



# Environmental Performance Reviews

## GERMANY

ENVIRONMENT

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# Environmental Performance Reviews

## GERMANY



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

## **ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT**

Pursuant to Article I of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

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## FOREWORD

The principal aim of the OECD's Environmental Performance Reviews is to help *Member countries improve their individual and collective performances in environmental management*. The primary goals for this programme are:

- to help *individual governments* assess progress;
- to promote a continuous policy *dialogue among Member countries*, through a peer review process; and
- to stimulate *greater accountability* from Member countries' governments towards their public opinion, within developed countries and beyond.

Environmental performance is assessed with regard to the degree of achievement of *domestic objectives and international commitments*. Such objectives and commitments may be broad aims, specific qualitative goals, precise quantitative targets or a commitment to a set of measures to be taken. Assessment of environmental performance is also placed within the context of historical environmental records, the present state of the environment, the physical endowment of the country in natural resources, its economic conditions and demographic trends.

These systematic and independent reviews have been conducted for all Member countries as part of the first cycle of reviews. The OECD is now engaged in the second cycle of reviews directed at *promoting sustainable development*, with emphasis on implementation in domestic and international environmental policy, as well as on the integration of economic, social and environmental decision-making.

The report was peer-reviewed by the Working Party on Environmental Performance (Paris, November 2000). The conclusions and recommendations of the report are approved by the Working Party.

Joke Waller-Hunter, Director,  
Environment Directorate

## GENERAL INTRODUCTION

This review of Germany's environmental performance *examines results* in the light of domestic objectives and international commitments. Three countries assisted particularly with this review: Hungary, Japan and the United States.

The report is organised in three parts:

- Part I is entitled “Environmental Management” and focuses on air, water and waste management, as well as nature conservation and biodiversity.
- Part II is entitled “Sustainable Development” and focuses on the environmental-economic interface, the environmental-social interface and the New Länder.
- Part III is entitled “International Commitments” and focuses on international co-operation and climate protection.

The OECD extends its most sincere thanks to all those who helped in the course of this review, to the representatives of Member countries to the Working Party on Environmental Performance, and especially to the examining countries (Hungary, Japan and the United States) and their experts. The OECD is particularly indebted to the Government of Germany for its co-operation in expediting the provision of information and the organisation of the experts' mission to Germany, and in facilitating contacts with many individuals both inside and outside administrative and governmental structures of the country.

The OECD Working Party on Environmental Performance conducted the review at its meeting on 8th November 2000 and approved its conclusions and recommendations. This report is published under the authority of the Secretary-General of the OECD.

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## ABBREVIATIONS AND SIGNS

### Abbreviations

AAMA	American Automobile Manufacturers Association
ACEA	European Association of Automobile Manufacturers
AOX	Adsorbable organically bound halogens
BAT	Best available technology(ies)
BBR	Federal Office for Construction and Spatial Planning
BDI	Federal Association of German Industry
BfN	Federal Office for Nature Conservation
BMF	Federal Ministry of Finance
BML	Federal Ministry for Food, Agriculture and Forestry
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMWI	Federal Ministry of Economy and Technology
BOD	Biochemical oxygen demand
BUND	German environmental NGO
CAP	Common Agricultural Policy (EU)
CFCs	Chlorofluorocarbons
CH <sub>4</sub>	Methane
CHM	Clearing House Mechanism
CITES	Convention on Trade in Endangered Species
CMS	Convention on Conservation of Migratory Species of Wild Animals
COD	Chemical oxygen demand
CSCWM	Closed Substance Cycle and Waste Management
DAC	Development Assistance Committee, OECD
DAU	German EMAS accreditation and licensing body
DAX	German stock exchange index
DBU	German Federal Environment Foundation
DNR	NGO umbrella organisation
DO	Dissolved oxygen
DSD	Duales System Deutschland
DtA	German Equalisation Bank
DUX	German Environment Index
ECMT	European Conference of Ministers of Transport

EDTA	Synthetic organic chelating agent
EIA	Environmental impact assessment
ELV	End-of-life vehicle
EMAS	Eco-Management and Auditing Scheme (EU)
ERP	European Recovery Programme
EUR	Euro
FAO	Food and Agriculture Organisation of the UN
FGD	Flue gas desulphurisation
GDR	German Democratic Republic
GEF	Global Environment Facility
GEIN	German Environmental Information Network
GHG	Greenhouse gas
GSOEP	German Socio-Economic Panel
HCB	Hexachlorobenzene
HELCOM	Helinski Commission – Baltic Marine Environment Protection
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
IEA	International Energy Agency
IKSE	International Commission for the Protection of the Elbe
IKSR	International Commission for the Protection of the Rhine
IMA	Interministerial Committee
IMIS	Integrated Radioactivity Information and Decision Support System
IPPC	Integrated Pollution Prevention and Control
IRF	International Road Federation
ISO	International Organisation for Standardisation
ITUT	Institute for the Transfer of Environmental Technology
IUCN	International Union for the Conservation of Nature and Resources
JCP	Joint Comprehensive Environmental Action Programme (Baltic Sea)
KfW	German Development Bank
LANA	Länder Working Group on Nature Conservation
LAWA	Länder Working Group on Water
Mtoe	Million tonnes of oil equivalent
N <sub>2</sub> O	Nitrous oxide
NABU	Naturschutzbund Deutschland (NGO)
NGO	Non-governmental organisation
NH <sub>3</sub>	Ozone
NMVOCs	Non-methane volatile organic compounds
NO <sub>x</sub>	Nitrogen oxides
NTA	Synthetic organic chelaing agent
O <sub>3</sub>	Ozone

ODA	Official development assistance
OSPARCOM	Commission for Protection of the Marine Environment of the North-East Atlantic
PAC	Pollution abatement and control
PAHs	Polycyclic aromatic hydrocarbons
PEFC	Pan-European Forest Certification
PFC	Perfluorocarbon
PIC	Prior informed consent
PM <sub>10</sub>	Particulate matter < 10 microns in diameter
POPs	Persistent organic pollutants
PPP	Polluter-pays principle
PPPs	Purchasing power parities
PU	Pollution unit(s)
RFT	Road freight traffic
RTV	Road traffic volume
RWI	Rhine-Westphalia Institute for Economic Research
SF <sub>6</sub>	Sulphur hexafluoride
SMEs	Small and medium-sized enterprises
SPA	Special Protected Area
SRU	Council of Environmental Advisors
StALA	Standing committee supporting the Cabinet Committee on Environment and Health
StBA	Federal Office for Statistics
TA Luft	Technical Instruction on Air Quality Control
TFC	Total final energy consumption
TPES	Total primary energy supply
UBA	Federal Environment Agency
UGB	Environmental Code
UMK	Conference of Environment Ministers
UNCED	UN Conference on Environment and Development
UNCSD	UN Commission on Sustainable Development
UNDP	UN Development Programme
UNEP	UN Environment Programme
UNFCCC	UN Framework Convention on Climate Change
USD	United States dollar
UVZ	Unfragmented low traffic area(s)
VA	Voluntary agreement
VCI	German Federation of Chemical Industries
VDA	Association of the German Automotive Industry
VOCs	Volatile organic compounds

WBGU	German Advisory Council on Global Change
WTO	World Trade Organisation
WWF	Worldwide Fund for Nature (NGO)

## **Signs**

The following signs are used in Figures and Tables:

- . . : not available;
- : nil or negligible;
- . : decimal point.

## **Country Aggregates**

OECD Europe: All European Member countries of the OECD, i.e. countries of the European Union plus the Czech Republic, Hungary, Iceland, Norway, Poland, Switzerland and Turkey.

OECD: The countries of OECD Europe plus Australia, Canada, Japan, Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

The sign \* indicates that only western Germany is included.

The sign \*\* indicates that not all countries are included.

## **Currency**

Monetary unit: deutsche mark (DEM).

In 1999, DEM 1.82 = USD 1.

## **Cut-off Date**

This report is based on information and data available up to September 2000.



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## CONCLUSIONS AND RECOMMENDATIONS\*

In Germany, environmental protection continues to be a major public concern and a high policy priority. This is largely due to *pressures on the environment* resulting from its high population density, level of industrialisation and strong dependence on fossil fuels. Transport and agriculture also continue to generate diffuse pressures on the environment. Economic and social changes in the New Länder (representing 30% of Germany's land, 20% of its population and 10% of GDP) have led to the alleviation of some environmental pressures, but they also present new sustainable development challenges.

The decoupling of economic growth from emissions of several major pollutants during the 1990s is indicative of Germany's achievement and its continuing efforts to reconcile economic growth and environmental objectives. However, important *environment related challenges* remain (e.g. waste treatment and disposal, strengthening of the waste water infrastructure, combating nitrate pollution and transport pollution, nature conservation, progressive phasing out of nuclear energy, further implementation and development of the eco-tax reform and climate change related commitments).

It is all the more necessary, therefore, for Germany to: i) further implement environmental policies and strengthen their cost-effectiveness; ii) better integrate environmental concerns in economic and sectoral decisions; and iii) continue international environmental co-operation.

This report examines progress made since the previous OECD Environmental Performance Review of Germany, and the extent to which its environmental *domestic objectives and international commitments* are being met. A number of recommendations are put forward that could contribute to strengthening the country's environmental performance, and to its progress towards sustainable development.

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\* Conclusions and Recommendations reviewed and approved by the Working Party on Environmental Performance at its meeting in November 2000.

## 1. Environmental Management

### *Implementing environmental policies*

#### *Achievements*

Overall, Germany has met most of its national environmental objectives and international environmental commitments. In the 1990s, its *progress in decoupling* economic growth from emissions to air (e.g. SO<sub>x</sub>, NO<sub>x</sub>, VOCs, CO), water pollution (e.g. BOD) and use of resources (e.g. water, energy) was impressive. Significant progress was also achieved in regard to waste management. In the Old Länder, these improvements have resulted mostly from environmental investment and management efforts; in the New Länder, economic contraction and restructuring and changes in energy supply have also played a major role. Nonetheless, Germany has established further ambitious objectives and is exploring new approaches to reach them.

German *environmental legislation* has continued to develop, influencing and being influenced by EU legislation. Cross-media approaches have gained importance (e.g. environmental impact assessment, environmental liability, environmental audits). *Enforcement and compliance are generally effective*, based on good monitoring and institutional capacities. An Environmental Code, aiming at harmonising, simplifying and integrating environmental legislation, is at an advanced stage of preparation.

German environmental policy is guided by *three principles (polluter-pays, precaution, and co-operation)*, expressed in regulations and economic instruments, pro-active initiatives addressing new challenges, and increasing participation and involvement of stakeholders. The PPP is well established and implemented, particularly for traditional air pollutants; those benefiting from waste and water management are increasingly covering the full costs of environmental services. A *range of economic instruments* are used to internalise costs and contribute to economic efficiency.

*Emphasis on best available technology (BAT)* and related work to introduce clean technology has triggered innovations upstream and presented new research, development and marketing perspectives. Many industries and individual firms have recognised the benefits of *voluntary agreements* and good environmental management (with high rates of participation in ISO and EMAS schemes), often accompanied by savings in energy and resource use and export benefits. Germany is a leading exporter of environmental technology, goods and services.

#### *Strengthening the cost-effectiveness of environmental policies*

However, there is *scope for further improvement* in regard to some challenging national and international commitments (e.g. CO<sub>2</sub> and GHGs, nitrates, transport

related pollution) and the relatively limited results of nature conservation policies. Given the environmental progress and economic and energy changes achieved in both the New and Old Länder, *marginal pollution abatement costs at point sources* are increasing substantially. Moreover, environmental pressures of a diffuse nature (e.g. those deriving from patterns of consumption, transport and agriculture) require more determined and cost-effective actions.

Further progress will depend on *more cost-effective environmental policies*, as well as *improved integration* of environmental concerns in sectoral and economic policies. Transposition of the EU Directives on integrated pollution prevention and control (IPPC) and on environmental impact assessment should contribute to progress in this regard. As stressed in the 1993 OECD Environmental Performance Review of Germany, use of measures differentiated according to ecosystem characteristics should be increased (e.g. varying deadlines for the introduction of BAT in existing installations). Use of economic instruments should be expanded, taking into account their wider economic and social implications. In turn, it is essential to better ensure that economic policy incentives are consistent with basic environmental objectives and do not encourage environmentally unsustainable production and consumption modes. The effectiveness and efficiency of *voluntary agreements* should be reviewed. Alternative measures should be considered if the targets of these agreements are not reached.

It is *recommended* to:

- further pursue *efforts to decouple* economic growth and employment creation from pollution pressures and energy and resource use;
- extend environmental policy attention to *unsolved or new challenges*, including nature conservation and diffuse pollution from agriculture and transport;
- continue efforts to harmonise, streamline and further develop *environmental legislation* within an integrated Environmental Code;
- strengthen and extend use of *economic instruments* to internalise external costs, and to progress towards sustainable production and consumption;
- improve the efficiency and transparency (e.g. accounting practices) of water and waste related *services provided at municipal level*;
- ensure that *voluntary agreements* become more effective and efficient (e.g. clear targets, reliable monitoring, improved transparency and third party participation);
- increase *economic analyses* of environmental policy measures, with the aim of achieving environmental objectives more cost-effectively.

Although in the 1990s Germany's annual *expenditure on pollution abatement and control* (PAC) remained one of the highest among OECD countries (around 1.5% of GDP), a continued investment effort will be needed particularly, but not only, in the New Länder for waste water and waste infrastructure and clean-up of contaminated sites.

## Air

Since 1990, Germany has achieved *large reductions in emissions* of a number of air pollutants (e.g. 76% for SO<sub>x</sub>, 34% for NO<sub>x</sub>, 47% for NMVOCs, 52% for CO). The intensity of SO<sub>x</sub> and NO<sub>x</sub> emissions (kg/unit GDP) is 65% and 50% below the OECD averages, a performance surpassed by only a few countries. In the Old Länder, these reductions have mainly resulted from effective environmental management focusing on regulatory measures and their enforcement, pollution control techniques at stationary sources, and mandatory fuel quality and efficiency improvements in the transport sector. In the New Länder, emission reductions have largely been driven by economic contraction, energy supply switching from lignite to natural gas, and the upgrading of many polluting installations. State-of-the-art flue gas control equipment is now installed at the majority of large combustion facilities, with high removal efficiencies for criteria air pollutants. Concerning dioxins and other POPs, control measures have been taken and progress made. Good progress has also been made in reducing ambient levels of criteria air pollutants.

Nonetheless, the intensity of CO<sub>2</sub> emissions is close to the OECD average and *ground-level ozone* remains a problem in western and southern Germany. The transport sector's *CO<sub>2</sub> emissions* have increased in recent years. Control of NO<sub>x</sub> and CO<sub>2</sub> emissions remains a challenge. There is no general speed limit on German motorways. There is a need to strengthen the cost-effectiveness of air management policies, and to better use economic analysis in designing and assessing air quality regulations and management measures. Progress needs to be made in regard to integration of air quality concerns in energy and transport policies. The *trend towards larger cars* tends to increase fuel consumption per passenger-kilometre and, together with an increase in kilometres driven, erodes the benefits of emissions control. Although the 1999 eco-tax reform was a step in the right direction, and some fiscal measures have been taken to better *internalise the environmental costs of energy use*, coal production continues to be subsidised and coal is exempt from the recent eco-tax. Differential taxation also favours air over rail on long distance routes.

It is *recommended* to:

- reduce or eliminate *environmentally harmful subsidies* in the energy and transport sectors;
- reinforce measures *to limit NO<sub>x</sub> and CO<sub>2</sub> emissions from motor vehicle use and emissions of NMVOCs from solvent use*;
- develop more *rational transport pricing and taxation* to further internalise associated environmental costs, and to encourage more fuel efficient and less polluting modes;
- develop mechanisms to evaluate the *cost-effectiveness of control policy options*, and make broader use of economic incentives for achieving air quality objectives;
- take further *measures to reduce total final energy consumption* in the residential sector.

## Water

During the 1990s, the *quality of surface waters* (rivers and lakes) continued to improve. The coverage and level of *municipal and industrial waste water treatment* also continued to increase, particularly in the New Länder. Major improvements to the quality of the Elbe were partly due to declining industrial activity in the New Länder. *Full cost recovery* of public water services is well implemented in the case of both households and industry, although further exemptions from water effluent charges were introduced in 1994 and some investment in municipal water infrastructure benefits from financial transfers. *Monitoring of water quality* has been expanded to the New Länder, including for toxic contaminants. Germany has set the *very ambitious policy objective* of having 100% of its rivers in quality class II by 2010.

Significant steps towards achieving the quality class II target have nonetheless been made for organic pollution only. In the case of nutrients, heavy metals and toxic contaminants, there is a general need for progress in the New Länder, while problems persist in the Old Länder. The 1993 OECD Environmental Performance Review of Germany identified water pollution from diffuse agricultural sources as an environmental challenge facing the country. The 1996 fertiliser ordinance was enacted to harmonise German legislation with the EU's 1991 Nitrate Directive. However, there are still regions with very high nitrogen surpluses from farming. *Diffuse pollution* of rivers and groundwater by nitrates persists, and international commitments related to releases in the North Sea

have not been met. Progress has been made in reducing concentrations of heavy metals and other toxic contaminants in water, but there is still room for improvement. The incentive function of *water effluent charges* has been weakened. *Flood damage* has increased, resulting from lack of integration between water management, transport policy and nature conservation objectives. There is a need to revitalise river banks, especially those of the Rhine and Danube. The EU Water Framework Directive reinforces the need to meet water quality standards, within defined time horizons and through river basin management, which should facilitate dialogue and co-operation among stakeholders.

It is *recommended* to:

- develop a *comprehensive strategy to address diffuse pollution* of surface and groundwater, including a mix of measures to further reduce nutrient surpluses from agriculture and to implement specific, more stringent requirements for farmers in vulnerable areas;
- further reduce *point source pollution* of water through further investments in advanced treatment facilities, and through increasing the incentive function of water effluent charges;
- address *diffuse water pollution by heavy metals* in a comprehensive manner, through extension of charging for rainwater collection and treatment;
- enhance *flood prevention* in the main river basins by developing partnership approaches among stakeholders, and by including flood plain areas in regional land use planning and nature conservation;
- pursue efforts to develop *water quality monitoring*, particularly for pesticides and nutrients in groundwater and lakes;
- take further steps towards implementation of *water resource management using a river basin approach*.

## **Waste**

Germany has a *comprehensive set of laws and regulations* to address solid waste management, particularly hazardous waste management. The Closed Substance Cycle and Waste Management Act (1996) introduced a new principle in waste management policy, assigning *manufacturers and distributors* extensive responsibility for waste generated in association with their products. The Packaging Ordinance, which entered

into force in 1991, has also played a pioneering role in reducing the amount of *packaging material* in marketed products and increasing the proportion of material recovered from packaging waste. Apart from packaging, *separate collection and recycling schemes* are now applied successfully to a large number of waste types including bio-waste, used oil, construction waste, batteries, end-of-life vehicles and electronic scrap. Registration of *abandoned waste disposal sites* is almost complete, and remediation measures have been taken in the most urgent cases under the responsibility of the Länder.

Although these policies have been successful and effective in reducing waste arisings and increasing recovery rates, their *cost-effectiveness should be improved*. Implementation of the Packaging Ordinance has been criticised, on the grounds that it is not sufficiently open to competition and is too focused on recycling quotas at the expense of efficient environmental protection. The Duale System should be subject to a comprehensive economic analysis of its cost-effectiveness. The costs of high levels of material recycling may become disproportionate, compared to those of other means of waste disposal ensuring similar environmental benefits. The present system for *recovery and disposal of household waste*, which remains the responsibility of public authorities, is rather costly and suffers from diseconomies of scale. How Germany will achieve the stated objective of allowing only stabilised waste in

It is *recommended* to:

- improve *efficiency of household waste management* by opening the disposal market to competition, with monitoring and control by public authorities;
- conduct *an analysis of the cost-effectiveness of the Duale System* for recycling packaging material, and of material recycling schemes in general; assess their environmental benefits compared with other forms of treatment and disposal;
- further develop implementation of the *principle of extended producer responsibility* in the industrial sector, possibly expanding the use of economic incentives;
- elaborate plans to ensure that *treatment and disposal of waste* (e.g. *hazardous waste, household waste*) which is *unsuitable for recycling* are organised efficiently, building on *enhanced co-operation* between federal and regional authorities and better identifying future infrastructure needs;
- continue efforts aimed at *upgrading landfill sites* to meet legal requirements, and at *remediating closed dump sites* and contaminated sites, especially in the New Länder;
- take measures to *improve the availability and timeliness of data* pertaining to waste generation, treatment and disposal at the national level.



landfills after 2005 is unclear, given its limited treatment capacity and present lack of investment in additional treatment capacity. Existing *thermal treatment capacity* at the national level is notably insufficient, and siting of new facilities has encountered strong opposition. Considerable efforts are still needed, especially in the New Länder, to upgrade *existing landfills* to meet current legal requirements and to apply remediation measures to closed dump sites that threaten groundwater quality.

### *Nature conservation and biodiversity*

Germany's efforts to conserve nature and biodiversity have produced several successes. For example, the salmon is back in the Rhine and the beaver in the Elbe basin; aquatic species have increased in these and other large rivers. The white-tailed sea eagle, still classified in 1984 as critically endangered, has increased in number and range and is now accorded the less critical "vulnerable" status. About one-quarter of Germany's territory has been designated as *protected landscape*. In the late 1980s and 1990s, Germany kept up the momentum in creating new national parks (of which there are now 13, seven in the New Länder) and UNESCO Biosphere Reserves (of which there are now 14). Implementation of *agri-environmental measures* is showing some good results. A national forest programme, including a strategy to maintain biodiversity in forests, is under public consultation.

Yet the fact remains that Germany's high population density and economic activity continue to generate such strong pressures that nature is not holding its own. *Fragmentation* of the landscape by transport routes and urban and industrial settlement, and the effects of contaminants and nutrients, are the main causes. *Loss of biodiversity* has not been halted. Germany is among the cluster of central European countries with the highest shares of red-listed species for several classes. Only 6% of biotope types are classified as currently not threatened. Overall, nature conservation does not appear to have been given the thrust or resources commensurate with its status as one of the five priority themes of environmental policy. Notwithstanding the large area of protected landscape, less than 3% of total land area is more strictly protected, and IUCN Categories I, II or III are not represented at all; only three national parks meet the IUCN Category IV criteria. Most existing protected areas are very small in size. As a whole, they are not representative of the German ecosystem types. *Designation of Natura 2000 sites* is behind schedule and thus far inadequate. There is no national biodiversity strategy. Neither the Federal Government nor any of the Länder has formally adopted or published a nature conservation plan with more detailed or quantified objectives in terms of desired results. Most important, *national objectives* are mainly informal and are not supported by political commitment on the part of the government or Parliament.

It is *recommended* to:

- formally adopt a *set of specific national objectives* for nature conservation, and develop specific *nature conservation plans* at the level of the Länder;
- increase understanding and awareness of nature conservation and biodiversity issues among decision-makers and the general public; in particular, develop and adopt a *national biodiversity strategy*;
- strengthen efforts and set targets for creating *new protected areas* (including Natura 2000 sites) and improve the representativeness of the network of protected areas;
- obtain agreement and transposition, at the Länder and local levels, of the federal objective of reducing the *rate at which land is urbanised* to 30 hectares per day by 2020;
- establish a performance assessment system to increase the transparency and effectiveness of *spatial and landscape planning decisions*;
- extend the role of *landscape protection groups* in stakeholder mediation procedures concerning extension and management of protected areas;
- further improve the effectiveness of voluntary *agri-environmental measures* by ensuring that they are applied on an ecologically appropriate scale;
- encourage *private landowners* to conserve nature and biodiversity on their land, e.g. through a wider range of economic instruments.

## 2. Towards Sustainable Development

### *Integrating environmental and economic concerns*

Germany's Basic Law, amended in 1994, now provides a *constitutional basis* for promoting environmental management and sustainable development. A number of quantitative environmental objectives have been adopted nationally or as a result of international commitments. Some are monitored through the *Environment Barometer*, which is included in the Federal Government's annual economic report. Efforts to firmly establish and refine this scheme (e.g. to cover biodiversity) should continue. As part of a wider reform, Germany has strengthened the *environment related components of its tax system*. The *eco-tax reform* is an important step in the right direction, although its steering capacity is limited. It is revenue neutral. Revenue is used to lower ancillary labour costs. The reform aims at producing a double dividend:

improved environmental performance and stimulation of employment. Increases in energy prices are likely to bring about reductions in energy intensity and better resource efficiency in general. The environmental guidance function of eco-taxes should be strengthened, particularly by reviewing the concessions made. Exemptions motivated by competition concerns should be modulated. The recently adopted climate protection programme is a positive example of an integrated, cross-sectoral approach.

Progress in developing a *national sustainable development strategy* has been very slow. At all levels of government Germany still faces significant problems that hamper better integration of economic, social and environmental concerns. The new Council for Sustainable Development will serve as a forum for exploring common ground, organising consensus and mediating conflicts. The newly established Green Cabinet should strengthen institutional mechanisms for *horizontal policy co-ordination* and oblige the ministries concerned to develop sector-specific sustainable development strategies, including commitments to act and timelines. *Vertical co-operation* also needs to be improved among different levels of government. co-operation among environmental administrations should be strengthened, both among Länder and between the federal

It is *recommended* to:

- define and implement a *national sustainable development strategy* with targets, timelines, and commitments by the key actors;
- improve co-operation and *co-ordination among Länder environmental administrations*, and with the federal level, in regard to environmental integration and sustainable development;
- better *integrate environmental concerns* in transport, agriculture, energy and regional policies;
- further use the *Environment Barometer* and other tools to contribute to environmental and economic policy formulation, implementation, monitoring and assessment; in particular, extend its coverage to biodiversity;
- continue to integrate environmental concerns in *fiscal policies* (e.g. eco-tax reform) and, in particular, review concessions leading to major distortions and disincentives;
- review the environmental significance of *subsidies* (e.g. in the federal biannual subsidy report), in order to phase out those which are environmentally harmful, and provide incentives for sustainable development, environmental management and innovation.

and Länder level. For example, a Länder working party or Bund-Länder task force could be established to improve environmental policy integration and co-ordination of sustainable development initiatives. Efforts to *green the budget* should be intensified. As stressed in the 1993 OECD Environmental Performance Review of Germany, integration of environmental concerns in sectoral decisions should be increased. Sectoral policies need to be reviewed in regard to their funding schemes and economic incentive mechanisms. Eco-responsibility ought to imply that support is to be linked to compliance with basic environmental standards. Subsidies with environmentally harmful effects should be phased out in a number of sectors (e.g. agriculture, energy, transport).

### *Integrating environmental and social concerns*

Ecological modernisation and job creation are among Germany's top policy priorities. Emphasis is placed on exploiting win-win situations and positive synergies. Major policy initiatives, such as the eco-tax reform, are aimed explicitly at achieving a double dividend: improving the environment while generating employment. Close to 3% of the total workforce (1 million people) is estimated to be directly or indirectly involved in environmental protection activities. With stable environmental investment, and parallel gains in productivity, direct *environmental employment* is unlikely to increase. In particular, in the New Länder a significant number of environmental jobs created in the context of short-term labour market programmes will be lost. The environmental dialogue among government, business organisations and trade unions launched in the context of the German Alliance for Jobs (Bündnis für Arbeit) should explore how potential synergies among environmental protection, nature conservation and job creation could best be exploited.

Overall, the *distributive effects of the eco-tax reform* are limited. In almost all branches of industry the net effect of increased energy taxes and lower contributions to the statutory pension scheme is positive. Households shoulder the main tax burden, but even in low-income households the change in disposable income will rarely exceed 1%. The distributional implications of the eco-tax will depend primarily on the employment effects of the reform. The reform's long-term impact on employment is expected to be clearly positive.

*Environmental education* has been successfully established in school curricula, teacher training courses and vocational training. However, *public concern about environmental protection* decreased significantly during the 1990s, reflecting improved environmental quality and persistent economic concerns. Discrepancies have increasingly been observed between general environmental awareness and actual practice (particularly among younger people). Nonetheless, waste separation and recycling, energy-saving and water-saving continue to progress.

The German public is generally well informed about environmental matters, deriving information from a number of different sources: e.g. media, publications and the internet; governmental and non-governmental sources. But, the German *Environmental Information Act* still does not meet all the requirements of the 1990 EU Directive on freedom of *access to information on the environment*. There is also a *lack of adequate, coherent and up-to-date data*. For example, those on national waste volumes are out of date. The data collection, aggregation and provision process is often too slow. The 1993 OECD Environmental Performance Review of Germany already highlighted the need for improved data exchange between the Länder and federal levels. Although *citizen participation* in environmental matters is generally accepted, and is considered a positive contribution to permitting and administrative licensing procedures, several acceleration and simplification laws adopted in the early 1990s reduced options for participation and presentation of objections. The Federal Nature Conservation Act establishes participation rights for recognised environmental NGOs, but does not foresee *NGO standing in lawsuits*. At sub-national level, a majority of Länder give NGOs legal access to the courts; however, some important Länder such as Baden-Württemberg, Bavaria and North Rhine-Westphalia have no such provisions.

It is *recommended* to:

- further examine *disparities in environmental quality* and their impacts on health and living conditions in different parts of society;
- further review the *distributional implications* of major environmental policy measures and ensure discussion of the results;
- further implement the joint action programme on *environment and health*;
- build on successful local initiatives (e.g. *Local Agenda 21*) to foster environmental and sustainable development progress;
- improve the availability and timeliness of *data and indicators* on environmental quality, environmental pressures and related responses;
- improve *public access* to environmental information and access to justice for environmental stakeholders;
- strengthen *public participation* in the design, implementation and assessment of environmentally relevant projects and policies;
- broaden *environmental education* and encourage behavioural changes towards more sustainable consumption patterns.

### *Environmental convergence in the New Länder*

*Environmental progress in the New Länder has generally been impressive.* The environmental situation in these Länder has undergone lasting improvement, becoming closer in many respects to that in the Old Länder. Economic contraction, investments in new establishments and in best available technology, together with improvements in environmental infrastructure, have brought about a significant reduction of air emissions and concentrations. River water quality has improved, and many contaminated sites have been cleaned up. These improvements are reflected in a significant change in the public's perception of environmental quality in the New Länder.

However, *more needs to be done* to reach the “uniformity of ecological conditions at a high level” anticipated for 2000 in the Unification Treaty. Concerning “industrial” air pollutants, water infrastructure (water supply, sewerage and waste water treatment) and waste management, there is still a performance gap between the New and Old Länder. Environmental convergence will take longer than initially estimated. In areas like transport emissions or nature conservation, new challenges have emerged. Pressures from urban sprawl and road traffic have increased. Diffuse pollution from nutrients used in agriculture persists. In many areas of high natural value, satisfactory

It is *recommended* to:

- accelerate connection to *sewerage and waste water treatment* facilities, and explore more cost-effective ways of financing, building and operating such facilities;
- continue remediation of *contaminated sites* and abandoned landfills, setting priorities with the use of risk assessment and cost-benefit analysis;
- review land privatisation and land use practices in areas with high natural value, to guarantee effective management of *protected areas*;
- improve *integration of environmental concerns* in policies, plans and programmes for the New Länder, particularly with respect to transport, agriculture and regional development;
- ensure *better monitoring and assessment* of development plans, programmes and projects, and improve data bases for systematic indicator analyses;
- *facilitate participation of environmental NGOs and other stakeholders* in the design, implementation and evaluation of structural policies and other development initiatives;
- launch sustainable development *partnerships at the local and regional levels*, using innovative mechanisms for granting support, and encourage networking of these initiatives.

land use management solutions have not yet been found. Despite massive transfers (in the order of 33% of New Länder GDP in 1998) from the federal level, the Old Länder and the EU, the New Länder are *not yet on a sustainable development path*. The *integration of economic, social and environmental concerns* in a coherent development strategy, and the effectiveness and efficiency of support schemes, need to be improved. Environmental monitoring and evaluation based on proper data and indicators are indispensable. National co-funding schemes for EU support provide limited scope for environmental measures. Innovative sustainable development approaches at the local and regional levels should be encouraged, and experiences better shared through effective communication and networking.

