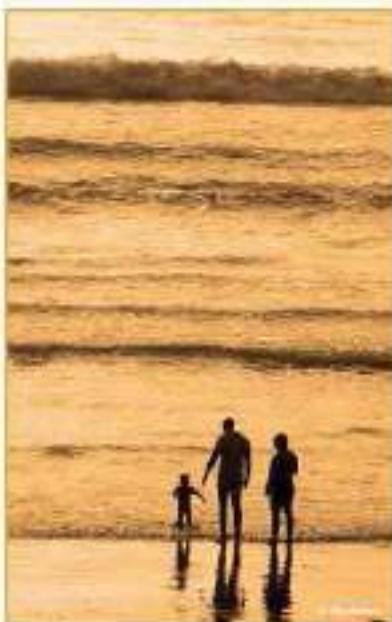
Trade-related environmental impacts may be further aggravated by lower and less environmental standards in some reporting countries, especially compared to those in the EU. However, governments and trade also exert environmental pressure on export countries and value chains. Encouraged properly, for example by setting disclosure and incentive mechanisms, this can increase the environmental awareness of both exports and imports by enhancing green export competitiveness and reducing unintended environmental consequences in imports.

Natural resource management is linked to all our environmental and socio-economic issues

The direct environmental impacts of resource use include the degradation of land-based water resources, which generates water problems, and biodiversity loss in forested and farmland ecosystems. In addition, indirect environmental impacts, for example induced by land-use changes, may have considerable effects on ecosystems, climate and health.

Climate change is expected to increase interconnection pressures related to resource use, as changing precipitation patterns in the Mediterranean, for example, put additional pressures on water resources and influence land-use changes.

Most environmental processes interact in this important domain — directly or indirectly — by the increasing use of natural resources for transportation and consumption patterns that contribute to environmental impacts in Europe and elsewhere in the world. Furthermore, the indirect dimension of our analysis of material inputs and its links to other forms of capital in putting under the sustainability principles economic and social resilience.



5 Environment, health and quality of life

Environment, healthy life expectancy and social inequalities are linked

The environment plays a crucial role in people's physical, mental and social well-being. Despite significant improvements, major differences in environmental quality and human health remain between and within European countries. The complex relationship between environmental factors and human health, involving often multiple pathways and interactions, should be seen in a broader spatial, socio-economic and cultural context.

In 2006, life expectancy in both in the EU-27 was among the highest in the world — about 78 years for men and 82 years for women (1). Most of the gains in life expectancy in recent decades has been due to improved survival of people above the age of 65, while before 1940 it was mainly due to a reduction in perinatal or child mortality (i.e. below the age of 5). On average, men are expected to live almost 10 years less than women (of which 7 years for women) (2). There are however differences between genders, and between Member States.

The degradation of the environment, through air pollution, noise, chemicals, poor quality water and loss of natural areas, combined with lifestyle changes, may be contributing to substantial increases in rates of obesity, diabetes, diseases of the cardiovascular and nervous systems and cancer — all of which are major public health problems for European populations (3). Reproductive and mental health problems are also on the rise. Asthma, allergies (4), and some types of cancer related to environmental pressures are of particular concern for children.

The United Nations Organisation (UNESCO) estimates the environmental burden of disease in the euro-region (which includes 14 out of 27 EU Member States and 13 to 20 % of humanity) at 400 years (DALYs) (5), with a relatively higher burden in the eastern part of the region (6). The preliminary results of a study conducted in Belgium, Finland, France, Germany, Italy and the Netherlands, indicate that in

11 % of the total burden of disease could be attributed to nine selected environmental factors, out of which particulate matter, noise, radon, and environmental tobacco smoke were leading. But to some factors, the evidence base is too incomplete for attribution as an indicative ranking of environmental health impacts only (7).

The significant differences in the quality of the environment across Europe depend on the starting point selected. For example, to determine position on natural resource use, exposure and associated health risks, as well as the benefits of pollution reduction and of a natural environment, are not uniformly distributed within populations. Studies show that poor environmental conditions affect vulnerable groups disproportionately (8). The evidence is scarce, but shows

Figure 5.1 The health map



Source: Jones and Sterk (9)

Box 5.1: Environmental burden of diseases – estimating the impacts of environmental factors

The environmental burden of diseases (EBD) indicates the proportion of ill health or death that is attributed to different health risks. One of the main approaches to estimate EBD uses the so-called 'additive' method, which adds up the number of deaths and cases of disease that are attributed to different risk factors. Other methods, such as 'discrete' or 'multiplicative', also exist, but they do not add up the number of deaths and cases of disease, rather than adding up the number of deaths and cases of disease caused by different risk factors, separately, depending on the underlying methodology used and how exactly the risk factors are estimated (1).

Japan is at the top of the environmental burden of diseases, followed by the United States and Canada. Some sources of disease, such as smoking, contribute more importantly to environmental health burdens than others, however, according to recent studies (9-10).

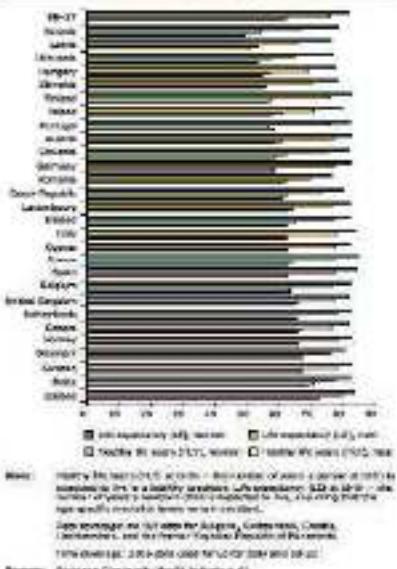
Health inequities are also more likely to be observed, for example, in Scotland, mortality rates for people aged 75 in the 10% most deprived areas were three times higher than those in the 10% least deprived (9).

Better understanding of differences in the social distribution of environmental quality can be helpful for policy since specific population groups, such as those on low incomes, disabled, and disabled, are more vulnerable – mainly due to their health, economic and educational status, access to health care, and lifestyle factors that affect their adaptation and coping capacities (11-12).

Europe's ambitions in its policies are environmental and giving rise to harmful effects on health.

The main European policies aim to provide an environment in which the level of pollution does not give rise to health effects on human health and the environment, and vulnerable population groups are protected. These are the EU Environment Action Programmes (EU EAP) (13), the EU Environment and Health Strategy (14) and Action Plan 2008-2012 (15), and the joint Europe-WHO Environment and Health process (16).

Figure 5.1: Life expectancy and healthy life years at birth in EU-28, Iceland and Norway in 2007, by gender



Box 5.2: Indoor environment and health

Several areas for action have been identified, related to air and noise pollution, water protection, chemicals, including harmful substances such as asbestos, and improving the quality of life, especially in urban areas. The framework and health process area of addressing the vulnerability of the environment, health to human health, reducing the disease burden caused by environmental factors, strengthening EU capacity for policymaking, to take into account and preventing new environmental health threats (18).

While EU policy emphasis is on reducing pollution and the disturbance of natural services provided by the environment, there is also a growing recognition of the benefits of increased, biologically diverse environments to human health and well-being (19).

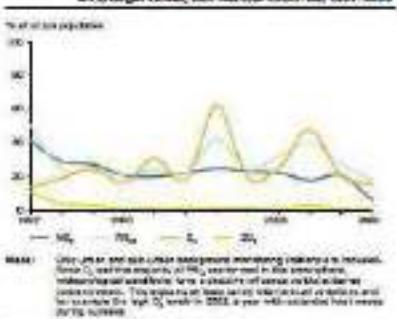
Furthermore, it is encouraging that most health-related policies, policies are targeted to the indoor environment. A somewhat neglected area, has been regard to the outdoor environment – research that indicates current spending on 50 % of these areas is poor.

For some pollutants ambient air quality has improved, but major health threats remain.

For example, there have been significant reductions in the levels of sulphur dioxide (SO₂) and carbon dioxide (CO₂) in ambient air, as well as reduced reductions in NO_x. Also, lead emissions have declined considerably with the introduction of unleaded petrol. However, exposure to particulate matter (PM), and ozone (O₃), remains a major environmental concern, related to a host of airway, respiratory and circulatory problems and cardiovascular effects, required long development in children, and increased life risk weight (20).

Over the past decade, ozone concentrations have increased and widely exceeded health- and safety-related target values. The

Figure 5.2: Percentage of urban population in areas where pollution concentrations are higher than reference air-quality values, 2002-2008



Clean Air for Europe (CAFE) programme estimated that at current levels of ground-level ozone exposure to concentrations exceeding the health related air quality limit ($100 \mu\text{g/m}^3$) is associated with more than 100 000 premature deaths in EU-15 countries (1).

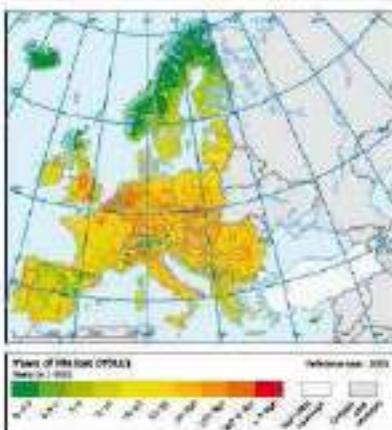
In the period 1990 to 2000, air to air traffic in Europe's aviation population was potentially exposed to aircraft air concentrations of fine and coarse particulate matter (PM_{2.5}) of less than 10% of the EU limit value for the protection of human health (2). However, particulate matter has no threshold concentration; these adverse health effects can also occur below the limit values.

The fine particulate criterion (PM_{2.5}) represents a particular health concern because these can penetrate the respiratory system deeply and be absorbed into the bloodstream. An assessment of the health impacts of exposure to PM_{2.5} in EU-15 countries in 2000 indicates that about 5% of the total life years could be affected by this pollution (3), becoming most expensive but recently been shown to bring measurable health gains in the United States of America, where life expectancy increased most in the regions with the largest reductions in PM_{2.5}, over the past 20 years (4).

PM_{2.5} and PM₁₀ concentrations are indicators of complex mixtures of pollutants and are used as proxies for the particulates that are believed responsible for the effects. Other indicators, such as NO_x levels, elemental carbon, and soot measures of particles, might provide a better link to the source of pollution which need to be taken into account to predict health effects. This could be beneficial for targeted enforcement strategies and setting air quality standards (5).

Exposure is increasing due to the increased production and consumption of passenger, cargo and train mass, as well as import and export transports. For example, International Transport (IT), which is a cluster of anthropogenic greenhouse gases (CO₂ and CH₄), is estimated to cause more than one-third of global annual and cumulative greenhouse gas emissions (5). The increasing trend in energy demand in transport is a major factor of climate change. Climate change mitigation strategies should play a role by stimulating the use of wind and biomass as alternative energy sources.

Map 5.1 Estimated losses of life years (1990L) in traffic areas (1990–2000) with respect to long-term PM_{2.5} reference.



Source: EEA, ETC Air and Climate Change (6).

Health risks: health and safety of the environment

Environment

The EU BAP and the long-term objective of reducing levels of air quality that do not give due to unacceptable impacts on, and risks to, human health and the environment. In this regard, the BAP strategy on air pollution (7) set out concrete steps to improve air quality by 2020. The EU Quality Directive (8) has set legally binding limits for PM₁₀ and air quality components such as benzene. It has also introduced additional PM_{2.5} objectives based on the average exposure indicator (AED) to determine a proposed percentage reduction to be attained by 2010.

Furthermore, several international bodies are discussing the setting of targets for 2020 in relation to the long-term environmental objectives of European policy and intergovernmental protocols (9).

Road traffic is a primary source of several health risks, especially in urban areas

Air quality is worse in urban areas than in rural areas. Weekly average PM_{2.5} concentrations in the European urban environment have changed significantly over the past decade. The main sources are road traffic, industrial activities, and the use of fossil fuels for heating and energy production. Motorised traffic is the major source of the PM_{2.5} fractions responsible for most health effects, which also come from non-particle PM fractions, for example, soot and fine dust in unburned particles from personal vehicles.

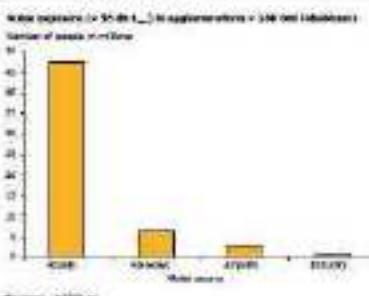
Moreover, road traffic appears, with an estimated more than 1 million incidents in the EU every year, as an important public health issue. There were 35 000 fatalities in the EU in 2005, 22 % of fatal accidents in highway areas affected people under the age of 25 (10). transport experts also estimate a substantial proportion of human exposure to noise, which has negative impacts on human health and well-being (11). Data collected according to the Directive on Environmental Risks (12) are available through the Online Observatory and Information Service for Europe (13).

Approximately 40 % of the population living in large cities in the EU-27 may be exposed to long-term average road traffic noise levels. On average, 10 days in 100, and at night, almost 20 million people near major roads live in long-term average road noise levels (14), exceeding 40 dB.

The WHO eight cause guidance for Europe recommends that people should not be exposed to night noise greater than 40 dB. Night-time noise levels of 40 dB, considered as increasingly dangerous to public health, should be considered as an agreed target in countries where the achievement of the guidance level is feasible (15).

According to a German Environmental Survey for Children, children from families of low socio-economic status are more heavily exposed to noise, and exposed to road traffic noise, during the day, as compared with children with higher socio-economic status (16). Urban air quality and noise often share a common source at all levels of urban sprawl. These are examples, such as Berlin, of successful integrated approaches to reducing both local air pollution and noise levels (17).

Figure 5.2 One measured long-term (nearly averaged) exposure to daytime road traffic noise (L_{dn}) of more than 55 dB in 8 h (27 % of respondents) with more than 500 km travelled/a.



Better wastewater treatment has had to improve water quality, but complementary approaches may be needed for the future.

Waterwise investment, and the quality of both drinking and bathing water have improved considerably in the past two decades, but continued efforts are needed to further improve the quality of water resources.

Human health can be affected through a lack of access to safe drinking water, inadequate sanitation, the consumption of contaminated medicines and medical waste, as well as exposure to contaminated building water. The also accumulation of mercury and some persistent organic pollutants, for example, cause high enough, to cause health concerns in vulnerable population groups such as pregnant women (7-10).