### 3. International Co-operation

#### *International commitments and co-operation*

In the 1990s, Germany carried out a very *wide-ranging and successful programme of international co-operation* on environmental protection, particularly with the nine neighbouring countries, its EU partners, the central and eastern European countries and developing countries. It has played a *leading role* at the EU and pan-European levels in combating transfrontier pollution and enhancing environmental co-operation. Germany has considerably decreased its emissions of pollutants to international *rivers* and has met nearly all its commitments concerning pollution of the North Sea and Baltic Sea by *land based sources*. It has implemented all its international commitments in regard to *transfrontier air pollution* by reducing ahead of time its emissions of SO<sub>2</sub>, NO<sub>x</sub> and VOCs. In particular, all large sources of atmospheric pollution in the New Länder have been eliminated, considerably reducing air pollution problems in the Black Triangle area. During the 1990s, Germany reinforced co-operation with its *two eastern neighbours* (Poland and the Czech Republic). It has implemented new bilateral and trilateral agreements, provided know-how and financial support, and been *the leading country in terms of bilateral aid to central and eastern European countries*. Germany supports global co-operation on *climate change* and biodiversity. It has *phased out halons and CFCs* and halted production of equipment using HCFCs. The Secretariats of the Climate Change Convention and Desertification Convention are located in Bonn. Germany is *one of the main donors of environmental funds in many international settings*.

Despite these achievements, there are a few areas in which commitments or expectations have not been met. Regarding *pollution of the North Sea and Baltic Sea* from land based sources, Germany (like other countries concerned) did not achieve the intended 50% reduction of *anthropogenic nitrogen inputs* between 1985/87 and 1995. The reduction achieved during that period was in the order of 25% only.

This reflects the limited progress in abating these releases from diffuse sources, particularly in the agricultural sector. Germany has so far eliminated only half the hot spots on its territory identified as significant sources of Baltic Sea pollution. Progress in implementing the EU Urban Waste Water Directive in the New Länder has been behind schedule. Because the EU Habitat Directive was implemented in Germany with some delay, the European Commission has notified Germany of a possible delay in releasing Structural Funds. Although Germany supports sustainable development, as agreed at Rio, it has not yet developed a *national sustainable development strategy* in consultation with all stakeholders. Neither has it increased *official development aid* as foreseen at Rio. On the contrary, Germany has reduced aid in relative terms. Its ODA (expressed as a percentage of GNP) ranks 16th among DAC countries. The considerable expenditure Germany has devoted to ensuring rapid transition in the New Länder and in countries formerly behind the Iron Curtain is now being reduced; this could increase its capacity to provide official development aid.

It is *recommended* to:

- develop internal procedures further in order to speed up *implementation of EU Directives* requiring action by the Länder;
- further address international environmental issues related to the *agricultural sector*, such as releases of nitrates to rivers and ammonia to air;
- implement action plans to cope with *flooding in international river basins*;
- continue international environmental co-operation with *central and eastern European countries*, with a view to facilitating early accession of EU candidate countries;
- increase the level of *official development aid*, particularly so as to facilitate the solution of global environmental problems.

### *Climate protection*

Germany has established an *ambitious national CO<sub>2</sub> emissions target* for 2005. It is committed to an *ambitious international GHG emissions target* for 2008-12. Having reduced CO<sub>2</sub> emissions by 15.5% in 1999 compared with 1990 levels, Germany is one of the few countries likely to achieve the emissions goals set out in the Framework Convention on Climate Change and its Kyoto Protocol, i.e. to return CO<sub>2</sub> emissions by the year 2000 to levels in 1990, and to significantly reduce GHG emissions by 2008-12. Emissions of GHGs such as CH<sub>4</sub> and N<sub>2</sub>O decreased rapidly in the same period.



Germany has adopted a number of *important measures to reduce CO<sub>2</sub> emissions*. The 1999 *eco-tax* reform was a major step towards energy efficiency improvements, as well as energy saving, without increasing the overall tax burden. The recent Renewable Energy Act offers financial support for *renewable energy*, such as wind and solar power. Germany has effective bodies to advise on climate change policies, such as two independent Councils to the Federal Government and a Parliamentary Inquest Commission, which have been effective in incorporating expert scientific and technical opinion in decision-making by the Federal Government.

Although Germany has succeeded in reducing CO<sub>2</sub> emissions significantly, this is largely due to economic decline and a changed energy mix in the New Länder following unification. To achieve its national as well as international emission targets (the Kyoto Protocol and associated EU burden-sharing agreement), Germany will need to *pursue the measures taken so far more effectively* and to *implement those adopted in the recent climate protection programme*. Eco-tax concessions should be reviewed. In the energy sector, it has not been able to reduce sufficiently the subsidies provided to maintain coal production. The decision to phase out nuclear energy progressively will make CO<sub>2</sub> emissions reduction even more challenging. *Transport emissions have increased* continuously since 1990, but few mandatory measures have been taken. Economic and other quantitative analysis concerning climate policies has not been fully reflected in the implementation of policies and measures. Little analysis has been carried out of policies related to enhancement of *carbon sinks* and to reducing emissions of GHGs other than CO<sub>2</sub>.

It is *recommended* to:

- *implement agreed measures* concerning climate change, taking into account the phase-out of nuclear energy, and specify related schedules;
- speed up the ongoing gradual *elimination of subsidies for coal* production;
- further encourage development of *renewable energy* and *greater energy savings*;
- more vigorously address issues related to CO<sub>2</sub> emissions from *the transport sector*, going beyond voluntary agreements; encourage use of *public transport*;
- develop measures to enhance *carbon sinks* and to reduce emissions of *non-CO<sub>2</sub> GHGs*;
- develop and implement *additional policies and measures* to enable national and international emissions targets to be met and energy efficiency to be increased;
- make *greater use of cost-effectiveness analysis* in determining the components of climate policies.

Part I

# **ENVIRONMENTAL MANAGEMENT**

# 1

## AIR MANAGEMENT\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- reduce or eliminate *environmentally harmful subsidies* in the energy and transport sectors;
- reinforce measures to *limit  $NO_x$  and  $CO_2$  emissions from motor vehicle use and emissions of NMVOCs from solvent use*;
- develop more *rational transport pricing and taxation* to further internalise associated environmental costs, and to encourage more fuel efficient and less polluting modes;
- develop mechanisms to evaluate the *cost-effectiveness of control policy options*, and make broader use of economic incentives for achieving air quality objectives;
- take further *measures to reduce total final energy consumption* in the residential sector.

## 1. Evaluation of Performance

### *1.1 Objectives and institutional framework*

Germany's Federal Immission Control Act (1974) establishes the *overall aim* of protecting human health, as well as the biological, physical and cultural environment, from the harmful effects of air pollution. A comprehensive set of regulations is in place

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\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993.

to facilitate implementation of the Act, covering aspects of air quality management ranging from ambient air quality monitoring to requirements for fuel quality, plant safety and hazard prevention. General responsibility for implementing and enforcing air management regulations in Germany rests with the Länder, which have the authority to issue permits, carry out inspections, monitor air quality and levy fines.

Since the 1980s, Germany has established numerous *ambitious reduction targets for national emissions* of SO<sub>x</sub>, NO<sub>x</sub> and NMVOCs through a range of international agreements (Table 8.1). Under the Gothenburg Protocol (1999), it has set further ambitious reduction targets to be achieved by 2010; relative to 1990 levels, emissions of SO<sub>2</sub> are to be cut by 90%, NO<sub>x</sub> by 60%, and NMVOCs by 69%. Germany is also a signatory to the 1998 Aarhus Protocol on persistent organic pollutants (POPs). Once ratified, the Aarhus Protocol will require the reduction of national emissions of dioxins, furans, polycyclic aromatic hydrocarbons (PAHs) and hexachlorobenzene (HCB) to below 1990 levels within two to eight years of its entry into force. Through the Chemicals Law (1980), the Federal Government has already banned or severely restricted the use of numerous toxic compounds, many scheduled for international bans or severe restriction under the Aarhus Protocol. The most significant set of air management *regulations*, the Technical Instruction on Air Quality Control (TA Luft), establishes permitting procedures that set emission limits specific to individual industries based on “*best available technologies*” (BAT). In addition to limits for criteria air pollutants, source emission limits are established for approximately 200 hazardous air pollutants based on the level of control possible through application of BAT.

*National ambient air quality standards* correspond to levels set in relevant EU Directives (Chapter 1, Section 2.2). Emission limits established in permits are reinforced by “*immission*” *limits* (i.e. local ambient air quality standards) applicable in the immediate vicinity of the polluting facility. They are established after consideration of ambient loading in the area surrounding the facility.

## 1.2 Air management

### *Trends in air emissions*

In the 1990s, Germany achieved *large emission reductions* for a range of pollutants, including criteria air pollutants, POPs and heavy metals (Chapter 1, Section 2.1). To date, Germany has met or exceeded all of its *international commitments to reduce emissions* of air pollutants, and has made good progress towards meeting pending commitments (Table 8.1). Between 1990 and 1998, national emissions of SO<sub>x</sub> fell by 76%, NO<sub>x</sub> by 34%, NMVOCs by 47% and CO by 52%. Building on significant progress made in the 1980s, SO<sub>x</sub> and NO<sub>x</sub> emissions were *further decoupled* from economic growth in the 1990s. This can be attributed to the

combined effects of economic and energy supply changes and environmental policy measures. In particular, the contraction of economic activity in the New Länder has had a significant role.

The *intensity of air pollutant emissions* (kg/unit GDP) in Germany varies significantly according to the pollutants concerned. Emission intensities of SO<sub>x</sub> and NO<sub>x</sub> are 65% and 50%, respectively, below the OECD averages (Figure 1.1). Among OECD countries, for these two indicators Germany's performance is surpassed only by a few other European countries and Japan. However, CO<sub>2</sub> emission intensity is only slightly lower than the OECD average; among OECD countries, Germany ranks 14th for this indicator. Progress towards Germany's ambitious reduction targets will clearly require additional measures (Chapter 9).

The toxicity of atmospheric emissions of *heavy metals* in Germany declined more than six-fold between 1985 and 1995 (Chapter 1, Section 2.1). Over the same period, emissions of *dioxins and furans* decreased by an estimated 71%; in 1995, per capita dioxin emissions were the second lowest in the EU. Concerning eventual commitments under the Aarhus Protocol, the overall toxicity burden of Germany's heavy metal emissions is rapidly declining. In 1995, emissions of dioxins and furans were already well below the Aarhus target.

### *Trends in air quality*

*Good progress has been made in reducing ambient levels of criteria air pollutants.* There has been a consistent decreasing trend since 1990, and levels generally satisfy ambient air quality standards (Chapter 1, Section 2.2). Although average annual NO<sub>x</sub> levels in urban areas are slightly higher than the ambient guideline, SO<sub>x</sub> levels are well below it. Progress has been most marked in the New Länder, as they started at much higher levels and polluting activities have declined. For example, in industrial regions of Saxony, where SO<sub>2</sub> concentrations averaged over 200 µg/m<sup>3</sup> at the time of reunification, ambient concentrations have been more than halved. These improvements in air quality reflect economic and energy supply changes, as well as significant progress in controlling emissions.

Nevertheless, high NO<sub>x</sub> levels signal the continuing need to reduce urban emissions from transport. *Ground-level ozone (O<sub>3</sub>)* has been of concern since the early 1990s, when high levels were detected in rural regions bordering large cities. The frequency and severity of ozone exceedences have fallen significantly at the national level since 1992 (Chapter 1, Section 2.2); however, they still frequently occur near Frankfurt and Freiburg, signalling the continuing need to limit regional emissions of ozone precursors, especially NO<sub>x</sub> from motor vehicles and VOCs from industrial solvent use (Figure 1.2). Particularly in Freiburg, co-operation with neighbouring

countries may be required. Under the Ozone Act (1995), regional authorities have the power to ban or severely restrict road transport during ozone exceedences extending over an area greater than 50 km; so far, this provision has been little used.

### *Policy measures*

Air quality improvements have stemmed in part from the implementation of *strong regulatory measures* to reduce emissions. *End-of pipe measures* have dramatically reduced air emissions from a range of source categories, particularly industry and power production (Chapter 1, Section 2.1). However, because they are generally applied on the basis of BAT, the *cost-effectiveness* of these measures, compared to other potential environmental protection measures that could have been taken, should be examined where possible. A high level of emissions control has already been achieved at most large stationary sources. Thus there is a danger that at some locations the rather high investment required for an incremental increase in emissions control is disproportionate to the small benefits in terms of reduced risk to public health or the environment.

Strict application of BAT-derived emission limits at polluting facilities has required a significant investment in technological change. *Expenditure on air pollution abatement and control (PAC)* since the early 1990s has been extensive. In 1997, total PAC expenditure for air management (by the public and private sectors) was DEM 6.6 billion, or approximately DEM 80 per capita (Table 5.4). Over 99% of PAC expenditure on air management between 1991 and 1995 was made by the private sector; it amounted to 44% of business's total PAC expenditure (on water, waste and air management) in 1995. However, recovery of expenditure through increasing electricity prices has necessitated only nominal price increases.

*Permit requirements* are central to controlling emissions from stationary sources in Germany. Despite its efforts, Germany missed the 1999 deadline for transposing the EU Directive on Integrated Pollution Prevention and Control. Permitting for point sources of air pollutants is therefore still carried out under the TA Luft. The number of installations regulated under the TA Luft is estimated at over 56 000. Application of BAT for emissions reduction is a binding permit requirement. All licensed facilities must file *emission reports* every four years with the Länder, summarising emissions of criteria pollutants as well as of POPs and heavy metals. Plants emitting hazardous air pollutants of toxicity Class I (e.g. carcinogens, heavy metals, toxic organic and inorganic gases) must carry out *daily measurements* or evaluations of these emissions unless they demonstrate (e.g. through functional control of the flue gas treatment system) that relevant standards are not exceeded. The frequency of reporting will be shortened to every three years with implementation of the European Pollutant Emission Register.

There is strong *monitoring and enforcement* of air quality management measures in Germany. Primary responsibility for monitoring lies with the Länder, but is supplemented with background monitoring by the Federal Environment Agency (UBA). The air quality monitoring network is comprehensive, with stations in all major urban areas as well as in rural regions throughout the country. Responsible local authorities may order ambient air quality measurements to be carried out in an area affected by a certain plant if harmful pollution levels are suspected. *Air pollution fines* (up to DEM 100 000) apply to stationary sources not in compliance with federal regulations: fines may be levied for establishment or significant modification of an installation without authorisation, contravention of an ordinance, or failure to comply with permit conditions.

### 1.3 Integration of air pollution objectives into sectoral policies

#### *Transport*

Road transport is the dominant *transport mode* in Germany, for both *passenger and freight transport*, and its market share is still growing (Chapter 1, Section 2.3). Since 1991, the number of passenger cars registered has grown by more than 15%, while use of public transport has declined by over 10%. The rate of growth of road freight transport has exceeded that of GDP since the early 1990s (Figure 1.3), as it has taken market share from rail and inland waterway shipping. From both the energy efficiency and air emissions perspectives, this modal shift is negative. For example, in the case of long distance goods transport, UBA estimates that CO<sub>2</sub> emissions for 1 tonne of freight amount to 111 g/km by road, 53 g/km by rail and 44 g/km by inland waterways. For other pollutants (NO<sub>x</sub>, CO, NMVOCs, particles), emissions are estimated to be double those for rail.

Although *improvements in the emissions performance of the transport sector* have been achieved in recent years, there is still considerable progress to be made. Between 1990 and 1998, NO<sub>x</sub> emissions from mobile sources decreased by 30%, those of NMVOCs by 70% and those of CO by 55%. Nonetheless, in 1998 the transport sector remained among the largest sources of national emissions of NO<sub>x</sub> (60%), NMVOCs (27%) and CO (58%). *Mobile sources of CO<sub>2</sub>* accounted for an estimated 189 million tonnes (21% of Germany's total CO<sub>2</sub> emissions from energy use) in 1998, an 11% increase from 1990 levels. *Control of NO<sub>x</sub>*, an important contributor to Germany's persistent ground-level ozone problem, should be a priority. German auto manufacturers improved the *fuel efficiency* of new vehicles by 12% between 1990 and 1998 (Chapter 1, Section 2.3). They have made further voluntary commitments to improve fuel efficiency and reduce CO<sub>2</sub> emissions. More should still be done to reduce emissions from the existing fleet. Serious consideration should be given to instituting a speed limit on national motorways as a way to limit NO<sub>x</sub> and CO<sub>2</sub> emissions. Germany

remains the only country in western Europe without a general speed limit for motorways. In 1994, a speed limit was in fact enacted for some trucks and buses on motorways.

### *Energy*

In 1998, the German economy's *energy intensity* equalled the OECD Europe average. It had decreased only slightly since the early 1990s. Substantial improvements in energy efficiency were a by-product of the *economic restructuring* which accompanied reunification; while energy intensity fell by some 3% between 1991 and 1995 in the Old Länder, it decreased by one-third during the same period in the New Länder. Progress was much slower in the late 1990s. Overall, reductions in total final fuel consumption (TFC) have been greatest in industry and agriculture and weakest in the residential and transport sectors. In the late 1990s, the largest energy-consuming sector was the residential/commercial sector (38% of TFC), followed by industry (30%) and transport (27%) (Figure 9.1). Final consumption in the transport sector (excluding electricity) relative to GDP increased more rapidly in Germany than in most OECD countries in the 1990s.

Germany's *fuel supply is dominated by fossil fuels*, with oil and coal/lignite accounting for 65% of supply in 1998. Since 1991, significant *fuel switching* has occurred in the power production, industrial, and residential/commercial sectors. *Coal and lignite consumption* has decreased by almost one-third; consumption of *natural gas* has increased proportionately. Between 1990 and 1996, the share of natural gas in total energy supply increased from 18 to 20% in the Old Länder and from 8 to 27% in the New Länder.

### *Policy measures*

Germany has implemented a wide range of measures to reduce emissions from road vehicles through *technological change driven by strict regulation*. National emission limits for mobile sources are based on values set in relevant EU regulations. Since 1985, exhaust emission regulations have required, de facto, that new gasoline-fuelled cars have three-way catalytic converters; since 1993, exhaust gas emission inspection programmes for in-use vehicles have been operated country-wide with vigorous implementation. Owners of vehicles complying with emission regulations in force receive exhaust gas control cards, while those not in compliance may be fined. *Fuel quality improvements*, as mandated by EU Directives, have also played a significant role in reducing mobile source emissions, particularly of SO<sub>x</sub> and toxics.

An *annual vehicle tax* is charged for all vehicles that can use public roads in Germany. The tax is differentiated according to the vehicle's emissions performance,



ranging from DEM 10 to 65 per 100 cm<sup>3</sup> engine capacity. Since it is differentiated in favour of smaller and less polluting vehicles, this tax would seem to create an incentive to buy smaller cars. However, the strength of the incentive is apparently rather limited given the German trend towards purchasing ever larger cars in the 1990s. Although *road user charges* would be effective in internalising some of the environmental costs incurred during operation of passenger cars, they are presently considered politically unacceptable.

Heavy goods vehicles must pay a *road user charge* to obtain a “Eurovignette” giving the right to use German motorways. The Eurovignette scheme is a joint programme with the Netherlands, Luxembourg, Denmark and Sweden. The annual cost is EUR 1 891 for trucks with up to three axles and EUR 3 151 for those with four or more. Introduction of an additional distance-related road user charge for heavy goods vehicles is planned for 2002. The charge will be differentiated according to vehicle weight and number of axles. The *vehicle tax* applied to heavy goods vehicles is weight-based and differentiated according to emissions and noise class.

*Deduction of commuting expenses* from German income tax is allowed for a range of transport modes. In particular, it tends to encourage automobile use: DEM 0.70 per kilometre is deductible if commuting is by passenger car. The full costs of commuting by public transport are deductible. Use of public transport by commuters is encouraged under a scheme launched in 1994, whereby employers may provide “*job tickets*” which serve as transport vouchers. Businesses may deduct all the costs, and employees do not have to pay income tax on this fringe benefit; nearly 20% of public transport tickets sold in 1999 were purchased under this scheme. For trips of less than 50 kilometres, a *reduced VAT* (7%) applies to passenger transport by bus, train, ship or taxi.

Tax deductions for *use of cars for business purposes* are generous in Germany. Costs incurred through business use of passenger cars and other vehicles are fully tax deductible, regardless of whether the vehicle is owned by the business or belongs to an individual. These costs may include operating expenses for oil, fuel, maintenance and repair, car insurance and car tax. In addition, employers may deduct all VAT on the purchase price of *company cars* and on their maintenance and repair. The comprehensiveness of these deductions may be undesirable from an environmental point of view, effectively encouraging automobile use as long as it can be treated as a business expense.

### *Energy prices and taxation*

In 1999, Germany implemented an “*eco-tax reform*” aimed at changing the structure of energy taxation (Chapter 5). The overall objective was to encourage

resource and energy efficiency while raising funds to alleviate labour-related taxation. The reform is being phased in over a three-year period. Tax increases on oil and electricity, introduced in early 1999, will be adjusted each year until 2003. From 2001, excise tax on motor vehicle fuel will be differentiated according to sulphur content. Although this reform is a step in the right direction, energy taxes are still not clearly aligned with environmental objectives and there is potential for major inconsistencies (Chapter 1, Section 2.4).

Since the early 1990s, *fuel tax differentials* have increased in favour of certain fuels. This evolution has not always encouraged use of fuels with lower environmental externalities. For example, natural gas use by industry is still more heavily taxed than use of heavy fuel oil or coal. For households, the price of natural gas is still higher than that of light fuel oil. Electricity generated from oil or gas is subject to double taxation; that produced from coal or nuclear power is only subject to the electricity tax, thus enjoying the same tax treatment as electricity from renewables. Tax differentials favouring diesel over gasoline for motor vehicles are among the highest in OECD countries. Future adjustments to the eco-tax should address these discrepancies as a priority, since they undermine achievement of environmental objectives (Chapter 5).

The present *taxation regime for transport fuels* also needs further adjustment to favour less polluting modes. Commercial aviation oil remains exempt from excise tax and VAT, as in other OECD countries. On the other hand, train trips longer than 50 kilometres are subject to the full VAT of 16%; in addition, if the train runs on diesel, the full fuel excise tax must be paid.

## 2. Focus on Selected Topics

### 2.1 Steady declines in air emissions

#### *Criteria air pollutants*

Germany's  $SO_x$  emissions declined by 76% between 1990 and 1998 (Table 1.1 and Figure 1.1). The reduction was mainly achieved in three source categories: power plants (55% of the reduction), industrial combustion sources (20%), and residential and commercial heat generation (19%). Economic decline in the New Länder and *fuel switching*, from coal or heavy fuel oil (Old Länder) or from lignite (New Länder) to light fuel oil or natural gas, achieved much of the reductions. *Flue gas desulphurisation (FGD) systems* have also been widely applied. With average removal efficiencies of over 90%, FGD systems now cover more than 95% of the installed capacity of medium and large combustion facilities.

*Emissions of NO<sub>x</sub>* decreased by 34% between 1990 and 1998 (Table 1.1 and Figure 1.1). This reduction mainly occurred with regard to mobile sources (50%), power stations (29%) and industrial combustion (15%). The use of catalytic converters in cars accounted for the major part of emission reductions in mobile sources. Beyond economic and energy supply changes, reductions in stationary sources were mostly achieved through primary measures (e.g. energy optimisation, low NO<sub>x</sub> combustion) with removal efficiencies of 30 to 50%, supplemented by secondary measures (e.g. selective reduction) where more stringent control was required (overall removal efficiency exceeding 85%).

*NMVOCs emissions* fell by 47% between 1990 and 1998 (Table 1.1). The majority (70%) of this reduction was achieved in transport. Reduction of emissions from miscellaneous sources (e.g. solvents use, extraction and distribution of fossil fuels) accounted for an additional 22%, with installation of state-of-the-art vapour control equipment at German service stations playing a major role. In 1998, the major sources of NMVOCs emissions remained solvent use (59%) and mobile sources (27%).

*CO emissions* declined by 52% from 1990 to 1998 (Table 1.1). Lower emissions from mobile sources accounted for 66% of this reduction, while reduced emissions from residential and commercial heat production comprised 28%.

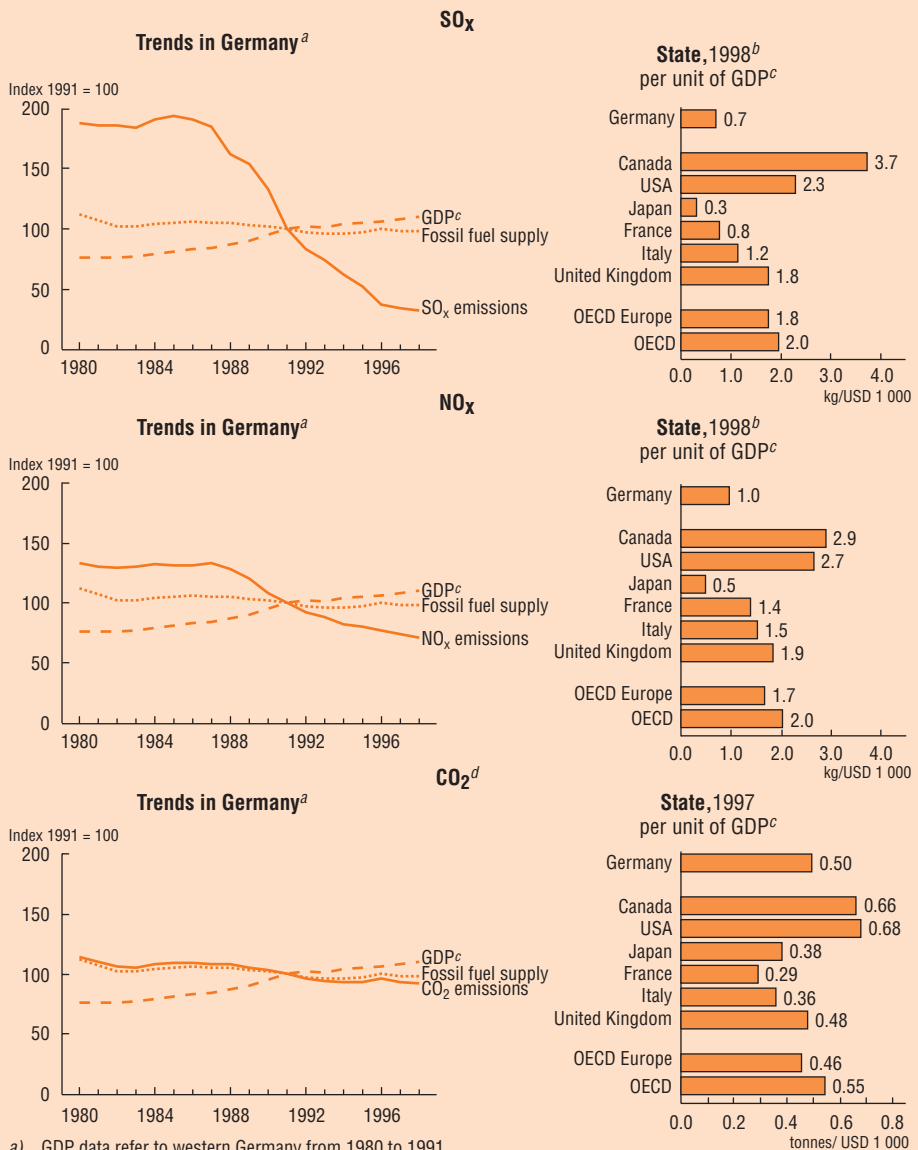
*Emissions of CO<sub>2</sub>* declined by 128 million tonnes between 1990 and 1998, a net decrease of about 13% (Table 9.1 and Figure 1.1). Per unit of GDP, CO<sub>2</sub> emissions have fallen by about 16% since 1991 (Table 5.6). Transport's role in achieving this reduction has been nominal; the energy and industrial sectors have achieved the bulk of the reduction, accounting for 54% and 42%, respectively.

### *Persistent organic and toxic pollutants*

According to toxicity calculations, the atmospheric *persistent organic pollutants* (POPs) most relevant to human health are polychloro-dibenzodioxins and -furans, collectively referred to as "dioxins". Available dioxin emission indicators (in toxic equivalents per capita) suggest that Germany's emissions decreased by 36% between 1990 and 1995, and by 71% between 1985 and 1995. Per capita, Germany's dioxin emissions were among the lowest of EU countries in 1995 (Table 1.2).

The toxicity of *atmospheric emissions of heavy metals* declined more than six-fold between 1985 and 1995 (Table 1.2), using an aggregated index which weights the toxicity of heavy metals emissions from power generation, industrial combustion, iron and steel processing, and road transport. For the transport sector, the 1995 index was less than 20% of its 1985 value, mainly due to elimination of lead in motor fuels.

Figure 1.1 Air pollutant emissions



a) GDP data refer to western Germany from 1980 to 1991.

b) Or latest available year.

c) GDP at 1995 prices and purchasing power parities.

d) Emissions from energy use only; excludes international marine bunkers.

Source: OECD; IEA.

Table 1.1 **Atmospheric emissions by source, 1990-98**

		SO <sub>x</sub> <sup>a</sup>	%	NO <sub>x</sub> <sup>a</sup>	%	NMVOCs <sup>a</sup>	%	CO <sup>a</sup>	%
Power stations	1990	3 078.3	57.9	605.1	22.3	8.2	0.3	179.8	1.6
	1998	874.0	67.6	331.1	18.6	6.3	0.4	115.1	2.1
Industrial combustion	1990	993.8	18.7	355.4	13.1	12.2	0.4	827.9	7.4
	1998	169.4	13.1	220.0	12.4	7.9	0.5	630.8	11.6
Non-industrial combustion	1990	911.5	17.1	173.4	6.4	137.3	4.3	2 539.7	22.6
	1998	138.8	10.7	140.4	7.9	60.6	3.6	944.2	17.4
Industrial processes	1990	225.6	4.2	31.0	1.1	153.1	4.7	702.0	6.3
	1998	75.0	5.8	13.0	0.7	126.0	7.4	600.0	11.1
Mobile sources	1990	111.2	2.1	1 544.5	57.0	1 534.1	47.6	6 941.4	61.9
	1998	35.0	2.7	1 075.9	60.4	461.8	27.1	3 135.4	57.8
Miscellaneous	1990	0.0	0.0	0.0	0.0	1 379.7	42.8	27.2	0.2
	1998	0.0	0.0	0.0	0.0	1 042.0	61.1	0.0	0.0
Total	1990	5 320.5	100.0	2 709.4	100.0	3 224.5	100.0	11 217.8	100.0
	1998	1 292.3	100.0	1 780.4	100.0	1 704.6	100.0	5 425.5	100.0
% change 1998/90		-76		-34		-47		-52	

a) SO<sub>2</sub>, NO<sub>2</sub>, NMVOCs, CO emissions indicated in thousand tonnes (kt).

Source: OECD; IEA.

Table 1.2 **Indicators of persistent organic and toxic pollution, selected countries**

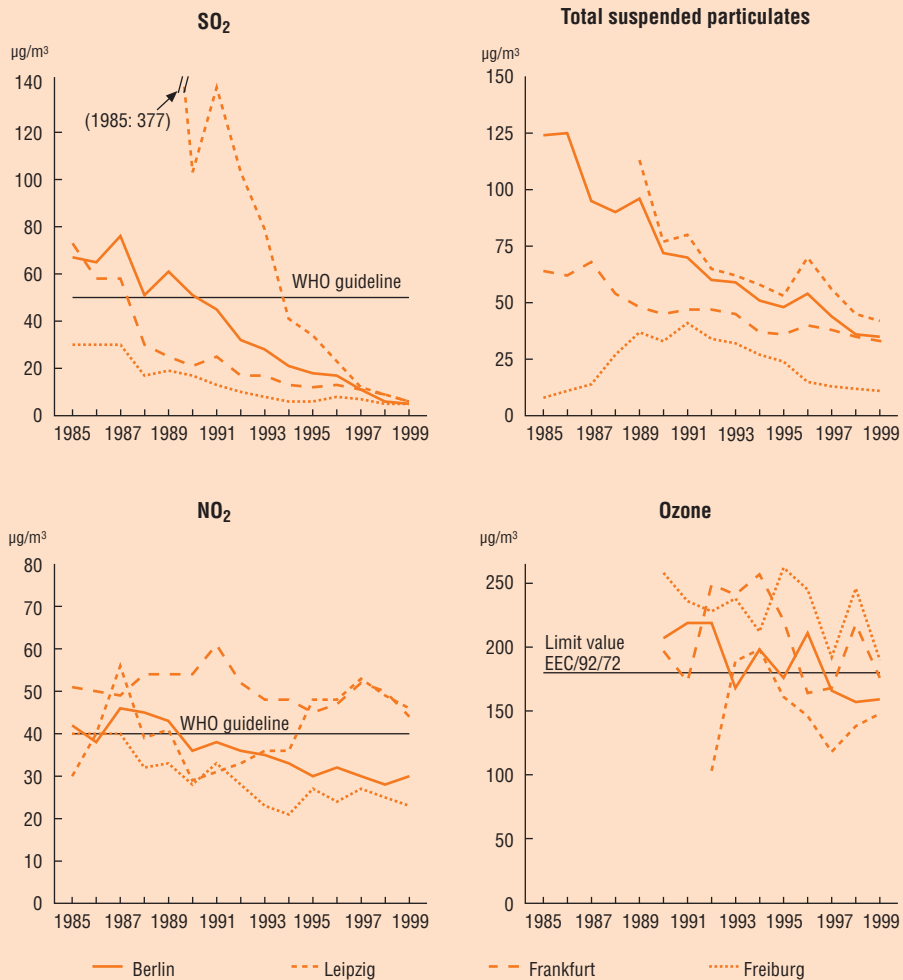
	Dioxin emissions <sup>a</sup>			Heavy metal emissions <sup>b</sup>			Consumption of toxic chemicals (%) <sup>c</sup>
	1985	1990	1995	1985	1990	1995	1995
Germany	24.4	11.1	7.0	681	411	100	31.0
France	35.8	22.5	18.2	333	227	100	19.0
Ireland	17.5	10.2	8.5	157	123	100	0.9
Netherlands	31.3	11.1	6.5	590	269	100	13.3
Portugal	21.2	13.7	12.2	111	125	100	2.8
Spain	18.2	9.7	7.4	150	165	100	6.5
United Kingdom	32.8	17.4	14.8	236	168	100	9.3

a) Dioxin emissions to air, in µg/m<sup>3</sup> international toxic equivalent per capita, as calculated in the European Dioxin Inventory.

b) Weighted index of emissions of arsenic, cadmium, chromium, mercury, nickel and lead; index 1995 = 100.

c) % of EU-15 total in 1995, based on Eurostat estimations.

Source: European Commission; Eurostat.

Figure 1.2 Trends in air quality,<sup>a</sup> selected cities, 1985-99

a) SO<sub>2</sub>, particulates and NO<sub>2</sub>: annual means of half-hourly averages. Ozone : annual maximum of hourly maximum concentrations.

Source: OECD.

## 2.2 Improvements in urban air quality

### Criteria air pollutants

*Ambient air quality standards* in force at the national level are based on EU legislation (Table 1.3). They are complemented by “immission” limits (i.e. local ambient air quality standards applicable in the immediate vicinity of major point sources), which are designated in operating permits. Monitoring carried out in major urban areas has shown a significant *decrease in ambient air concentrations of most criteria air pollutants* since 1990. As the averaging times of the ambient air quality data made available for this review did not correspond to those designated in EU standards, WHO guidelines are used here for comparison (Figure 1.2).

Table 1.3 **Selected ambient air quality standards**

Pollutant	Parameter	Limit value	International reference
SO <sub>2</sub>	Annual median of daily mean values Winter median of daily mean values <sup>b</sup>	120 µg/m <sup>3</sup> , if smoke < 40 µg/m <sup>3</sup> 80 µg/m <sup>3</sup> , if smoke > 40 µg/m <sup>3</sup> 180 µg/m <sup>3</sup> , if smoke < 60 µg/m <sup>3</sup> 130 µg/m <sup>3</sup> , if smoke > 60 µg/m <sup>3</sup>	EU Directive 80/779/EEC
Suspended particulates <sup>a</sup>	Annual median of daily mean values Winter median of daily mean values P <sub>98</sub> of all daily mean values measured throughout the year	80 µg/m <sup>3</sup> 130 µg/m <sup>3</sup> 250 µg/m <sup>3</sup>	EU Directive 80/779/EEC
NO <sub>2</sub>	Annual median of 1-hr mean values P <sub>98</sub> of all daily mean values measured throughout the year	50 µg/m <sup>3</sup> (guide level) 200 µg/m <sup>3</sup>	EU Directive 85/203/EEC
O <sub>3</sub>	1-hr mean 8-hr mean	180 µg/m <sup>3</sup> population information level 360 µg/m <sup>3</sup> population warning level 110 µg/m <sup>3</sup> health protection level	EU Directive 92/72/EEC
Lead	Annual mean value	2 µg/m <sup>3</sup>	EU Directive 82/884/EEC

a) Black smoke method.

b) Winter period defined as October to March.

Source: BMU; OECD.

Between 1990 and 1999, *ambient concentrations of SO<sub>2</sub>* fell by 50 to 90% in major urban areas (Figure 1.2). In 1999, the average ambient SO<sub>2</sub> level in these areas was 6 µg/m<sup>3</sup>, well below the WHO annual air quality guideline (50 µg/m<sup>3</sup>).

*Ambient concentrations of NO<sub>2</sub>* in most of these urban areas fell by about 15% in the 1990s, to reach an annual average concentration of 37 µg/m<sup>3</sup>, just below the WHO annual guideline (40 µg/m<sup>3</sup>). Concentrations have not decreased in Frankfurt, where the annual average has hovered around 50 µg/m<sup>3</sup> since the early 1990s, or in Leipzig, where the annual average has increased by nearly 60% since 1990, reaching 46 µg/m<sup>3</sup> in 1999 (Figure 1.2).

*Ambient concentrations of suspended particulates* have decreased substantially in major urban areas since 1990. In Freiburg, the annual average concentration fell by 67% between 1990 and 1999, reaching 11 µg/m<sup>3</sup> in 1999; the other cities reviewed showed decreases in annual concentrations on the order of 20 to 50% (Figure 1.2). In 1999, the annual average concentration of particulates in major German cities was 36 µg/m<sup>3</sup>.

### *Photochemical pollution*

Since the mid-1990s, the annual average of maximum concentrations of *tropospheric ozone* has fallen substantially in most of the cities reviewed (Figure 1.2). In the early 1990s, the population information level for ozone (180 µg/m<sup>3</sup>) was exceeded 100 to 200 times per year in several regions, primarily in the western and southern parts of the country and particularly in areas near Düsseldorf, Frankfurt, Stuttgart and Freiburg. Exceedences have become less severe and less frequent in recent years, although levels above 240 µg/m<sup>3</sup> are still frequently observed in areas around Frankfurt and Freiburg.

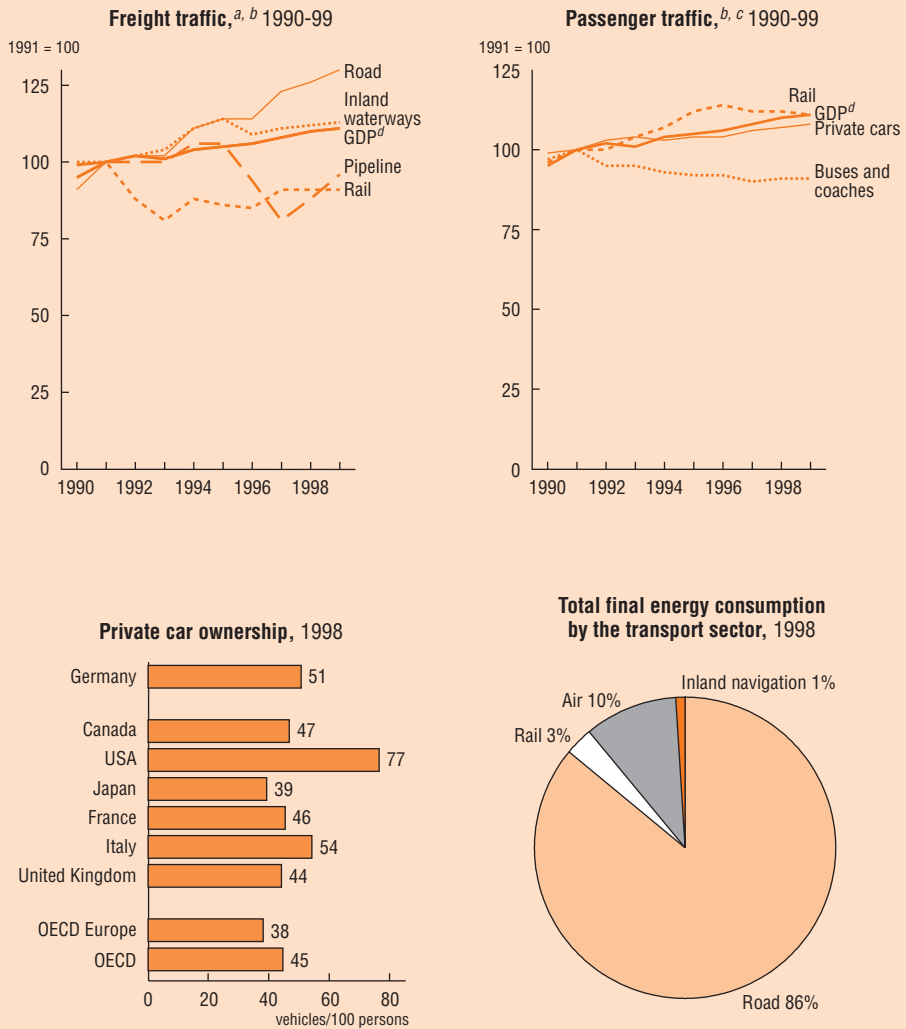
## **2.3 Key trends in the transport sector**

### *Motorisation, mobility and modal mix*

In 1999, the German *road vehicle fleet* consisted of some 42.6 million passenger cars and light duty vehicles, 6.9 million heavy trucks and buses and 1.5 million two-wheelers. Between 1991 and 1999, the number of registered passenger cars and light duty vehicles increased by 15%. The rate of motorisation in Germany (around 50 cars per 100 people) is approximately 35% higher than the average for OECD Europe (Figure 1.3). Between 1991 and 1999, the annual number of *kilometres travelled per vehicle* increased by about 6%. Road traffic (7 500 vehicle-kilometres per capita) in Germany is about 27% higher than the OECD Europe average.



Figure 1.3 Trends in the transport sector



a) Index of relative change since 1991 based on values expressed in tonne-kilometres.

b) 1990-91 data refer to western Germany only.

c) Index of relative change since 1991 based on values expressed in passenger-kilometres.

d) GDP expressed in 1995 prices and purchasing power parities.

Source: ECMT; AAMA; IRF; OECD.

In the late 1990s, the predominant *modes of passenger transport* in Germany were private cars (82%), buses and coaches (8%), rail (7%) and air (3%). The growth of passenger car use has tracked GDP growth fairly closely since the early 1980s (Figure 1.3). Rail use has also largely kept pace with GDP. On the other hand, use of public transport (buses and coaches) has decreased substantially as GDP has risen. Even so, public transport systems are relatively well developed in major cities. Extensive renovation of Berlin's subway was carried out in the 1990s.

*Road transport* is the *principal mode of freight shipment* in Germany, accounting for over 302 billion tonne-kilometres (67% of freight shipment by weight). Rail is the second most important, accounting for 16% of total tonne-kilometres; shipment by inland waterways accounts for an additional 14%. Shipment by road has increased more rapidly than GDP since the early 1990s, while shipment by inland waterways and rail has decreased (Figure 1.3).

### *Energy consumption*

*Total final energy consumption by the German transport sector* amounts to more than 65 Mtoe. Road transport accounts for the greatest portion (86%), followed by air (10%), rail (3%) and inland navigation (1%). These proportions of TFC were relatively stable in the 1990s, except that energy consumption increased slightly for air transport and decreased slightly for rail. Of the energy consumed by road vehicles, 58% was gasoline and the rest diesel. Electricity represents 68% of the energy consumed by railways in Germany, and diesel the remainder. All inland waterway navigation is diesel-fuelled.

In 1995, the *German automobile industry* agreed to improve the fuel efficiency of passenger cars sold by an average 25% by the year 2005 (relative to 1990 figures) through vehicle improvements alone. This would result in average fuel consumption of 5.97 l/100 km in 2005. According to the German Association of Automotive Industries, German manufacturers reduced specific fuel consumption by 12% between 1990 and 1998. Thus they are well on their way to achieving this goal. In 1998, in response to the Kyoto Protocol, German automobile manufacturers, as members of the European Federation of Automobile Manufacturers (ACEA), further pledged to reduce average CO<sub>2</sub> emissions of new passenger vehicles by 25% by 2005 relative to 1995 levels (5.67 l/100 km; 140 g CO<sub>2</sub>/km). These voluntary agreements have entailed independent auditors and public reporting requirements.

Strong emphasis has been placed on reducing motor vehicles' fuel consumption by technological means, but few measures have been taken to improve fuel efficiency through influencing the mode of operation. As mentioned above, no *national speed limit* exists on motorways.

## 2.4 Economic signals: pricing and taxation

### *Energy prices and subsidisation*

In 1998, *electricity prices* for German industry and households were slightly higher (by 3 to 6%) than the average for OECD Europe (Table 1.4). As part of the national eco-tax reform initiated in 1999, a new tax of DEM 20 per MWh was introduced on electricity. Levied on the producer, this tax is passed on to consumers. It will be increased by DEM 5 annually until 2003. Electricity generated from renewable energy sources is exempt from the eco-tax, and electricity used by local public transport enjoys a 50% tax reduction. A number of other exemptions also apply (Table 5.2).

*Natural gas prices* for industry are about 20% higher than the OECD Europe average, while prices for households are over 15% lower (Table 1.4). A special tax

Table 1.4 **Energy prices in selected OECD countries, 1998**

	Electricity		Oil		Natural gas	
	Industry (USD <sup>a</sup> /kWh)	Households (USD <sup>a</sup> /kWh)	Industry (USD <sup>a, c</sup> /toe)	Households (USD <sup>b, d</sup> /1 000 litres)	Industry (USD <sup>a</sup> /toe)	Households (USD <sup>a</sup> /10 <sup>7</sup> kcal)
Germany	0.067	0.14	..	201.5	210.9 <sup>e</sup>	360.7 <sup>e</sup>
Canada	..	..	86.2	323.4 <sup>f</sup>	78.4	217.1
United States	0.040	0.08	89.0	241.6	132.5	262.6
Japan	0.146 <sup>e</sup>	0.15 <sup>e</sup>	160.4	274.5	514.8 <sup>e</sup>	952.9 <sup>e</sup>
France	0.047	0.12	108.3	303.7	161.6	394.1
Italy	0.095	0.17	156.2	832.6	190.4	740.0
United Kingdom	0.065	0.11	134.4	190.1	120.8	304.4
OECD Europe	0.066	0.13	135.5	296.5	158.8	432.9 <sup>e</sup>
OECD	0.051	0.10	137.7	283.9	134.8	357.7 <sup>e</sup>
German price/OECD Europe	103%	106%	..	68%	120% <sup>e</sup>	83% <sup>e</sup>
German price/OECD	131%	137%	..	71%	128% <sup>e</sup>	101% <sup>e</sup>

a) At current exchange rates.

b) At current purchasing power parities.

c) High-sulphur oil.

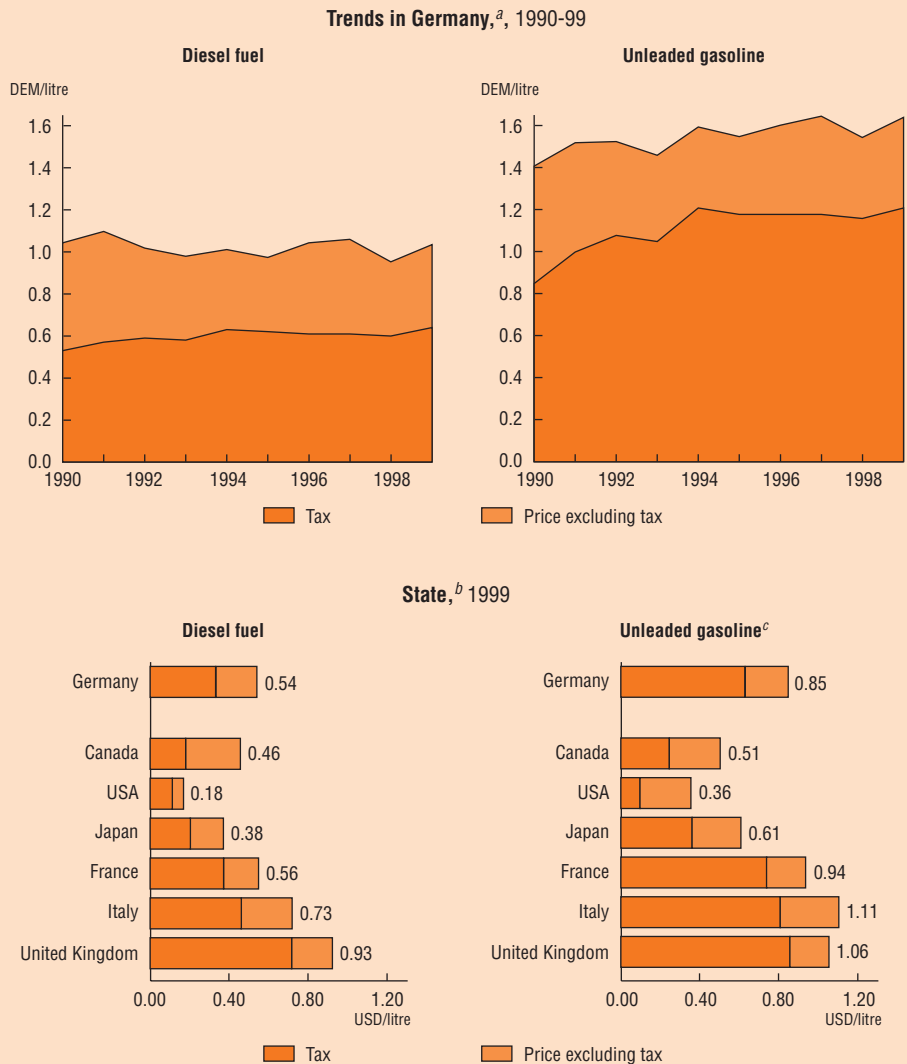
d) Light fuel oil.

e) 1997 data.

f) 1996 data.

Source: IEA. *Energy Prices and Taxes*, 4th quarter 1999.

Figure 1.4 Road fuel prices and taxes



a) At constant 1995 prices.

b) In USD at current prices and purchasing power parities.

c) Unleaded premium. For Canada and Japan: unleaded regular.

Source: IEA-OECD.

(DEM 0.36/100 kWh) is applied to natural gas used for heating, electricity or heat production by stationary turbines, and for cogeneration with at least 60% efficiency. Natural gas for motor fuel, and cogeneration with less than 60% efficiency are subject to a higher tax rate (DEM 4.76/100 kWh).

*Industrial and household fuel oil prices* are lower than the OECD Europe average (Table 1.4). A tax on light oil applies to heating, cogeneration (over 60% efficiency) and production of electricity or heat by stationary turbines and motor engines (Table 5.2). All energy products are subject to a *value added tax* of 16%. A reduced VAT of 7% is applied to passenger transport if the journey is not longer than 50 km.

*Prices of motor vehicle fuels* in Germany are somewhat lower than in neighbouring European countries, after adjustment for purchasing power parities (Figure 1.4). In 1999, the pump price for unleaded fuel in Germany was 10% lower than in France, 20% lower than in the United Kingdom and 23% lower than in Italy. Diesel prices at the pump are also relatively low in Germany compared to other European countries: 4% lower than in France, 42% lower than in the United Kingdom and 26% lower than in Italy.

Oil products used for energy are subject to *excise tax* (Table 5.2). However, those used for commercial transboundary air transport are exempt from excise tax and VAT. Train trips longer than 50 kilometres are subject to the full VAT (16%); if the train uses diesel, the full fuel excise tax is applied. No excise tax is applied to coal. Excise duty on motor vehicle fuels is levied as a consumer tax; on unleaded premium fuel the tax amounts to 74% of the pump price, and on diesel fuel it is 62% of the pump price (Figure 1.4). The excise tax on diesel fuel is lower than that on gasoline, primarily to protect the interests of road hauliers and agriculture. During the phase-out of leaded fuel in the 1990s, fuel tax on leaded and unleaded petrol was differentiated by 10% to make unleaded fuel more attractive.

*Production of hard coal is heavily subsidised* in Germany (around DEM 200 per tonne in 1999). In 1996, the average production costs of steam coal were estimated at DEM 397/toe, compared with an average import price of DEM 107/toe at the border. Production costs for coking coal are also higher. Subsidies, in the form of direct and indirect grants to finance production as well as price supports, have been established to maintain largely uneconomical domestic coal production. In 1996, these subsidies totalled approximately DEM 203 per tonne of hard coal produced. Lignite production is not subsidised; in the New Länder, use of lignite for electricity production is exempted from competition (Chapter 9).

# 2

## WATER MANAGEMENT\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- develop a *comprehensive strategy to address diffuse pollution* of surface and groundwater, including a mix of measures to further reduce nutrient surpluses from agriculture and to implement specific, more stringent requirements for farmers in vulnerable areas;
- further reduce *point source pollution* of water through further investments in advanced treatment facilities, and through increasing the incentive function of water effluent charges;
- address *diffuse water pollution by heavy metals* in a comprehensive manner, through extension of charging for rainwater collection and treatment;
- enhance *flood prevention* in the main river basins by developing partnership approaches among stakeholders, and by including flood plain areas in regional land use planning and nature conservation;
- pursue efforts to develop *water quality monitoring*, particularly for pesticides and nutrients in groundwater and lakes;
- take further steps towards implementation of *water resource management using a river basin approach*.

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\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993.

## 1. Evaluation of Performance

### 1.1 Water quality

#### *Policy objectives*

*Policy objectives* in the area of water management include the following national targets and international commitments:

- all rivers: biological and chemical quality class II (moderate pollution) by 2010; this applies, inter alia, to nitrates and adsorbable organically bound halogens (AOX), as shown by the Environment Barometer (Chapter 5);
- all agglomerations above 2 000 population equivalent (in line with the EU's 1991 Urban Waste Water Directive): sewerage and secondary waste water treatment, with more advanced treatment for discharges to water bodies subject to eutrophication and primary treatment for discharges to less sensitive marine waters;
- all farms: maximum application of nitrogen from livestock manure at 170 kg N/ha/year from 1999, in compliance with the EU's 1991 Nitrate Directive, but with a 30% flexibility margin and a target of 210 kg N/ha/year on grassland;
- drinking water: quality standards as contained in the EU's 1998 Drinking Water Directive;
- major rivers flowing to the North Sea: land-based inputs reduced by 50% for 32 priority pollutants and by 70% for dioxins, mercury, cadmium and lead in 1985-95, as agreed by the Second and Third International Conferences on the Protection of the North Sea (London, 1987, and The Hague, 1990) (Chapter 8);
- major rivers flowing to the Baltic Sea: nutrient inputs reduced by 50% in 1987-95, as agreed by the Ministerial Meeting of the Helsinki Commission in 1988 (Chapter 8);
- overall water management: implementation of the EU's 2000 Water Framework Directive, including developing basin-wide integrated water management.

#### *Trends in the state of water quality*

Classification of river water quality is based on a seven-stage system (four main and three intermediate stages). In the early 1990s, Germany established the *very ambitious policy objective* of ensuring that 100% of its rivers were in stage 3 (quality class II, or moderate pollution) by 2000. This deadline was recently extended

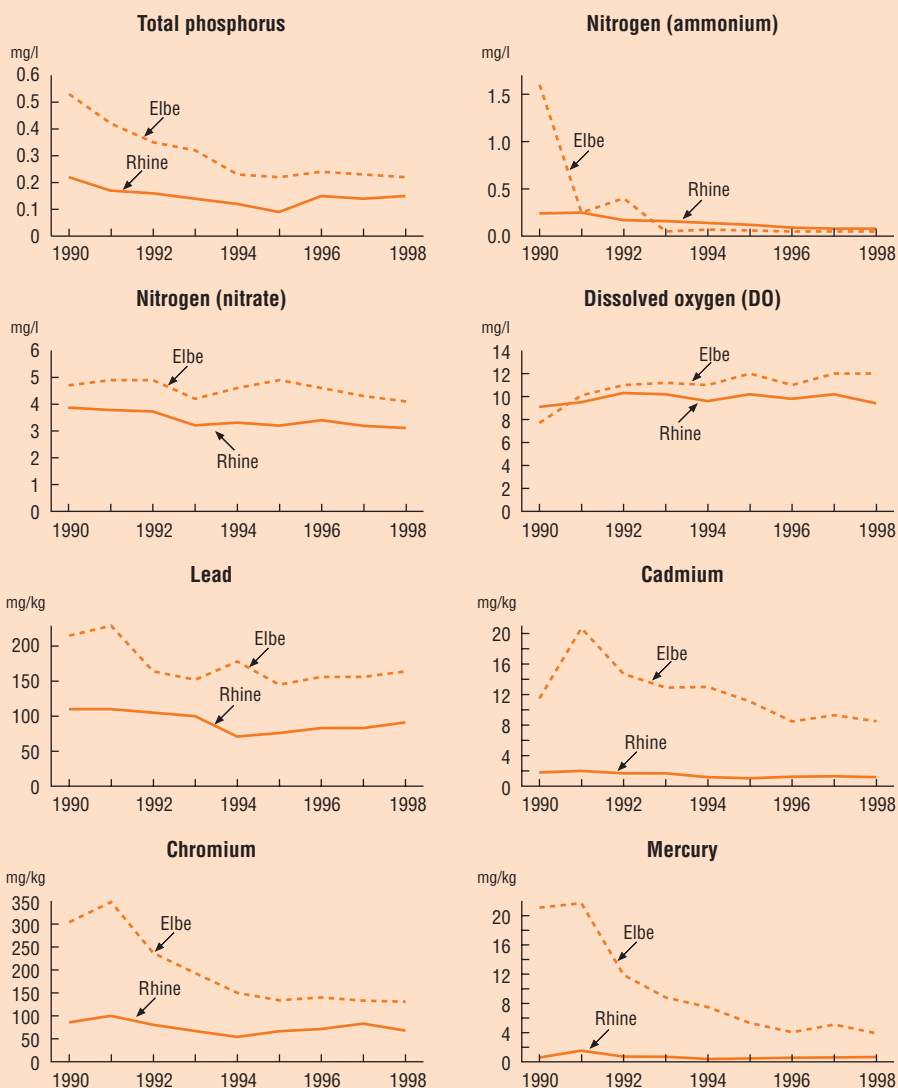
to 2010. *Biological water quality* maps have been published every five years since 1975. Rivers' biological water quality is based primarily on the presence of organisms that indicate the extent of organic pollution. However, the values for parameters such as BOD used to support these findings are not stringent and do not relate well to fish habitat criteria. It is also necessary, therefore, to look at chemical water quality.

Since the mid-1990s, a classification system has been established for assessing rivers' *chemical water quality* based on pollution by nutrients, heavy metals and other toxic contaminants. Work is in progress regarding *pesticides*, whose quality targets hitherto applied exclusively to drinking water supply (0.1 µg/l). Water quality targets have been defined in relation to aquatic life (bacteria, green algae, small crustaceans, fish); human consumption (maximum permissible contaminant levels in foods); sediments (soil limit values in sewage sludge); drinking water (legally binding objectives in the EU's 1975 Directive on surface water intended for abstraction of drinking water); and irrigation water.

A large proportion of German rivers' total length has the required biological water quality (class II). Only a few stretches have water of higher quality (i.e. non-existent or low pollution). In the *Rhine* there has been a substantial increase in the number of *fish species* (currently 44), although species composition has changed. In the *Elbe* the number of fish species has also increased along with a dramatic rise in oxygen level: since 1991, DO has not fallen below the critical value for fish of 4 mg/l (Figure 2.1). Rivers with very severe or excessive pollution (quality classes III-IV and IV) include the *Emscher* in the Ruhr region, as well as small rivers in the *Ems* catchment area and in densely settled regions and regions with intensive farming. On the first biological water quality chart for unified Germany, published in 1990, it was necessary to introduce an additional eighth class ("ecologically destroyed") to describe water quality in the Elbe; the entire Elbe is now class II-III (critical pollution).

As regards chemical water quality, the New Länder generally need to catch up, while problems persist in the Old Länder (Table 2.1). Today there are no major differences in *nutrient concentrations in rivers* between the Old Länder (Danube, Rhine and Weser) and New Länder (Elbe and Oder). Nitrate levels have not fallen compared with the early 1980s, and nitrates still originate mainly from agriculture. Total phosphorus concentrations have declined following the introduction of phosphate-free detergents and the construction of phosphate precipitation plants, since the mid-1980s in the Old Länder and since 1990 in the New Länder. The Elbe was the German river that was by far the most polluted by ammonium until 1990; concentrations have been lower in recent years, as industrial production has fallen and waste water treatment has improved.



Figure 2.1 Water quality<sup>a</sup> of selected rivers, 1990-98

a) Annual medians measured at Kleve-Bimmen (Rhine) and Schnackenburg (Elbe). Heavy metals: pollution in suspended particulate matter.

Source: LAWA; Federal Institute of Hydrology.

*Heavy metal concentrations in rivers* have greatly decreased, although they began to increase again in the mid-1990s (Figure 2.1). In the Rhine, the decrease has been between one-half and one-tenth compared with the early 1970s, but some heavy metals are still present. There is moderate pollution by lead, nickel and mercury, critical pollution by copper, and critical or heavy pollution by zinc. The Elbe is much more seriously polluted: there is still critical pollution by lead, chromium and nickel, heavy pollution by copper and very heavy pollution by mercury, cadmium and zinc. Since 1989, pollution loads of some of these substances have fallen by 50-90%, mainly due to factory closures. Progress has been made in reducing other *toxic contaminants* such as organic solvents and pesticides in rivers throughout Germany, but significant quantities are still present (Chapter 2, Section 2.1). A number of heavy metals and other toxic pollutants accumulate in sediments.