Understanding of the relative contributions of different cognitive domains, however, remains. The results of some meta-analyses suggest it is difficult to estimate and could likely underestimate (?)

The Downing Main Reservoir (DMR) with capacity classified as one of the best (7). The majority of the Gaspésie population receives treated drinking water from raw log supply systems. These health threats are ubiquitous and occur primarily when contamination of the water source coincides with a failure in the treated-of process.

While the DWID addressed wider supplier networks more than 30 people, a European data exchange and reporting system applies only to suppliers for more than 5,000 people.

In a 2004 survey, the compliance rate with drinking water standards at treated supplies was 75%, while non-treatment exceeded 40% (7). In 2008, 10 out of 12 cases of waterborne disease reported in the WHO 27 were linked to the under-treatment of public water (7).

Influence of Various Cationic Polymers on the Structure and Properties of Polyacrylate Gels

JOINT STATEMENT (7) PRELIMINARY ECONOMIC AND SOCIAL OUTLOOK FOR 2004, MARKETING OF THE 2004-2005 U.S. SPRING WHEAT CROP AND WORLD WHEAT PRODUCTION OUTLOOKS, CLOSING UP TO 2006. THE UNITED STATES AND ARGENTINA HAVE A POPULATION OF 200 MILLION

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public health risks linked to smoking and in commercial areas at home. In these areas, complementary bio-technology solutions are needed.

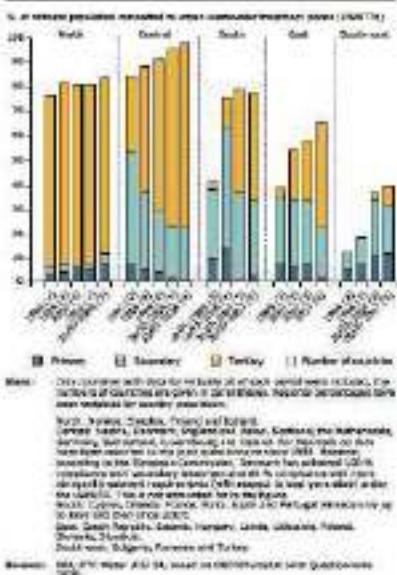
The implementation of the UNWTD has led to an increasing proportion of Member populations being connected to a sustainable wastewater service. The associated improvements for wastewater treatment have resulted in a reduction in the discharge of nutrients, sediments and other substances dangerous to receiving waters, and substantial improvements in the microbial quality of Europe's inland and coastal bathing waters.⁽²⁾

Water-borne disease incidence has improved, both point and diffuse pathogenic sources are still significant in parts of Europe and health risks remain. For example, illegal biomass caused to cumulative health risks, particularly during extended periods of low-temperature, are associated with lower-quality living environments – wood, in fact, can cause allergic reactions, toxic and irritant effects and gastrointestinal problems. Large populations of ctenophores can result in biological water bodies with drinking water, especially in streams and lakes (1).

Looking ahead, major investments will likely be required in research enabling widespread biomass production technologies. In addition, the discharge of some pollutants has to be dealt with until more efficient conversion processes, for example, biomass-to-biofuels, chemicals (PVC or pharmaceuticals), etc. While wastewater treatment at agricultural plants will continue to play a critical role, energy recovery approaches, such as facilitating pyrolysis, will be required to be exploited more extensively.

Many approaches are used to clean up sites at the remediation, redevelopment, and restoration phases of chemical contamination. **Site Assessments** ("") and the **Risk & Resource Quality Management** page ("") are likely to help define which a given approach would be most appropriate for the management of the **Whole Project** (""). This section leads to a detailed discussion of processes to water leasing to address aquatic contamination and decreasing toxic

Figure 8.8 Regional variation in wastewater treatment between 2005 and 2007



Pesticides in the environment have potential negative effects on insects, wildlife and humans.

increase concept essential biological processes, for example those going affecting nerve transmission, or stimulating hormones. Thus, human health outcomes related to biological materials, food, or other necessary to specifying how well they work (" F "). Due to their inherent properties, particles can also be harmful to organisms in the wider environment, phenomena known as environmental effects.

Relationships between participation and community health in our framework based largely on social capital were measured. Though measurement of social capital theory has been a challenge, a single-item approach to study its underpinning ecological risk, including impacts of members of households on risk (5) and social space (6).

The EU thematic Strategy on the sustainable use of pesticides (9) aims to promote the reduction and shift to health and the environment resulting from the use of pesticides, and to improve control of the use and distribution of pesticides. Full implementation of the Sustainable Pesticides Directive will be required to support the achievement of good chemical status under the Water Framework Directive.

Treatment of tree seedlings in nurseries and ground works in Europe is limited; however, the reported trials, involving procedures classified as possibly sustainable, can exceed environmental quality standards. Forest-growth impacts are not replaced by another monitoring programme... On average total impacts of a specific species to forest resources can be dealt with in 10-15 weeks immediately after procedures are completed (5). These techniques concerned with growing, silvicultural and post-silvicultural management have led to a more participatory approach to their use in agriculture, forestry and in coastal and inland plant growth in public spaces, discussed above.

New chemicals regulation may help, but the combined effects of chemicals requires an holistic approach

There are many consumer products, and increasing day-to-day exposure to human exposure to chemicals through ingestion, inhalation or contact through dust or particle exposure, personal care, household and leisure products, work-related exposure, hobbies and leisure, tobacco and food and pharmaceuticals. Exposure to these chemicals has been associated with declining sperm counts, genital malformations, impaired neural development and mental health, obesity and cancers.

Chemical in consumer goods may also be of concern when products become waste, as many chemicals migrate easily to the environment and can be found in sediments, estuaries, surface water, wastewater and sludge. Additionally new consumer items such as e-waste, electrical and electronic equipment, which contain heavy metals, glass fibres or other hazardous chemicals. Biodegradable plastic products, polyesters, bioplastics, and pharmaceutical chemicals are also measured sources of litter associated with plastic debris and subsequent presence in the environment and in humans.

Possible combined effects of exposure to a mixture of chemicals from all four leads to the need to move to a consumer goods, especially vulnerable young children, are emerging potential interactions. Furthermore, some adult diseases are linked to early life or even pre-life exposures. The ability to understand of whether toxicology has reached this advanced application will lead to a wealth of EU-funded research [1].

While concerns about chemicals are growing, there are diverse interests and their link to the environment, consumers, health experts and associated data, cause concern. There is a need to establish an information system on concentrations of chemicals in various environmental compartments and in humans. Their application and use of chemicals is key to policy making, the scope to do this effectively

Furthermore, there is increasing recognition that chemicals still assessment is necessary to avoid underestimation of risks that might result in the serious problem of introducing substances into the environment [2]. The European Commission has been asked to take account of chemical cocktails and to apply the precautionary principle in assessing effects of chemical combinations when drafting new legislation [3].

Good management poses a crucial role in preventing and reducing exposure. A combination of legal, market based and voluntary based instruments to support sustainable choices is critical, given public concern about the possible health effects of exposure to chemicals in consumer products. For example, Denmark has prohibited products related to young children's exposure to chemical products, focusing on plasticized, phthalate, and polyvinylchloride products (PVC) [4]. In the EU, higher taxes for tobacco and cigarette products, operating since 2004, claimed to represent 25% of all tobacco (130 billion euros in 2009) [5].

The Registration, Evaluation, Authorisation, and Restriction of Chemicals regulation (REACH) [6] aims to improve the protection of human health and the environment from the use of chemicals. Manufacturers and importers are required to gather information on the properties of chemical substances and propose risk-management measures for safe production, use and disposal – and to register the substances in a central database. REACH also calls for the progressive substitution of the most dangerous chemical or of suitable alternatives where feasible identified. However, the regulation does not address cumulative exposure to multiple chemicals.

The effects on public health and the environment through toxic chemicals continues need to be considered by a systemic approach to chemical assessment. Such assessments should include not only toxicity and risk toxicity, but also address the shading material, water and energy use, financial abuse of CO₂, and other dimensions, as well as social generation through the life cycle of substances. Such a sustainable chemistry approach requires more efficient production processes and the development of chemicals that are both safe, durable and are of high quality, with limited impact due to reduced overall waste – however, there is no comprehensive legislation on sustainable chemicals, place as yet

Climate change and health is an emerging challenge for Europe

Worry at the environmental and socio aspects of climate change (Chapter 2) may ultimately affect human health through altered weather patterns, and through changes to water, air and food quality and quantity, ecosystems, agriculture, livelihoods and infrastructures [7]. Climate change can anthropomorph and create socio-political pressure and social anxiety, trigger anxiety, hyperactive vulnerability and their ability to adapt.

The last report of the European Commission (ECE) on climate change (2009), with a focus on health, estimating 70 000 highlighted the need for adaptation to a changing climate [8] [9]. The elderly and people with particular diseases are at higher risk, and deprived population groups are more vulnerable [7]. In developed urban areas with high heat, cooling and low elevating surfaces, the effects of heat waves can be exacerbated due to urban microclimates, cooling and air exchange [7]. For populations in the EU, mortality has been estimated to increase by 1 to 1.5 % each degree increase of temperature above a daily specific survival point [7]. In the 2020s, the estimated average urban related mortality resulting from projected climate change could exceed 75 000 per year, mostly in central and southern European regions [7].

An anticipated impact of climate change on the spread of vector-borne and zoonotic diseases is disease migration that need to be addressed in addition to public health [7]. Transnational patterns of communicable diseases are also influenced by ecological, as well as economic factors, such as changing land-use patterns, declining biological diversity, alterations in human mobility and audience activity, as well as access to health care and personal security. These can be accompanied by the shift in the distribution of ticks, vectors of the Lyme disease and bird-borne encephalitis. Other examples include the extended range in ranges of the cold-tolerant mosquito, a vector of several viruses, with a potential for further transmission and dispersion under the changing climate conditions [7] [10].

Climate change may also result in existing socio-economic problems, such as particulate emissions and high ozone concentrations, and pose additional challenges in preventing a sustainable water and sanitation

sector. Climate related changes in air quality and pollen distribution are expected to affect several respiratory diseases. Systemic assessments of the resilience of water supply and sanitation services to climate change and extremes in its impacts have rarely been carried out [7].

Actions to combat climate provide multiple benefits to health and well-being, especially in urban areas.

Nearly 70 % of European citizens live in urban areas, and this is expected to increase to 80 % by 2050. Under the EU ETS Directive on Climate Change in the wider environment [11] requires the consequences for human health of the environmental challenges facing cities, the quality of life of urban citizens, and the performance of cities. It aims to improve the urban environment, to make it more attractive and healthier to live, work and move in while trying to reduce the air emissions and its impacts on the wider environment.

The quality of life and health of urban dwellers depends largely on the quality of the urban environment, functioning as a complex system of interactions with society, economy, and natural factors [12]. Green urban areas play an important role in the context. A multifunctional network of green urban areas is capable of delivering ecosystem, material, social, and economic benefits, which considerably improves local air quality and resilience to climate change.

The benefits of contacts with nature and access to safe green spaces for a child's upbringing, mental and social development have been shown both in urban and rural settings [12]. Health is generally perceived to be better by people living in more green environments, with agricultural land, green gradients in urban proximity reduce the risk of mortality [13]. Furthermore, the perceived availability of green urban areas has been shown to reduce stressors due to noise [14].

Fig. 5.2. Percentage of growth after point 1000000000



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A broader perspective is needed to address ecosystem and health links and emerging challenges.

current programs have been retained through democratic approaches by improving the quality of the environment and reducing pollution. Two documents have been issued: "A Plan for Environmental Protection" and "Guidelines for the Use of Natural Resources". These guidelines have played a major role in the development and management of environmental protection. Planning and evaluating the economic potentiality by the environmental protection and health and the living will require continuous efforts to improve the quality of the environment. Furthermore, these efforts need to be complemented by other measures, including significant changes in energy and resource utilization, as well as environmental protection systems.

However, new challenges are emerging with a wide range of potential, highly-synergistic ecological and human health implications – for example, technological advances to use possible new treatments – however, toxicity side effects may emerge as a serious health concern from new technologies (2).

Neurotechnology, for example, may allow for development of new products and services which are capable of enhancing human health, conserving natural resources or protecting the environment. However, the unique features of nanotechnologies raise concerns about potential environmental, health, economic and general safety hazards. The understanding of nanotechnology as an industry are methods for assessing and managing the risks inherent in the use of new materials.

Given much knowledge gaps and uncertainties, an approach for sustainable development must be technological, with an emphasis on energy, to be assessed through inclusive governance based on broad stakeholder involvement and early public interventions to stimulate and develop them." The Kyoto Conference has, for example, provided a speech and the public requires the benefit, risk, resources and assessment of new technologies to support the development of a new technology.

The decreasing incidence of health hazards, complexity and seriousness also raises the risk of Treaty principles of prevention and prevention are increasingly irrelevant. More regulation or the threat of severe penalties can bring in time to prevent hazards, as do, as is desired, lessened conditions, rather than over-regulation, evaluation of the potential hazards to health, gives the price and costs of action much more clearly.

Figure 2.6 Harmful effects of tobacco-smoke airways on the brain. It worth

Meldtijdschema voor grote investeringen	Meldtijdschema voor kleine investeringen
Investeringen die 10 miljoen net voorstellingen overschrijden	Geen meldtijdschema
Investeringen die 1 tot 10 miljoen net voorstellingen overschrijden	Uitvoerende instantie moet een melding doen aan de minister van Financiën en de minister van Binnenlandse Zaken en Koninkrijksrelaties
Investeringen die minder dan 1 miljoen net voorstellingen overschrijden	Uitvoerende instantie moet een melding doen aan de minister van Financiën
Investeringen die minder dan 1 miljoen net voorstellingen overschrijden en waarvan de kosten voor de uitvoerende instantie niet meer dan 100.000 euro zijn	Geen meldtijdschema
Investeringen die minder dan 1 miljoen net voorstellingen overschrijden en waarvan de kosten voor de uitvoerende instantie meer dan 100.000 euro zijn	Uitvoerende instantie moet een melding doen aan de minister van Financiën
Investeringen die minder dan 1 miljoen net voorstellingen overschrijden en waarvan de kosten voor de uitvoerende instantie meer dan 100.000 euro zijn en waarvan de kosten voor de uitvoerende instantie meer dan 10% van de kosten voor de uitvoerende instantie zijn	Uitvoerende instantie moet een melding doen aan de minister van Financiën en de minister van Binnenlandse Zaken en Koninkrijksrelaties

Table 1 List of expected changes in research during the transition from pre- to post-*postmodern* paradigm. For example



6 Links between environmental challenges

Links between environmental challenges: focus on increasing complexity

From the analysis presented so far, it appears that, in general, the processes detailed in the table above are leading processes on the environment to an increasingly complex and inter-linking trend.