Concerning *lakes*, excessive nutrient inputs and subsequent eutrophication are still a major problem. There continue to be phosphorus inputs from waste water and agriculture, despite the introduction of phosphate-free detergents. In the Old Länder, lake eutrophication has decreased due to sewage diversion beginning in the mid-1970s. However, concentrations of inorganic nitrogen, mostly originating from agriculture, have not fallen. The deep pre-alpine lakes have reacted with a markedly lower trophic status, while shallow lakes influenced by intensive farming have shown no visible reduction. In Lake Constance, total phosphorus concentrations decreased markedly at the end of the 1970s but are still high enough to cause algal biomass. In the New Länder, nutrient loads have been reduced through improved waste water

Table 2.1 **Chemical water quality of selected rivers,<sup>a</sup> 1998**

Chemical parameters	Rhine	Weser	Elbe	Danube
Ammonium	53	47	9	100
Nitrate	17	0	12	37
Total phosphorus	22	0	10	61
Trichloromethane (chloroform)	100	92	90	100
Cadmium	48	17	14	89
Mercury	90	100	35	89
Zinc	3	0	0	78

a) % of measuring stations in class II or above, considering the most stringent target of all protected assets (aquatic life, fishing, sediments, drinking water, irrigation water).

Source: UBA.

treatment since 1990. In Lake Müritz, sewage diversion is already having some effect. Problems persist in lakes with large catchment areas and in areas with a high proportion of agricultural land use. A uniform classification scheme is being prepared for lake water quality (with five trophic classes).

*Groundwater*, representing more than 70% of drinking water supply, is polluted at many locations and to a considerable degree. Besides contamination from point sources (e.g. former industrial and waste disposal sites, accidents involving hazardous substances, leaking sewers), contamination from diffuse sources is increasingly polluting or endangering groundwater resources. For decades, reports have documented and warned against the *growing nitrate pollution* of groundwater resources: in a 1995 national survey, 25% of measurements exceeded 25 mg/l (11% were above the WHO drinking water limit value of 50 mg/l). High nitrate levels usually result from agricultural pollution. Groundwater pollution by agricultural *pesticides* is also of concern: a 1995 survey shows that the drinking water limit value of 0.1 µg/l was exceeded at about 10% of monitoring stations; the substances most frequently detected are herbicides, particularly atrazine (despite a ban on its use since 1991). Atrazine is still found in groundwater due to its long residence time in soils.

In 1990, 10% of the population of the New Länder was supplied with *drinking water* that exceeded maximum permissible concentrations for toxic substances. In 1996, this figure had fallen to 0.1%. The Drinking Water Ordinance is now implemented in the New Länder. Nitrate problems still exist in Germany as a whole, with limit values being exceeded for 0.6% of the population (mainly in communities served by small waterworks).

### *Policy measures regarding diffuse sources of pollution*

*Agriculture* accounts for 60% of nitrogen input to surface waters; 30% is from urban waste water and 10% from industrial waste water and rainwater treatment. Over 40% of nitrogen from agriculture finds its way to rivers, having leached to groundwater. Half of phosphorus input to surface waters is associated with agriculture, mainly in the form of eroded soil from farmland.

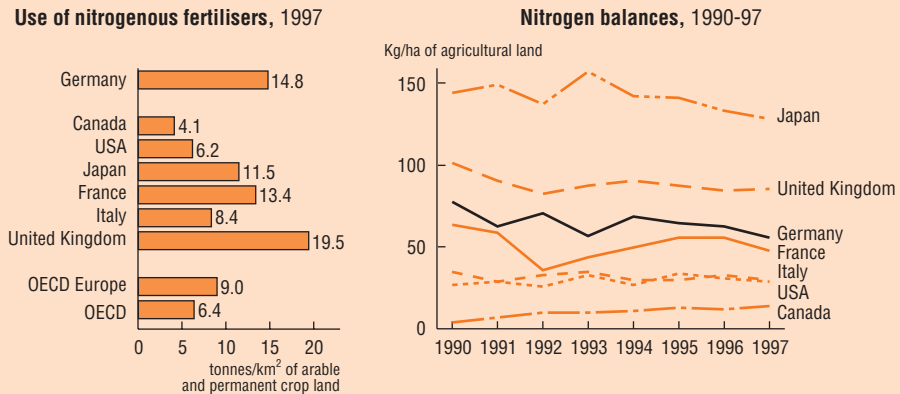
The EU's 1991 Nitrate Directive has been implemented through the *1996 Fertiliser Ordinance*, which requires fertiliser balance sheets at farm level and the adjustment of fertiliser dosage to crop requirements on a plot basis. The Nitrate Directive set the permitted maximum application of nitrogen from livestock manure at 210 kg N/ha/year from 1996, and at 170 kg N/ha/year from 1999. The Fertiliser Ordinance allows a 30% flexibility margin, to take account of ammonia losses during manure spreading and storage. Moreover, 210 kg N/ha/year is authorised on grassland.

It has been proposed that acceptable levels of nitrogen surplus from German agriculture should be below 50 kg N/ha. OECD estimates that the national surplus (soil surface nitrogen balance excluding atmospheric losses) has already been reduced from 78 kg N/ha in 1990 to 55 kg N/ha in 1997 (Figure 2.2). This reflects a decrease in herd size over the last 15 years of 29% for cattle, 24% for sheep and 28% for pigs. Since 1990, total consumption of commercial fertilisers (NPK) has fallen by 13%, following a decline in the 1980s. However, this has not yet led to a fall in nitrate concentrations in rivers, partly due to groundwater's long flowing time (up to several decades in the case of flat land). There is a *need to further reduce nitrogen inputs*, to meet both domestic objectives and international commitments concerned with protection of the North Sea and Baltic Sea (Chapter 8). The application rate of nitrogenous fertilisers, at 148 kg N/hectare of arable and permanent cropland, is well above the OECD average (Figure 2.2). About 12% of farms, covering 10% of farmland, do not comply with the target of 170 kg N/ha/year for nitrogen supply from livestock manure.

In Germany as a whole, there is greater nitrogen input from *mineral fertilisers* (60%) than from livestock manure (40%). Introduction of a nitrogen tax has not been envisaged, on the grounds that it would lower farm income and have unfair distributional effects. Alternatively, a fine might be imposed on farms with nitrogen surpluses. To a greater extent than in the past, economic incentives should be designed to contribute to water quality objectives. The new provisions of the EU's Common Agricultural Policy (CAP), under Agenda 2000, provide an opportunity to make farm support conditional on compliance with *environmental standards*. Agri-environmental payments (8% of total budgetary transfers to agriculture in 1997) should also be targeted to produce more clearly defined environmental benefits. In 1997, one-third of farmland (5.5 million hectares) was included in agri-environmental programmes.

*At regional level*, nitrogen input from mineral fertilisers does not differ by more than 10% from the national average. However, there is *wide variation among regions* in nitrogen input from *livestock manure*. Regions with intensive pig and poultry production have a nitrogen surplus of over 140 kg N/ha (Figure 2.2). Nitrogen surpluses greater than 120 kg/ha exist in regions with a high level of livestock and crop production, mainly in north-western Germany. There are many technical options for using nitrogen from manure more efficiently, at no or low cost to farmers, such as choosing the optimal spreading time, mixing manure with soil directly after spreading, and sharing advanced spreading techniques with other farms. Others include better manure storage, lower protein content in animal feed, substitution of residual manure for mineral fertilisers, and transporting manure to other farms. In particular cases it may be necessary to *reduce livestock numbers*: upper limits for livestock density are already a precondition for agri-environmental payments. Lower livestock density can also be achieved by increasing the amount of land used.

Figure 2.2 **Nitrogen**  
Nitrogen balance in Germany, 1995



Source: UBA; FAO; OECD.

The aim of the Nitrate Directive is to conform to the WHO limit of 50 mg/l for drinking water, which in Germany mainly comes from groundwater. Additional measures need to be taken in groundwater protection areas. Regions with high concentrations of livestock can be identified as vulnerable to *leaching of nitrogen* to groundwater. In these *vulnerable areas*, more stringent requirements should be imposed on farmers and implementation of the Fertiliser Ordinance should be closely monitored and enforced.

Use of *mineral phosphate fertiliser* in agriculture has been dramatically reduced, from 30 kg P/ha/year in 1980 to 12 kg in 1995. The Ordinance requires mineral and organic fertilisation of phosphate over-saturated soil to be halted in areas where hazardous consequences with regard to waters may be expected. This is the case in the marshlands responsible for eutrophication of the North Sea and Wadden Sea.

Efforts should be pursued to establish a classification system for assessing rivers' chemical water quality, based on the extent of pollution by agricultural *pesticides*, and to define corresponding water quality targets in relation to protected

assets. Information on the use of active ingredients and application periods should be compiled, in order to identify regions prone to pesticide runoff.

Inputs of *heavy metals* from diffuse sources are much higher than direct discharges by industry (72% and 28%, respectively, in the Rhine catchment). About one-half of inputs from diffuse sources can be attributed to storm water from city streets and roofs. Due to phasing out of leaded fuel and the introduction of new amalgams for dental use, the share of urban diffuse sources in total fluxes has been reduced for lead and mercury. Copper (from overflows of combined sewers) and zinc (from storm sewer outflows) are the main concerns in the case of diffuse sources. However, copper and zinc are so widely used in construction that the required reduction will probably not be achieved in the foreseeable future. Facilities to keep heavy metals in storm water from flowing directly to rivers are generally inadequate. Other important pathways are erosion (nickel and chromium) and drainage flows (cadmium), which account for about one-quarter of diffuse sources. Atmospheric deposition to open water (essentially mercury from waste incineration plants) accounts for 5% of the total. The need to improve urban storm water treatment calls for urgent action. More infiltration basins are needed. Efforts should be made to find alternatives to heavy metals use in construction and motor vehicle manufacture. Measures concerning agriculture should focus on drainage and erosion control, and on greater use of low-cadmium fertilisers. Several municipalities charge a separate fee for rainwater collection and treatment. The revenues are used to help prevent flood events, particularly by promoting ways to improve rainwater infiltration.

### *Policy measures regarding point sources of pollution*

The percentage of German *households* connected to public waste water treatment plants (89%) is among the highest in OECD countries (Figure 2.3 and Annex I.A); this represents an increase of 6 percentage points since 1987. The rest of the population (located in some rural areas) is served by individual treatment facilities. Between 1987 and 1995, the population connected rose from 90 to 94% in the Old Länder and from 57 to 63% in the New Länder. Most waste water treatment is secondary (97%), and most secondary treatment (82%) is carried out with nitrogen reduction. The remaining 3% is primary treatment. The share of the population that has secondary waste water treatment (with nutrient reduction) rose from 7 to 72% between 1987 and 1995. In *industry*, substantial progress has been made in recent years in treating, and minimising the amount of, waste water in response to environmental legislation. However, *considerable effort is still necessary* to equip all communal and industrial waste water treatment plants with more advanced phosphorus reduction techniques (Chapter 2, Section 2.2).

Since 1986, minimum requirements have applied to waste water discharged to ambient waters. These requirements are based on generally available technology (or best available technology in the case of hazardous substances), irrespective of the quality of recipient waters (uniform effluent standards are differentiated according to industrial sectors). Since the 1996 amendment of the Federal Water Act (to comply with EU legislation), all waste water management should be based on BAT standards. *Waste water discharge permits* are granted only if discharges from the various sources satisfy minimum requirements laid down in the 1997 Waste Water Ordinance. As yet, the Ordinance applies to 48 (out of 55) sources, including municipal waste water. Administrative rules continue to apply to the other sources of pollution. Under the Ordinance, the BAT approach can require different pollution abatement standards in relation to marginal abatement costs. For instance, maximum concentrations of oxygen demanding substances (COD, BOD), ammonium, nitrogen and phosphorus in municipal waste water are more stringent in the case of large waste water treatment plants.

In 1986, it was decided to curb the rise of *water effluent charges* (Chapter 2, Section 2.2). There had been an annual fixed increase. The rate per unit of toxicity subsequently increased more slowly and in limited steps, from DEM 40 in 1986 to DEM 70 in 1997, and has remained unchanged since. Moreover, effluent charge rebates have been designed to provide incentives to comply with compulsory BAT standards. Part of the investment expenditure by treatment plants that conform to the BAT standards (50% in 1986, 100% since 1990) can be offset from the charges payable for up to three years during construction. Since 1994, investment in sewers and installations other than treatment plants has also been eligible for a 50% rebate. New provisions have entered into force to promote investment in the New Länder, where investment expenditure at one plant can lead to a reduction in charges payable by another plant.

Associating charge rebates with the need to conform to BAT standards reduces the *incentive function of charges* during the investment period. In addition, water effluent charges are based on the quantity of the discharge for which a permit has been given. Direct emitters are therefore not motivated to exceed the discharge permit requirements. Changing the basis on which effluent charges are calculated (from permits to measurement of actual volumes discharged), and limiting the scope of charge rebates, would improve the charges' incentive function. It would also strengthen enforcement of regulations through closer monitoring of discharges.

## 1.2 Flood control

### *Trends in river development*

Germany has 6 500 kilometres of federal *inland waterways* (75% rivers, 25% canals). Weirs constructed along major rivers in recent times, mainly for navigation

purposes, are also frequently used for power generation. The Rhine is the most important inland waterway. Extension of the waterways network is planned in the New Länder (linking the greater Berlin and Magdeburg area to the western European network). Rivers have been made deeper through dredging. Further construction of new barrages and weirs (impounding) is planned, in order to adapt rivers to even larger vessels (from the current Euro-ship size of 1 350 tonne loads to barges with 3 500 tonne loads).

Severe flood events in recent years are largely attributed to *river development* carried out for purposes of navigation and power generation. Straightening rivers and narrowing river beds (as much as from 12 kilometres down to 200 metres along some sections of the Upper Rhine) accelerate flood waves. Moreover, construction of dykes for flood control has reduced the area covered by floodplains (by 60%, or 13 000 hectares, in the Upper Rhine). The effect of these measures has been a substantial increase in flood peaks in large rivers (Chapter 2, Section 2.3).

All major rivers have been subject to *structural modifications* in the past. The Rhine is a prominent example. River meadows (riparian zones that are flooded when the water is high) have shrunk by 87% between Basle and Karlsruhe, following construction of dykes and channels to cut off meanders. A simplified three-stage map of hydromorphological water quality was recently published in Baden-Württemberg, based on modifications of watercourses and on the quality of riverbanks and riparian strips. Only 3% of the rivers in Baden-Württemberg are “largely natural”; in most rivers that are “impaired” and “not natural” there are man-made obstacles to fish migration. Unlike the Rhine, the Elbe and its floodplains have almost retained their natural character, at least in the river’s middle section where considerable stocks of aquatic species are found. Unique floodplain landscapes have survived along the lower reaches of the Oder.

### *Policy measures*

Comprehensive *flood protection measures*, mainly construction of dykes but also of retention basins and reservoirs, have substantially reduced the danger of flooding in Germany. However, due to urbanisation on floodplains accompanying river development, considerable damage can occur if riverbanks overflow or dykes give way in the case of extreme flooding. To absorb peak flows, priority should be given to *conservation of river meadows and natural floodplains* that still exist (including riparian forests). Dykes should be moved back to the extent possible (as was recently done in North Rhine-Westphalia), to reactivate the earlier natural retention basins. Conservation of small tributaries in a near-natural state, or their renaturing, could also contribute to reducing the scale of flood events by absorbing runoff of heavy rainfall within the catchment area. Natural retaining areas can be secured through bans on



development and more extensive use of farmland, as well as through imposing the obligation to provide compensatory areas where land is used for building purposes. Comprehensive measures are necessary, as flooding takes place in the main rainfall areas. Where rain will fall heavily is impossible to predict. Regions previously flooded may be affected again by flood events, but new regions may also be affected.

There is a need for co-ordinated responses to flood prevention and nature conservation objectives on one hand, and to objectives relating to navigation and power generation on the other. This could best be achieved using a *river basin management* approach. Such an approach will be generalised in response to forthcoming EU framework water legislation. Germany has six main river basins: the Danube, Elbe, Ems, Oder, Rhine and Weser. Co-operation between the 16 Länder takes place through a Länder Working Group on Water (LAWA) whose mandate already includes co-ordination of water management in major river basins and discussions concerning EU matters.

Under natural conditions, rivers and their floodplains are the central European ecosystems with the greatest species diversity. River development reduces habitat diversity and the dynamics of water flows, disrupts watercourses' continuity (e.g. with weirs, dams) and destroys the unity of the river/floodplain system. This leads to impoverishment of the original species inventory and a shift in the spectrum of aquatic life. As recent trends have shown, improved water quality can significantly increase species diversity. Nonetheless, further colonisation now requires the *creation of nearly natural biotopes*. In 1991, a comprehensive ecological programme called "Salmon 2000" was adopted for the Rhine. It included restoration of continuous routes upstream to spawning grounds and downstream to the sea, with climbing aids ("fish ladders") at dams and weirs. Established as part of international commitments, the Salmon 2000 programme was a success (Chapter 8). co-operation with the Czech Republic to protect and improve the course of the Elbe was initiated in 1990 (Chapter 8). In small watercourses, weirs are often used entirely for power generation; additional habitat improvements have been implemented by the Länder, such as raising water levels and renaturing riparian zones. To complement water quality targets, binding targets for conservation or regeneration of near-natural features of major rivers should be adopted.

## 2. Focus on Selected Topics

### 2.1 Toxic contaminants in rivers

The water quality of German rivers has been evaluated above (Chapter 2, Section 1.1) with respect to biological quality, nutrients and toxic contaminants (e.g. heavy metals, organic industrial chemicals, pesticides) (Figure 2.1 and Table 2.1). A

*comprehensive set of regulations* is in place to regulate handling by factories of hazardous substances found in water, including their production, storage, transport and use. In the mid-1990s, water quality targets for some 1 355 substances were defined for drinking water, aquatic life, fish to be eaten, and sediments. This enlarges the scope for enforcement authorities and plant operators to specify organisational and technical requirements for plants. At the same time there is an obligation to use best available technology, whether or not toxic effects will occur in ambient waters following waste water discharges. These requirements contribute to the substitution of less harmful compounds for highly toxic ones.

*The overall burden by organic industrial chemicals has declined.* For example, the chloroform load has fallen due to use of chlorine substitutes as bleaching agents in the cellulose industry. HCB levels, however, have shown hardly any significant reduction. Since HCB is very persistent and the *Elbe's* sediments are very highly polluted in some locations, only a slow reduction of pollution loads can be expected in the foreseeable future. Sediments of the Mulde tributary contain substantial concentrations of DDT and tetrabutyltin (there is an organotin production facility in Bitterfeld). Unlike the Rhine, the Elbe is heavily polluted by halogenated ethers (by-products of plastics and refrigerant manufacturing); concentrations are alarmingly high at the German/Czech border and in the Saale tributary. The *Oder* is polluted by polycyclic aromatic hydrocarbons (PAHs). In the *Rhine*, compared with 1990, concentrations of synthetic organic chelating agents (NTA, EDTA) are considerably above those of other individual substances. The *Weser* has the highest salt levels among major rivers, as a result of discharges to the Werra tributary by the potash industry. Serious consequences are the destruction of most freshwater plant and animal species and prohibitions on drinking water supply. A waste water engineering concept has made possible a dramatic reduction of chloride concentrations since 1991. The *Danube* is the least polluted of Germany's major rivers, due to dilution of pollutants by the abundant water in the Danube catchment area and to relatively lower industrial pollution loads compared with those of other river basins.

The Drinking Water Ordinance sets an across-the-board limit value of 0.1 µg/l for individual pesticides and 0.5 µg/l for the total of all pesticide active ingredients. In the Rhine, more stringent quality targets have been set for 18 individual substances to protect aquatic life and human health. Levels of the herbicides atrazine and simazine have fallen continuously since their use was banned in 1991; concentrations in the Elbe have fallen considerably, but remain above 0.1 µg/l. Diuron concentrations in the Rhine have decreased since 1985. However, *pesticide concentrations* over 0.1 µg/l still occur in many places for various substances. This is the case, for example, in the Nidda (a main tributary), where many active ingredients are found in concentrations of 1-2 µg/l. Despite a

substantial reduction in the quantities of the insecticide lindane applied, quality targets suggested for aquatic life are exceeded at 50% of river measuring stations.

## 2.2 *Expenditure on waste water management*

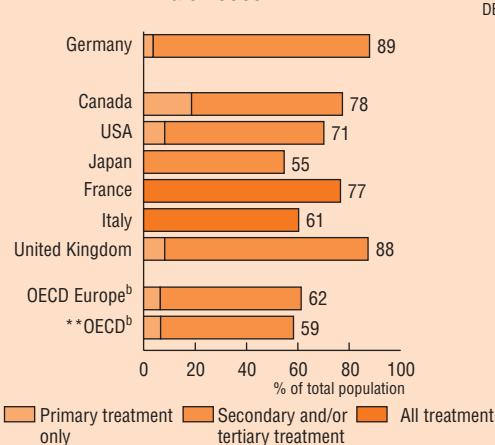
*Overall expenditure on waste water management increased in the 1990s*, particularly in the New Länder (Table 2.2). Since unification, 200 sewage treatment plants have been created through public-private joint ventures in the New Länder, for an expenditure of DEM 15 billion. In the Old Länder, investment expenditure has decreased while operating expenditure has increased. At the national level, investment expenditure currently amounts to DEM 13 billion a year, three-quarters of which is financed by the public sector; operating expenditure by local communities and waste water boards is currently DEM 12 billion. The overall level of connection to public waste water treatment plant is high (Figure 2.3).

*Heavy investment is still needed* in order to carry out advanced waste water treatment to reduce nutrients, and to use best available technology to prevent and respond to the presence of hazardous substances. It is estimated that investments will be in the order of DEM 75 billion between 2000 and 2005, shared equally between the Old and New Länder. A similar level of investment would be needed to extend the sewerage system and for rainwater treatment. There is scope to extend the privatisation of waste water services initiated in the 1990s, which currently accounts for one-third of operations. In principle, waste water treatment fees should cover the costs of waste water management. However, in cases of initial investment in waste water treatment plants, the Länder often grant subsidies in the range of 20 to 25% to local authorities.

*Water effluent charges* have been amended several times since their initial implementation in 1981 (following the 1976 Water Effluent Charges Act). Successive amendments were aimed at harmonising administrative procedures for collection of charges (1984), expanding the number of taxable pollutants to include halogenated organic compounds (1986) and phosphorus and nitrogen (1990), and promoting reduction of the pollution load through extended charge concessions (1994). In the New Länder, the water effluent charge was applied for the first time in 1993.

The rate of effluent charges increased annually up to 1986 (Figure 2.4). Thereafter, *it was decided not to raise the rate every year, and to provide charge concessions* to reduce the pollutant load through systematic use of best available technology. Water effluent charges are defined per unit of toxicity and are based on permitted discharged volume. Toxicity is defined using the following parameters: chemical oxygen demand, phosphorus, nitrogen, halogenated organic compounds, heavy metals and fish toxicity.

Figure 2.3 Population connected to public waste water treatment plants, late 1990s<sup>a</sup>

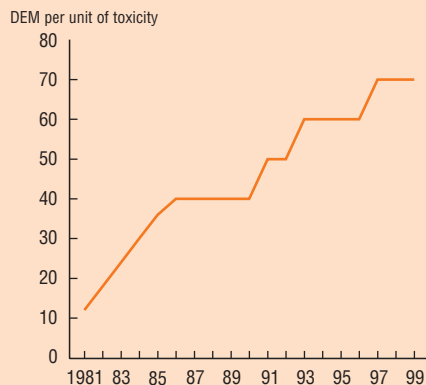


a) Or latest available year.

b) Secretariat estimates.

Source: OECD.

Figure 2.4 Unit rates of water effluent charges



Source: BMU.

Table 2.2 Pollution abatement and control expenditure on waste water management (DEM billion)

	1985	1991	1994
Total Germany		22.7	26.6
Old Länder total	13.5	20.7	21.9
of which:			
Investment public	6.0	9.7	9.3
business	1.1	1.9	1.4
Operation public	3.1	4.8	6.2
business	3.3	4.3	5.0
New Länder total		2.0	4.7
of which:			
Investment public		1.1	2.2
business		0.7	1.6
Operation public		0.1	0.2
business		0.1	0.7

Source: OECD.

### 2.3 Increased flood occurrence and damage

In the 1990s, *five major floods* occurred in Germany, some with an intensity greater than that of a 100-year flood. The country's five most important rivers flooded separately except in 1995, when both the Rhine and Weser were affected. The consequences were considerable: the 1993-94 Rhine flood caused more than DEM 1 billion in damage; the Elbe flood in 1994 caused DEM 600 million in damage, and 6 500 people were temporarily evacuated.

River development, land use changes and agricultural drainage have increased flood risks and damage. This has led the Government to take measures aimed at a *more integrated catchment policy*. The 1996 revision of the Federal Water Act addressed the need to preserve existing floodplains and to reclaim former ones. In 1997, the Federal Building Code and Federal Regional Planning Act were amended to control land management, particularly to curb increasing use of land for transport and residential purposes, organise zoning to protect retention basins, and include preventive flood alleviation measures. In 1998, the Federal Soil Conservation Act imposed, for the first time, uniform national requirements governing soil conservation measures of significance for flood prevention and water related soil erosion.

Simultaneously, the *International Commission for the Protection of the Rhine* (IKSR) submitted a flood action plan to the Rhine Ministers, who adopted it in 1998. Implementation of this plan should entail a global expenditure of DEM 24 billion, three-quarters of which is under German responsibility. The International Commission for the Protection of the Oder and the riparian countries of the Elbe have initiated the same approach.

# 3

## WASTE MANAGEMENT\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- improve *efficiency of household waste management* by opening the disposal market to competition, with monitoring and control by public authorities;
- conduct *an analysis of the cost-effectiveness of the Duale System* for recycling packaging material, and of material recycling schemes in general; assess their environmental benefits compared with other forms of treatment and disposal;
- further develop implementation of the *principle of extended producer responsibility* in the industrial sector, possibly expanding the use of economic incentives;
- elaborate plans to ensure that *treatment and disposal of waste* (e.g. *hazardous waste, household waste*) which is *unsuitable for recycling* are organised efficiently, building on *enhanced co-operation* between federal and regional authorities and better identifying future infrastructure needs;
- continue efforts aimed at *upgrading landfill sites* to meet legal requirements, and at *remediating closed dump sites* and contaminated sites, especially in the New Länder;
- take measures to *improve the availability and timeliness of data* pertaining to waste generation, treatment and disposal at the national level.

\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993.

## 1. Evaluation of Performance

### 1.1 Objectives and institutional framework

While *federal waste management policy* initially concentrated on environmentally compatible disposal of waste, the 1994 Closed Substance Cycle and Waste Management (CSCWM) Act established a new holistic approach encompassing economic activities and waste generation (Chapter 3, Section 2.1), aimed at reducing the rate of waste generation at the source. The CSCWM Act introduced the *principle of extended producer responsibility* into waste management policy at the national level, constituting a fundamental policy shift. It changed the *definition of waste* to include everything incurred during production, manufacturing or processing whose creation is not the actual aim of the action. This change, which conforms to EU legislation, considerably expanded the list of materials subject to waste regulation. Waste is also to be classified as being for recovery or disposal. In practice, uncertainties still exist regarding precise definitions of “waste” and “product”, as well as the distinction between “waste for recovery” and “waste for disposal”.

*Implementing waste management legislation* is the responsibility of the Länder and regional authorities. According to national legislation, the implementing objectives of waste managers are: to recover as far as possible non-avoided wastes; to keep the pollutant content of wastes as low as possible; and to ensure environmentally compatible treatment and landfilling of non-recoverable wastes. Generally speaking, while recovery and disposal of household waste remain the responsibility of public authorities, industrial and commercial waste management has been privatised and mechanisms for monitoring waste recycling are becoming more flexible. The situation is complicated by the fact that large volumes of waste are now diverted from the household waste stream due to increased recovery rates, and that the size of public authorities’ waste management jurisdictions is intended to correspond to administrative jurisdictions rather than to waste management needs. To run their disposal facilities at full capacity, thus reducing unit costs, public authorities must compete not only with private operators but also among themselves. More extensive co-operation among public authorities would no doubt enhance the efficiency and lower the costs of waste management.

### 1.2 Waste generation trends

Precise figures are not available to *quantify waste flow trends* in Germany. Waste statistics at the national level were not really organised until 1994, when major restructuring of the system occurred with the adoption of the Environmental Statistics

Act. Even now, since responsibility for waste management monitoring is at the Länder level and co-ordination between federal and Länder governments is weak, the availability of national data is poor, often involving delays of several years. Further difficulties with data comparison stem from recent changes in the definition of waste.

However, it is generally claimed that waste generation has fallen off since 1990, having increased over several decades, and that waste recovery rates have substantially improved (Chapter 3, Section 2.2). In the late 1990s, the total *volume of waste generated* annually in Germany, excluding agricultural and mining waste, was estimated at 350 million tonnes. Available figures from the Ministry for the Environment indicate that construction/demolition waste would account for about 50% of this total, mixed household and commercial waste about 21% and special (hazardous) waste about 5%.

### 1.3 Management of municipal waste

#### *Recovery and disposal trends*

Country-wide data on *household and commercial waste recovery rates* are not available. Local data suggest high rates of material recovery (Chapter 3, Section 2.2). Under the CSCWM Act, public authorities responsible for managing household waste are to prepare *waste management plans* concerning recovery and disposal of the waste generated in their jurisdictions. The Länder were to prepare waste management plans for their respective jurisdictions by the end of 1999; most Länder are behind-schedule in developing such plans. It is hoped that, once developed and implemented, these plans will lead to more systematic monitoring and data collection.

In the late 1990s, some 70% of *household and commercial waste* was sent to landfill, mostly without treatment. Approximately 30% of this waste was incinerated. A large number of landfills, especially in the New Länder, still did not satisfy current legal requirements regarding lining and the collection of leachate and gas emissions. Ensuring that unrecoverable waste receives pre-treatment before landfilling by 2005 is a national objective (Chapter 3, Section 2.3). Incineration is currently the only pre-treatment method that meets legal requirements, but national incineration capacity is largely insufficient and commitment to expanding it is uncertain. A number of old landfills, which will close by 2005 since they will not meet the new standards, are trying to attract waste in the meantime by offering low prices, thus delaying investment in landfill development. Further efforts are needed, in Germany as a whole and at regional level, to clarify the situation and to establish appropriate economic incentives during this transition period.



Production and disposal of *packaging waste* have been reduced since the Packaging Ordinance was implemented (Chapter 3, Section 2.4). Total packaging consumption, which decreased from 15.6 to 13.6 million tonnes between 1991 and 1996, was 13.8 million tonnes in 1997. The volume of packaging material recycled, about 2.8 million tonnes in 1991, was 5.4 million tonnes in 1997 and the ambitious recycling quotas fixed by the Ordinance were all met or exceeded. The 72% quota for refillable drinks packaging was also met. Practical difficulties arose during the first five years of the Ordinance's implementation, since recovery capacity was inadequate to meet Germany's recycling provisions and quotas. The fact that the Ordinance did not recognise incineration as thermal recovery prompted the export of substantial amounts of packaging material to neighbouring countries, sometimes subsidised by the Duales System Deutschland (DSD); this in turn overloaded these countries' recycling capacities, undermining their recycling schemes.

### *Policy measures*

Concerning *household waste*, private households pay *waste management charges* based on local authority fee scales that reflect the actual cost of treatment and disposal, including the amortised *costs of disposal facilities*. Annual charges for household waste disposal have dramatically increased since 1990; in 1996, they averaged DEM 144 per person, ranging from DEM 45 to DEM 270. Commercial waste *disposal charges* are based on standard market prices for disposal services. In the case of commercial waste similar to household waste, these prices are generally lower than those paid by private households. Bearing in mind that the CSCWM Act was designed to open the waste management market to competition, and that the cost of household waste management is now relatively high, some form of *privatisation of household waste disposal* might be worth considering.

*Separate collection and recycling schemes* are generally operated by means of a combination of ordinances and voluntary agreements. The sale of recovered material is currently unable to meet the full costs of recycling, and funding systems are often required in order to *develop markets*. For example, such a funding system was introduced for packaging waste, with *contributions to recycling costs* levied as consumer charges according to the type of packaging material. These charges were about DEM 50 per person in 1995. This leads to an ambiguous situation, since the citizen who pays consumer charges for recovery of valuable material might reasonably expect to see waste disposal charges decrease accordingly.