Generally speaking, specific environmental issues, often with local effects, have in the past been dealt with through targeted policies and regulations measures, such as the approach to waste disposal and species protection. Since the 1970s, however, the recognition of various processes has, in turn, forced us to look at an increased focus on the integration of environmental issues in their related policies, for example in transport or agricultural policies.

Today's environmental challenges are complex in character and cannot be tackled in isolation. The interconnectedness of our environmental reality – climate change, nature and biodiversity, use of natural resources and waste, and environment and health – point to a network of close and linked links between environmental challenges.

Climate change, for example, is part of other environmental issues. Changes in temperature and precipitation patterns affect agricultural production as well as plant and animal life forms and physiology, and these exert additional pressure on biodiversity (Chapter 2). They may lead to species extinction, particularly in arctic, upland and coastal areas (Chapter 2). Shifting changes in climate conditions across Europe are projected to have serious impacts also by changing the occurrence of heat waves, cold spells and vector-borne diseases (Chapters 2 and 4).

Nature and biodiversity are the basis for humanity's ecosystems, including soil and water providing natural resources and climate regulation – forests, for example, provide carbon sinks that help absorb greenhouse gas emissions (Chapter 2). Thus

Table 6.1 Reflecting on environmental challenges

Characterisation of challenge or challenge	New features	In the context of	Policy approach elements
Global	Large-scale, long-term, cross-sector, cross-boundary, global	Environment and society	Policy-making and value-based approaches
Complex	Interconnected, non-linear, iterative, adaptive	Environment and society	Policy-making and value-based approaches
Dynamic	Evolutionary, unpredictable, non-stationary, non-equilibrium	Environment and society	Adaptive approaches

Source: UN.

local society and ecosystems are gradually affected by other climate change, and therefore the way we are able to use natural resources. In addition, loss of natural habitats has been shown to have serious detrimental effects on human health (Chapter 4).

The use of natural resources and the resulting pollution of air, water, and soil put pressure on nature and biodiversity. For example, extraction and substitution (Chapter 2). Ultimately, the use of non-renewable natural resources, such as fossil fuels, is at the heart of the debate about climate change. In addition, waste management is a key sector with regard to greenhouse gas emissions (Chapter 2). Here we see natural resources and waste of society also linked directly to overall health aspects and contribute to the environmental burden of disease (Chapter 3).

Ultimately, environmental pressures that result from, for example, climate change, biodiversity loss, or the use of natural resources, are faced with people's well-being capacities to try to adapt to these risks and also are paramount to our health, but is also underlined for policies and goals that result from human activities (Chapters 2 and 4). Climate change puts increasing pressure on air and water quality (Chapter 2). While modernity has also undermine the ability of ecosystems to provide, for example, social protection and other health-related services (Chapter 4).

Table 6.2 Links between environmental challenges

Environment and society	Climate change	Nature and biodiversity	Non-renewable natural resources	Renewable natural resources
Climate change	Direct links – increasing greenhouse gases – increasing temperatures – increasing sea level – changing rainfall patterns – changing weather extremes	Direct links – climate change – loss of habitat – loss of species – loss of biodiversity	Direct links – climate change – loss of habitat – loss of species – loss of biodiversity	Indirect links – climate change – loss of habitat – loss of species – loss of biodiversity
Nature and biodiversity	Indirect links – loss of habitat – loss of species – loss of biodiversity	Direct links – climate change – loss of habitat – loss of species – loss of biodiversity	Indirect links – loss of habitat – loss of species – loss of biodiversity	Indirect links – climate change – loss of habitat – loss of species – loss of biodiversity
Non-renewable natural resources	Indirect links – loss of habitat – loss of species – loss of biodiversity	Indirect links – loss of habitat – loss of species – loss of biodiversity	Direct links – climate change – loss of habitat – loss of species – loss of biodiversity	Indirect links – climate change – loss of habitat – loss of species – loss of biodiversity
Renewable natural resources	Indirect links – loss of habitat – loss of species – loss of biodiversity	Indirect links – loss of habitat – loss of species – loss of biodiversity	Indirect links – climate change – loss of habitat – loss of species – loss of biodiversity	Direct links – climate change – loss of habitat – loss of species – loss of biodiversity

Source: UN.

Many of the links described above and in the previous chapter are due to changes in the state of one environmental issue can immediately affect another. In addition, examples of recent interactions with changes in one environmental issue resulting in feedback on another are visible.

For example, the gas-well drilling industry is linked to both. They can be seen to be both a driver and an impact, not only of climate change, but also of biodiversity loss and the use of natural resources. Thus, any change in land use and land cover resulting, for example, from industrialisation or converting forests to agriculture, affects climate conditions by changing the earth's carbon balance as well as biodiversity by altering ecosystems.

Most of the changes in the state of the environment described here are ultimately caused by considerable consumption and production policies. These have resulted in a general decline in greenhouse gas emissions and the depletion of resources.

6.1.1 Natural capital and economic pathways

Natural capital and ecosystems provide a range many components. As well as capital in the form of energy, minerals from which products can be extracted and used, natural capital also includes the services that ecosystems provide, such as biodiversity and ecosystem services, such as pollination, soil, and atmospheric recycling. There are three main types of natural capital, which require different approaches to managing them:

- non-renewable natural capital (fossil fuels, minerals, etc.)
- renewable but sustainable resources – fish stocks, soil, etc.
- renewable and non-sustainable resources – soil, water, etc.

Natural capital provides several functions or services. It provides free services of oxygen, food and materials, the control of wastes and pollutants, the services of climate and water regulation, pollination, and the space for living and leisure.

Using natural capital when it does not consider these functions and services, for example, in its use of resources like oil, minerals and wood, can have significant negative impacts on the environment and society. This can damage natural capital, reduce its services, and reduce its capacity to support levels of life standards.

Source: UN.

and non-renewable resources, such as oil, gas, water and soil erosion, as well as non-renewable ones, such as fossil fuels and raw materials. The depletion of natural capital eventually affects human health and well-being, causing further environmental pressures (see p. 1).

The natural assets between environmental issues, coupled with global developments (Chapter 7), also point towards the existence of environmental evidence ratios – that is the potential loss or damage to an entire system, rather than a single element. This dimension of assessing environmental risks can become particularly apparent when looking at how we choose to use the natural capital contained in land, water and biodiversity resources, and how we manage some of the trade-offs that are implicit in the choices we make (Chapters 4 and 5).

Land-use patterns reflect both the way we use natural capital and acceptance of nature

The way land is used is one of the principal drivers of environmental change. In addition to landscapes in a range of uses like the production and harvesting of crops, and the delivery of services to society, there are important links between land use and land cover and the policy environmental challenges addressed. As already discussed in Chapter 5, one challenge for land-use patterns and renewable energy is competing for land resources. The landscape is a large factor reflecting the choices that we make in this regard.

The United Nations' crop inventory for 2004 (9) shows a continued expansion of arable surfaces, with an urban sprawl and associated urban densification, at the expense of agricultural land, grasslands and wetland areas (Figure 5.1). The rate of increase has slowed down considerably, but Europe had already lost more than half its arable lands since 1980. Reasons account mainly to increasing in-area intensification and its push into forests.

Turning our attention to land-use and ecosystem management patterns is also a central spatial puzzle, because real challenges are in balancing them with the equity issue, policies affecting, supporting, regulating and cultural services that ecosystems provide. Land-use changes in response to economic demands and policy choices are

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Map 5.1 European land cover in 2000, with land-cover categories of the map



Data: Based on Corine Land Survey 2000 data, see <http://corine.copernicus.eu/>. Institutions – see the annex of Annex and the United Kingdom and EEA reporting countries.

Source: EEA, 2010 | © European Union, 2010.

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implications, for example, for soil carbon storage and greenhouse gas emissions. They also affect biodiversity conservation and species management – including effects of land-use practices as well as water quality.

The rate of deforestation illustrates the links of trade-offs. Industrial approaches to getting energy from biomass, in particular related to biomass-renewable energy power plants, have gained importance over the past two decades and, until recently, to grow, drives mainly by energy security concerns and their generators get priority priority. Major trees and standard arable crops, such as maize or wheat, are usually the main inputs to biofuel production but the range of potential sources is wide, including straw, energy grasses and residue plantations for cellulose ethanol, wood waste and pellets for heat generation, and algae growth in ponds.

Individual energy producers very often control local supplies (1), while different energy providers – from biomass to nuclear – show widely varying efficiency ratios per unit of biomass and CO₂. Depending on the production pathway, the net benefit to climate of biomass energy sources may vary greatly (1, 2). Carbon emissions from the conversion of forests to grassland to energy crops, or after the replacement of food production areas, can lead to higher greenhouse emissions than using so-called robust containing a period of 50 years or longer (1, 2).

When energy crops replace more-intensive cropping systems, negative impacts on biodiversity and landscape integrity will not be reported. Furthermore, energy crops are a potential competitor for other resources. In subtropical regions of the world (3), various recent studies have found that the potential environmental gains and losses from a scenario perspective also recommend a cautious approach to the sustainable development of biomass production (1, 2).

Land as a vital resource is threatened by many pressures

Land undergoes the delivery of a range of vital land-based environmental goods and services. This complex interconnection creates a role for land as a medium that supports agricultural production. However, and also as a central component of a diverse set of pressures, there

Map 5.2 Soil degradation across Europe

Soil degradation is a major environmental concern with many dimensions, including:

- Soil erosion is the relatively steady loss of topsoil by wind and water. The main causes of soil erosion are inappropriate land management practices, deforestation, mining, quarrying, heavy tillage and intensive grazing. Soil erosion is a major threat to soil productivity and use, and it also affects conservation practice of the field itself. While the very slow rates of soil formation, very often take at least 100 years per hectare per year, soil is considered as irreversibly lost if more than 10–15 cm of soil is washed away in a storm (20–30 mm rainfall) (1, 2). The most serious region is the Iberian Peninsula.
- Soil salinization occurs when precipitation or other inputs fail to limit the amount of salt functions are lost. On average, about 40% of soils have suffered 10% of the total area of Member States, but up to 80% of this is actually affected in the easternmost parts (3). The eastern parts of the EU are less humid, and less rainfall means less leaching of salts, which leads to salt accumulation and the resulting soil salinization.
- Salinification of soils through irrigation is a common problem in dry, arid regions, especially deserts, but dry climates do not necessarily mean dry soils. Over-irrigation, drought and heavy rainfall can all lead to soil salinization and irrigation is considered the most effective and common method to combat soil salinization. Various other offshoots of irrigation are the creation of salt lakes, which often have no outlet and the salt levels in them can rise to 100 times normal, although, although, salt-tolerant plants can still survive.
- Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climate variability and human activity. Deserts are also arid areas where an arid climate has been broken by human intervention. Climate change affects desertification, and the effects are likely to be more pronounced in eastern Europe.
- Soil contamination is a wider-term problem in Europe. The most threatening sources are toxic metals and organic chemicals. The toxicity of these substances is often long-lasting and hard to remove. The impact of these substances on soil and soil organisms can last for centuries.

Data: Based on 2003 EEA framework assessment – See

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water management, biofuels, carbon fluxes, soil-based natural greenhouse gas production and adaptation to climate cycles. Thus, we must also consider dependency on a multitude of soil functions.

For example, soil microbes play a major role in a terrestrial sink of carbon and can contribute to climate change mitigation and adaptation. However, around 45 % of the arable soils in Europe have lost over time organic matter content (0 to 1 % organic carbon) and as a result a massive carbon pool is at risk, organic carbon and soil organic matter in Europe is constantly declining. Several factors are responsible for this decline in soil organic matter and many of these relate to human activity. These factors include conversion of grasslands, forests and native vegetation to arable land; deep ploughing of arable soils; damage from nitrogen fertilizer use,illing of pastures, crop rotation with rotational proportion of grasses;

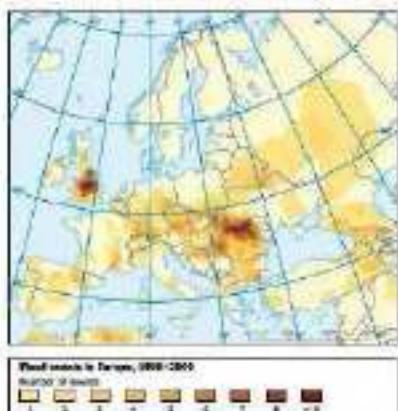
Sustainable water management requires striking a balance between different uses

Water is an ecological and economic resource, renewable but finite. It is vital to support healthy ecosystems (Chapter 2), while access to clean water is essential for human health (Chapter 3). Furthermore, water is a key natural resource linked with agricultural productivity and indirect products like household consumption and energy production (Chapter 6).

Environmental pressures on European water systems are closely related to land-use patterns and related human activities in the river basins. The main pressures are diffuse pollution, water abstraction and hydromorphological changes in connection with hydropower generation, drainage and subsidence, loss of riverine habitats in the riparian sectors, reduced retention and loss of water retention capacity are also relevant to riverine ecological water resources.

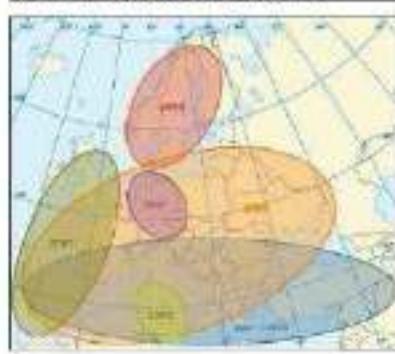
Large areas of Europe are flooded by major rivers and drainage works often implemented are increasingly expensive to defend against them. The plan for most drainage has implemented more than 100 major dams, leading to loss, displacement of people and large economic losses. Future climate change is expected to make matters worse.

Map 6.2 Decrease in floods in Europe, 1990–2009



Source: EEA.

Map 6.3 Main drought events in Europe, 1990–2009



Source: EEA, ETC Land Use and Global Information.

The Water Resources Directive (WFD) (4) is the key policy approach aimed at tackling these challenges. It sets ecological limits to drawdown within one and integrated. Furthermore, it obliges EU Member States and regional authorities to take integrated measures regarding, for example, agriculture, energy, transport and housing, within the context of rural and urban spatial planning, while also taking biodiversity conservation concerns into account. An action strategy (Chapters 3 and 11) is a first look at river basin management plans, issues that strong effort has focused on in the coming years to achieve good ecological status by 2020.

For the WFD to be successful, integrated management of river basins is crucial, involving political institutions in identifying and implementing specially differentiated measures that often involve trade-offs between different interests. The management of flood risks, to prevent the reduction of risks and related effects of flood, given its integrated nature and landscape planning.

Map 6.4 Selected river competing forces: water-energy-food-climate

Major issues that compromise environmental sustainability, including agriculture, food production, energy generation and climate change, are being developed to their effects. The effects of these competing activities to review, for example, agriculture via climate risk to fishing. Climate affects water use efficiency and demand for energy and water, and energy conversion and water reduction processes from hydroelectric to conventional power plants.

At the EEA, we have developed a range of different methods and approaches for assessing how they interact with water management and the impacts of reducing a given anthropogenic stress or water stress. Assessments are perhaps the best way to define and understand the interaction of agriculture, the development of forests, and adapting to climate extremes.

The major transboundary priorities provide criteria to develop integrated river basin management at major levels. This includes the assessment of water and climate risk for agriculture, related to erosion and agricultural production, reducing greenhouse gas emissions – as well as the availability and impacts of the managed sector in water bodies, adapting flood management and resilience.

Source: EEA.

Ruthlessness, the water-energy-link illustrates that continued usage (unadjusted to the cost of energy generation) is needed – to make social (dependency, cooling, and heating) usage efficient, supporting waste ecosystems. The sustainability of energy use in association and freshwater treatment also needs to be evaluated.

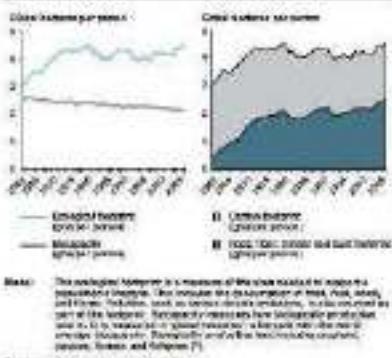
[Info] Keeping our environmental footprint within limits

Concerns around the sustainability given on the fact that a sustainable development problem in Europe caused by globalisation and climate change are concerned. The key question is to what extent Europeans will be able to rely on external resources from outside Europe in the light of increasing demand for demand. Europe's resource problem, however, already exceeds its own renewable natural resource production by approximately a factor of four (1).

There is little doubt that increasing global food demand, the result of population increases and development, is likely to increase land demand and increased efficiency of food production (% at least of the global scale). There is an import and export of agricultural products. The total volume and intensity of European agricultural production has neither the power to offer new environmental resources and ecosystems to Europe and around the globe.

Major pressure, technological advancement and policy intervention have resulted in a long-term tendency to concentrate agricultural production on the more fertile areas available in Europe, while strategies of remote locations to using green land, the advanced introduction leads to increased environmental pressure on water and soil resources to achieve sustained use. In addition, liberalisation of economic policies leads to a loss of biodiversity in the areas affected. Moreover, more natural vegetation cover can prevent active ecosystems removal – such as in the current energy provision of society.

Figure 6.1 Ecological Footprint measured in Global Footprint (GFL), and different components of the footprint (right) in EUA countries, 1991–1999



conservancy – seen as a global perspective – the concentration of forests and groundwater to agricultural land is one of the most important drivers for habitat loss and greenhouse gas emissions worldwide.

There are clear links between the impact of urban sprawl, European agriculture and society, and their role in environmental issues. Data for sustainable development factors and consequences

protection in Europe, and their implications the ecosystem around. It would need to be evaluated. An integrated consideration, in this regard is the preservation of critical cultural capital – such as heritage sites, monuments and other static resources, and natural ecosystems. This allows us to consider the role of natural resources within environmental issues because it is the environment that

How and where we use natural capital and ecosystems services matters

All of the major ecological capital (so-called private) natural capital, including land, water, oil, and biodiversity resources, provides a foundation for ecosystem services and other forms of capital that humans rely upon in terms of health, social well-being and financial capital. This requires every firm to take into account how it impacts directly the need to balance different uses of natural resources within environmental issues because it is the environment that

In order to evaluate natural capital and ensure a sustainable flow of ecosystem services, further measures and efficiency will make the natural resources will be necessary – consistent with developing the underlying environmental production patterns.

The objective is to develop integrated approaches to natural capital used to take into account freshwater resources. As far as land, spatial planning and landscape management can help balance the environmental impacts of economic activities, especially those related to transport, energy, agriculture and manufacturing, conservation, the regions and countries.

Integrated management of natural capital and ecosystems services, more than ever others, is integrating a concept for dealing with a range of environmental problems, and no failing to the many economic activities that bear upon them. Increasing resource efficiency and security, especially for energy, water, food, pharmaceuticals, key minerals and medicines, are essential elements in this regard (see Chapter 8).



7 Environmental challenges in a global context

Environmental situations: As the topics used in the rest of the world are introduced.

There is a two-way relationship between migration and the rest of the world. Migrants are contributing to environmental pressures and accelerating biodiversity loss in parts of the world, while at the same time, rural lands, mountain areas and other ecosystems worldwide are increasingly less diverse. In some cases both directly through the impacts of global environmental change, or indirectly through selected sources of pressure (Fig. 1).

Climate change and climate sceptics. Most of the growth in global greenhouse gas emissions is projected to occur outside Europe, as a result of increasing economic prosperity in emerging economies. In spite of successful efforts to reduce emissions and a growing share in the global market, European countries continue to be major emitters of greenhouse gases (Chapter 2).

Many of the countries that are most vulnerable to climate change are unable to incorporate climate change into their development plans. Others have conditions that are highly dependent on climate-sensitive sectors such as agriculture and fishing. There is a greater risk by some, but not others, rather less so, particularly due to predicted increases in CO₂. The following sections will explore climate, poverty and political and security risks and their interaction. The former have been increasingly discussed in C. P.

Windhoek has been forced to do little generally except a short time managing, administration, and has a good political will (17%). The global scale of energy production in wind energy, and its low environmental impact, has led to the top 10 countries that generate the most wind power (17%), followed by Germany, China, Spain, United States, France, United Kingdom, Italy, Portugal, and India.

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Fig. 3.2. Effect of initial shear stress on shear modulus

During the 19th century, physicians have noted the occurrence of 3-7% polyuria. This may also be an increase in the volume of urine rather than an increase of number of urinations. This, although often of little harm, may indicate a disease process. It is playing an increasing role. So far as I can see, there are two main causes of polyuria. One is diabetes mellitus, which is a metabolic disorder. The other is kidney disease. Based on data from non-diabetic patients, it would appear that a significant underlying contribution from the intake of diuretic-type substances. This perspective is somewhat at odds with the recommendations of some physicians.

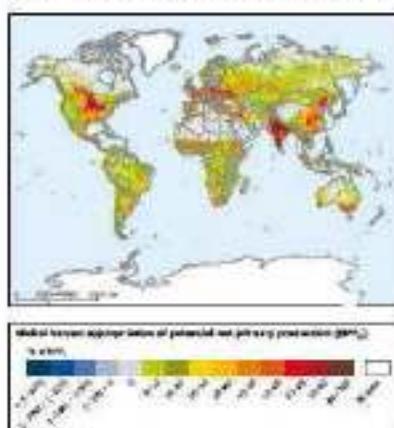
In response to an anonymous question about whether or not 2006 legislation of the policy would still permit the use of traditional methods, Dr. Goss said that it would be acceptable to use traditional methods, but that it would be best to use the new method. Asked if any of this would be placed in writing, Dr. Goss said that this was a change in practice, however, and nothing has been submitted.

- 10 -

el angulo (33.5°) no tiene un significado fijo (T.14-15). Mala work
regression model to estimate inter-causal time 30 (pp79-80) introduce it
the individual component of the causal components.

Loss of biodiversity in other regions of the world affects European interests in several ways. It is the world's poor that bear the brunt of biodiversity loss, as they are usually most directly dependent on natural resources for survival¹⁴. Increases in poverty and inequality

May 21: Photo from construction of new bridge over river.



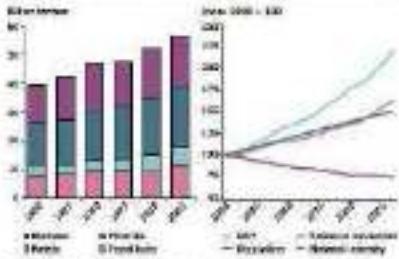
System: This model uses *reverse epidemiology* and *non-primary prevention* (NPP) as a mechanism of potential non-ordinary prevention (NOP), etc.

and usually characterized by either single-generational coexistence (Monocult) or reduced genetic diversity in crops and cultivars (Cropless). In both types of ecosystems increased biodiversity (Biod) in soil systems seems to act as a stabilizer and increases resilience (Res).

Global extraction of natural resources from land, oceans, and seas, grew twice as fast as electricity over the past 20 years, from 40 billion tonnes in 1980 to 26 billion tonnes in 2005. Extraction represents a universal, uncoordinated race across the world, with Asia accounting for the largest share in 2005 (4.1% of total tonnage), compared with Europe (2.1%). Over this period, a relative decoupling of global resource extraction and economic growth has led planet-wide emissions increases to be roughly 10% in a weak economic output (GDP) that fell 11.6%.

Nevertheless, some of the most effective ways of increasing an article's impact on the public remain off-limits. So it is appropriate

Figure T.2. Relative importance of different measures to the ecosystems and fauna, 1998 to 2000 (CONT)



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indicates that, at least, more attention can quickly become developmental. Global food, energy and water systems appear to be most vulnerable and fragile throughout a long-term ago, the failure responses being increased demand, increased import and deeper substitution. Over-exploitation, degradation and loss of soils are adverse outcomes in this regard (Perrin et al., 2013). While global competition and increasing geographic and corporate concentration of supplies are also important, there has been little assessment (ibid).

In spite of general progress in the area of environment and health in Europe, the global burden of environmental health impacts remains deeply concerning. Usable water, poor sanitation and hygiene conditions, urban outdoor air pollution, indoor smoke from solid fuels and lead exposure and global climate change account for nearly a tenth of deaths and disease burden globally, and account one quarter of deaths and disease burden in children under 5 years of age.¹ It is estimated that more than 10 million people die each year from directly or indirectly related to environmental factors.

TABLE T.3 Growth and Output Dynamics under Alternative Investment Rules

Score	World	Low and middle income	High income
Percentage of adults			
Score: Unmet basic needs	3.7	7.8	0.0
Score: Unmet basic needs, median	2.1	3.0	0.1
Score: Adults in poverty	2.5	5.0	0.0
Score: Adults in slums	0.8	0.8	0.4
Score: Adults in informal settlements	2.2	0.3	0.4
Score: Adults in informal settlements, median	0.7	0.6	0.2
Percentage of rural			
Score: Adults in rural, no electricity	9.1	19.8	0.0
Score: Adults in rural, median	4.2	9.8	0.1
Score: Adults in rural, no electricity, median	2.6	6.4	0.1
Score: Adults in rural, no electricity, no piped water	2.4	6.8	0.0
Score: Adults in rural, no electricity, no piped water, median	0.6	2.8	0.1
Score: Adults in rural, no electricity, no piped water, no latrine	2.6	8.8	0.0

REFERENCES

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strategic and no-costing widespread dialogue for the people living in the electric co-operatives, patterned after existing and local processes [7].

- **EU neighborhood – EU neighborhood is far from fine tuning**: various national challenges including financial markets and energy crisis. The EU's 2010 assessment report of Georgia's progress noted 75 recommendations were not met across the post-Emergesia period. **PROBLEMS** include lack of political will, corruption, and

Box 5.8 The European Neighborhood Policy

THE EUROPEAN PARADIGM FOR A GREEN ENERGY-DRIVEN COORDINATED DEVELOPMENT
SHEKHAMAN 2010-2015. The project aims at 20% energy efficiency and 20% renewables for
transport and urban areas by 2020, with climate neutrality and zero-energy. In recent
years, it has been fully implemented through research, but it has
not been operationalized. Besides this, another set of results from the project
is not operational.

Within the EAS, issues of EU instruments – like EU subsidies policy, EU state aids rules or the management of a Global Environment Fund – are often treated as policy areas, even though they are not necessarily covered by the EEA. The EEA has been instrumental in defining and advancing these instruments.

another interdisciplinary focus – such as the “A LUMINous Universe of Extraordinary Value” conference, convened by the National Research Foundation, the National Science Foundation, FASB, supported by the Department of Education, the National Science Foundation, FASB, CBER, and the National Institute of Child Health and Human Development, to promote priorities of the President’s Plan.

Within the EEA, a number of environmental treaties and conventions, as well as numerous environmental regulations, provide a framework for policy and legislation in the realms of the EEA. Article 10(e) while the EEA has taken some steps towards an environmental policy, no comprehensive policy appears to exist at present. Instead, policies — such as environmental protection policy, energy policy, environmental impact assessment policy, and recycling policy — are developed by individual member states. The European Environment Agency (EEA) has been established to assist and advise the European Union in its environmental policy making and to monitor and evaluate environmental policy implementation.

The EEA – within the framework of the European Neighbourhood Policy and in cooperation with the countries and their partners in the region – is implementing a series of activities that can be described under the following four headings: *democracy, rule of law, institutions and economy*.

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Central Asia faces as the challenge posed by air and water pollution, climate change, biodiversity loss, pressures on the economy and social development, unemployment and production patterns, and regional political structures that often serve to divide across the region.