The *Packaging Ordinance*, which came into force in 1991, had a pioneering role in the area of extended producer responsibility and has been quite successful with regard to waste reduction and increasing the proportion of material recycled (Chapter 3, Section 2.4). Although the philosophy behind the Packaging Ordinance

and the manner of its implementation have attracted keen international interest, the Ordinance has been *severely criticised* nationally. First, the monopolistic structure of the Duales System Deutschland (DSD), as well as its strong links with waste disposal firms and its high costs, have created concern. In a 1998 report, the German Environmental Council estimated that “should cost-benefit analysis and eco-reports confirm doubts not only about the economic efficiency of the system, but also about its ecological benefits for certain kinds of packaging, then the Packaging Ordinance would have to be overhauled”. Second, the Ordinance does not contain specific objectives for packaging material reduction or avoidance, focusing instead on promotion of recycling. These concerns were partially addressed in 1998, when it was amended in accordance with the EU Packaging Directive. Provisions were introduced to encourage competition among recycling companies, improve monitoring of packaging producers and retailers that do not participate in the DSD, slightly revise the recycling quotas and allow for some energy recovery of plastic materials. A review of the cost-effectiveness of the scheme is currently underway.

The 1998 *Battery Ordinance* is an important step towards a closed substance cycle and implementation of extended producer responsibility. This Ordinance replaces an earlier voluntary agreement by the battery industry which failed to achieve satisfactory results. Measures to implement it are similar to those taken in the case of the Packaging Ordinance.

In 1995, manufacturers and distributors of information and *office communications equipment* proposed a voluntary system to ensure free return of used equipment by the final owner, based on a disposal fee levied at the time of initial purchase. A draft framework ordinance, recently under discussion at the Bundesrat, is intended to provide a legal safeguard for industry’s voluntary measures.

By 2005, separate collection of *biological waste* by public waste management authorities will be mandatory. This requirement will supplement efforts which had already resulted in an increase in the amount of bio-waste collected separately, and processed into compost for agricultural use, from 1 million tonnes in 1990 to 7.5 million tonnes in 1997.

### **1.4 Management of non-municipal waste**

#### *Recovery and disposal trends*

Of the 18 million tonnes of special (hazardous) waste generated annually, some 7 million tonnes is disposed at specialised facilities. Treatment of the remainder is carried out by the waste generator. National treatment capacity includes 14 specially designed landfills, three underground storage sites, 31 incinerators and three plants

providing other forms of thermal treatment. *Disposal of special waste* has mostly been privatised, under supervision of the Länder. Monitoring is ensured through a system of consignment notes involving the transport organisation and the responsible authorities, as well as the waste generator and disposer.

Germany is the only OECD country in which significant quantities of off-site *hazardous waste* are disposed in underground mines that are no longer operational. An underground waste disposal site in Hessen (Herfa-Neurode) has received hazardous waste since 1972. During the 1990s, this site accepted an average of 130 000 tonnes per year. Since reunification, a number of mines in the New Länder have been licensed for hazardous waste disposal. Use of hazardous waste as *filling material in disused mines* is growing. This is considered a form of recycling, although strictly speaking it is no different from underground waste disposal.

Exports of special (hazardous) waste have increased continuously over the last few years. Germany is by far *the largest special waste exporter* among OECD countries (Chapter 3, Section 2.5). About 90% of the amount exported is destined for material or energy recovery. Imports have also increased, but remain well below exports in volume. There is no official explanation. It has been suggested that strict environmental standards enforced at German recovery or disposal plants place these facilities at an economic disadvantage vis-à-vis similar plants in neighbouring countries. However, since most waste exported to EU countries and Switzerland is thermally treated (86% in 1997), this situation may simply reflect Germany's stringent requirements regarding energy recovery from waste (e.g. the minimum calorific value a particular type of waste must possess to be acceptable for energy recovery).

Every year some 175 million tonnes of rubble, broken up road surface material and *construction site waste* is generated in Germany. In 1996, companies involved in construction and demolition voluntarily agreed to halve the volume of recyclable construction waste landfilled by 2005. Around 31 million tonnes per year is already recycled; 8 million tonnes is thought to be contaminated and therefore unsuitable for recycling.

### *Policy measures*

Under the CSCWM Act, *producers of "waste requiring supervision"* (essentially industrial waste) must prepare a *life-cycle analysis* with information on the nature, quantity and whereabouts of the waste generated, as well as details about measures to be taken with regard to the avoidance, recycling and disposal of this waste. They must also notify the responsible Land authority concerning waste type, quantity and composition, together with recovery and disposal plans, for authorisation and monitoring purposes.

Collection and recycling of *end-of-life vehicles* is regulated under a 1998 ordinance stipulating that these vehicles are to be taken to a recognised collection centre or recycling operation. This ordinance specifies uniform disposal standards. It is being used in combination with a voluntary agreement by industry to reduce the volume of waste from used vehicles requiring disposal from the current level of approximately 25% by weight to a maximum 15% by 2002 and 5% by 2015.

A statutory ordinance concerning collection and recovery of *waste oil*, in force since 1987, imposes a *take-back obligation* on retailers. A fee of DEM 0.10 per litre of new oil sold helps cover this system's costs. An amendment introducing targets for recycling and energy recovery (a 60/40 ratio) is under discussion.

### 1.5 Remediation of contaminated sites

#### *Waste disposal sites and mines*

Monitoring *abandoned waste disposal sites* is the responsibility of the Länder. At the national level, there were over 88 000 suspected contaminated sites at the end of 1997. In the New Länder, more than 160 disused open cast lignite mines in need of remediation contained industrial waste and some 38 500 hectares of wasteland and abandoned dumping grounds required rehabilitation. Extensive *clean-up and remediation* have been completed in the most urgent cases, at a cost of over DEM 7 billion between 1993 and 1997 in the New Länder alone (Chapter 7). Country-wide data are not available.

#### *Policy measures*

The purpose of the 1998 Soil Protection Act is to establish a legal structure for protection or restoration of soil quality. The Act includes *closure provisions for waste disposal sites*. Pursuant to this Act, a 1999 ordinance on *investigation and remediation measures* for closed sites was adopted. These are welcome developments. Although general procedures have been similar in the different Länder, there has been a lack of uniformity in practice (e.g. regarding soil and groundwater standards, risk assessment and prioritisation of remedial actions).

A loophole in German waste management regulation concerns storage of *hazardous waste* as filling material in open cast pits or underground mines. This waste is subject to *mining rather than waste legislation*. An increasing number of Länder consider such storage a form of waste recovery, an issue which should be addressed by the Federal Government.

## 2. Focus on Selected Topics

### 2.1 Evolution of waste management legislation: towards extended producer responsibility

Over the past 30 years, the focus of *German waste management legislation* has shifted from improving disposal facilities' environmental performance to minimising the volume of waste sent to these facilities. In the early 1970s, legislation focused on closing unauthorised dump sites and developing modern disposal infrastructure. In 1986, the Waste Avoidance and Management Act emphasised waste avoidance and

Table 3.1 **Key provisions of the Closed Substance Cycle and Waste Management Act**

Provision	Action/aim
Definition of waste	Extends definition to include all by-products of industrial processes. Aims to broaden scope of extended producer responsibility to include waste generation as well as disposal.
Mandatory avoidance requirement	Requires: 1) introduction of low-waste industrial production techniques, and 2) promotion of low-waste products (e.g. products with a long service life that may be re-used, repaired, recycled or disposed of in an environmentally compatible manner). Aims to institute concept of extended producer responsibility.
Mandatory recovery requirement	Requires unavoidable waste to be recovered or recycled. Material and energy recovery are given equal ranking, but energy recovery is only permissible if a number of requirements are met regarding the waste's calorific value and the plant's thermal efficiency, and if the heat generated is also recovered for use. Aims to ensure that materials are recovered where technically and economically feasible.
Mandatory disposal requirement	Requires that waste which is unavoidable and unrecoverable be disposed of in an environmentally compatible manner. Aims to minimise negative environmental effects of waste disposal.
Autonomous compliance with polluter-pays principle	Establishes conditions and procedures for transferring waste from producers to private waste operators, so as to avoid public authorities' assuming responsibility by default. Aims to require waste producers to meet avoidance, recovery and/or disposal obligations in accordance with the polluter-pays principle.

Source: BMU.

recovery, establishing the “waste hierarchy” (avoidance-recovery-disposal). It was superseded and reinforced in 1994 by the Closed Substance Cycle and Waste Management Act (CSCWM Act). In this Act, important steps were taken towards establishing a recycling-based economy in which resources are conserved and waste generation and disposal rates are reduced. The CSCWM Act introduced a number of provisions to implement the principle of extended producer responsibility at every stage of the production process (Table 3.1).

## 2.2 Achieving high waste recovery and material recycling rates

In general, *waste recovery* in the 1990s substantially increased with regard to a number of materials. Although national data are not available, the general trend is illustrated by data from Berlin (Figure 3.1). There the volume of household waste going to disposal fell by 43% between 1992 and 1998, while that of materials recovered from the waste stream increased by nearly 70%.

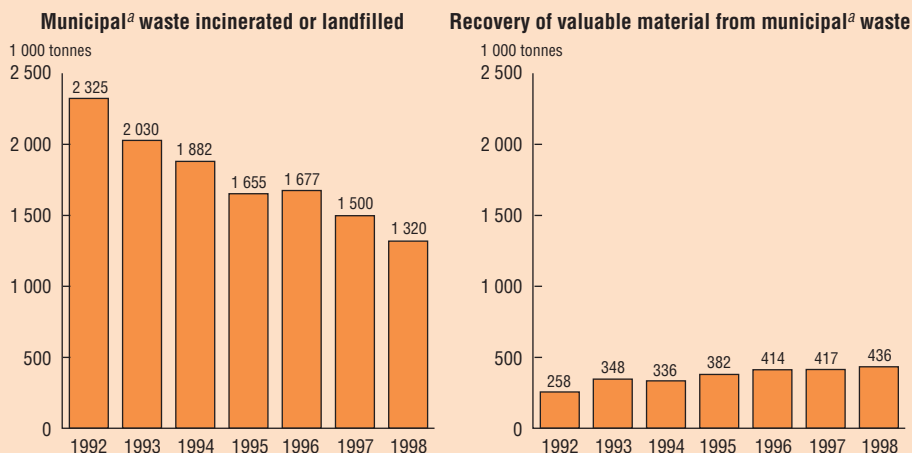
National *glass and paper recycling* rates have greatly increased since 1985 (Table 3.2). In 1999, these had reached 81% of apparent consumption of glass, and 73% of that of paper. Used glass is generally collected by the producing industry in co-operation with municipalities, using special containers; it is often separated into white, brown and green. Since 1994, printing paper and newspaper have been collected as a joint activity by the industries concerned, with operational costs paid by municipalities.

Many products and materials are subject to separate *collection and recycling programmes* in Germany. Apart from glass and paper, these programmes concern bio-waste, used oil, construction waste, batteries, end-of-life vehicles and electronic scrap, as well as packaging waste (Chapter 3, Section 2.4). In 1996, the volume of waste recovered through separate collection schemes was estimated at 10 million tonnes.

## 2.3 Waste disposal capacity: a difficult situation

The number of *household waste landfill sites* and storage facilities operating in Germany fell dramatically between 1990 and 1995. This mainly occurred in the New Länder, where thousands of small dumps had been filled to capacity and were closed. Many operational landfills are still not lined, especially in the New Lander (Figure 3.2). Large-scale efforts to upgrade these facilities or construct new ones are underway.

The situation with regard to *future required disposal capacity* is unclear for several reasons. The success of recycling measures prompted by legislation has resulted in a continuous decrease in the volume of *household waste* sent to landfills

Figure 3.1 Treatment of municipal<sup>a</sup> waste, Berlin

a) Household and commercial waste.  
Source: Berlin Senate.

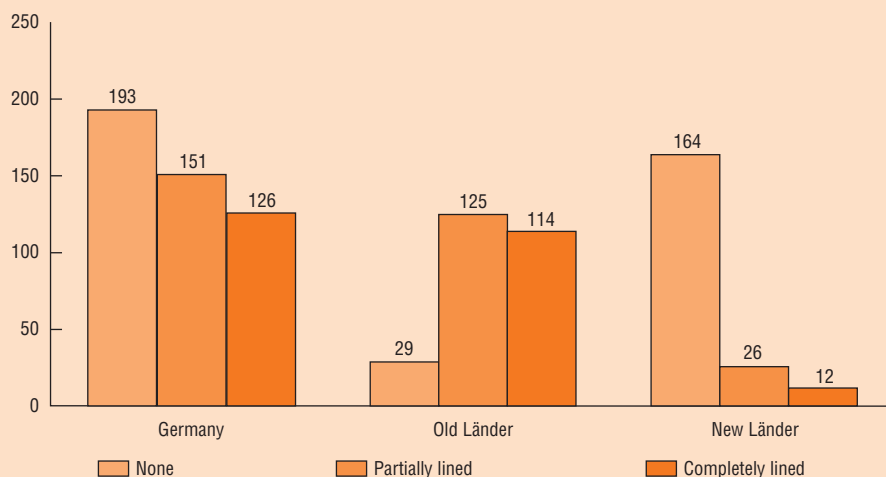
Table 3.2 Glass and paper recycling rates, 1985-99  
(% of apparent consumption)

	1985	1991	1993	1995	1996	1997	1998	1999
Glass	43	61	65	75	79	79	81	81
Paper	43	47	55	67	71	70	71	73

Source: OECD Environmental Data, 1999; UBA.

operated by public authorities. Furthermore, Technical Instructions issued at the federal level pursuant to the CSCWM Act contain stringent requirements concerning the properties of household waste acceptable for landfilling. In particular, pre-treatment of all landfilled waste will be required by 2005.

Figure 3.2 Number of household waste landfills with base lining, 1995



Source: UBA.

Incineration is the only pre-treatment method that currently meets the 2005 technical requirements, but existing *thermal treatment capacity* is largely insufficient. Total thermal treatment capacity provided by the 61 incinerators operated in Germany in 2000 was some 14 million tonnes per year, or only about 40% of that needed by 2005. Incineration capacity is also unevenly distributed throughout the country. Since incineration is strongly opposed by much of the population, and siting of new facilities is difficult, alternative (e.g. mechanical/biological) methods of pre-treatment are being investigated. Whether such processes could be developed sufficiently by 2005 to meet current legal requirements, or whether the Technical Instructions should be amended, is under discussion.

#### 2.4 Applying the principle of extended producer responsibility: packaging waste

At the end of the 1980s, *packaging waste* was approximately 30% by weight and almost 50% by volume of total municipal waste. It was estimated that, if no action were taken, half the existing landfill capacity would be exhausted by 1995. This situation resulted in adoption of the *Packaging Ordinance*, which was enacted



in 1991 and gradually came into effect over two years. Generally speaking, it requires packaging producers and retailers to take back and recycle a certain percentage of their products (Table 3.3). It also establishes a minimum requirement for refillable beverage containers in order to reduce one-way packaging; if use of refillable containers falls below 72%, a mandatory deposit-refund system covering all other beverage containers such as cans or one-way bottles will be set up.

The overall *aims of the Packaging Ordinance* are to ensure that packaging is made of environmentally compatible and easily recoverable material, and that generation of packaging waste is avoided to the extent possible (Table 3.4). Specific waste

Table 3.3 **Recycling quotas and performance, 1999**  
(%)

Materials	Glass	Paper, cardboard	Plastics	Tin	Composites	Aluminum
Recycling quota in the Packaging Ordinance	75	70	60	70	60	60
% recycling achieved under DSD, 1999	83	169 <sup>a</sup>	108 <sup>a</sup>	105 <sup>a</sup>	66	87

a) Recycling rates greater than 100% result because consumers also place packaging not licensed under the DSD system in recycling bins.

Source: DSD.

Table 3.4 **Packaging material recycled in Germany, 1991-98**  
(1 000 tonnes)

	Total	Glass	Paper, cardboard	Plastics	Tin	Beverage cartons	Aluminum
1991	2 849	2 050	514	30	251	0	4
1992	3 182	2 112	723	40	296	6	5
1993	3 955	2 372	880	280	353	56	14
1994	4 342	2 458	948	461	373	82	21
1995	4 693	2 557	1 057	506	445	93	35
1996	5 090	2 671	1 217	541	493	119	49
1997	5 362	2 721	1 336	591	531	129	53
1998 <sup>a</sup>	5 519	2 761	1 407	620	525	142	65

a) Estimates by GVM.

Source: Gesellschaft für Verpackungsmarktforschung (GVM), 1999.

reduction measures favoured include i) reducing volume and weight to the minimum necessary to protect and market goods; ii) making packaging refillable; and iii) ensuring material recovery of packaging that cannot be refilled.

The Ordinance contains specific provisions for recycling *three categories of packaging*. *Transport* packaging must be taken back and reused, or materially recycled, by producers and retailers outside the public waste disposal system. *Secondary* packaging (blister-pack, cardboard, etc. used in addition to sales packaging) must be taken back by retailers at the point of sale. *Sales* packaging, accounting for approximately two-thirds of the total volume, must be taken back at or near the point of sale by retailers. Although precise data are unavailable, it is claimed that provisions regarding transport packaging have rapidly led to a large increase in re-use. Secondary packaging use has been considerably reduced, as take-back at point of sale entails a major organisational effort for the retail trade.

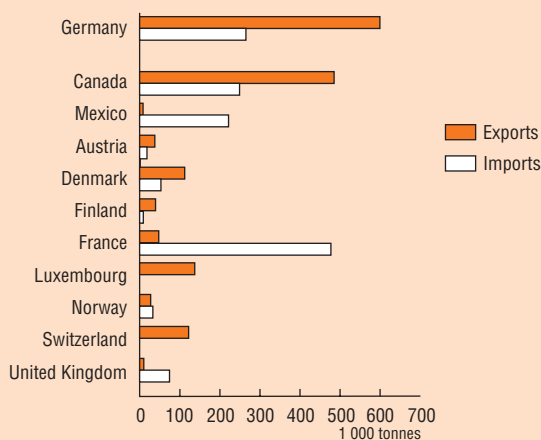
Practical organisation and implementation of policy targets is entrusted to the industries concerned. On the national level, these industries have set up a single private company known as the *Duales System Deutschland (DSD)* which, in co-operation with local authorities, organises collection and sorting of used sales packaging. Retailers participating in the DSD are relieved of the duty of taking back sales packaging material. Collected material is subject to recycling according to quotas, depending on the material in question. Under the DSD, all quotas have been met or exceeded so far, and recovery levels are high for a range of packaging material (Table 3.3).

*Costs* of the DSD collection and recycling scheme are covered by licence fees paid by participating producers and retailers, based on the type of packaging material. These costs are passed on to all those involved, from fillers to consumers; it is estimated that each citizen pays some DEM 50 per year in the form of higher prices. Every tonne of recovered material costs about DEM 800 on average, although recycling costs differ substantially according to the material.

## 2.5 Transfrontier movements of waste

Germany has ratified the *Basel Convention*. It also fulfils the provisions of Council Regulation (EEC) No. 259/93 on the supervision and the control of shipments of waste within, into and out of the EC. This is supplemented on the national level by the *Waste Movement Act*, which contains specific details and provisions, e.g. for re-importation in case of illegal exports. This Act requires exporters to contribute to a special fund, which will be used to finance re-importation of waste illegally exported from Germany when the exporter cannot be identified or is unable to pay. Of the DEM 16 million in this fund, so far only DEM 0.7 million has been needed.

Figure 3.3 **Transfrontier movements of hazardous waste, late 1990s**



Source: OECD.

Table 3.5 **Germany's transfrontier movements of waste, 1995-98**

	Exports (1 000 tonnes)				Imports (1 000 tonnes)			
	1995	1996	1997	1998	1995	1996	1997	1998
Between Germany and:								
EU countries	821	935	974	1 113	188	242	394	552
Switzerland	30	25	51	54	81	91	115	129
Other OECD countries	37	49	22	13	4	5	3	3
Non-OECD countries	212	209	232	205	8	9	6	17
<b>Total</b>	<b>1 100</b>	<b>1 218</b>	<b>1 278</b>	<b>1 385</b>	<b>281</b>	<b>347</b>	<b>548</b>	<b>701</b>
<i>Of which:</i>								
for recovery	939	1 108	1 127	1 311	212	254	418	545
for disposal	161	112	151	74	69	93	130	155
<i>Of which:</i>								
household waste	32	29	50	—	0.2	1	3	—
hazardous waste <sup>a</sup>	740	720	601	568	241	232	267	396

a) As defined in the Basel Convention.

Source: UBA.

At the beginning of the 1990s, about 1 million tonnes of *waste was exported* from Germany. This amount was about 0.6 million tonnes in 1993, affected in particular by the almost complete suspension of exports of household waste. Since figures were based on the limited German definition of waste, which did not cover residues used as secondary raw materials, no direct comparison can be made with figures for the years since 1994. Data concerning waste exports and imports between 1995 and 1997 show that exports have increased continuously over the last few years (Table 3.5) and continue to largely outweigh imports, although exports of hazardous waste (as classified under the Basel Convention) have decreased somewhat.

Germany's waste exports amounted to 1.4 million tonnes in 1998, making it the *largest waste exporter* among OECD countries (Table 3.5). Large quantities of OECD/EU "green list" waste (i.e. waste not subject to control) are exported to neighbouring countries which recently acceded to the OECD, but which still require notification for this type of waste. During the first years of the Packaging Ordinance's implementation, large volumes of packaging waste had to be exported since the capacity of German treatment facilities was inadequate. Most transfrontier movements of special (hazardous) waste (some 80% of exports and 95% of imports) involve *other EU countries* (especially Belgium, France, Italy and the Netherlands) as well as Switzerland (Figure 3.3). Waste exported to non-EU countries primarily falls under the green list. In some 90% of cases, this waste is destined for material or energy recovery.

# 4

## NATURE CONSERVATION AND BIODIVERSITY

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- formally adopt a *set of specific national objectives* for nature conservation, and develop specific *nature conservation plans* at the level of the Länder;
- increase understanding and awareness of nature conservation and biodiversity issues among decision-makers and the general public; in particular, develop and adopt a *national biodiversity strategy*;
- strengthen efforts and set targets for creating *new protected areas* (including Natura 2000 sites) and improve the representativeness of the network of protected areas;
- obtain agreement and transposition, at the Länder and local levels, of the federal objective of reducing the *rate at which land is urbanised* to 30 hectares per day by 2020;
- establish a performance assessment system to increase the transparency and effectiveness of *spatial and landscape planning decisions*;
- extend the role of *landscape protection groups* in stakeholder mediation procedures concerning extension and management of protected areas;
- further improve the effectiveness of voluntary *agri-environmental measures* by ensuring that they are applied on an ecologically appropriate scale;
- encourage *private landowners* to conserve nature and biodiversity on their land, e.g. through a wider range of economic instruments.

## 1. Evaluation of Performance

Germany's efforts to conserve nature and biodiversity have resulted in *several successes*. For example, the salmon is back in the Rhine and the beaver in the Elbe basin. The increase in aquatic species in these and other large rivers is testimony to the positive effects of the water clean-up initiatives of the last two decades. The white-tailed sea eagle, which through hunting and egg removal almost disappeared from Germany early in the 20th century, now has more than 300 breeding pairs in north-eastern Germany and is extending its range. The seals in the Wadden Sea have recovered from a lethal virus epidemic of the late 1980s; their number increased from an estimated 4 000 in 1989 to over 14 000 in 1998. These results can be attributed at least partly to species protection programmes run by the Länder and some NGOs. The programmes are targeted at a few major and well known species, and also have benefits in habitat terms, but are no substitute for protection of larger areas. Successes to date *should therefore not be attributed to general improvement* in the state of nature and biodiversity in Germany.

The fact remains that Germany's high population density generates such *strong pressures* that nature is not holding its own. The density of the road and motorway networks is among the highest in the OECD area, causing severe fragmentation of the natural landscape. Moreover, they are heavily used: traffic per network length is the fourth highest among OECD countries. The trend towards greater fragmentation has not been halted, and reversal would be almost impossible. Intensity of water use is high: over 25% of total resources and 40% of internal resources. Most rivers have been rectified, particularly to facilitate freight transport, with consequent losses in biodiversity of aquatic and neighbouring ecosystems and reduction of flood buffering capacity. Despite improvements in recent decades, the goal of achieving class II (moderately polluted) water quality has so far been met only in about half of German streams and rivers. Acidifying substances still exceed the deposition threshold value on 90% of forest area, and water quality criteria for entrophying nitrogen are not met for 86% of river courses. As a result of these pressures, the share of species threatened in Germany is among the highest in OECD countries for most classes of fauna and flora (Chapter 4, Section 2.1).

### 1.1 Nature conservation and biodiversity objectives

The Federal Nature Conservation Act is basically a framework law, complemented by the Länder's individual nature conservation laws. It specifies the paramount *objectives* of nature conservation for the whole of Germany. Article 1 states that nature and landscapes must be protected, managed and developed in populated

and unpopulated areas in such a way that i) the functioning of ecosystems, ii) the sustained usability of natural resources, iii) flora and fauna, and iv) the diversity, characteristic features, and beauty of nature and landscape are sustainably secured as a basis for human life and as an essential element of human recreation in nature and landscape. Some provisions of the Act, such as those concerning protection of species and trade in flora and fauna, are directly valid as law and do not need complementary Länder laws.

Nature conservation is one of five national priority themes identified in 1998 by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). BMU selected several *policy goals* within this theme, which remain relevant despite never having been formally adopted:

- safeguarding 10-15% of non-settled land as ecological priority areas, creating a system of contiguously linked biotopes (*biotope network*) by 2020;
- severing the link between land use for settlement and infrastructure and economic growth (“*decoupling*”);
- decreasing the rate of *land loss to settlement* or transport to 30 hectares per day by 2020;
- trend reversal in regard to threats to native *wild animal and plant species*;
- increase in the proportion of *organic farming* from 1.9% to 5-10% by 2010;
- reduction of *nitrogen surplus* in agriculture to 50 kg per hectare per year;
- *groundwater* largely free of anthropogenic pressures;
- further reduction in *emissions* of SO<sub>2</sub> (by some 90%) and NO and ammonia (by just under 60% each) by 2010.

While four of these policy goals do not have specific deadlines, it is clear that *there is still a long way to go* before they are achieved. The other four have a time horizon of one or two decades and cannot yet be evaluated. Nonetheless, taken together these goals clearly show that the key to nature conservation in Germany lies in reducing pressures from human settlement and certain economic sectors, such as transport, agriculture and forestry (Chapter 4, Section 2.4). Effective integration of nature conservation policy with sectoral policies and spatial planning is therefore essential.

In addition, Germany has ratified a number of *international agreements* and has to meet related international commitments (Chapter 4, Section 2.3). The EU Habitat Directive presents special challenges for Germany (Chapter 4, Section 1.4).

### 1.2 Expenditure on nature conservation

For *public and private expenditure* on nature conservation no consistent data set is available. With less than 4% of the overall public environmental expenditure, the nature conservation share is relatively low.

*Private expenditure* on nature conservation, for which no figures are available, will not add significantly to these amounts. The large private foundations active in nature conservation in some countries are not present in Germany. NGO activities, other than the unpaid contribution of members' labour, are largely financed by the Government and included under public expenditure.

### 1.3 Raising the visibility of nature conservation

Nature conservation *does not appear to have been given the thrust or resources* commensurate with its status as *one of the five priority themes* of environmental policy. Neither the Federal Government nor any of the Länder has formally adopted or published a nature conservation plan with more detailed or quantified objectives in terms of desired results. The absence of a strategic perspective makes nature conservation interests very vulnerable to competing claims for space and the gradual frittering away of remaining valuable natural areas and cultural landscapes.

With about 3 million members, German environmental NGOs are comparatively strong (Chapter 6, Section 2.5). They are actively engaged in managing several thousand protected sites and species protection programmes. They also have intensive educational activities. Nonetheless, nature conservation policy has a relatively *low profile among the general public* compared with other environmental issues. An effort should be made to increase understanding and awareness of nature conservation among decision-makers and the general population. To achieve this, many countries have found it useful to organise a broad-ranging public debate leading to the formulation of a *national biodiversity strategy* (as recommended in the Biodiversity Convention). Germany should consider doing the same.

### 1.4 Protected areas

The total *area benefiting from some measure of protection* seems impressive, at nearly 27% of the territory, but 94% belongs to the lowest IUCN category (category V – protected landscape) and 5% to category IV (managed nature reserve/wildlife sanctuary). IUCN categories I, II or III are not represented in Germany (Figure 4.2).



*More strictly protected areas occupy less than 3% of German territory.* Under the Federal Nature Conservation Act, the most stringent protection is accorded to *Nature Conservation Areas* and *National Parks* (Table 4.2). Nature Conservation Areas occupy 2.3% of the total land area; two-thirds are smaller than 50 hectares and only 118 out of a total of 6 202 (1.9%) are larger than the minimum 1 000 hectares recommended by the IUCN.

Germany created its first *National Park* (Berchtesgaden) in 1970; after a slow start, new ones were established regularly in the late 1980s and 1990s. There are now 13 National Parks, of which seven are in the New Länder. A new National Park (Elbtalau) had been established in Lower Saxony, along the Elbe. It was ruled to be illegal by the constitutional court, due to the restrictions imposed on land owners. Not counting the extensive surface in the North and Baltic Seas, National Parks barely cover 0.5% of total land area. Only three (Bayerischer Wald, Berchtesgaden and Jasmund) belong to IUCN category IV. Much therefore still needs to be done to improve these parks. More parks also need to be created, so that all the main German ecosystem types are represented.

The 1990s saw an increase in the number of UNESCO *Biosphere Reserves*, which have had legal status under the Federal Nature Conservation Act since 1998. As of January 2000, 14 such reserves (with a total area of 4.5% of German territory) were in place, each with core, care and development zones.

Designation of *Special Protected Areas* (SPAs) under the *EU Habitat Directive* (92/43/EEC) is lagging behind both the schedule stipulated in the Directive and progress made by other EU Member States. To date, 2 302 areas with a total of 1.43 million hectares, or 4% of German territory, plus more than 600 000 hectares of tidal flats and water, have been reported to the European Commission. The list of SPAs presented is still far from adequate in terms of its overall area or representativeness of the various biotope types (notably beech forests) listed in the Directive. There is also a need to go beyond sites that are already protected, and insufficient attention has been paid to the more linear elements connecting the various areas.

The Länder are preparing to designate more SPAs, but are meeting *resistance from various interest groups*. Conflicts of interest at the root of such resistance can only be resolved by promoting greater appreciation of the role of the Natura 2000 network in sustainable land use and by fostering participatory decision-making processes in preference to a top-down approach. The public participation procedures used in establishing Biosphere Reserves provide a good model. BMU has recently developed a strategy to improve acceptance by landowners, which should be implemented with determination. The landscape protection ("Landcare") groups that have sprouted throughout Germany in the last 15 years could play a positive role in this respect, as they already bring together some of the key players: farmers, conservationists and local politicians.

A *unique opportunity* exists to establish protected areas in the New Länder, where just before reunification the outgoing East German government accorded protection status to 173 000 hectares. Privatisation of federal land in these protected areas has caused conservation problems. The Federal Government agreed to stop the sales and to review privatisation practice. It was agreed that 100 000 hectares of previously State-owned forest and agricultural land will be excluded from privatisation and handed over to NGOs for nature conservation; one-half free of charge, the other half sold under favourable conditions.

The Federal Forest Act provides for the creation of *Natural Forest Reserves*. Sixty-seven forest biotope types have been red-listed, but only 0.24% of the total forest area has been so designated to date. The Länder Working Group on Nature Conservation (LANA) has suggested that at least 5 to 10% of total forest area be left to evolve into near-natural forest, representative of the forest types that would occur naturally, but this has not been followed up by a firm political commitment.