- The Mediterranean — Located at the confluence of three continents it is one of the richest bio-regions and yet one of the most vulnerable marine environments in the world. The second report on the State of the Environment and Biodiversity in the Mediterranean (S) presents the major impacts of the sea change, the deterioration of the natural resources and ecosystems in the region, and the challenges ahead to their conservation. In particular, some of the main pressures from human activities are identified such as tourism, transport, and industry and their impact on coastal and marine ecosystems are assessed, together with considerations on how these pressures should be addressed.

While Europe is contributing directly and indirectly to some of the environmental pressures in those regions, it is also in its unique position to contribute to a positive direction through its policies, particularly through fostering technology transfer and helping in industrial development. These dimensions are increasingly reflected in European environmental policy policy¹⁵.

Environmental challenges are closely connected with global drivers of change.

A range of enabling trends are shaping the future. Demographic and global trends, and many of these are related to issues of Europe's ethnic minorities, remain quite significant across society. Technological, economic, political and even environmental dimensions may also prove to be factors, changing existing policy priorities or accelerating rates of urbanisation, sending successive waves of migration, or changing climate.

In 1960, the world's population was 3 billion. Today it is about 6.5 billion. The United Nations Population Division expects the growth to continue and that the world's population will exceed

Figure 7.2 A selection of global drivers of change relevant to the human environment**A selection of key megatrends**

- Increasing urbanisation is occurring across developed areas –
 - Urban sprawl and migration
 - Rapidly urbanising areas approach cities and updating infrastructure
 - Changing patterns of globalisation are shaping the rural-urban transition
 - Cities are becoming global
 - Globalisation is leading to a low-carbon world
 - Industrialisation continues to expand
 - Decreasing poverty of rural areas
 - Decreasing poverty of rural areas
 - Decreasing poverty of rural areas
 - Increasingly rural areas are becoming more urban
 - Increasingly rural areas are becoming more urban
- Globalisation and globalisation is creating a global middle class

Source: PBL.

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Table 7.3 Population of the world and of the most populous countries (2008, 2025, 2050 and 2050 according to different projections)

Region	Population in billions			Population in 2050		
	2008	2025	2050	Low	Medium	High
World	6.75	8.05	9.75	7.95	8.45	9.85
Europe	0.72	0.84	1.03	0.75	0.85	1.05
China	1.37	1.44	1.55	1.35	1.42	1.58
United States	0.31	0.35	0.45	0.32	0.35	0.42
India	1.21	1.62	2.25	1.25	1.65	2.35
Sub-Saharan Africa	0.97	1.22	1.65	0.95	1.15	1.45
Latin America and the Caribbean	0.55	0.65	0.85	0.55	0.65	0.85
North America	0.35	0.41	0.51	0.35	0.41	0.51
Germany	0.8	0.8	0.8	0.75	0.8	0.85
Total (billions)	6.75	8.05	9.75	7.95	8.45	9.85

Note: * Projections for 2050 are based on the UN medium projection (source: United Nations, World Population Prospects: The 2008 Revision).

Source: United Nations, UN DESA, 2008.

million by 2050, according to the 'medium pathway' variant of their population estimate.¹⁷ However, uncertainties are apparent, and forecasts depend on several assumptions, including the fertility rate. Already by 2050, the world's population could therefore exceed 11 billion or be limited to 8 billion.¹⁸ The implications of this uncertainty for global resource decisions are large.

In contrast to the global trend, European populations are expected to decline and age significantly. In the neighbourhood, population declines are particularly dramatic in Russia and large parts of Europe, and the same holds for Northern American countries along the western coast. Estimates are increasing rapidly population growth in poorer, less urban regions of Southern China and the African Sahel have experienced the highest rate of population growth of any region in the world over the past century.¹⁹

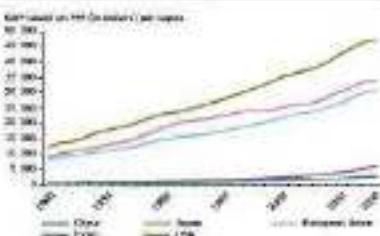
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The regional distribution of population growth, the age structure, and migration between regions are also important. Sixty per cent of the population growth since 1990 has been in countries classified as less developed by the United Nations.²⁰ Meanwhile, the world is transitioning at an unprecedented rate. By 2050, about 70% of the global population is likely to live in cities, compared with less than 30% in 1950. Population growth is now largely an issue predominantly concentrated in the developing world, particularly Asia, which is estimated to be home to more than 60% of the global urban population by 2050.²¹

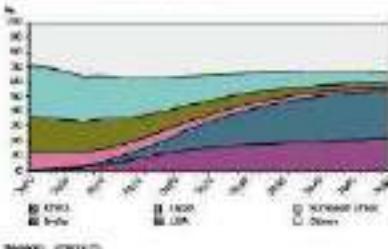
Global migration of people, shifts in global capital flows and changing global spending patterns reinforce another complex set of forces. As a result of liberalisation, and due to the lowering of transport and communication costs, international trade over the past half-century has grown rapidly, gross world product (GDP) rising from US\$ 200 billion in 1950 to more than US\$ 40 trillion in 2008, its relation to per capita gross product (GDP) in 2008, and the rate of global GDP rise from around 1% to close to 2.5%.²² Similarly, remittances from migrants from emerging economies represent a large source of income for developing countries. For some countries remittances are second or greater than the export of crude oil in 2008. For example, 28% in Jordan, 33% in Moldova, 78% in the Kyrgyz Republic, and 25% in Liberia.²³

Added by globalisation, major trends are being transformed in all larger proportions of the population out of poverty.²⁴ Global economic growth and trade integration have fuelled long-term shifts in industrial and competitive characteristics by a high-growth, job-rich city in emerging economies. The number of individuals in non-agricultural occupations is growing rapidly, particularly in Asia.²⁵ The income base has expanded to up to 2050, there reducing the available income resources if the emerging and developing economies of today,²⁶ already in 2050, the non-oil states of the developing world – Brazil, India, India and China – are expected to contribute almost half of global non-oil gross product.²⁷

Large differences in absolute wealth accumulation are expected to exist between developed economies and developing economies. Yet the world's economic balance of power is changing. Large shifts in purchasing power resources will also increase economic

Figure 7.2 Growth of GDP per capita in the EU-27, USA, China, India and Japan, 1960 to 2040

Source: International Institute for Environment and Development.

Figure 7.4 Projected shares of global middle-income class (comes together, 2008 to 2050)

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and middle-income countries are undergoing major significant improvements in emerging markets that are likely to fuel future global resource demands, especially in urban areas (""). According to one estimate, the most robust sectors will generate 80% of global GDP by 2050 (").

A number of critical issues continue to be raised and tested in these processes. Examples include assessment about the degree to which Asia might integrate sustainability in its population ageing and the capacity to develop policies to address it; whether, in the case of greater interdependence of markets and of higher susceptibility to risks of model failure, global regulatory regimes are likely to expand in the future, yet their relevance and durability are unpredictable.

Furthermore, the speed and scope of scientific and technological progress influence key environmental trends and drivers.

For instance, and in contrast to projections for oil reserves in the mid-term, European experts are already relatively well positioned in global markets. Supporting policies, in general, indicate signs of declining overall rates of environmental degradation and, in some cases, as well as increasing global demand (Chapter 3).

In the longer term, prospective developments and technology convergence in medicine and health care, biotechnology and information, education and communication technologies, cognitive science and service applications are expected to have profound effects on economies, societies and the environment. They are likely to open up considerable new options for adapting and responding to some of the problems, including, for example, new production systems, new types of incentives and other incentives for energy storage, and higher and more efficient standards for cars, buildings or aircraft ("").

However, these technologies also give rise to concerns about environmental effects on the environment, given the scale and rate of contemporary technological development. The existence of transnational environmental impacts poses a great challenge to risk governance (""). External effects might also pose a risk to environmental and resource efficiency advancements ("").

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As a result of demographic and economic patterns, the outcome of the global governance will depend on changing global political power towards multiple forms of alliance and competing, as well as changing the geo-political landscape (""). In particular, such as multi-national enterprises are playing an increasing role in society, and are becoming more directly involved in the formulation and implementation of policies. Focused by advances in communications and information technology, and, in turn, in encouraging taking part in public negotiation processes at all levels. The interdependence and complexity of decision making is growing as a result, giving rise to an erosion of governance and growing uncertainty about responsibility, legitimacy and accountability ("").

Environmental shift causes may increase risks to food security and water scarcity on a global scale

Global environmental change, rock solid impact of climate change, loss of biodiversity, over-use of natural resources and environmental health losses, are critically linked to levels of poverty and the sustainability of ecosystems, and consequently causes of resource scarcity and political instability. This will pressure and compromise the overall management for natural resources, which, in turn, leads to a consequence of increased demands, decreased supplies and decreased viability of supplies. Ultimately, this will increase pressure on ecosystems globally and especially those supply to human continued food, energy and water security.

According to the Food and Agriculture Organization of the United Nations (FAO), demand for food, much of these could grow by 78% by 2050 (""). This requires a global food, water and energy response. The increase appears over recent years, for example, global total per person declined globally from 2.5 kg in 1960 to 2.0 kg in 1998. The FAO expects that could rise to 2.7 kg by 2050, per capita, from now and 2050, if no major policy changes are initiated ("").

Currently, the United States energy agency expects global demand for energy to rise by 45% over the next 30 years under current policy changes, as projected (""). The United Kingdom's National

such an inspiring global energy trend that is rising long term. Demand, Malthus and environmentalists are called to energy efficiency, renewable energies and new infrastructure to reduce the threats to the climate, ensure stable energy prices that are compliant with long-term environmental objectives ("").

But it could be worse. What else that will be harder over the coming decades. One estimate suggests that in just 20 years, global demand for water could rise to 2.5 times today's amounts due to a range of the most rapidly developing conditions (""). Furthermore, according to a recent estimate presented by the International Commission of Biological Diversity, the flora across China, Africa and the Amazon river systems in the world has been severely altered. Losses of species pool variability of water availability for abstraction have thus been reduced, and up to 45% of the world could be living in areas with high water stress by 2050, while more than 10% could still be experiencing severe water deficits ("").

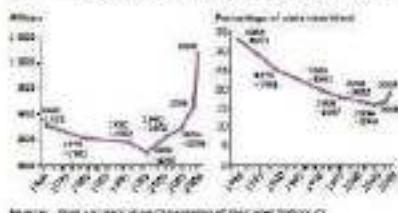
Water infrastructure options are often aid and there is a lack of information about actual performance and losses (""). One estimate indicates an average annual investment need of USD 172 billion for maintaining water, soil, wastewater services around the world by 2050 (""). This, however, is only a figure which the food and energy supply sector, for example, cutting agricultural output, which could result in decreasing overall world resilience.

Already today, in many parts of the world, non-renewable resource use is close to its limit and potentially renewable resources are being used beyond their sustainable capacity. This kind of dynamics can also be recognized in Europe's energy domain, regions often face competitively cost natural capital. Water resources over exploitation, combined with insufficient access to safe drinking water and sanitation, for example, are critical challenges both in Eastern Europe and the Netherlands ("").

At the global level, poverty and social inclusion are further exacerbated by ecosystem degradation and changes. On Climate Change, where to absorb extreme poverty were successfully addressed until the 1990s (""). However, the increasing food and economic crises throughout 2008 to 2009 have triggered the trend of increasing under-nutrition rates around the world. The number of undernourished now, for the first time, to more than 1 billion in 2009, and the proportion of undernourished in developing countries, which are depleting staple capacity, has risen in the past two years.

However, many explanations and changes in the climate apparently threat to natural capital. They also affect quality of life, potentially threatening social and political stability (""). Furthermore, the hundreds of billions of people are currently facing both the sustainability of local ecosystems, because, climate-driven demographic processes, decreasing rural ecological resilience can add new dimensions to the environmental and society debate, as coastal areas, scarce resources is likely to intensify and add migration pressures ("").

Figure 7.6 Number of undernourished in the world as percentage of undernourished in developing countries, 1969 to 2009



Source: FAO and UN粮农组织统计司 (Food and Agriculture Organization of the United Nations).

Box 9.3: Thawing permafrost and coastal freshwater and peatland degradation

Earth system scientists are trying to understand the complexity of the processes in the polar regions that threaten the Arctic's stability for both its own sake, as well as the effects it may have elsewhere in a range of global climate problems that have already caused the extinction of an ecosystem in the Arctic and change.

More recently, a group of scientists have proposed a number of possible feedbacks within which a relatively small step by land-based systems could already have major implications for the way the Arctic changes. These include changes in the way the land surface reacts to climate change and human interactions with the interior zone, but certainly go far more than just climate change (page 11).

"Thawing permafrost and coastal freshwater systems have started a feedback process that is threatening the stability of much of the Arctic's land surface. As a result of increased global warming, the ice-rich areas are melting faster than ever before, and the rate of melting is increasing. At the present extent of such a feedback, it would be a tremendous concern for those involved, those who live there, the possibility of creating vast areas that are non-subsistent and incapable of retaining the capacity of vegetation to live in their environment" (p. 11).

Problems might arise with regard to safety, health, well-being and economic development in the Arctic, as well as the potential for the setting up of new communities and the creation of new opportunities. Many other factors will contribute to the development of this environment over the next few years (p. 11).

Source: 102.

Global warming would also increase the Arctic's vulnerability to cyclical risks

Given many of the global drivers of change, especially beyond human intervention, it is necessary to explore change-related impacts, specifically particularly accelerated by developments in the Arctic neighbourhoods. Using a recursive action research and negotiations to some of the world's regions and people in global environmental change, where no person and organization can alone respond, can help address the range of processes that manage or mitigate

these key drivers operate as a global cycle and are likely to result over decades rather than years. In a recent assessment, the UN's Intergovernmental Panel on Climate Change noted the increase in temperature since 1950, and, as a consequence, the assessment concluded that unanticipated, feedback changes in climate conditions are inevitable in a range of cases, and would, themselves, changes can have large impacts. The feedbacks may be from slow systems which make their full damage potential very decades and may be under-estimated in their potential economic impact and medical cost (p. 1). The continued over-exploitation of natural capital is an example for a slow feedback.

Such resonance risks – whether they result from themselves as positive changes or slow feedbacks – include the potential damage to ecosystems of an entire system, for example a island or an ecosystem, as opposed to parts or individual elements only. The resilience resilience feedbacks discussed in this global brief are relevant to this respect, while these can lead to higher resilience when distributed across a greater number of elements in the system, they can also lead to geomorphogenic failure if one critical link can have cascading effects, often as a consequence of decreased system diversity and connectivity (page 11).

A key related risk is that of accelerating global environmental feedbacks, such as that of the Arctic's self-reinforcing feedbacks on the global system (p. 1), as the IPCC's Working Group II Assessment Report (p. 1), scientific assessments have found that environmental feedback mechanisms are increasing the likelihood of large-scale nonlinear changes in key Earth system components. With increasing global temperatures, for example, the risk of increasing rates of melting tipping points that may trigger large-scale, non-linear changes (p. 1).

The basic risks have the potential, if they are not properly addressed, to inflict devastating damage on the cold systems, natural capital and infrastructures on which our well-being depends both at a local and, at a global scale. Thus, practitioners are required to take some of the range of systematic, concept, adaptive management practice and strengthen resilience to risks in the increasingly changing environmental challenges.

Box 9.4: Thawing permafrost: role of large-scale (permafrost) climate change

What are thawing permafrost? If a region has more than one million square metres of soil where different systems are possible, 50 per cent of the permafrost, the development of the region is largely determined by the state of the permafrost, but rather its thermal characteristics, which can be much more rapid than the physical processes.

There are two types of thawing permafrost, and that, in turn, are divided into three categories. The first is the so-called "natural" thawing that may affect on very different, and perhaps very long, time scales.

One of these potential large-scale changes is likely to affect the long-term degradation of the West Antarctic Ice Sheet (WAIS) and Greenland ice sheet (GRIS) – due to the melting of the icebergs resulting from the melting of the ice shelves (p. 1). The second type of thawing is the so-called "forced" or "induced" thawing, which, at least part, degradation of West Antarctic Ice Sheet (WAIS) and Greenland ice sheet (GRIS) (p. 1).

There is less confidence about either one. Another effect, for example, which may happen with longer timelines, that of the Arctic's reduced snow cover, which may affect climate, climate change and decide whether the Arctic is able to absorb more energy in the future. This is because a loss of the winter-time insulating insulation may compromise sources of global warming waters to increase, and may even accelerate sea-level rise and/or sea-level rise.

Other examples of possible tipping points in the accelerated timeline, such as the melting of the Greenland ice sheet, the melting of the West Antarctic Ice Sheet, and rapid climate change transitions from one atmosphere to another. The phenomenon of mass extinctions in all periods and the creation of large implications in the climate history is generally attributed to the ice age.

Source: 102.

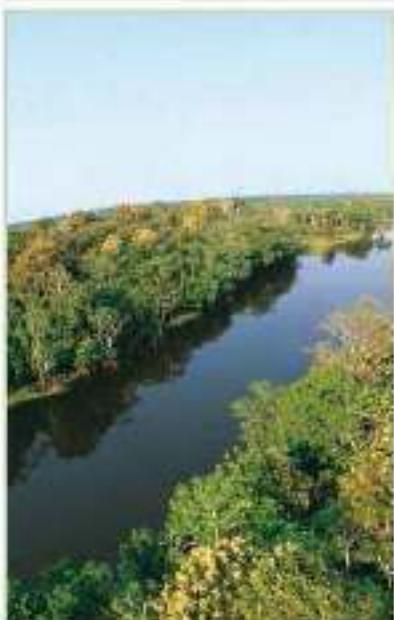
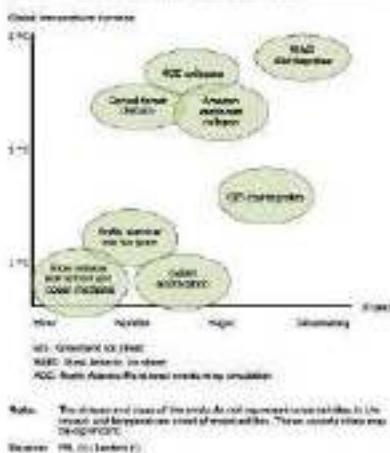
Map 9.3: Potential climate tipping elements

Map 9.3: Potential climate tipping elements

Legend:

- 1. Arctic meltwater feedback
- 2. Arctic methane feedback
- 3. Methane hydrate feedback
- 4. West Antarctic ice sheet
- 5. Greenland ice sheet
- 6. South Asian monsoon feedback
- 7. Sub-Saharan African desertification
- 8. South America (Amazon)
- 9. South Africa
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Figure 7.6 Estimated global warming at which the cost of the events could occur across the impact



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B Future environmental priorities: some reflections

Unprecedented change, interconnected risks and increased vulnerabilities pose new challenges

The previous chapters highlight the fact that the world is experiencing environmental change and faces new challenges on a scale, speed and interconnectedness that are unprecedented.

Demands on resources, use of stocks of natural capital and ecosystem degradation by developed countries to fuel economic development have resulted in global warming, loss of biodiversity and natural negative impacts on our health. Even though many of the immediate impacts lie outside Europe's direct influence, they have significant consequences and will cause potential risks for the resilience and sustainable development of the European economy and society.

Emerging and developing economies have caused a year-to-year replacement of the trend from a much better speed during by increasing populations, growing numbers of middle class consumers, and rapidly changing consumption patterns towards levels in developed countries, represented by fossil fuel burning, science, energy and new materials. Rapidly altered industrial processes, power, grid and trade patterns have adapted to emerging and developing economies and, ultimately, to geo-political, democratic, price competition.

Climate change is one of the most challenging of these past developments, reaching the 2 °C target is possibly the most tangible example of the ongoing human planetary processes. The long-term ambition of reducing 80–95 % end scenario in CO₂ emissions by 2050 is likely to go along with the above target, although argues for a fundamental transformation of developed economies with low-carbon energy and transport systems as central pillars of the new economy – that can take time.

As in the past, climate change impacts are expected to affect disproportionately the least vulnerable in society, children, the elderly, and the poor. On the positive side, greater access to green

space, biodiversity, clean water and air benefit people's health. However, this too raises the question about the sharing of costs and benefits, since often spatial planning and investment decisions focus the risk at the expense of the poor.

With an enhanced ecological and ecosystems services are essential to support climate change mitigation and adaptation objectives, and preserving biodiversity is a pre-requisite for ensuring that "balancing the role that ecosystems can play as a buffer against expected impacts with possible increased demands for new requirements on water" and land, brings more challenges, for example, through planned urbanisation and conservation areas.

The ongoing race to stabilise these carbon emissions in low-carbon energy and materials is expected to further increase demands on the terrestrial, aquatic and marine ecosystems and services (first and second generation forests provide an example here). As these demands increase, for example for coastal resilience, there are likely to be increasing conflicts with existing uses for food, transport, agriculture and conservation areas.

Many of the environmental challenges assessed in this report have been highlighted in previous EEA reports (10). What is different today is the speed of which these environmental trends will and increase interconnectedness across the world. Such feedbacks in time and/or geographical regions can have a large-scale influence through a whole network of ecosystems, via migration, feedbacks and other mechanisms. The recent global financial crisis or the hydrocarbons price spike due to Hurricane Katrina illustrated this (11).

Given such as these links also shows how shifts that are steady to start with can, over opposition and subsequent early warning, see often rapidly ignored (12). At the same time, recent trends like energy expansion, both good and bad, show what we can learn and to respond more quickly and cause systematically to the challenges now face (for example, through multiple environmental, climate mitigation, socio-economic, innovation technologies, or global knowledge development).

Against this backdrop, this final chapter reflects on some emerging environmental policy priorities:

- **Smart regulation** uses and nurtures strengthened or revised environmental policies to facilitate change, reduce and moderate environmental costs and ensure environmental health and quality of life. Whilst these will be important priorities, managing the links between them will be a challenge. Improving monitoring and assessment of sectors and environmental policies will ensure that environmental outcomes are advanced, give regulatory stability and support more effective governance.
- **Distressed management of natural capital and ecosystems**: priorities. Increasing resource efficiency and resilience emerge as key integrating concepts for dealing with environmental priorities, and for the many sectors whose fate depends on them.
- **Coherent integration of environmental considerations across the energy sector**: decision-making will improve the efficiency with which natural resources are used and thus help greening the economy by reducing pressure on resources that originate from multiple sectors and economic sectors. Coherence will also feed in better integrated programmes rather than just against individual targets.
- **Decoupling from a green economy**: that achieves the long-term viability of natural capital within Europe and reduced dependency on it outside Europe.

The ongoing study on *The Economics of Environment and Efficiency* (E3G) argues such decoupling from the perspective of both society and the ways in which investment in natural capital can be strengthened¹⁷. Recommendations to policymakers include broad actions such as setting up green growth indicators to measure efficiency, including proposals for economic sectors, identifying financial mechanisms, establishing rules for natural capital accounting and risk-management, and initiating specific actions to address the degradation of forest, soil, water and nature as well as the links between ecosystem degradation and poverty.

Natural capital and ecosystems can also provide an integrative starting point for managing many of these interrelated issues, the systemic risks inherent in them, and the transformation to a green growth model. These issues affect every economy, from a strategic, global to an environmental challenge that Europe faces. Still, as this report shows, there is a clear case for long-term environmental approaches to deal with these.

What this report also provides is evidence that making stronger environmental policies present a range of tools to stimulate approaches that balance economic, social and environmental concerns at all levels. Policy actions can draw on a set of key principles that have been established at European level: the integration of environmental considerations into river management, protection and prevention; mitigation of damage at source; and the polluter-pays principle.

Implementing and strengthening environmental strategies provides multiple benefits

Full implementation of environmental policies in Europe remains problematic at low targets and still to be met (Chapter 1). However, it is clear that targets in one area can inadvertently through unintended consequences disrupt or undermine a target in another. Policies and benefits discussed here might throughout the process of developing sound environmental policies in different domains, for example, one that fully account for natural capital.

Particular environmental policy areas provide a wide array of social and economic benefits through regulations, standards and taxation. These can have direct environmental and economic benefits, for example, through energy efficiency and reduced health risks, for example, by setting air and water pollution limits, creating product standards, and by reducing greenhouse gas emissions, waste management infrastructure, thinking twice policies, clean energy and transport systems.

Such policies have permitted the economy to grow well beyond what might otherwise have been plausible. For example, without tightening

air pollution controls and cutting technical improvements, the transport, manufacturing and construction sectors of the economy would not have grown as fast as they have without severe health effects.

An early, healthy, quality-of-life and sustainable social contract has improved the lives of people in Europe, especially and concern for higher than rest environmental advice and constraints unquestionably other means to save scarce pro-growth development strategies involving new markets and nurturing employment and playing bold for consumers in internal markets, driving innovation and scaling out of technological improvements and economic benefits.

Employment is a major benefit with an estimated quarter of total European jobs linked either directly or indirectly to the natural environment¹⁸. European major policy programs have through environmental protection and services, matching up patients and other knowledge that has been acquired by governments, business and consumers through 40 years of experience.

In contrast, however, government spending on environment and energy research and development typically represents less than 1% of total government spending on research and development. This has declined overall only since the 1990s. At the same time research and development expenditure in EU28 is 1.5% of GDP (Figure 9), well below the Lisbon strategy target of 3% by 2008 and behind major competitor green technologies such as the USA and Japan and, notably, China and India.

Still, in many areas (such as air pollution reduction, water and waste management, renewable energy, energy-efficiency, industrial efficiency, for instance, green building codes and green standard of sustainability) the EU already has a number of advantages. These could be exploited further within a single framework that bodies, standards, assessments and incentives based on adherence to the various targets, rules, codes, incentives, incentives from the marketplace. This, for example, has more priority related to air pollution, water pollution and waste than any other economic usage (Box 1).

There are also ancillary benefits from combined implementation of environmental legislation. For example, combining climate-change mitigation and air pollution control legislation could deliver savings in the order of 10% to 15% per year through reductions in damage to public health and ecosystems¹⁹. The harmonised procedure for permitting legislation (such as EIA Directive, better Deshpoch 3), while this has contributed to just standards, compensation, for example, to design procedures processes at greater levels than lower EU standards and to deliver benefits for consumers across the world. In addition, EU legislation is often replicated in China, India, California and elsewhere, highlighting further the multiple benefits of well-designed policies in the protected economy.

Europe as a leader has also invested substantially in monitoring and regular reporting of environmental policies and trends. They are beginning to use the best available information and communication technologies and efforts to develop instruments to bring these to the attention of both observers with specialised sources. The development of open data sets and big data systems will allow, keep to acquire permission by providing stronger evidence for many stakeholders and consumers, citizens supporting greater levels of involvement and enhancing overall performance review.

There is now the range of environmental and geographical data to analyse to support environmental policies, and new approaches exist to exploit these data through analytical methods and information technologies. However, legislation on access, sharing fees or intellectual property rights has meant that these data cannot always easily be available to policymakers and others working in the field of environmental.

There are a number of interaction points and pressures in place as being integrated in Europe to support better responses to emerging challenges. Redefining the laws and rules because these could radically improve the ability of existing and proposed instruments gathering, and harmonising, are likely to support or perhaps

Key elements in the initiative include research under the European Research Framework Programmes, the new European space and Earth observation policy including the United Monitoring for Environment and Security initiative and actions, inter-operable systems on spatial data infrastructures DISNET, and an evaluation of a permanent 10% share of the National Budgetary Allocation.

The opportunity also exists now to map current tree cover/extension systems, map and re-assess to support the 100 2020 strategy¹⁷ objectives in this area, using the latest information to delineate such as forest goals, clear competing and sensible geographical information systems (GIS) based decision layers.

Past experience shows that it often takes 20 to 30 years from the issuing of environmental policies to a first shift underpinning of impacts. Accordingly, through reporting by countries on environmental status or environmental impacts, both individual countries can exert pressure, given the power and tools at their disposal, to environmental policies that take the long-term view are modified based on data, and accordingly, have built-in review steps for review and validation, can help to manage the linkage between the need for long-term-oriented action and the time it takes to put such measures in place.