### 1.5 *Conserving nature outside strictly protected areas*

#### *Agricultural land*

*Use of fertilisers and pesticides* in agriculture has been somewhat reduced in recent years, at least partly due to promotion by the Federal Ministry of Food, Agriculture and Forestry of good agricultural practice (e.g. through guides on soil use, plant protection agents), which is gradually becoming more accepted by farmers. However, the surplus (input minus output) of the nitrogen and phosphate load on agricultural land continues to seriously affect nature in and outside protected areas.

*Voluntary agri-environmental measures*, partially funded through the EU, have become a significant tool for improving conditions for nature in the agricultural landscape, particularly in less intensively used areas (Chapter 4, Section 2.2). Implementation of these measures is showing good results in some areas. This tool could be sharpened further by ensuring that i) measures are applied at an ecologically appropriate scale, and ii) uptake by farmers reflects real nature conservation needs in specific areas, rather than different interpretations among the Länder of the boundary between non-subsidised good farming practice and subsidised positive actions to create and maintain habitats.

#### *Landscape and spatial planning*

Loss of biotopes caused by competing land uses remains the single most important threat to biodiversity in Germany. There is a need for an effective landscape and spatial *planning system that allows nature to retain a foothold* in areas where the

main use is human settlement, agriculture or forestry. This is all the more essential in situations where the total amount of strictly protected areas in which nature receives priority is so small.

It is encouraging that the *objective of reducing land losses to 30 hectares per day by 2020* appears to have been accepted at the federal level (beyond BMU itself). This objective will need to be implemented through a landscape and spatial planning system, which is a responsibility of the Länder and municipalities rather than of the Federal Government. The Länder and municipalities should also adopt such an objective and begin implementing it.

The institutions and instruments needed to achieve this objective are all in place. The 1996 Federal Regional Planning Act features sustainable development as its guiding principle. Indicative landscape plans at regional level already cover 80.6% of the territory, and further plans covering 15.5% are being drawn up. There was a sharp increase in landscape planning at the local level during the 1990s. As a result, almost one-quarter of German territory has the status of *Landscape Reserve*; the distribution of these reserves across the country ranges from 11.1% in Berlin to as much as 53.6% in Hessen.

It is not clear to what extent planning increases *land use decisions* in favour of nature. For instance, uptake in municipal zoning plans of guidance provided by regional and local landscape plans is proving poor in practice, as revealed by an examination of the zoning and landscape plans of more than 400 municipalities (out of the 2 776 municipalities with such plans). Little information is available on the degree to which municipalities adhere to their own zoning and urban land use plans when they issue planning permits. Indications are that compliance by landholders with any constraints on use of their land could be improved by *strengthening enforcement*.

It is critically important for nature conservation outside protected areas, and for the establishment and consolidation of the Natura 2000 network, that the landscape and spatial planning system *actually fulfils its integrative functions*. The performance of this system should be monitored regularly, and the results reported on a country-wide basis, so that stakeholders know which parts are working well and which should be improved.

## 1.6 The “impact regulation”

The so-called “impact regulation” (Section 8 of the Federal Nature Conservation Act) has the general purpose of protecting the functioning of ecological processes outside Specially Protected Areas. It requires developers (including public authorities submitting a sectoral plan) to avoid negative impacts on nature and, if that is not

feasible, to *take compensatory nature conservation measures* corresponding to the detrimental effects of a project (e.g. a new motorway). Since 1998, this section also applies to urban land use planning. Decision-making relating to the impact regulation (and to similar provisions of the Länder's nature conservation laws) is part of the relevant permitting procedure, depending on the nature of the project.

The impact regulation is a vital nature conservation tool, but in practice it suffers from *implementation difficulties* in terms of its interpretation by various permitting authorities, determination of the required compensation measures and monitoring of their longer-term effectiveness. Further development of its modalities, already being considered, is therefore desirable.

### 1.7 Other instruments

*Reparcelling of rural land holdings*, and the associated infrastructural works, offer an opportunity to safeguard and enhance conditions for nature. The scale of these activities is not insignificant: for example, 29 of them, involving almost 23 000 hectares and 10 000 landowners, were completed in 1999 in Baden-Württemberg. Länder agencies responsible for reparcelling have traditionally focused mainly on agricultural production aspects, but they are also beginning to take account of nature conservation. This trend should be further encouraged.

The Federal Nature Conservation Act *requires landowners to be compensated* for any constraints placed on use of their land in the interest of nature. Without wishing to reduce private property rights, some parties (e.g. the German Council of Environmental Advisors) are suggesting that greater emphasis be placed on owners' concomitant social obligation to avoid external social costs. They maintain that rather than compensating owners for partial loss of use of their land, funds should go towards paying them to take positive actions that benefit nature. Whatever the legal/political implications, it is desirable that, in addition to the current set of regulatory instruments, a greater range of *economic instruments* be put in place to promote biodiversity and nature conservation on private land.

## 2. Focus on Selected Topics

### 2.1 The state of biodiversity

Some 45 000 *animal species* are found in Germany, of which almost 30 000 are insects and 5 000 are monocellular organisms. Among the 668 vertebrates are 240 bird and 79 mammal species, representing about one-half of the total number of

each class present in Europe (Table 4.1 and Figure 4.1). Germany has a special responsibility for those species of which it harbours a significant share of the total population, such as the red kite (60%) and firecrest (25%). There are some endemic subspecies, like the Elbe beaver and alpine shrew, but overall few endemic species have developed in the area that is now Germany, much of which was glaciated until 10 000 to 15 000 years ago. The Federal Office for Nature Conservation has evaluated the *conservation status* of almost 16 000 *animal species*, including all vertebrates and more than 6 500 beetles. Overall, 36% of species are considered threatened (i.e. either critically endangered, endangered or vulnerable in terms of the IUCN classification system), but the situation varies greatly depending on the species grouping. In the European context, Germany is among the OECD countries with the highest percentage of threatened species in several classes. Over one-third of indigenous species of mammals are threatened. There are also positive trends. The white-tailed sea eagle, still classified in 1984 as critically endangered, has increased in number and range and now has the less critical “vulnerable” status.

An estimated 28 000 *plant species* are found in Germany. Just over 3 300 are vascular plants (Table 4.1 and Figure 4.1). Again, endemism is low due to recent glaciation. Of the 42 endemic plant species identified, most have their niche in locations subject to extreme conditions (e.g. mountainous areas). Almost 14 000 *plants* were evaluated for the 1996 Red List of threatened species. *Many groupings show a large proportion of threatened species*. The status of Germany’s endemic plants is of particular concern: 5% are already extinct and 67% are threatened. About one-quarter of vascular plants are threatened; the main causes are habitat destruction, the intensification as well as extensification of agriculture, and excessive input of nutrients. While protection measures so far have not brought about a general alleviation of the situation, some successes can be recorded. For example, populations of gentian and orchid species in nutrient-poor meadows have been stabilised through clearing and appropriate farm management.

The functioning of *ecosystems* – one of the concerns set out in Article 1 of the Federal Nature Conservation Act – depends not only on the status of individual plants and animals, but also on the health and diversity of the approximately 500 *biotope types* identified in Germany. Only 6% of these have been classified as currently not threatened. More than two-thirds are threatened to some degree. About 15% of all biotope types are endangered, to the extent that complete destruction is to be feared if the factors contributing to their decline continue to affect them; one-third are strongly endangered; and about one-quarter are considered not particularly valuable (e.g. intensively used agricultural areas, forests planted in exotic trees, hypertrophic water bodies) and do not require protection measures.

Biotores have also been classified according to their *potential for restoration* or regeneration if appropriate measures are taken for their protection. About 35% of those threatened have been classified as not, or as hardly, redeemable. Another 38% are considered difficult to regenerate, in a process that would take from 15 to as much as 150 years. Only 21% are deemed capable of being regenerated within 15 years.

Although little is known at present about the *genetic diversity* of wild flora and fauna, it is threatened by the same factors affecting biotope and species diversity (habitat loss, fragmentation, loss of quality). Ex-situ conservation efforts of the 70 botanical and 34 zoological gardens, and of five gene and seed banks, make an essential though necessarily limited contribution in this area. The role of ex situ measures is more important in regard to conservation of *agricultural genetic resources*. Intensification and rationalisation have strongly limited the number of varieties used in modern agriculture and horticulture. Gene and seed banks, particularly voluntary associations, are doing essential work to ensure that diversity of plant, fruit and domestic animal varieties is preserved.

Table 4.1 **State of fauna and flora**

Class	Species known	Threatened species		Declining species	
		Number	%	Number	%
Mammals	79	29	36.7	12	15.2
Birds	240	70	29.2	18	7.5
Freshwater fish	66	45	68.2	..	..
Reptiles	14	11	78.6	1	7.1
Amphibians	21	12	57.1	..	..
Vascular plants	3 301	772	23.4	168	5.6
Mosses	1 121	333	29.7	165	14.7
Lichens	1 691	1 691	39.0	–	–

Source: BfN.

## 2.2 Environmental measures in agriculture

Agriculture adds a gross value of 0.8% to German GDP; 40% of this amount stems from crops and 60% from animal production. About 54% of total land area (193 000 km<sup>2</sup>) was dedicated to agriculture in 1997, a 0.65% decline since 1993.

Figure 4.1 Fauna and flora



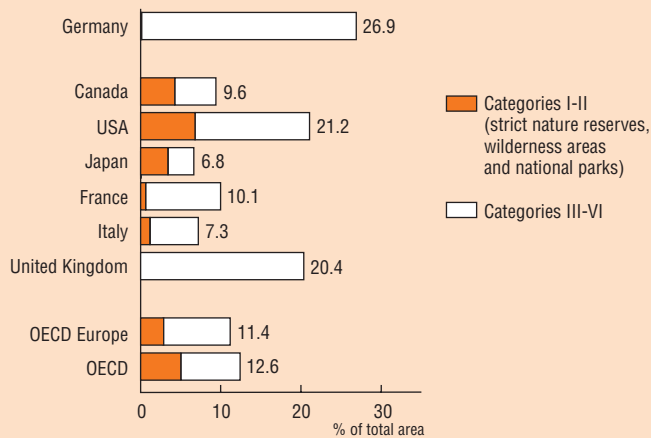
a) Mammals: indigenous species out of 87 known species. Birds: number of breeding species. Fish: freshwater only. Reptiles, amphibians: indigenous species. Vascular plants: indigenous species out of 3 319 known species.

b) Categories "endangered" and "vulnerable" (IUCN classification) in % of known species; also includes species that may already be extinct but have been observed in the last 50 years.

Source: OECD.

Average farm size is 29 hectares in the Old and 201 hectares in the New Länder. In 1999, 1.43 million people were employed in agriculture, of which 27% full-time, 52% part-time and 21% on a seasonal basis. About two-thirds of agricultural workers are farm family workers.

Figure 4.2 **Major protected areas,<sup>a</sup>**  
late 1990s



a) IUCN management categories I to VI; national classifications may differ.  
Source: IUCN; OECD.

Table 4.2 **Protected areas<sup>a</sup>**

Type	Number	Area (ha)	% of land area
Nature Conservation Areas	6 202	824 161	2.3
National Parks	13	730 505	2.0
		(168 200) <sup>b</sup>	(0.5) <sup>b</sup>
UNESCO Biosphere Reserves	14	> 1 583 378	> 4.4
Landscape Reserves	Approx. 6 159	Approx. 8 897 232	24.9
Nature Parks (comprising mainly landscape reserves and nature conservation areas, with a management focus on recreation)	93	7 627 870	21.4
Ramsar wetlands	29	671 204	1.9
Proposed Natura 2000 areas (provisional)	1 129	1 121 416	3.0
		(520 459) <sup>b</sup>	(1.7) <sup>b</sup>
Special Protected Areas under Birds Directive 79/409/EEC	554	1 544 949	4.3
		(855 984) <sup>b</sup>	(2.4) <sup>b</sup>

a) Many areas have more than one protection status. The figures in this table therefore cannot be added.

b) Not including areas in the North and Baltic Seas.

Source: BfN.



Promoting *environmentally sensitive farming practices*, i.e. implementation of EU agri-environmental measures (initially EEC 2078/92 and now EC 1257/99) is the responsibility of the Länder, in co-operation with the Federal Government, through the Joint Task Force for the Improvement of Agricultural Structures and Coastal Protection. In 1998, total spending on agri-environmental measures amounted to DEM 926 million, whereas traditional product linked subsidies were still in the order of DEM 7 billion. The EU contribution to agri-environmental measures constitutes 50% of project costs in the Old and 75% in the New Länder; the remainder is shared between the Federal Government and the Länder. Some Länder also use the EU's less-favoured areas scheme to promote environmentally sound farming practices.

*Farmer uptake* of these measures has strongly increased since the mid-1990s, with 29% of all farmland (around 5 million hectares) now covered. Payments are intended to reward production methods that go beyond usual good farming practice. Among eligible measures are i) environmentally favourable extensification of farming and management of low-intensity pasture systems; ii) conservation of high nature-value farmed environments that are under threat; and iii) upkeep of the landscape and historical features on agricultural land. The uptake of various agri-environmental measures shows *wide variation across Germany*, partly reflecting differences in natural and farming conditions. Uptake is higher in less-favoured areas, where farming is difficult and hence less profitable. In highly productive areas the premiums are not high enough to interest farmers. Measures demanding little adaptation have proven more popular than those requiring a real change in farming approach.

### 2.3 International agreements

Germany ratified the 1971 *Ramsar Convention* in 1976. It has since designated 29 wetlands of international importance, with a total area of over 671 000 hectares. About 80% consists of three wetlands along the Wadden Sea on Germany's north-west coast. About 40% of total Ramsar areas are also protected as National Parks or Nature Conservation Areas.

In 1984, Germany became a party to the 1979 *Bonn Convention* on the Conservation of Migratory Species of Wild Animals (CMS). It participates in four regional agreements under CMS: i) seals in the Wadden Sea; ii) small cetaceans of the Baltic and North Seas; iii) bats in Europe; iv) African-Eurasian migratory water birds. Germany became a contracting party to the 1979 *Bern Convention* on the conservation of European wildlife and natural habitats in 1985, and to the UN Convention on *Biological Diversity* in 1994. It operates a Clearing House Mechanism, as called for in Article 18(3) of the Biodiversity Convention, but has not yet formulated or adopted a national biodiversity strategy (Annexes II.A and II.B).

Germany has been a party to the 1973 *Washington Convention* on International Trade in Endangered Species (CITES) since 1976. In 1999, the Federal Agency for Nature Conservation organised a training seminar for customs agencies of eastern European countries.

## 2.4 Sustainable forestry

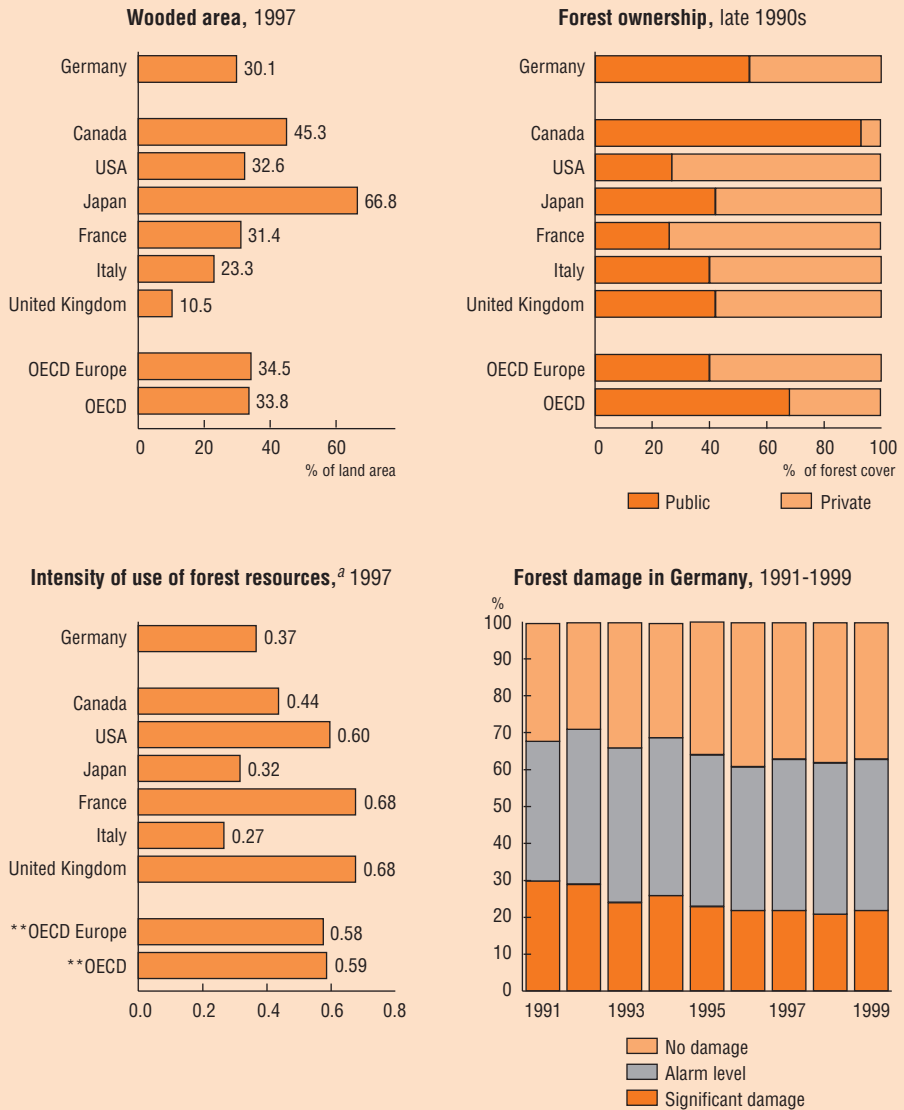
Almost 107 000 square kilometres (30% of Germany's land area) is covered by *managed forests*, comprising mainly conifer (51% of total forested area), broadleaf (21%) and mixed (also 21%) stands (Figure 4.3). About one-third of trees are older than 80 years. At 270 cubic metres per hectare, the average timber stock is among the highest in Europe. Nothing remains of the great primeval forest.

Just over half of forest land is owned by the Federation, the Länder or municipalities. The remainder is in *private ownership* (Figure 4.3). About 30 000 square kilometres of private holdings is managed by 5 400 co-operatives, representing over 446 000 small owners. Annual timber production is around 40 million cubic metres, representing a value of DEM 2.5 to DEM 3.5 billion. About 75 000 people work in forests and 750 000 in downstream industries.

Having peaked at the beginning of the 1990s, *forest damage* gradually diminished in the first half of the decade (on average, the forest area showing needle and leaf loss in excess of 25% fell from 30 to 22% in the period 1991-96) and has stabilised since (Figure 4.3). Actual damage, which varies with tree species and age, fluctuates from year to year depending on weather conditions. Pine forests seem most resistant, with 13% of forest area showing clear damage in 1999. Beech (29-32%) and oak (44% in 1999) are the worst affected species. Trees older than 60 years are more seriously affected than younger ones. While forest damage cannot be attributed to a single cause, acidifying substances, mainly nitrogen from transport and animal husbandry, will remain a key factor as long as threshold values for nitrogen deposition are exceeded on 90% of German forest area.

*Past forestry practices* have had serious consequences for biodiversity. The Red List of threatened biotope types contains 67 forest types that are currently threatened, at least on a regional scale. Near-natural forest stands are found only in fragments, and not all of these are suitably protected. Forest drainage, forest roads (still subsidised in some Länder) and monocultural planting of non-endemic coniferous and exotic tree species have all impoverished forest ecosystems. Moreover, species from open biotopes such as inland dunes or oligotrophic grasslands have been affected by afforestation of such sites.

Figure 4.3 Forest resources



a) Harvest divided by productive capacity (measured as annual growth).

Source: FAO; OECD.

The 1975 Federal Forest Act gives equal weight, in principle, to forests' commercial, protection and recreational functions. This *multifunctionality* implies the need to manage forests sustainably in a way that takes account of, inter alia, their environmental, conservation and landscape functions. It is the task of the Länder to lend substance to this general principle in their respective forest laws. The national forest programme being elaborated by the federal and Länder governments should bring a much-needed national biodiversity perspective to forestry planning.

Transforming the current forest composition into species-rich, sustainable forests will necessarily be a long-term project. A start has been made, however. Silvicultural practices have begun to change: single-age, single-species plantations now tend to be avoided in favour of management methods that are more easily reconciled with biodiversity and nature conservation objectives. For example, in March 2000 State and private forests in Thuringia and Baden-Württemberg were the first to be accredited under the Pan-European Forest Certification (PEFC) scheme, an initiative of forest owners and industry based on the six Helsinki criteria for *sustainable forestry*. It is expected that 75% of forest areas will be PEFC-certificated by mid-2001. About 100 000 hectares of forest has thus far been accredited under the certification scheme run by the Forest Stewardship Council, a joint stakeholder initiative involving owners, industry, and environmental NGOs such as WWF.

While certification schemes encourage nature-friendly management practices at the production end, other measures such as creating *natural forest reserves* are required for forest that is mainly being managed for protection. This can more readily be done in public forests than in private ones, where there is a lack of incentives (e.g. tax measures) to make it attractive for private owners to take an active interest in protecting nature. The Federal Ministry of Food, Agriculture and Forestry presented a national forestry programme to the public in October 2000. This programme, directed at all stakeholders, constitutes the basis for discussion concerning the future of German forest policy.

Part II

**SUSTAINABLE DEVELOPMENT**

# 5

## THE ENVIRONMENTAL-ECONOMIC INTERFACE\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- further pursue *efforts to decouple* economic growth and employment creation from pollution pressures and energy and resource use;
- extend environmental policy attention to *unsolved or new challenges*, including nature conservation and diffuse pollution from agriculture and transport;
- continue efforts to harmonise, streamline and further develop *environmental legislation* within an integrated Environmental Code;
- strengthen and extend use of *economic instruments* to internalise external costs, and to progress towards sustainable production and consumption;
- improve the efficiency and transparency (e.g. accounting practices) of water and waste related *services provided at municipal level*;
- ensure that *voluntary agreements* become more effective and efficient (e.g. clear targets, reliable monitoring, improved transparency and third party participation);
- increase *economic analyses* of environmental policy measures, with the aim of achieving environmental objectives more cost-effectively.
- define and implement a *national sustainable development strategy* with targets, timelines, and commitments by the key actors;
- improve co-operation and *co-ordination among Länder environmental administrations*, and with the federal level, in regard to environmental integration and sustainable development;

\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993. This chapter also takes into account the latest OECD Economic Surveys of Germany.

### *Recommendations (cont.)*

- better *integrate environmental concerns* in transport, agriculture, energy and regional policies;
- further use the *Environment Barometer* and other tools to contribute to environmental and economic policy formulation, implementation, monitoring and assessment; in particular, extend its coverage to biodiversity;
- continue to integrate environmental concerns in *fiscal policies* (e.g. eco-tax reform) and, in particular, review concessions leading to major distortions and disincentives;
- review the environmental significance of *subsidies* (e.g. in the federal biannual subsidy report), in order to phase out those which are environmentally harmful, and provide incentives for sustainable development, environmental management and innovation.

## **1. Evaluation of Performance**

### ***1.1 Towards sustainable development***

#### *Economic growth and resource use*

In the 1990s, Germany made some further progress in *decoupling* economic growth from resource use and environmental damage, principally with respect to traditional air pollutants (e.g. SO<sub>x</sub> NO<sub>x</sub>), emissions of CO<sub>2</sub> and discharges of organic substances to ambient waters (Chapter 5, Section 2.1). In particular, control of emissions from industrial point sources improved considerably. While environmental progress in western Germany has resulted largely from implementation of environmental policies, in the New Länder it has mainly been due to economic restructuring and the closing of many production sites. Over 80% of Germany's total reduction of SO<sub>2</sub> emissions since 1990 has been achieved in the New Länder.

Environmental concerns receiving priority attention include air pollution by toxic substances, water pollution by nutrients and toxic substances, waste generation and nature protection. *Diffuse pressures* are created by agriculture (e.g. through intensive crop and livestock production), changes in consumption patterns and increased mobility. Changing settlement patterns, different territorial development dynamics and related transport impacts tend to aggravate problems in particular areas. Curative and preventive technological solutions need to be supplemented by integrated approaches to cope with these diffuse pressures.

Although lower emissions cannot be attributed exclusively to “*wall-fall profits*”, it is unlikely that the pace at which reductions were achieved in the 1990s can be maintained. In western Germany, further improvement will probably require greater expenditure than in the past. In the New Länder, where it is likely that industrial production will recover, consumption patterns will continue to change and car use will increase, new upward pressures are to be expected. The *cost-effectiveness* of environmental measures, and *better integration of environmental concerns* in other policies, are thus becoming priority policy issues.

### *Towards a national sustainable development strategy*

Germany *does not yet have an agreed national strategy for promoting sustainable development*. In the 1990s, administrations and agencies, Parliamentary Commissions, the scientific community and NGOs devoted major efforts to clarifying the concept of, and designing strategies for, sustainable development. However, sustainable development is still not generally perceived as constituting a challenge to both government administrations and civilian society. Only 15% of the population had heard of “*Nachhaltigkeit*”, the German term for sustainability, in a recent survey.

Germany’s constitutional *Basic Law* was amended in 1994 by a new Article 20a, which makes protection and management of the environment a national objective. It declares that “The State, aware of its responsibility for present and future generations, shall protect the natural sources of life”. A binding commitment in all areas of policy-making is therefore established, as well as a basis for promoting sustainable development.

The Federal Ministry for the Environment (BMU) launched the so-called “steps process” in 1996, leading to the *1998 draft programme* of environmental policy priorities for sustainable development. This programme has not been widely discussed or adopted by either the Government or Parliament. The 1998 coalition agreement reiterated the commitment to draft a sustainable development strategy and establish institutional mechanisms for its implementation. In 2000, a *Council for Sustainable Development* was created, together with a “*green cabinet*” consisting of Secretaries of State, which is in charge of promoting, drafting and implementing the national strategy.

Up to now, Government documents concerning sustainable development have been strongly or exclusively focused on the environment. The 1998 draft programme contains detailed, quantified environmental quality targets. The existence of the Council for Sustainable Development and the green cabinet should revitalise and broaden the steps process, particularly through formulation of *sectoral strategies* and adoption of *targets* for relevant administrations and actors.



### *Institutional integration*

In Germany, as in other countries, sustainable development depends on effective institutional integration of environmental concerns in other policies. In practice, this calls for smooth *horizontal and vertical co-ordination* among various branches and layers of administration on strategies, plans, programmes, budgets and projects. Many of these integration efforts also call for involving NGOs and private actors.

Several committees, working groups and institutional mechanisms aim at *horizontal co-ordination*. For instance, a Cabinet Committee on Environment and Health was set up in 1972; it is backed by a standing committee of Director Generals from the various ministries (StALA Bund). Most ministries create their own environment related divisions and are routinely involved in environmental policy formulation. Specific *Interministerial Committees* (IMAs) work on topics such as forest damage or climate protection. At Länder level, similar mechanisms for interministerial co-ordination are in place.

In a multi-layered federal system, ensuring *vertical co-operation* between different levels of government is particularly important. *Länder working parties* (Länderarbeitsgemeinschaften) have the task of co-ordinating Länder and federal activities in areas such as water management and nature conservation. Of special importance is the *Conference of Environment Ministers (UMK)*, which meets twice a year and groups the environment ministers of the Länder and the Federal Minister for the Environment. In the 1997 Jena declaration, the ministers reaffirmed the need to integrate environmental protection in all policy fields and proposed new partnerships involving the State and relevant stakeholders.

Existing horizontal integration mechanisms have not always proved effective enough. While the environment units of most ministries strongly influence environmental policy-making, they are much weaker with regard to *integrating environmental concerns* in their own administrations' policy formulation and implementation. Co-ordination efforts should better ensure environmental integration and exploitation of win-win options. Too often agreement is sought on the lowest common denominator, avoiding priority-setting and innovation. In policy areas such as agriculture, regional development and transport co-funding mechanisms (involving Länder, federal and even EU funds) have supported close formal and informal ties among sectoral administrations. They have strengthened the respective federal administrations, which are consequently in a stronger co-ordinating position. This is not the case for environmental administrations, which, in addition, are often hampered by a lack of resources and competent staff to promote integration of environmental concerns in other policies.

## 1.2 Implementing environmental policies

### *Environmental objectives, targets and principles*

In the 1990s, Germany i) established environmental protection and sustainable development as *fundamental State objectives* by amending its *constitutional Basic Law* (1994); ii) adopted more specific environmental policy objectives and principles in Federal Government reports on overall environmental policy (1994, 1998) and in *government reports and acts* concerning environmental issues (e.g. climate, biodiversity, water and soil); and iii) translated a number of objectives into quantified policy targets with timelines (Chapter 5, Sections 2.2 and 2.4).

In particular, a basic set of key environmental indicators, the *Environment Barometer for Germany*, was initiated (Chapter 5, Section 2.3). The Environment Barometer provides a tool for better defining and communicating environmental policy targets. Currently, it covers emissions of greenhouse gases and air pollutants, surface water quality, increases in built-up area, and productivity of energy and raw materials use.

In 1999, for the first time, indicator charts from the Environment Barometer were included in the Federal Government's *annual economic report* (Jahreswirtschaftsbericht), which provides the basic orientation for German economic and fiscal policy. The Barometer does not yet cover all relevant areas of environmental policy concern. With respect to nature conservation and biodiversity in particular, the development of indicators is still at an early stage. A major German television station has decided to further aggregate indicators into an *overall environmental index* (DUX, Deutscher Umwelt Index) analogous to the German stock exchange index (DAX), which is intended to be reported on a regular basis.

German environmental policy is guided by *three principles* (*polluter-pays, precaution and co-operation*) which find their expression in regulations and economic instruments, pro-active initiatives addressing new challenges, and the increasing participation and involvement of stakeholders. The *PPP is well established and implemented*, in particular for traditional air pollutants; waste and water management users are increasingly confronted with the full costs of environmental services. A *range of economic instruments* is used to internalise costs and contribute to economic efficiency (Tables 5.1 and 5.2).

### *Environmental legislation and regulations*

In the 1990s, German environmental law was further developed by amending previous legislation and by addressing new areas such as soil protection (Chapter 5,

Section 2.4). While the initial focus of environmental law was on individual media or issues (e.g. water, air and waste management), *cross-media focus* has gained importance (e.g. environmental impact assessment, environmental liability, environmental audits).

Table 5.1 **Economic instruments**

<b>Waste</b>	Green Dot licence fees		
	Private company (DSD) charges licence fee for packaging waste disposal		
	Fee depends on volume, weight and type of packaging material		
	Deposit-refund system for beverage containers		
	Obligatory deposit becomes effective only if recycling level of 72% is not met		
	This was the case for the first time in 1997		
	Waste charges (for households) defined by local administrations		Charges in the order of
	Various types: flat rate, by household size, by type and size of container or by actual volume/weight		DEM 100-900/t
<b>Water</b>	Abstraction charges depending on water use: levied in some Länder only		
	For industry		DEM 0.01-1.10/m <sup>3</sup>
	For public water works		DEM 0.01-0.50/m <sup>3</sup>
	Water prices drinking water (average) for households		DEM 2.81/m <sup>3</sup>
	Waste water treatment fees defined by local administrations for households		DEM 4.46/m <sup>3</sup>
	Water effluent charge for industry and waste water treatment plants	1981	DEM 12.00 per PU
	According to pollution load measured in pollution units (PU)	1991	DEM 50.00 per PU
		1999	DEM 70.00 per PU
	50% reduction if certain minimum standards are met; concessions during construction phase of major investments	1998	DEM 720 million
<b>Nature</b>	Compensation charges for interference with nature (often earmarked for nature conservation), defined by the Länder		
	Example of Baden-Württemberg:		
	Surface area		DEM 2.00-10.00/m <sup>2</sup>
	Soil extraction		DEM 0.50-1.50/m <sup>3</sup>
	Property tax exemption or reduction for land in nature conservation areas		

Source: BMF.