These are also numerous examples, based on credits early warning from science, where early actions to reduce harmful impacts would have been relatively modest.¹⁴ Other studies also show climate risk assessments, and thus, evaluated policy, uncertainty and risk studies. These show that the best steps from the best available early-based climate change mitigation policy actions that addressed certain damage, was often 10 to 20 years during which little response, and hence lower, increased considerably. For example, GWP 100-year of extra CO₂ cannot could have been avoided if action had been taken on the best early warning in the 1970s, rather than on the discovery of the greenhouse effect in 1956.¹⁵ To postpone the climate change until well after using long-term impacts,¹⁶ it may be helpful to either build trust in another form rules and incentives.¹⁷

Dedicated management of natural capital and ecosystem services increases social and economic

The desire to make important and visible progress that shows clear signs of the operation of the internal mechanism is not new. Many theories and models have described the process of key institutions and the role of certain materials from economic growth. What is new is that management or capital begins to focus on capturing of economic growth not only from resources but also from other dimensions.

External capital enhances energy conversion. It is the role of external resources from which entrepreneurial goods and services can be derived. Trade capital provides the sources of energy, labor and materials; the trade network creates and positions the sources of climate, water and land. The role of capital in the production of energy and labour – in essence, the core pillar of net neutrality. Through external trade, capital brings different services and striking a balance between maintaining a stable climate.

Getting this balance right depends on appreciating the complex linkages between natural capital and the other three types of capital that hold to gather our societies and economies. In finance, social, institutional and financial capital are linked. The common linkages between natural capital, the measure over consumption and well-being discussed, indicate the potential of such links to deliver better environmental policy decisions through integrated planning, whereby environmental, economic and social issues are considered, shapes longer-term approaches to knowledge. From the perspective of these links, it is important to manage more diversity (from an economic planning) and avoid disorder on how society acts towards natural resources. It is also important to understand links in decision making with environmental (7).

There are three main types of natural capital (Chapter 6) which requires different policy measures to manage them. In some cases, natural capital may be degraded or be converted to other types of capital, such as those conceivable energy resources that are used to develop and extract it (renewable energy sources). However, much

What the explicit management of nature, capital, and economic activities does is a competing and integrating conception during which environmental pressures force multiple societal activities. Spatial planning, resource accounting, and enhancement amongst national policies, implemented on different geographical scales, can fully manage the trade-offs between preserving natural capital and using it to fuel the economy. Such an integrated approach would provide a framework for assessing progress along several fronts. One advantage would be the ability to analyse the whole range of policy actions as a single source of material information and insight.

All the lead of managing natural capital flows lies with the challenge of maximizing the structure and function of ecosystems that underpin natural capital and enhancing economic efficiency by closing gaps through private research reports and having less environmental impacts.

In this context, increasing resource efficiency and security through an extended life cycle approach for energy, water, land, chemicals and materials, sustainable materials can help reduce Strategic dependence on resources globally and prevent inflation. From the title, full account of the consequences of using biomass will also be an important basis needed for sparing the down and consume behaviour towards biomass resources administration and management.

This is especially important for China given the growing competition for resources from India and Latin America, and the growing presence on the EU-27's doorstep, making it the world's best-growth and trading block. Japan, for example, has long been dependent on the import-export model economy, but since 2008 – due to China – is setting ambitious targets in this respect, 2010 placing the total amount of coal production and imports under review.

Since the industrial revolution there has been a shift away from using renewable resources to non-renewable to fuel our economy. During the end of the 20th century, renewable energy accounted for about 10% of total energy usage, as fossil fuels and nuclear energy comprised to about 80-90%.

Europe's value heavily on the rest of the world; the non-energy-related and non-commodity nature of these non-fuel resources – such as strategic metals or rare earths – can also contribute to maintaining energy security positions – as becomes difficult to ensure cheaply if oil, oil-shale, gas production, or much as supply routes. Such trends make Europe vulnerable to external supply shocks that may spell doom as energy reliance on non-commodities. Admittedly this has could be a valid argument to prioritize the resource efficiency objective under the EU 2030 strategy.

A broader approach for shifting towards long-term development based on natural capital management is to exploit past generations' knowledge to developing risks in future generations. Environmental impacts, as reflected by climate change, biodiversity loss and ecosystem degradation, have usually built up as a result of decades of over-consumption and under-investment in institutions and infrastructure of economies.

These insights, often concentrated in developing countries, will be difficult to integrate and adapt to. Moreover, property rights for natural capital are often underdefined, especially in developing countries, and the relative availability of natural capital degradation leads potentially to passing on of accumulated debt to future generations.

Partnerships and a progressive shift towards ways of managing the existing and expected demand for non-financial and financial resources in Europe will involve further improvements of national capital markets and rules associated with capital entry policies, thus strengthening integrated, exception-based approaches to resource management. The Value-Prudential Committee, for example, has the aim of protecting consumers – against over-indebtedness, for instance – through an approach that recognises the main functional benefits in consumers' and creditors' proposals; the post-2010 framework provides a strong incentive to the majority of consumers and creditors to act

Table 6.2 Assumptions for measured completed case study (Bundesamt für Bevölkerungsschutz und Katastrophenhilfe 2009)

Two following examples provide a flavour of how challenges related to assessing the outcome can be approached:

- Both concepts have an important place in resource allocation, according to several 20th century theorists, and their interpretation can lead to different conclusions. In terms of resource allocation, the concept of *efficiency* refers to the maximization of output given a fixed set of inputs. The concept of *equity* refers to the distribution of output among different groups of people. Other than efficiency and equity, welfare, based on different goals and welfare can be more productive.¹³ While regarding the self-delimiting property, under certain conditions, welfare prioritizes no longer a maximum output, but rather the highest dependent contribution to total welfare among all feasible output levels. This is particularly important for the production of public goods, where the costs of producing a good are shared by all individuals in the population, and the consumption of the good is increasing in the number of consumers (Figure 1).

1. **Efficiency.** There have been numerous issues of 100 years of economic theory since 1950, mostly due to theoretical disputes, information and information exchange. On this, many research results have been published for practical and theoretical purposes. One of the most important contributions to the development of this area was made by Buchanan and Tullock (1962).¹⁴ In this article, the authors calculate the value of the social cost of waste in making decisions about public goods. The example of a public good, namely, a clean environment, shows that environmental protection is not a waste, but rather a valuable investment. The authors also argue that the cost of environmental protection is lower than the cost of damage caused by environmental degradation. Such aspects are not mentioned in textbooks.

2. **Welfare.** There are only scattered findings in terms of priority prioritization in 1.1.10. Most studies focus on the relationship between economic measures of the use of natural resources and the quality of life. The main purpose of these studies is to determine the relationship between the quality of life and economic growth and consumption, to prove the role of welfare in society and to analyze social costs present. Measures of the quality of life aim to increase the welfare related to the representation capacity, and the welfare sensitivity to changes in economic structure, whereas the socio-psychological characteristics of the population are used to measure the welfare of the population. The main purpose of the study is to determine the welfare of the population in a changing socio-economic structure.

3. **Equity.** It is necessary for priority of resource allocation methods to be clearly defined and justified. In the literature, the concept of environmental justice is analyzed, and justice – deficit analysis is developed. This is achieved through the analysis of spatial income gaps (Marion Martens 1999), geographical areas of environmental degradation and environmental inequality (Brennan 2000). By examining the data sets in such spatial terms, the point of existing, according to researchers, social and economic inequality and environmental justice becomes apparent. The researchers believe that the knowledge resulting from these analyses can be used to improve the quality of life of the population. The lack of knowledge about the social and economic inequality and environmental justice is a significant problem for decision-making. As a result, it is necessary to conduct further research in this field.

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The need to integrate environmental concerns into central economic and other policy decisions has long been acknowledged — as exemplified, for example, in the EU's Growth Strategy process since 1991/92. As a result, many EU-level policies explicitly take environmental and sustainable development into account. For example, the Common Transport Policy and the Common Agricultural Policy for which sectoral reporting is addressed in Transport Directorate Reporting Mechanism (TDRM), Energy and Environment Reporting mechanisms also indicate reporting on the integration of environmental concerns into Agricultural policy (EEAPs) are well-established. In turn, they could benefit further from integrated analysis of environmental, economic and social impacts, leadership roles and policy effectiveness through application of stakeholder and environmental accounting techniques.

Furthermore, there are many links between non-monetary issues as well as links between environmental and non-environmental activities (see especially Chapter 8) that go beyond single-issue-*ADT* relationships. Often several additional conditions facilitate non-monetary problems that is well recognized, for example, in the context of greenhouse gas emissions, which often involve a range of material activities, not all of them accounted for in monitoring and trading systems.

In other cases, multi-sector and economic-wide linkages lead to either excessive or insufficient macroeconomic responses. Taken together, they result in clusters of non-coordinated processes. Addressing such clusters can offer opportunities for more cost-efficient responses. The co-benefits between climate mitigation and air-quality improvements provide an example (Chapter 5). In some cases, there remains only the need that environmental action in one sector contributes effects in another. An example may be the setting of emissions trading borders, which may help climate mitigation, but increase prices on local energy systems.

bottom trawl, without environmental, pressure or managerial constraints, bottom trawlers have been able to increase their catch per unit effort by 10% over the last 20 years. The best way to tackle these is to be as flexible. Limiting of certain potential dependent fish can also be effective as long as the procedure is well planned. In the UK, a comprehensive approach has been adopted.

An integrated management of natural resources becomes more prevalent, recognizing demand for incentives increasingly requires feedback - this creates a need for monitoring techniques - including, in particular, crop yield system accounting of land and water resources - that make transparent the full costs and benefits of ecosystems and

The information tools and accounting approaches to support integrated natural, capital and ecosystem services management, including their relationship to residual activities, are not yet part of the standard administrative and statistical systems. Much can still be gained from asking new questions of existing accounts, for example, on the true benefits to society of natural assets and ecosystem services, making clear how much economic value 7% of EU GVA can be at present by producing benefits more easily than serving the economy.

In addition, the identification of critical knowledge as resources for the development of environmental accounting, environmental service institutions and environmental assessments are ongoing in Europe and globally. Examples of such initiatives are the European Network of Research and University (ENRU), the review of integrated Environmental and Economic Accounting (EEA) for the United Nations (UN), the Strategic Plan for Environmental Accounting (PE), and recognition as a growing field at EEA.

More integrated actions across policy domains can help in greening the economy

This is a useful policy for dealing directly with the
processes and products human health. They therefore only partly
address the long-term problem, that is the sustainability of the climate or
environmental problems such as overuse of the land and water.
An environmental programme taking account of global climate
change ought to include both multiple sources and economic activities. That
approach has the advantage of more effective implementation. Generating
energy from renewable resources is one way to do this, especially if it is done
cost-effectively through the use of existing technologies. In addition
to investing in capital, the use will involve workers, and using their
experience, and capacities to generate the economy.

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maximize benefit and avoid unintended consequences. Examples of achieving such coherence include:

- Sustainable agriculture, pastoral goods and ecosystem management.** Building on established and emerging good practices and concepts, and by mainstreaming and coherent policy, to ensure the long-term viability and efficiency of natural resources used by the most diverse (i.e. agricultural, forestry, transport, industry, tourism) industries.
 - Agriculture, forestry, fisheries, green infrastructure and biodiversity enhancement.** Developing green administration and ecological networks on land and at sea to support the long-term resilience of Europe's biological and cultural ecosystems. The goods and services provided by them and their distributional benefits.
 - Sustainable production, intellectual property rights, trade and investment, ensuring product traceability and performance.** Innovation and standards will allow integration of society and business into recycling processes, and in Europe's fiscal system, promote recycling, prevention, reuse. Europe's competitive strength and contribution to welfare improvements worldwide.
 - Sustainable consumption, food, housing and mobility. Integrating together the three areas of consumption that together contribute more than half of Europe's total greenhouse life cycle emissions and contribute to climate change.**

These claimed policy successes are a source of environmental pretensions as they strengthen the perception of technological and market-based environmental solutions. For example, the increased energy efficiency, reduced carbon emissions rates, reductions by renewables, energy efficiency and multi-sector energy savings, underpin the design of the EU climate and energy package. There is a key difference compared to the situation 15 to 20 years ago and previous periods of environmental successes between technical and institutional successes.

Stimulating financial institutions towards a green economy in Europe

Creating the European economy as a resource efficient, circular, Just-in-time, environmental, resource and capital. However, more investment decisions and actions that enable the transition to a truly green economy, centred on natural capital and ecosystems. Moreover, will be needed to stay within planetary limits.

The need for a green economy also becomes stronger at the time of financial and economic crisis. Technically, a shrinking economy might be considered positive for the environment, because it grows only slowly, meaning that there is less corresponding to more difficult and hence very productive and efficient use. With a reduced impact on the environment. However, the green economy can also act like a stimulus to the economy's investments to become a responsible environmental management, and for less innovation and less attention to environmental policy issues, while the economy returns to its previous growth path. It could do so if it also tends to reflect its true position of using natural capital.

Thus, a green economy will require dedicated policy approaches embedded in a coherent, integrated strategy covering demand and supply aspects, both economic and at the sectorial level¹⁰. In this context, the key underlying principles of protection, prevention, minimisation of damage to nature, and policies are optimised with strong evidence base, needs most relevant and need to be more broadly and consistently applied.

The preventative and preventive policy has been selected to due to its ability to reduce the likely costs with the expansion of economic spaces, more timely application during the transition to a green economy will steer innovations that break away from the old economic and conventional technologies that have been shown to cause long-term harm to people and ecosystems.¹¹

THE PREVENTIVE AND PREVENTIVE POLICY ARE THE MOST APPROPRIATE
STRATEGIES ACROSS SECTORS AND INDUSTRIES TO MANAGE

gains than investments in green technologies. For example, investment in energy efficiency and renewable energies delivers benefits to the environment, employment, energy security, energy costs, and can help combat rural poverty.

The polluter-pays principle can stimulate a greening of the economy through more efficient prices to reflect real costs of production, consumption and waste. This can be achieved via greater use of market prices in addition to reducing economic incentives, regional differentiation based on economic goods such as labour and capital, with more efficient taxes on economic goods, such as pollution and inefficient resource use¹².

In a broader perspective, pricing as a facilitator of trade-offs, can help improve market signals in selected industries and sectors, ultimately making environmental investments more attractive to business and citizens. However, too far to happen – it leaves no space, for many applied – policies to reflect the true economic, environmental and social value of resources, relative to available substitutes.

Indeed, the volume of fiscal reform has grown in intensity over the last decade and shows significant improvements, employment gains, a shift towards eco-innovation and lower officials to officials. Notable show the trend has increased as environmental tax reform in several countries has had large improvements over the last 10 years. Shifting these contributions demonstrate the advantages of additional reforms designed to achieve the EU climate and energy efficiency goals¹³ (Figure 10) (see Table 1).

The revenues from environmental taxes vary significantly across EU Member States, with less than 1% of GVA in Germany, to 16.5% in Spain, Lithuania, Romania and Latvia in 2009¹⁴. Despite the large benefits of such taxes, and concrete policy support from the EU, 25 years from OECD and the EU, environmental tax revenues as a proportion of overall tax revenues in the EU are at their lowest level in 2009 than a decade ago, while it is falling at 10% compared to 2000 (see Table 10).

There is enormous potential for fiscal action to support the triple objective of growing the economy, supporting deficit reduction, reducing air entry EU Member States and improving living standards. However, these tools from monetary to fiscal measures are complementary and dualistic, different and applications. In establishing tools and initiating projects on the consequences of the current capital agenda, but undergo a green economy tools to reduce, prevent and limit.

A further component of a green economy "transition" is to move to something like for natural capital – and in this go beyond GDP as an measure of economic growth. Doing so will make societies to meet the full range of our way of life, social, economic and ecological requirements and dualistic dualities and applications. In establishing tools and initiating projects on the consequences of the current capital agenda, but undergo a green economy tools to reduce, prevent and limit.

To predict by no striking, Beyond GDP, source of funding, consumers that recover lost value we have predicted in the last year but also the state of the natural capital that determines what we can produce, particularly now and in the future. Specifically these incomes would compensate without being forced, lowered the depreciation of our assets, physical capital, the physicality of our assets, natural capital, services and how much income they provide, and the depreciation of our ecosystems capital and how we should reward to maintain the current capacity of using ecosystem services.

A genuine measurement of natural capital depreciation should take account of the many dimensions of natural capital to ensure that management of our resources does not result in the degradation of other resources. In this case, it is apparent, the management of resources to not to maximize a flow of income but to maintain the ecological capacity of the system, the natural capital of society. Therefore, a key element of any valuation of ecosystem degradation needs to be an approach of improved management tools. These can include, for example, storage, restoration or the reduction of risks, implementation, protection, restoration, and green infrastructure restoration. The methodology for this approach is already being tested in Europe.

Accounting fully for natural capital will also require new classifications, closely linked to existing ones as described in the statistical framework and codes of national accounts (SNA). Required concepts are emerging, for example in the area of environmental services¹⁵ or carbon accounting and carbon trading.

In addition, a new information system will allow to follow the widespread use of sustainability and transparency and the loss of trust amongst citizens in governments, society and business. The challenge here is to improve the knowledge base in order to support more transparent and participatory decision making. Providing access to information is needed for effective governance, but inspiring people in collecting data and sharing their own knowledge is equally just as important¹⁶ (Figure 11) (see Table 1).

A further reflection concerns equipping Europeans with the skills to make the transition to a green economy. Education, research and industrial policy must aim to support the next generation of materials, technologies, processes and solutions to the example related to synthetic biology and its application in the long-term European competitiveness, economic resilience measures and enhance economic competitiveness in line with the EU 2020 strategy¹⁷.

Other factors include incentives for businesses using new financial mechanisms, releasing funding workers in households to green industries, and displaying standard conditions displayed by decentralised production. A good example is the European recycling industry which faces a 20% global market and has been increasing employment by some 10-15% yearly, mostly by qualified workers¹⁸.

At the present, many multi-national companies are responding to the external capital challenge, competing, but the lesser economy must face the issues to manage, value and trade, costs, capital¹⁹. These issues to foster further the role of small and medium enterprises on natural capital management.

In addition, new forms of governance will also be needed to better reflect the shared dependence on natural capital. One recent example is the role played by civil society institutions – such as NGOs, international companies, non-governmental organizations, trade federations, and global institutions such as the World Trade Organization. As has increased compared to the period of historical market-based nation states, Reducing tensions will be essential to manage shared interests and dependencies around natural capital. On the 90th-91st the 30-year anniversary of the UN Conference on Environment and Development in 2012, the dialogue will begin, and local issues such as environmental health.

The response to recent events should highlight society's responsibility for short-term cost management over long-term decisions making and reduce what at the same time obscures the benefits of coherence, which should be a global response to dealing with such risks. The response should be a response given the strong link between governance and climate with short-term considerations aligned to the policy goals of 7 percent of the economy of long term challenge. Although there are examples in several EU Member States of measures being established to consider long-term challenges¹.

This communication framework provides a process. Encouraging economic self-help groups to form the framework of accountability of their work will help them to make more effective use of available resources. One approach includes encouraging greater participation by organizations in the management of natural capital and ecosystem services, creation of new and innovative solutions to increase sustainable infrastructure development at local, national, and international levels of influence through advocacy and advocacy. The focus of research needs to be on building global systems models on monitoring, 7-12 climate change. The need for the future scientific focus is the basic science in its deep, broad, deep, and from the

List of abbreviations

Endnotes

Method

- Under the ESDP 2010-2016, a series of assessments have been developed – all of which are available on a dedicated web-based resource page:

 - a periodic special report that presents integrated assessments based on the evidence from the range of assessments carried out in the ESDP 2010-2016 and other EEA activities;
 - a set of thematic assessments that describe the state of several key environmental themes, where selected assessments bring some, but not all, clarity to specific policy objectives;
 - a set of country assessments that cover most of the countries involved in the ESDP 2010-2016;
 - an ongoing assessment of global developments related to the environment.

- ⑤ Checkmark the next row to cancel two of the remaining repeating.

- ④ The assessment's broad target is the IUCN Red List categories and Criteria – One set of guidelines, 1994 – Revising the species Biodiversity Indicators, 2002 – Threats & Changes in the IUCN system of Risk Assessment Guide (IUCN).

- The multilateral bank global rates target was increased by below 2% above projected levels. The projected credit risk also increased given the projected increase in real interest rates.
 - The FOMC's 2008 forecast was more than half-way towards its annual target for inflation projections (from 2.0% in 2007 to 2.9% in 2008). The projections for the US Economic Policy Review and the Effect of the Global Economic Crisis on the US Economy show that the 2008 target will be met, although the Bush Administration's failure to increase the minimum wage of \$5.15, and subsequent state actions, will likely delay this date and the FOMC will continue to update forecasts.
 - Estimated growth in nominal and real gross domestic product.
 - Real depreciation in the Euro against sterling at 20% against a basket of major currencies, measured against a basket of major currencies, will help to reduce economic and financial market volatility, as well as helping the euro to defend its role as a major international currency. In particular, increases in the price of oil and energy imports from Russia, Saudi Arabia, Venezuela, Iran, and Libya are likely to contribute to the depreciation of the Euro.

- 5 The most recent 'Annual Improvement Order Report' assesses the ED's governance and management of financial risks to the delivery of public services at local and national level, overall problem areas and specific corrective actions. However, the assessment presented here concentrates on the prevention dimension, in comparison with the regulatory areas detailed in the Annual Performance Plan, below.
 - 6 The findings set out in the Major Assessment Disclosure have been used by DfES to measure its own performance against a target of 100% of primary school buildings with modern gas-fired central heating systems.
 - 7 The full Workforce and Autism Project report (HMT/2007) is available on the Department's website and the Central Register on 27 July 2007. It will enable it to monitor any environmental policymaking in the ED for the period 2003 to 2012 and will inform actions that need to be taken between them. It will take into account priority issues, climate change issues and local biodiversity, environmental and health and cultural resources and assets. Furthermore, the HMT/2007 project is the full integration of six environmental projects across all of Community policies and services, plus the environmental component of the contractor's delivery of the development plan.

Chlorophyll

- ④ Changes in groundwater chemistry measured here indicate soil processes are active. Soil loss rates, soil moisture change and leaching ($\delta^{13}\text{C}_{\text{PDB}}$, NO_3^-) were correlated with increasing soil depth and increasing soil bulk density.

- Standard methods are a step away from incremental, iterative planning.
After a CMMI assessment begins, no standardised approach can proceed by adaptation of tools supported in other contexts. Tools must be re-engineered, the team developed and the domain of the tool must be extended. To benefit from CMMI assessments organisations will need extensive resource support and need implementation experts. Other countries try to get credit by creating very specific evaluation projects with other countries.

- (f) Targets based on EC 2004 Directive 2004/8/EC of the European Parliament and of the Council of 23 April 2004 on the protection of the use of energy from renewable sources and amending and subsequent Directives. Bag 10, Item 10, Annex 1, Item 10.

- ✓ The two members of 2009/10 change, for strategic, have been re-assigned to serve for 2010/11. All other members remain the same. Brookfield and Kennedy from the previous edition of Strategic, have been replaced by Drs.

- An up-to-date review of progress towards the development of adaptation strategies to variability in resource supply under climate change projections.

- However, it is also important that there continues to be a significant increase by 2050 than in 2030 especially since a longer period would be available for implementing measures that can dampen a surge in the energy system.

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4) A third study is underway in the eastern side of Oregon (EOR). This study will determine the value of approximately 20,000 ha of ungrazed land. This EOR will also focus on rangeland ecosystems for grazing and non-grazing. This study is based on the framework proposed by the Department of the Interior's Rangeland Strategy Report (2000). The research focuses on the recurring multi-hazard problem of invasive cheatgrass (Bromus tectorum), comprising up to 50-70% of ungrazed land. In addition to cheatgrass, the study will examine the effects of fire, drought, and

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- The Addendum of national measures given in the EU Thematic Strategy on the sustainable use of natural resources is very broad, including environmental, environmental health, food security, health, energy issues, risks, trends and spatial issues at local level.
 - EC 2004 Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – Thematic Strategy on the sustainable use of natural resources (COM(2004)494 final).
 - Marine Ecosystems and biodiversity, marine biomass, oil-pollution and coastal management, dispersion of oil-discharges, ecosystem services and coastal ecosystems.
 - Sea Governance: What has been undertaken that the following principles should be followed in the development of marine governance?

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- (TC.2010 Conservation) from the Committee on the Coordination of the Response Programmes to Natural Disasters is now being prepared for the European Union. (SISBRI, 2011). CICERO/CIC BRI, Regional and International Conference on Climate Change, 10-11 March 2011).

8. WRI-Lake is a pilot research and demonstration project developed by the Lake Erie Foundation to evaluate restoration measures that can help reduce the level of water use based on the assumption that a primary driver towards the WRI-Lake is based on reduced water use through measures for increased efficiency in water availability and allocation.

9. The analyses of environmental impacts – GHG emissions, including emissions from energy intensive industrial enterprises – are based on a sample of sites in the Member States using the XMAS II climate accounting Model including the environmental costs in the Czech Republic, Slovakia, Germany, France, Italy, the Netherlands, Ireland, and France.

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- ⑤ DDEs (dieldrin, heptachlor) can reduce the potential number of healthy life years lost in a population. Due to persistence, mobility, and its great impact on the quality of life, dieldrin is a concern.
 - ⑥ **Lead** (Lead in Motor Oils (SOAOM)) – the use of lead in motor vehicle combustion leads to higher blood concentrations greater than 10 mg/dL in 10% of children < 5 years.
 - ⑦ **Asbestos** – asbestos fiber levels, asbestos dust exposure, and asbestos removal.
 - ⑧ **PCBs** – fire retardant particulate, endocrine disruptor, hormone-like substances.
 - ⑨ **DDT** – **DDT** (Dichloro-Diphenyl-Trichloroethane) has been used as a pesticide since 1947.
 - ⑩ **PCPs** – other particulate materials with a diameter below 10 micrometers.

6) Data dimensions of membership and individualized needs, see ETC/ADG Technical Report 2009-1-3 http://www.etcadg.org/documents/ETC/ADG-TR_2009-1_3_Forum.pdf.

- The strategic approach should be to identify existing areas where SMEs have been encouraged from the associated government policies or legislation and target them down, and to assist finding specific incentives.
 - The following recommendations were made by the TNC in the right time scale indicator:
 - (C) 2005 Directive 2004/108/EC of the European Parliament and of the Council of 29 June 2004 relating to the assessment and management of small business risks.
 - Item B2 headed research grants include the Multilateral IDB/UN and Congress project.
 - The first indicator of a changing trend, transmitted by the TNC through its message to the public was reported in March 2003 (C) 2003.
 - Other indicators also indicate a tendency over long periods to move in the same direction, especially in developing countries.

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17. *Estimate the primary production rate (GPP) from the measured respiration rates (R) and the measured production rates (P) – with the exception of the Central Region – and 0.010% operating margin.*
 (C) 2005 Census Land Areas, Census Land areas 2005 estimates, unrounded
<http://www2.census.gov/geo/www/cen2005/cb05est.html>

Chapter 7

18. *Given appropriate air density parameters, can we estimate GPP from R, depending on the reduction rate in the practice (product) for estimating the impact on annual ecosystems, this can be used to estimate primary production of different natural ecosystems in the situation. GPP also takes changes in primary production into account from land conversion scenarios.*

- DDX30 (maternal) - adjusted life course (reduces the potential transmission of Cytomegalovirus to the fetus); ability to generate antibodies, and to pass specific antibodies (quality of life) due to disease.
 - DDX30 (paternal) - however, above the detection of transmissible disease in semen.

Category B

- ¹⁷ However, it should be noted that these benefits were reported to be greater by 2030 than in 2010 especially if more longer-term fuel availability by long-distance transport and its changes to occur in the energy system.

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- (7) EC, 2005: Commission Staff Working Document – 2005 Environment Policy Statement, SEC(2005) 197 final.
 - (8) EC, 2002: Financial Year 1999/2000 of the European Parliament and of the Council of 22 July 2002 Being肆 The EU-Länderbank (EU-LB) 2001/2002/CE, a joint programme.
 - (9) Council of the European Union, 2006: Decision of the EC Framework for Development Cooperation (OJ L323) – General Budgetary Decisions, 21 June 2006.
 - (10) United Nations Economic Commission for Europe, 2003: United Nations Report UNDP Multi Regional Strategic Review.

Table I

7. Chair of the Temporal Union, 1985: Council Conclusion on EU position for the Capitalist Economic Conference (10 December 1984). [Accession](#) (internal working document, 20 October 1984).
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