Table 5.2 Other environmental taxes and charges

Mineral oil tax	Fuel	DEM/litre	DEM/MWh
	leaded petrol	1.20	132
	unleaded petrol	1.10	121
	diesel	0.74	75
	LPG	0.14	21
	LNG	0.16	21
	Heating		
	Light oil	0.12	12
	Heavy fuel oil	0.04	3
	LPG	0.04	6
	LNG	0.05	7
	Total revenue in 1998:	DEM 66 415 million	
	Exemptions:		
	commercial aviation and navigation approx. loss in 1998	DEM 850 million	
	diesel for agricultural production reimbursement (approx.)	DEM 850 million	
Motor vehicle tax	Passenger cars	Petrol DEM p.a.	Diesel DEM p.a.
	Recurrent annual tax for cars meeting		
	No EURO standards	41.60	65.50
	EURO-1	13.20	37.10
	EURO-2	12.00	29.00
	EURO-3	10.00	27.00
	EURO-4	10.00	27.00
	Exemptions limited in time (max. up to 31.12.2005) until the following amounts are reached for cars with first registration before:	Petrol DEM	Diesel DEM
	EURO-3 (1.1.2000)	250	500
	EURO-4 (1.1.2005)	600	1 200
	Exemption for 3 (5) litre cars (max. up to 31.12.2005) can be cumulative with EURO exemptions until the following amounts are reached for cars of:		DEM
	120 g CO <sub>2</sub> /km		500
	90 g CO <sub>2</sub> /km		1 000
	Further exemption, e.g.:		
	for cars with solely electric traction: 5 years from first day of registration		
	buses for public transport		
	Lorries		
	Rates increase per 200 kg weight	Maximum rate p.a.	
	Depending on emission levels concerning	DEM	
	waste gas S2	1 300	
	S1	2 000	
	noise G1	3 000	
	not meeting S2, S1 or G1	3 500	

Table 5.2 **Other environmental taxes and charges** (*cont.*)

<b>Road pricing</b>	Highway user fee for lorries over 12 tonnes for a fixed time period (agreement with Belgium, Denmark, Luxembourg, the Netherlands and Sweden) Change to distance charge planned	Up to 3 axles EUR 750 p.a. Over 3 axles EUR 1 250 p.a.
<b>Income tax</b>	Commuting expenses: deductible, differentiation by vehicle type Company cars: taxed as benefit in kind	
<b>Value Added Tax</b>	Local public passenger transport Rail traffic Transboundary air traffic and kerosene  Drinking water Waste water	Reduced rate 7% Standard rate 16% Total exemption 0%  Reduced rate 7% Total exemption 0%

Source: BMF; OECD.

Standards are typically formulated as maximum permissible emissions per unit of product processed or manufactured, as ambient quality standards, or as product related specifications. The emphasis is on *best available technology* (BAT). Technical Instructions specify in considerable detail the emissions levels for various types of production processes. For specific pollutants, ordinances combine maximum emissions levels with requirements to exploit reduction potential as technology evolves.

The increasing amount of environment related legislation risks creating inconsistencies and inefficiencies with regard to its application and administration. German licensing law (Genehmigungsrecht) refers to some 10 000 individual standards on 154 lists. An *Environmental Code* (Umweltgesetzbuch, UGB) is being prepared with the aim of harmonising, synthesising and further developing environmental law. The Environmental Code will be divided into a general and a specific section, UGB I and II.

In the fall of 1999, a *first attempt failed* to transpose the EU Directives on Integrated Pollution Prevention and Control and Environmental Impact Assessment as part of a new UGB I. The relevant bill was withdrawn, as it seemed difficult to change existing procedures for issuing facility permits. It was also difficult to quickly clarify constitutional issues concerning responsibilities at the federal and Länder levels, particularly for water pollution control. Germany therefore missed the 1999 deadline for transposing these Directives. It is now intended to transpose them through separate legislation (Artikelgesetz).

The entire harmonisation effort is thus in danger of being undermined. There appears to be a *consensus* across political parties, business associations and environmental NGOs, however, that the UGB project should be pursued further. To find a solution to constitutional difficulties, the Federal Government has begun an initiative to review the constitutional basis of environmental management, with the aim of developing a more prominent federal role in water pollution control through “concurrent” legislation.

### *Voluntary agreements*

In the 1990s, voluntary agreements (VAs) gained importance in German environmental policy as a complement to regulatory instruments and as an expression of the “*co-operation principle*”. In the design and implementation of German environmental policy, the importance of this principle is similar to that of the polluter-pays principle (PPP) or the precautionary principle (Vorsorgeprinzip). More than 100 VAs are currently in effect (Chapter 5, Section 2.5).

The *status of German voluntary agreements* is not well defined: 97% are *non-binding commitments* presented in a declaration by one or more business associations. German ministries are not formally involved as partners, as they have no legal power to sign agreements with these associations. They usually recognise the commitments in a press statement. However, environmental administrations have often played an important role in encouraging such agreements (by considering additional regulatory or economic instruments that might be used should an agreement not be reached, or should targets not be met) or in shaping them (by influencing the definition of targets, or insisting on monitoring and reporting).

VAs refer in particular to the *phase-out of environmentally harmful products or inputs*. Some concern specific substances (e.g. CFCs, asbestos, solvents) while others extend over a range of industries (e.g. commitment by German industry to reduce CO<sub>2</sub> emissions). They have also become important tools for implementing German waste policy, with its emphasis on reuse and recycling of packaging, batteries, cars, electronic parts, etc. Most VAs are formulated by business associations at the federal level, but some have been adopted at Länder level. In Bavaria, business and trade associations (Umweltpakt Bayern) agreed in 1995 to increase participation in eco-audits (EMAS), reduce waste, improve energy efficiency and increase use of rail transport.

From the point of view of government *administrations*, VAs require less direct intervention and could therefore reduce transaction costs, be useful in new environmental policy areas where laws and regulations are not well developed, and allow a more targeted approach than economic instruments that might affect other industries.

For *industry*, they could allow greater flexibility in terms of adjustment than would regulations. *Environmental organisations and scientists* have expressed concerns, however, about VAs' environmental effectiveness, economic efficiency, competition impact, legal status and constitutional permissibility.

The great majority of German VAs have been *effective in reaching their targets*. It has been argued that their targets are generally not ambitious, as they do not go beyond the business as usual scenario and are set out in relative rather than absolute terms (with relative targets referring to intensities or productivity). For example, when the CO<sub>2</sub> reduction target (relative to output) for German industry was announced in 1995, it had already been over 80% achieved. Ambitious CO<sub>2</sub> targets were nonetheless set by the chemical and iron and steel industries. For many industries, marginal abatement costs will increase unless significant innovations occur in production or pollution abatement technology.

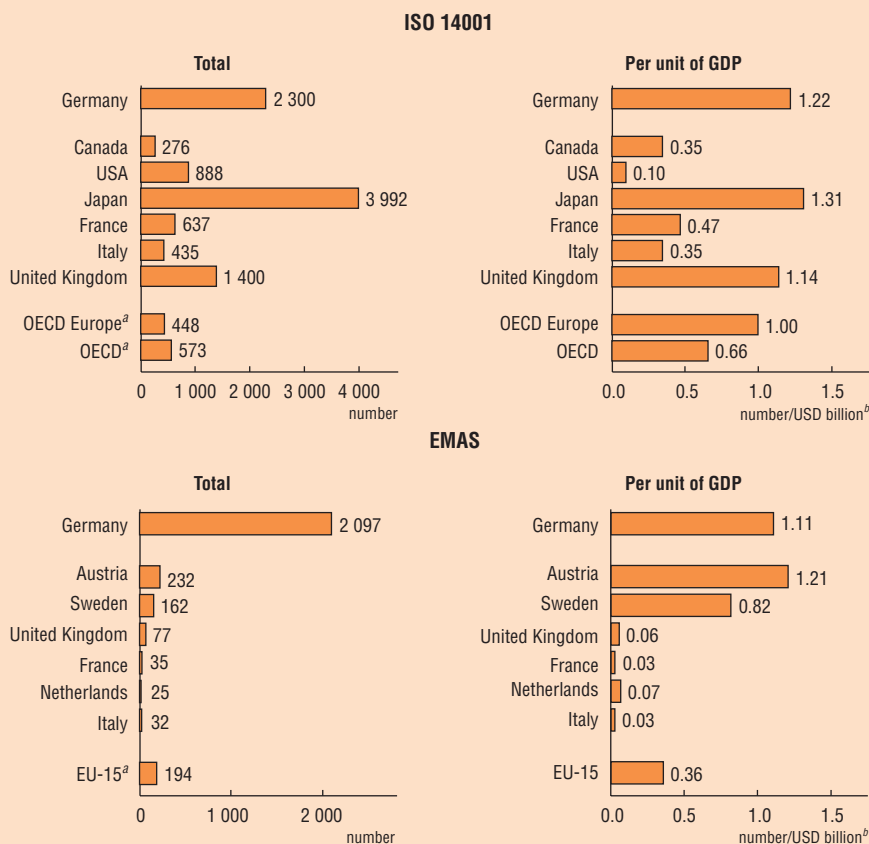
The *efficiency* of VAs is uncertain. Business associations face similar problems to those of governments in identifying the most *cost-effective solutions and optimal allocations* of reduction tasks. To ensure compliance by individual branches and firms, these associations have fewer instruments at their disposal than do government administrations. Both lack needed information on individual cost-benefit settings. *Free-riding* by firms, covered by an agreement, which allow other firms to bear the burden of implementation is an obvious problem. From a competition perspective, VAs risk degenerating into cartel agreements spreading beyond environment into other areas. In the context of German waste management, VAs may create monopolistic or monopolistic settings, with only one organisation in charge of collecting or handling the material.

Overall, German experience shows that VAs can usefully complement regulatory and economic instruments and stimulate private initiatives. Their environmental effectiveness greatly depends on the quality of monitoring and reporting, and on the possibility of using additional regulation or economic instruments if targets are not reached. Further progress is needed to improve these agreements' *cost-effectiveness*.

### *Environmental management and certification*

Many German firms participate in the EU's *Eco-Management and Auditing Scheme (EMAS)* or are certified for *ISO 14001* (over 2 300 sites and 1 800 sites, respectively, at the end of the 1990s) (Figure 5.1). These firms have over 1.2 million employees and represent more than DEM 125 billion value added. Germany is among the countries with the highest rates of participation. In 1999, 75% of total EMAS participants were German. In 1998, Germany extended the opportunity to participate

Figure 5.1 Certifications under ISO 14001 and participation in EMAS, 2000



a) Average.

b) GDP at 1995 prices and purchasing power parities.

Source: European Commission; UBA, 2000.

in eco-audits to companies in the service sector, such as those involved in retailing, transport, banking, insurance, travel and communication. Hospitals, universities and local administrations are encouraged to verify and improve their environmental management systems and performance.



Concerning *EMAS*, a system of 230 independent auditors has been established, supervised by an accreditation and licensing body (DAU). EMAS sites are registered by chambers of industry and commerce or chambers of crafts (for small enterprises). Active involvement by business associations partly explains the positive uptake of EMAS by German firms. Other reasons include concerns about operational environmental protection, energy and resource savings, improved image and staff motivation. Evaluations show that the scheme operates well, and that with few exceptions firms and auditors comply with the rules and standards. In the context of national and international competition, its reliability and image are perceived as an asset by participating firms.

*Initial financial outlays* for introducing EMAS average DEM 116 000 (small sites: DEM 70 000; chemical industry sites: DEM 190 000). Yearly *costs of maintaining* the scheme average DEM 31 000, or DEM 60 per employee. Benefits (savings achieved) resulting from EMAS have been estimated at an average DEM 330 per employee. The main savings have been achieved in the waste sector.

In the context of *revision of the EMAS scheme (EMAS II)*, it is planned to ensure compatibility with ISO, so that the ISO 14001 environmental management standard becomes an integrated component of the broader and more demanding EMAS II. The extent to which EMAS firms could benefit from reduced monitoring and reporting obligations will be addressed. "Substitution and deregulation" options have been considered in the context of drafting Germany's new Environmental Code.

### *Subsidies and environmental support*

A range of *environmental support programmes* are in place (Table 5.3). They provide reduced-interest loans, grants, and guarantees to encourage innovation and investment aimed at reducing environmental pollution and promoting environmentally sound production and consumption patterns. At the federal level, the most prominent examples are the ERP Programme for Environment and Energy Saving, the Environment Programme of the German Equalisation Bank (DtA) and the Environment Programme of the German Development Bank (KfW). These schemes are administered by State-owned banks, which do not deal with investors directly but lend support to *local branches of normal business and saving banks*. As "one-stop shops", local banks provide investors with an overview of available support schemes. They assist in identifying the most suitable ones, and in handling application and financial management of the subsidies.

In the period 1991-99, annual *State aid and tax concessions* (from all levels of government) increased by 15%, reaching DEM 116 billion, according to the federal report on subsidies. In the federal portion (around 40% of the total), subsidies with an

Table 5.3 Environmental support programmes<sup>a</sup>

Programme name Management body Funding	<ul style="list-style-type: none"> <li>• Subject</li> <li>• Beneficiaries</li> <li>• Type of support</li> <li>• Conditions</li> </ul>
<b>ERP Programme for Environment and Energy Saving</b> German Equalisation Bank (DtA) 1998: DEM 3.2 billion	<ul style="list-style-type: none"> <li>• Investments in: <ul style="list-style-type: none"> <li>– waste avoidance, reduction, recycling and disposal;</li> <li>– waste water treatment, water saving and supply;</li> <li>– air pollution control;</li> <li>– energy saving, rational use, use of renewable energy;</li> <li>– remediation of contaminated sites, if precondition for further investment;</li> <li>– costs for related eco-audit can also be covered.</li> </ul> </li> <li>• Companies with turnover of up to EUR 250 million; primarily SMEs as well as some public-private partnerships.</li> <li>• Promotional loans at reduced interest rates; duration 10-15 years (New Länder: 15-20 years). Rates fixed for 10 years; 2-year repayment free (New Länder: 5 years), maximum contribution: 50% of eligible costs or EUR 500 000 (New Länder: EUR 1 million). For SMEs with particularly valuable projects, limits can be exceeded (up to 75%).</li> <li>• Handling by intermediate regular banks, using DtA forms; up to 50% exemption from liability can be requested.</li> </ul>
<b>DtA Environment Programme</b> DtA 1998: DEM 0.9 million	<ul style="list-style-type: none"> <li>• Avoidance or significant long-term reduction of environmental impacts.</li> <li>• Complement to the ERP Programme.</li> <li>• Maximum contribution: 25% of eligible costs; up to 75% (SMEs 100%) if combined with ERP Programme.</li> </ul>
<b>KfW Environment Programme</b> Reconstruction Loan Corporation, German Development Bank (KfW) 1998: DEM 1.6 billion	<ul style="list-style-type: none"> <li>• Long-term investments and leasing projects which significantly improve environmental quality; promotion of renewable energy to reduce CO<sub>2</sub> emissions.</li> <li>• SMEs, self-employed investors; enterprises in which the public sector, churches or charitable organisations hold an interest; large enterprises, public-private partnerships, and operator models in waste and sewage treatment.</li> <li>• Reduced-interest loans; long repayment terms; repayment-free years during start-up period and long fixed-interest periods. Maximum investment EUR 5 million, KfW share 75%/66% if turnover below/above EUR 50 million.</li> <li>• Handling by intermediate regular banks or saving banks.</li> </ul>
<b>BMU Environment Investment Programme (Domestic Pilot Projects)</b> BMU/UBA, DtA 1998: DEM 0.03 billion 1990-99: DEM 0.5 billion	<ul style="list-style-type: none"> <li>• Promotion of pilot projects on a commercial scale aiming at: <ul style="list-style-type: none"> <li>– implementation of innovative techniques for reducing environmental impact;</li> <li>– encouragement of environmentally sound production processes, which improve best available technology in Germany;</li> <li>– development of environment-friendly products and substitution of materials.</li> </ul> </li> <li>• Private investors and local authorities.</li> <li>• Reduced-interest loans for up to 70% of eligible costs, up to 30 years, 5-year repayment free, rate fixed or 10 years, 5% reduction for 5 years; under certain conditions, also direct grants of up to 30%.</li> </ul>

Table 5.3 Environmental support programmes<sup>a</sup> (cont.)

Programme name Management body Funding	<ul style="list-style-type: none"> <li>• Subject</li> <li>• Beneficiaries</li> <li>• Type of support</li> <li>• Conditions</li> </ul>
<b>BMU Environment Investment Programme (Transborder Pilot Projects)</b> BMU, DtA 1992-99: DEM 0.13 billion (for 15 projects)	<ul style="list-style-type: none"> <li>• Investment projects to reduce transboundary environmental impacts in neighbouring regions of Czech Republic and Poland.</li> <li>• Reduced interest loans.</li> <li>• Subsidies for project related advanced training and exchange programmes.</li> </ul>
<b>Environmental Protection Guaranties Programme (UBP)</b> BMU, DtA	<ul style="list-style-type: none"> <li>• Promotion of investments in production of innovative, environment-friendly products and production systems aimed at avoiding environmental impacts from the outset or reducing them in the long term.</li> <li>• Liability for interest-reduced environment loans awarded by German Equalisation Bank is assumed by BMU/BMF.</li> <li>• Products must be developed to marketable standard and must present sustainable marketing opportunities.</li> </ul>
<b>Other environment related KfW and DtA schemes</b> KfW and DtA 1998 DEM 5.7 billion	<ul style="list-style-type: none"> <li>• Climate related investments in residential building stock; thermal insulation and efficient heating installations. Over 50% of the housing stock in the New Länder has been improved with support from this scheme.</li> <li>• ERP Innovation Programme. New products and processes, as well as new environmental and energy technologies. In the framework of R&amp;D projects, also measures for quality assurance.</li> <li>• Local Infrastructure Programme. Investment in water and waste management projects.</li> </ul>
<b>GRW Joint Task for Regional Development</b> BMWI and Länder	<ul style="list-style-type: none"> <li>• Investment in business related environmental infrastructure, particularly waste water treatment plants.</li> <li>• Local administrations.</li> <li>• Grants of up to 50% in Old Länder and up to 75% in New Länder.</li> <li>• Partly co-funded by EU Structural Funds.</li> </ul>
<b>100 000 Roofs Programme</b> KfW 1999-2004: DEM 1.0 billion (total investment of DEM 2.5 billion)	<ul style="list-style-type: none"> <li>• Investment in photovoltaic solar energy equipment with capacity of at least 1 kWp (max. 3 kWp).</li> <li>• Private investors and SMEs (fewer than 250 employees; turnover less than EUR 40 million).</li> <li>• Long-term reduced-interest loans, contribution up to 100%; maturity of 10 years; fixed reductions up to 4.5 percentage points; 2-year redemption-free grace period; option to repay loan in advance free of charge.</li> <li>• Handling by regular banks.</li> </ul>

a) Excluding agri-environmental subsidies.

Source: BMU; BMF; BMWI; DtA; KfW.

explicit environmental target represent 2-3%, whereas over 35% of federal subsidies are estimated to be potentially environmentally counterproductive. Based on a different definition and classification of subsidies and tax relief, the EU State aid report has calculated the share of *State aid to the manufacturing sector* devoted to environment and energy saving as 3% between 1996 and 1998. If tax concessions granted since 1999 as part of ecological tax reform were also considered, the EU State aid figures would increase to over 20%.

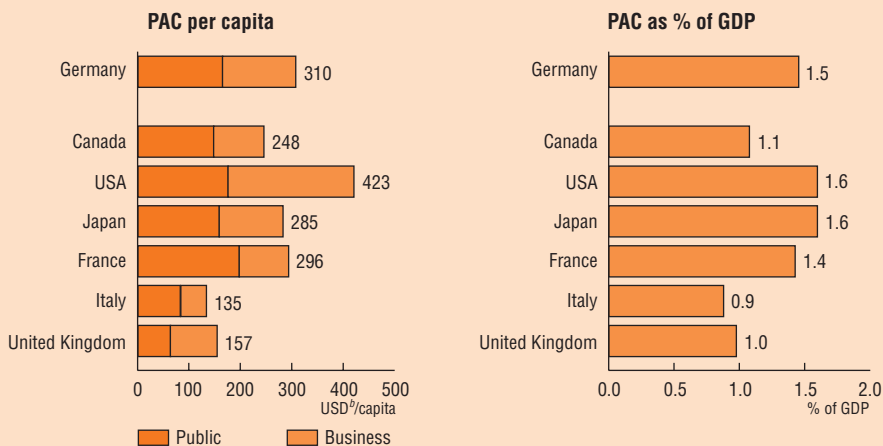
This suggests a major concern of German environment policy, beyond environment related research and development: how to promote environmentally innovative investment without negative *effects on competitiveness* nationally or internationally. The question is particularly important when Germany sets ambitious targets (e.g. for CO<sub>2</sub> and other GHGs, renewable energy) and adopts new economic instruments. This raises issues concerning i) the scope of State aid for environment and energy saving, and ii) the place of environmental support measures within the context of distorting subsidies associated with other policies (e.g. policies on coal, transport, agriculture). Sustainable development policies should promote relative prices which better reflect economic, social and environmental costs and benefits.

In addition to government aid, an *increasing number of foundations* support environmental research, development and investments. The most important, the German Federal Environment Foundation (Deutsche Bundesstiftung Umwelt), was established in 1990 with the proceeds from privatisation of State shares in a formerly publicly owned steel corporation (Salzgitter AG). With capital of about DEM 3 billion, DBU is one of the largest foundations in Europe. The income from its assets enables it to carry out promotional activities and fund innovative projects (about DEM 140 million annually). Since 1991, DBU has supported over 3 300 projects (over DEM 1.5 billion); about half of these have been in the New Länder. The foundation also runs an environmental protection scholarship programme and presents an annual German Environmental Award (DEM 1 million).

### *Environmental expenditure*

Since the mid-1980s, Germany's annual *expenditure on pollution abatement and control (PAC)* has been in the order of 1.5% of GDP. PAC expenditure per capita peaked in the first half of the 1990s; it has meanwhile fallen by about 10%. About 50% of total PAC expenditure relates to water pollution, 40% to waste and 10% to air pollution (Table 5.4 and Figure 5.2).

Total PAC expenditure by the public sector and by business is about equal. *Public and private investment is declining* as a share of total expenditure, while current expenditure is increasing. Investment by the public sector has dropped

Figure 5.2 Pollution abatement and control expenditure<sup>a</sup>

a) Includes Secretariat estimates.

b) At current prices and purchasing power parities.

Source: OECD, 1999.

from 53 to 44%, and that of industry from 40 to 30%. In the Old Länder, the advanced level of equipment has required increasing current expenditure over the years (e.g. for waste water management). In the New Länder, investments are needed to raise the level of equipment to that of the rest of the country.

*Public PAC expenditure* is mainly for waste water (about 60%) and waste management (38%). PAC expenditure by industry is mainly for air pollution control (44%), waste water treatment (38%) and waste management (16%). Overall, expenditure on air pollution control is tending to decline, while public expenditure on waste management and industry expenditure on waste water management are increasing.

*Environmental expenditure* (i.e. PAC expenditure plus expenditure for water supply, soil and groundwater protection, remediation of contaminated sites and nature conservation) is estimated to be close to 2.5% of Germany's GDP. Overall, both PAC expenditure and environmental expenditure place Germany among the OECD countries with the highest environmental spending as a share of GDP.

Table 5.4 Pollution abatement and control expenditure

		1985 <sup>a</sup>	1990 <sup>a</sup>	1995	1995 <sup>b</sup>	1997 <sup>b</sup>
<b>Total expenditure</b>						
amount	DEM (95) billion	35.8	45.5	51.3	69.3	65.4
per unit of GDP	(%)	1.4	1.5	1.5	2.0	1.8
per capita	DEM (95)	587	686	628	849	797
per capita change	(1995 = 100)	94	109	100	100	94
<i>of which:</i>						
Investment	(%)	46	46	37	40	34
Current expenditure	(%)	54	54	63	60	66
<i>of which:</i>						
Waste water	(%)	51	49	49	49	49
Waste	(%)	21	24	29	38	40
Air	(%)	26	24	21	12	10
Noise	(%)	2	2	2	1	1
<i>of which:</i>						
Public	(%)	49	52	54	40	33
Business	(%)	51	48	46	60	67
<b>Public expenditure</b>						
Amount	DEM (95) billion	17.7	23.5	27.5	27.5	21.7
Per capita change	(1995 = 100)	86	106	100	100	79
<i>of which:</i>						
Investment	(%)	51	53	44	44	38
Current expenditure	(%)	49	47	56	56	62
<i>of which:</i>						
Waste water	(%)	69	65	59	59	56
Waste	(%)	29	33	39	39	42
Air	(%)	0	0	0	0	0
Noise	(%)	2	2	1	1	1
<b>Business expenditure</b>						
Amount	DEM (95) billion	18.1	22.0	23.8	41.9	43.8
Per capita change	(1995 = 100)	102	114	100	100	104
<i>of which:</i>						
Investment	(%)	42	39	30	37	32
Current expenditure	(%)	58	61	70	63	68
<i>of which:</i>						
Waste water	(%)	33	33	38	42	45
Waste	(%)	13	15	16	38	39
Air	(%)	51	50	44	19	15
Noise	(%)	3	2	2	1	1

a) 1985, 1990: former Federal Republic of Germany only.

b) Based on new classification: business sector including privatised public enterprises.

Source: OECD.

### 1.3 Ecological tax reform (1999-2003)

In 1999, Germany launched an *ecological tax reform* as one element in a more general restructuring of the tax system. It aims at obtaining a *double dividend*: improving environmental performance while reducing unemployment. Increased energy prices would reduce energy intensity and improve resource productivity in general; lower labour costs would improve conditions for maintaining and creating employment. The eco-tax reform is meant to be *revenue neutral*. Receipts from increased energy taxes are to be used to reduce contributions to the statutory pension scheme, normally financed equally by employers and employees. This reform is designed to reverse the tendency, over the last three decades, for the share of labour taxes to increase continuously (up to 66%) while that of environment related taxes and charges has remained comparatively small (under 10%) and even fallen in recent years.

The pros and cons of eco-taxation have long been discussed in Germany. Various concepts have been put forward, including those of environmental NGOs and the scientific community. In 1998, ecological tax reform became a top priority of the new coalition government. Its implementation constitutes very significant progress in explicitly *integrating environmental concerns in fiscal policies*. *Ecological tax reform* is being implemented in several steps up to 2003 (Table 5.5). In April 1999, *mineral oil taxes* (Table 5.2) were increased and a *new electricity tax* was introduced. At the same time, *contributions to the pension scheme* were reduced by 0.8%, to 19.3% of chargeable income. Between 2000 to 2003, tax rates will increase annually for motor vehicle fuel and electricity.

There is scope for refinement, of course, particularly with respect to defining objectives, designing and balancing taxes, and the multiplicity of concessions. It cannot be assumed that *both objectives* (improving environmental performance and reducing unemployment) will always be in total harmony, at least from a dynamic, long-term perspective. With respect to the environment, there are at least two further objectives: *achieving energy savings* and *reducing CO<sub>2</sub> emissions*. Clarification of policy objectives and priorities should help in monitoring progress and assessing performance.

When tax rates were set, it appears that more attention was focused on the *revenue raising function* of eco-taxes than on their potential to motivate more environmentally sound behaviour. Firms and households may, in response to taxation, eventually adjust to more environmentally beneficial production and consumption modes (using new technologies with less energy and raw materials input or pollution output), thus producing comparatively less tax revenue for lowering ancillary labour costs.

The *steering capacity* of the German eco-tax reform should not be overestimated. In 2003, the reform is expected to result in redistribution of some 2-3% of total German tax revenue. Assuming price elasticities for fuel demand of 0.2-0.3,

Table 5.5 Ecological tax reform – steps, provisions, exemptions

<b>Step 1: 1 April 1999</b>	Introduction of electricity tax Increase in mineral oil duties for: motor vehicle fuel heating oil gas	DEM 20.00/MWh  DEM 0.06/l DEM 0.04/l DEM 3.20/MWh
<b>Step 2: 1 January 2000 to 1 January 2003</b>	Annual increases in tax rates: mineral oil duty electricity	 DEM 0.06/l DEM 5.00/MWh
<b>Step 3: 1 November 2001 to 1 January 2003</b>	Differentiation by sulphur content: mineral oil duty on petrol and diesel is increased according to sulphur content: > 50 ppm in 2001, > 10 ppm in 2003	Increase by DEM 0.03/l
<b>Revenue neutrality</b>	The entire package shall be revenue neutral (including additional VAT receipts)  Receipts are used to lower ancillary labour costs by reducing contributions to German statutory pensions insurance scheme	Total estimated revenue: 2000: DEM 13.5 billion 2003: DEM 30.0 billion  Reduction in contributions from 20.3% to 19.5%
<b>Exemptions</b>	<ol style="list-style-type: none"> <li>1. If charge exceeds DEM 1 000 per year (or over 50 MWh electricity): enterprises in manufacturing, agriculture and forestry pay only 20% of the standard rate on electricity and of the tax increase for heating oil and gas.</li> <li>2. If charge exceeds by 20% the savings from reduced contributions to the pension insurance scheme, employers can claim a refund.</li> <li>3. Electricity supplied from a network exclusively carrying electricity from renewable sources is exempt from the tax, as is electricity for electricity production. Other tax receipts from electricity generated from renewables will be used to fund a market introduction programme for renewables (DEM 1 billion until 2003).</li> <li>4. Electricity generated for own consumption from small facilities with a capacity of up to 2 MW (particularly district heating plants) is exempt from electricity tax.</li> <li>5. Combined heat-power plants with annual utilisation level of 70% are exempt from all mineral oil taxes.</li> <li>6. Other heat-power combination systems with efficiency of at least 60% are exempt from mineral oil tax increases.</li> <li>7. 50% refund on electricity tax and on mineral oil tax increase can be claimed for local public transport. LPG vehicles benefit from 60% reduction in 2000; degressive up to 2009.</li> <li>8. Tax on electricity used for off-peak storage heaters installed before 1 April 1999 is reduced by 50%.</li> </ol>	

Source: BMF.



potential reductions in demand are likely to be in the order of 3-5%, compared to a business as usual scenario of prolonged trends. The estimated tax-induced reduction of CO<sub>2</sub> emissions is about 9 million tonnes, or 2% of total emissions; over one-half of this amount would come from reductions in passenger traffic emissions. Between 1991 and 1998, mineral oil tax rates increased over 60%, from DEM 0.60 to DEM 0.98, while the new reform represents an increase of 30% by 2003. However, taxes are not the only component influencing energy prices. In 1999, the *price of crude oil* almost tripled (from USD 9 to USD 26/barrel); in 2000, *exchange rate* effects (EUR/USD) had a far greater impact on fuel prices than did eco-taxation. For electricity use the eco-tax reform has less steering potential. Despite the introduction of the electricity tax, electricity prices dropped dramatically in 1999 as the first steps were taken towards *liberalisation of the electricity market*.

The environmental guidance function of the German eco-tax reform is weakened by *a number of exemptions and concessions* limiting the tax burden for industry and agriculture. These are primarily motivated by competition concerns, and by the desire to avoid negative trade effects and to favour beneficial types of energy production. The concessions are neither environmentally effective nor economically efficient: different energy sources are taxed differently, without taking account of variations in actual or potential environmental impacts or potential development opportunities. Power generated by oil and gas is subject to the mineral oil tax and electricity tax, while that generated by coal, nuclear plants and renewable sources is taxed only once. Revenues from taxation of *electricity from renewable energy* finance a programme to support the market penetration of such energy sources. If the environmental relevance of energy sources is measured in terms of CO<sub>2</sub> emissions alone, the marginal tax burden for 1 tonne of CO<sub>2</sub> ranged from DEM 0 to DEM 36/t CO<sub>2</sub> in the first year (1999) (Table 9.2) and will be between DEM 0 and DEM 549/t CO<sub>2</sub> in 2003. The tax exemption for coal, largely motivated by social objectives, creates no incentive to substitute less polluting sources for this emission intensive energy source. Tax exemptions and reductions are also seen as means to preserve the international competitiveness of industrial branches, and as being necessary until major competitors move in the same direction. Modulating tax reductions, taking into account the competitive position of these branches, should be considered.

## 2. Focus on Selected Topics

### 2.1 Economic context

With 230 inhabitants per square kilometre, Germany is one of Europe's *more densely populated* countries. The population is distributed unevenly, densely settled

areas contrasting with sparsely settled ones. Environmental pollution and exposure to risk are therefore *spatially concentrated*. Between 1991 and 1998, the population increased by 3% (Table 5.6). The natural balance was negative. With fewer than ten infants per 1 000 inhabitants, Germany's birth rate is among the lowest in the world; population growth has been entirely due to immigration, particularly from Central and Eastern Europe.

Germany has the world's third highest GDP (over USD 1800 billion), after the United States and Japan. *GDP per capita* (more than USD 22 000) is 6% above the OECD average. Since unification in 1990, Germany has had to cope with significant territorial disparities: within the EU, the regions with the highest and lowest income per capita are both German.

Following a short boom in the early 1990s, the German economy experienced a deep *recession*. In 1993, GDP fell. Unemployment reached record levels in 1997 (over 4 million, above 10%). *Recovery* was slow and only gained momentum in 1999. Between 1991 and 1998, production growth was modest (10%) and GDP per capita increased by 7%. Total employment having fallen, labour intensity per unit of GDP also dropped (by 13%).

In this period *energy intensity* declined by 10%. Road freight traffic increased by over 20%, or 15% per unit of GDP. Road vehicle traffic grew by 4% in absolute terms, or 1% per inhabitant.

## 2.2 Institutional context and environmental administration

### *Institutional context*

*Germany is a federal republic* with three levels of government: federal (Bund), state (Länder) and local (Kommunen). Until unification, the Federal Republic of Germany consisted of 11 Länder: Baden-Württemberg, Bavaria, Hesse, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Schleswig-Holstein, Saarland and the city states of (West) Berlin, Hamburg and Bremen. In October 1990, after the first free election in the former German Democratic Republic (GDR), the five *New Länder* (Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia) acceded to the Federal Republic. East and West Berlin merged. Germany now consists of 16 Länder.

The *Länder* have jurisdiction, by default, over all aspects of government unless the constitutional Basic Law specifies otherwise or leaves open the possibility of a different arrangement. The competence of the *federal level* (Bund) includes all matters directly affecting the country's security, foreign affairs and defence, justice,

Table 5.6 Decoupling and resource efficiency

Population Area	POP km <sup>2</sup>	million inh. 1 000 km <sup>2</sup>	82.2 357	Change	Productivity Density Intensity	Absolute 1998 <sup>a</sup>	OECD = 100
Production	GDP	USD billion	1 842	1991-98 <sup>a</sup> (%)			
Employment	EMP	million	36.1				

1991 = 100

7	GDP/POP	USD 1 000 per inhabitant	22	106
3	POP/km <sup>2</sup>	inhabitants/km <sup>2</sup>	230	725
-13	EMP/GDP	jobs per USD million	20	98

1991 = 100

15	RFT/GDP	tonne-km/USD 1 000	171	..
1	RTV/POP	1 000 vehicle-km per inhabitant	7	92
-10	TPES/GDP	tonnes of oil equivalent per USD 1 000	0.19	85

1991 = 100

-16	CO <sub>2</sub> /GDP	tonnes per USD 1 000	0.48	91
-35	NO <sub>x</sub> /GDP	kg per USD 1 000	1.0	48
-71	SO <sub>x</sub> /GDP	kg per USD 1 000	0.7	36

a) Or latest available year.

Source: OECD.

finance, interior affairs and social security. The Bund also has competence in areas such as national economic policy and promotion of industry, research, science and technology, agriculture, transport, housing and urban development, energy, environmental protection and co-operation with developing countries. Some clearly defined tasks are planned and financed jointly at the federal and Länder levels. These include, in particular, improvement of regional economic and agricultural structures and coastal protection, as well as university construction.

The Basic Law guarantees *local authorities* the power of self-government. Thus, within the limits set by law, they are responsible for all matters that directly concern the local community and individual citizens including, for example, water supply and waste water treatment, waste disposal, maintenance of local roads, local welfare and health services, and construction and maintenance of general primary and secondary schools. The Länder have conferred powers to enforce many local aspects of federal or Länder legislation on the municipalities and districts.

The constitutional bodies with primarily legislative functions are the Bundestag and Bundesrat. Executive responsibilities lie principally with the *Federal Government*. It is headed by the *Federal Chancellor*, who chooses ministers, determines their number and responsibilities, and proposes them to the Federal President for appointment or dismissal. The Chancellor determines the orientations of Government policy. Federal ministers run their departments independently and on their own responsibility, but within the framework of these orientations. In a coalition government the Chancellor must take account of agreements reached with the other coalition parties.

The *Bundestag*, Germany's parliamentary assembly, is elected by the people every four years. Its main functions are to elaborate and pass laws, elect the Federal Chancellor and provide a check on the Government. The *Bundesrat*, which represents the 16 Länder, participates in the Federation's legislative process. It is not made up of elected representatives of the people, but rather members of Länder governments or their representatives. Depending on their population, the Länder have three to six votes which may only be cast as a block. More than half of all bills require the Bundesrat's formal approval, which means they cannot become law unless it so decides. This applies especially to bills concerning the vital interests of the Länder, such as their financial affairs and administrative powers.

### *Environmental administration*

With regard to the *environment*, the Basic Law does not provide for a general allocation of legislative power among different levels of government. Environmental law cuts across other areas with varying legislative arrangements. In principle, the main authority lies with the Länder. *Federal Acts and Ordinances* concerning the

environment must be approved by the Bundesrat, as the Länder have to implement legislation. Areas regulated by federal law include nuclear power, waste management, air quality management and noise abatement (Table 5.7). Water management, nature conservation and landscape protection are areas in which only framework legislation can be passed at the federal level. More specific regulation of these areas remains the responsibility of the Länder.

The *Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)*, established in 1986, took over environmental agendas formerly administered by other administrative branches. BMU is supported by a number of agencies, particularly the *Federal Environment Agency (UBA)*, which provides scientific advice on drawing up legal and administrative provisions and regulations in the fields of air pollution control, noise abatement, and waste and water management as well as general aspects of environmental protection. UBA collects environmental data and is responsible for information dissemination and public outreach. The *Federal Office for Nature Conservation (BfN)* is responsible for research and development, and for the progress of scientific concepts concerned with protection and management of nature reserves and Specially Protected Areas. The Ministry regularly consults independent experts such as the Council of Environmental Advisors (SRU).

The Länder have the main responsibility for implementing environmental protection laws. They determine the precise institutional forms of enforcement, which may vary from one Land to another. Often tasks are delegated to the *regional level* of Länder administration or to the municipal level. *Special authorities* exist to enforce environmental law when a high degree of technical knowledge is required. Examples include water management authorities, air and noise control agencies, or institutes charged with supervising soil quality.

### 2.3 The Environment Barometer

Germany has formally adopted a set of key environmental indicators known as the *Environment Barometer for Germany* (Figure 5.3). The Environment Barometer translates environmental policy objectives into quantifiable targets, which are also part of general economic policy documents (e.g. German Annual Economic Report 2000). It contributes to monitoring the actual performance of German policies and to informing the public with regard to the results achieved.

Concerning *climate* protection, the national target for CO<sub>2</sub> emissions is –25% between 1990 and 2005. This objective has been endorsed repeatedly by the Federal Government; it is also an accepted reference in regard to voluntary commitments by German industry. This national target is supplemented by the German international

Table 5.7 Selected legislation relating to the environment

Year of 1st publication	Act/Ordinance/Technical Instruction/etc.	Year of most recent amendment
	<b>Administrative foundations</b>	
1969	Creation of an "Environmental Protection" department in the Federal Ministry of the Interior	
1972	Constitutional amendment: Federal Government jurisdiction for air pollution control, noise abatement and waste management, plus general jurisdiction for water pollution control	
1972	Creation of Council of Environmental Advisors	
1974	Creation of Federal Environment Agency (UBA)	1996
1986	Creation of Federal Ministry for the Environment (BMU)	
1974	<b>Federal Immission Control Act</b>	1998
	with Ordinances, in particular, on:	
1983	Large firing installations	
1985	Installations subject to licensing	1999
1988	Small firing installations	
1980	Hazardous incidents	1991
1990	Incinerators for waste	1999
1993	Labelling and quality of fuels	1997
1996	Electromagnetic fields	
1972	<b>Waste Management Act,</b>	2000
	since 1994 Closed Substance Cycle and Waste Management Act	
1991	Packaging Ordinance	1998
1991	Technical Instructions on Special Waste	
1993	Technical Instructions on Waste from Human Settlements	
1982	Sewage Sludge Ordinance	1997
1997	End-of-Life Vehicle Ordinance	
1998	Biological Waste Ordinance	
1996	Ordinance on Specialised Waste Management Companies	
1994	Act on the Shipment of Waste	1998
1957	<b>Federal Water Act</b>	2000
1975	Act on the Environmental Compatibility of Washing and Cleansing Agents	1994
1976	Water Effluent Charges Act	1998
1978	Administrative provisions on waste water, since 1997 Waste Water Ordinance	2000
1996	Fertiliser Ordinance	
1997	Groundwater Ordinance	
1980	<b>Chemicals Act</b>	2000
1991	Second Ordinance on the Ban on Certain Ozone-depleting Halogenated Hydrocarbons	
1993	Chemicals Prohibitions Ordinance	2000
1993	Ordinance on Dangerous Substances	2000

Table 5.7 **Selected legislation relating to the environment** (*cont.*)

Year of 1st publication	Act/Ordinance/Technical Instruction/etc.	Year of most recent amendment
1976	<b>Federal Nature Conservation Act</b>	1998
	with selected Ordinances	
1993	Genetic Technology Act	
1998	<b>Federal Soil Conservation Act</b>	
	<b>Participation and Policy Integration</b>	
1990	Act on Environmental Impact Assessment	1994
1990	Environmental Liability Act	
1994	Environmental Information Act	
1994	Constitutional amendment (Article 20a): protection of the natural sources of life incorporated as a State objective	
1995	Environmental Audit Act	1997
	<b>Electricity</b>	
1991	Act on the Sale of Electricity to the Grid, since 2000 Renewable Energy Act	2000
1999	Electricity Taxation Act	

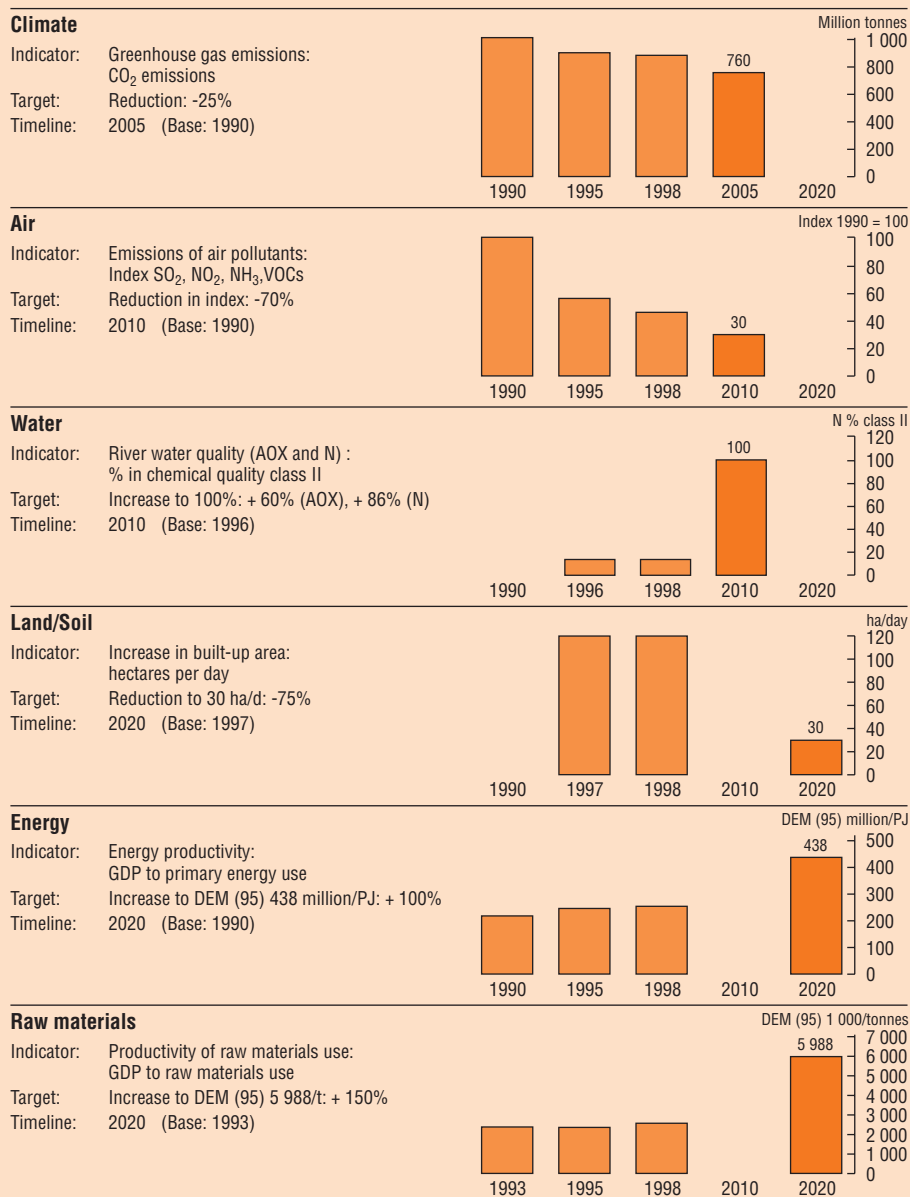
Source: BMU.

commitment (part of the EU's burden-sharing agreement) under the Kyoto Protocol (–21% for GHG emissions in 2008/12 compared with 1990). The *air pollution* target is –70% (1990–2010) for an air emissions index (SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub> and NMVOCs). More than 50% of this reduction has already been achieved, mainly as a result of major SO<sub>2</sub> reductions in eastern Germany (Chapter 9).

For water, the Barometer defines *river water quality* objectives (i.e. percentage of river courses in chemical water quality class II). By 2010, 100% should reach this quality class with respect to AOX and total nitrogen; only 14% currently meet the nitrogen target (Chapter 2). Concerning *land and soil conservation*, the Barometer measures the average daily increase in surface area occupied by human settlements and transport infrastructure. Based on an average 120 hectares lost per day in 1997, a 75% reduction target (i.e. to 30 hectares per day) has been established for 2020.

Two eco-efficiency targets have been established: *energy productivity* (i.e. the reverse of energy intensity, expressed in GDP/unit of energy used: DEM GDP/PJ) should be increased by 100% over the period 1990–2020, and *productivity of raw*

Figure 5.3 Selected environmental policy targets from the Environment Barometer



Source: BMF; BMU.



*material use* (DEM GDP/tonne) by 150% between 1993 and 2020. To measure these productivities, the Federal Office for Statistics (StBA) has set up a system of environmental accounting connected to the national economic accounting framework.

Work on *other indicators* is also underway. Among areas not yet covered by the Barometer are groundwater, biodiversity and noise. Waste generation is not directly addressed.

## 2.4 Recent legislation and the Environmental Code

*The context of German environmental legislation and regulations is complex.* Responsibilities are divided among the federal, Länder and local levels. Increasingly, environmental laws, regulations and administrations are also shaped by environmental legislation at the European level. Following amendments to the German Constitution, the Federal Government has obtained “concurrent” legislative power in the areas of waste management, air pollution control, noise abatement, protection from radiation, and criminal law related to environmental protection matters. In these policy areas federal regulations supersede Länder and local decisions. However, in the case of water management, regional planning, nature conservation and landscape preservation, the Federal Government can only issue framework laws which oblige Länder governments to provide supporting legislation. Länder legislation often defines only the framework within which local authorities will implement environmental policies.

In the 1990s, German environmental law was updated and expanded in various ways. The *Environmental Liability Act* provided a basis for coping with contaminated sites and stimulating investment in the New Länder. Three “acceleration acts” passed in 1996 rendered licensing procedures, disclosure and reporting obligations easier to implement. The 1996 *Closed Substance Cycle Law* (Kreislaufwirtschaftsgesetz) aims to increase waste prevention, reuse and recycling through better integrating ecological concerns in production and consumption decisions. The 1998 *Federal Soil Protection Act* contains country-wide soil protection standards. The 1998 amendment to the *Building Code* and the *Regional Planning Act* is aimed at strengthening integration of environmental concerns (especially land and soil protection) in the planning and practice of territorial development policy. The 1998 amendment to the *Federal Nature Conservation Act* aimed in particular at better integrating nature conservation concerns in farming practices. It has established compensation rights for farmers facing economic disadvantages due to management restrictions.

Several initiatives have been launched to reduce the complexity, and increase the consistency, of environmental legislation. First proposals for an *Environmental Code* (Umweltgesetzbuch, UGB) were presented by a group of professors in 1991 and 1994.

An independent expert committee, constituted in 1992 by the Federal Environment Ministry, presented a further proposal in 1997. The general part of the new code (UGB I) will provide the basis for integrating environmental protection in all relevant policy areas, and for public participation, information and access to the courts; it will also contain rules for standard-setting and regulation in planning and licensing, environmental audit and assessment, and liability law. UGB II will address these specific environmental areas: nature, forests, soil, water, immissions and energy, nuclear energy and radiation, transport and networks, genetics and biotechnology, hazardous substances and waste. The 1998 coalition agreement reconfirmed the commitment to adopt an Environmental Code as a priority for environmental policy.

### 2.5 Examples of voluntary agreements

In Germany, close to 100 *voluntary* environmental agreements and self-commitments are in effect (Table 5.8). Two prominent examples of multi-sectoral agreements concern CO<sub>2</sub> emissions and car recycling.

*German industry's declaration on prevention of global warming* is the country's most comprehensive and politically important voluntary environmental commitment. At the 1995 UNFCCC Conference in Berlin, German industry declared that it would "make special efforts on a voluntary basis to reduce its specific CO<sub>2</sub> emissions and its specific energy consumption by up to 20% by the year 2005 (base 1987)". This general undertaking was based on declarations from a total of 19 industrial and energy supply associations which had formulated different targets in individual declarations (Table 5.2). The offer was linked to the expectation that the Government would consequently forgo "*compulsory measures*". The objectives were updated in 1996: in line with international practice, 1990 was adopted as the base year and the target of "up to 20%" was changed to a definite 20%. The declaration covers over 70% of industrial final energy consumption, almost all public and industrial power generation, and a large proportion of energy suppliers providing energy to the residential and commercial sectors. In November 2000, the declaration was transformed into a more formal agreement between industry and the Federal Government on reducing specific emissions of CO<sub>2</sub> (–28% by 2005); and of all six Kyoto GHGs (–35% by 2012).

In 1997, the *Association of the German Automotive Industry (VDA)*, together with a range of associations from related industries, pledged to:

- set up a country-wide infrastructure for taking back and recycling end-of-life passenger cars (ELVs);

- improve ELVs' recoverability, so that the amount of residuals is reduced from an average 25% in weight to 15% in 2002 and 5% by 2015;
- take back cars registered within the last 12 years free of charge;
- set up a VDA working group to ensure adherence and provide evidence of achievement in a biannual report.

In other agreements, the VDA has also promised to *improve fuel efficiency* in new passenger cars by 25% (1990-2005) and to introduce a three-litre diesel car by 2000.

**Table 5.8 Voluntary agreements on reduction of CO<sub>2</sub> emissions, German industry and trade**

Association	Base year	Reference variable	Reduction in %
Potash industry	1990	t CO <sub>2</sub> /t raw salt	66
		CO <sub>2</sub>	78
Cement industry	1987	kJ fuel/kg cement	20
Lime industry	1987	kJ fuel/kg lime	15-20
Ceramic tiles and slabs	1990	kg CO <sub>2</sub> /t tiles and slabs	25
		kWh/t tiles and slabs	20
Brick industry	1990	kJ/kg bricks	28
Refractory industry <sup>a</sup>	1987	kg CO <sub>2</sub> /t refractory products	15-20
Iron and steel industry	1990	kg CO <sub>2</sub> /t rolled steel	16-17
		CO <sub>2</sub>	21-27
Non-ferrous metal industry	1990	GJ/t NF metals	22
Chemicals industry <sup>b</sup>	1990	Energy index/production index	30
	1987	CO <sub>2</sub>	44
Paper industry	1990	kg CO <sub>2</sub> /t glass	22
		GJ/t paper	20
Glass industry	1987	kg CO <sub>2</sub> /t glass	25
		GJ/t glass	
Textile industry	1987	PJ/a	20
Sugar industry	1990	kWh/dt beet processing	20
Public electricity supply <sup>c</sup>	1990	CO <sub>2</sub>	12
Petroleum industry	1990	heating oil/m <sup>2</sup> residential accommodation	25
Gas industry	1990	kg CO <sub>2</sub> /kWh net energy	34
Municipal energy supplies	1990	CO <sub>2</sub>	25

a) Data refer to former Federal Republic of Germany only.

b) The chemicals industry expects an absolute reduction in CO<sub>2</sub> emissions of 23.8 million tonnes by 2005.

c) Reduction target by 2015. By 2005, the electricity suppliers' association expects a CO<sub>2</sub> reduction of 8-10%.

Source: RWI.

# 6

## THE ENVIRONMENTAL-SOCIAL INTERFACE

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- further examine *disparities in environmental quality* and their impacts on health and living conditions in different parts of society;
- further review the *distributional implications* of major environmental policy measures and ensure discussion of the results;
- further implement the joint action programme on *environment and health*;
- build on successful local initiatives (e.g. *Local Agenda 21*) to foster environmental and sustainable development progress;
- improve the availability and timeliness of *data and indicators* on environmental quality, environmental pressures and related responses;
- improve *public access* to environmental information and access to justice for environmental stakeholders;
- strengthen *public participation* in the design, implementation and assessment of environmentally relevant projects and policies;
- broaden *environmental education* and encourage behavioural changes towards more sustainable consumption patterns.

This chapter reviews performance with respect to the environmental-social interface in the following areas:

- *disparities* in environmental conditions and *health risks*;
- *employment* and the environment;

- distributive and employment *effects of eco-tax reform*;
- environmental *education and awareness*;
- *environmental democracy*: information, participation and access to procedures.

The social context is briefly described (Chapter 6, Section 2.1). Social issues relating to environmental developments in the New Länder are addressed in Chapter 7.

## 1. Evaluation of Performance

### 1.1 Disparities in environmental conditions and in health risks

With German unification, *reducing disparities* in environmental quality, and in exposure to environmental risks, became a major policy goal. This goal was included in the Unification Treaty.

Analysis of the *environmental conditions and health status* of populations at some of the most polluted locations in eastern Germany (e.g. Bitterfeld, Dessau and Hettstedt, which previously had high concentrations of polluting activities in mining, metal processing and the chemicals industry), has shown very significant correlations between environmental conditions and health indicators (e.g. respiratory disease, heavy metal concentrations in blood, urine and milk teeth) (Chapter 6, Section 2.2): *people in polluted and contaminated locations are exposed to significantly greater health risks*. Since, to a large extent, polluting activities ceased or were substantially reduced in the New Länder following unification, most health indicators have shown improvement. Exceedance of threshold levels has become rare.

A study of exposure to environmental threats and socio-economic status has demonstrated a negative correlation between *pollution concentrations and a social index* in the 193 statistical areas of Berlin. Distribution of environmental threats and resulting cancer risks is clearly regressive (Chapter 6, Section 2.2).

In 1999, the German Council of Environmental Advisors (SRU) published a special report on environment and health. In the same year, the *action programme on environment and health* was jointly prepared by the Federal Ministry for the Environment and the Federal Health Ministry. The action programme reviews, for the first time, long-term strategies and measures in various environment and health areas, such as: comprehensive monitoring and reporting of environment related health issues; improved information management; early identification and rapid assessment of risks and consequent standard-setting; and communication, participation and research. The programme identifies shortcomings in the co-ordinated monitoring of environment and health and relevant reporting. Establishment of a differentiated

monitoring and reporting system is envisaged. The programme also identifies insufficiencies in *standard-setting procedures*, such as lack of public participation. Concerned parties were found to have participated in the definition of only 6% of standards, and to have been consulted about 17%.

## 1.2 Environmental employment

In Germany, *about 1 million jobs* (representing close to 3% of the total workforce) are directly or indirectly related to environmental protection (Chapter 6, Section 2.3). However, this share is unlikely to increase. Environmental infrastructure endowment is high, and productivity gains in its construction, maintenance and operation are expected.

Environment and employment links have become an issue in high level talks of the German *Alliance for Jobs (Bündnis für Arbeit)*. This initiative, launched in 1996, was renewed in December 1998. Chaired by the Federal Chancellor, it brings together government, business organisations and trade unions. While it was not originally intended to address environmental matters, an “environment dialogue” has been established. A subgroup is preparing a position paper and proposals for environmental measures that should stimulate employment (with measures focusing on environmental improvement and energy saving in the housing sector). Rough estimates of the direct employment effects of such measures range between 75 000 and 200 000 jobs.

Similar estimates have been made in regard to other environmental policy and sustainable development strategies. Depending on the analytical models and assumptions, very different results are generated. Recent studies on the *longer-term labour market effects* of shifting towards more environmentally sustainable production practices all expect positive employment effects at the macro-level. For individual branches and regions, however, the net-balance of job creation and losses may be negative. The capacity to analyse economic, social and environmental linkages should be improved to better support strategic policy decisions.

## 1.3 Distributive and employment effects of eco-tax reform

Assessment of the *social implications of German eco-tax reform* must distinguish several effects: the increased burden of tax increases; the compensatory effect of lower social security contributions; repercussions of various tax exemptions; the induced effects of employment changes; and, of course, positive impacts on health and the environment. Finally, the overall effects of the broader tax reform bundle, of which the eco-tax is only one component, should not be ignored.

Overall, the *distributive effects of the eco-tax reform are limited*, not least because its steering function is limited. For almost all branches of industry, the additional tax burden is less than 1% of their turnover and the compensation resulting from reduced pension scheme contributions is higher; thus, their net balance is positive. Agriculture and the retail and transport sectors face a strongly negative balance. Households bear the main tax burden: their tax rate is five times higher than that of energy intensive industries. Most households benefit from compensatory reductions in the amount of their social security contributions, but some individuals do not: e.g. unemployed or non-employed transfer recipients (e.g. pensioners), civil servants and the self-employed.

Even for *low-income households*, however, the change in disposable income will rarely exceed 1%. If induced employment effects of the reform are considered, the picture looks even better since the reform will improve the situation of the unemployed in particular. For pension recipients the disadvantage will only be temporary, as pensions will automatically be adjusted according to the development of net incomes in general. Households receiving social assistance will be able to claim higher allowances for increased heating costs. In addition, on social grounds electricity used for heating is taxed at only half rate.

The *employment effects* of the reform will depend on the outcome of wage negotiations. If they neutralise the incentive effects, additional jobs are unlikely to be created. Model calculations suggest that over the period 2000-05 the tax component of the reform would lead to a loss of 17 000 jobs annually, while the reduction in ancillary labour costs would result in an additional 93 000 jobs. In the longer term, the net employment effect (of the reform compared to a business-as-usual scenario) is estimated to be in the order of 50 000 jobs.

## 1.4 Environmental education and awareness

### *Environmental education*

In Germany, environmental education has been a *key concern* for many years. Besides schools and universities, many establishments and institutions offer environmental education. This includes adult education, nature and environment centres, consumer councils, conservation and environmental protection organisations, citizens' initiatives, party and church academies, nature conservation areas and biosphere reserves, museums and zoos.

Since the late 1980s, there have been *numerous initiatives, declarations and recommendations* on environmental education, particularly by the Standing Conference

of Ministers of Education and Cultural Affairs (KMK) and the Bund-Länder Commission for Educational Planning and Research Promotion (BLK), including:

- a work programme to promote “environmental education in schools” (1987);
- a KMK report on “environmental education at German schools” (1992);
- an evaluation of BLK pilot schemes, “environmental education as innovation” (1997); and
- BLK guidelines on “sustainable development education” (1998).

Environmental education in schools has advanced significantly. The *curricula* for most subjects include environmental issues. The range of courses available for advanced teacher training has been significantly expanded. Concerning *vocational training*, environmental protection has been designated a separate learning objective: in 1997, a binding agreement was reached between the Federal Government, the Länder, trade unions and employers ensuring that whenever training regulations are reviewed or amended, environmental protection will be taken into account. New concepts regarding the environmental qualifications of teaching and training staff were developed and tested in numerous pilot schemes.

### *Environmental awareness*

Environmental awareness, as reflected in survey responses, declined during the 1990s. *Opinion polls* show that compared to other policy issues, the percentage of people ranking environmental concerns high on the agenda has fallen by half, from 60 to 30%. This relates to both personal concerns and perceived policy priorities (Chapter 6, Section 2.4).

The two most important reasons for this decline are *deterioration of the economic situation* and *improvements in environmental quality*. In the late 1980s, environmental protection ranked even higher than job concerns. Today reducing unemployment, preventing crime and strengthening competitiveness are the top priorities. People are also much more positive in their assessment of the environmental situation: the level of perceived environmental problems has declined; a majority describe the quality of the environment where they live as good or even excellent; and overall, 46% of all those interviewed see major progress in water quality, 34% in energy saving and 30% in air quality.

*Road traffic* is perceived as causing the greatest nuisances on a personal level. Country-wide, about 15% of the population is disturbed by road noise and 12% by car exhaust fumes. In contrast, support for taking action in this area fell between 1991 and 1998 from 71 to 55% for a general speed limit on motorways, and from 34 to 17% for making car use more expensive.



Discrepancies between general environmental awareness and *actual environmental behaviour* can be observed. In the 18-30 age group, environmental knowledge and awareness are relatively high, yet older people behave in a more environmentally sound manner. Surveys show that environmental behaviour improves significantly and continuously with age. The increasing gap between awareness and action is seen as an expression of changing values: in older age groups, environmentally friendly behaviour by those with low environmental awareness can be a “side-effect” of values such as tidiness and thrift.

Apart from transport, there is no indication of a general refusal to behave in an environmentally friendly way. On the contrary, *household efforts* in regard to waste separation and recycling have been further intensified despite the high performance already achieved by Germany compared with other OECD countries. Energy- and water-saving activities have increased; use of energy-saving light bulbs and of water-saving devices is also increasing.

### 1.5 Environmental democracy: information, participation and access

#### *Provision of environmental information*

The *German public is generally well informed* about environmental matters. Information on a wide range of environmental topics is available from a number of sources. Environmental issues are regularly addressed by the media; the internet is increasingly used to facilitate access to and disseminate environmental information. Both the Federal Environment Agency and the Federal Office for Statistics (StBA) provide environmental data.

The *Federal Environment Agency (UBA)* has a key role in collecting, producing and disseminating environmental information. With a staff of about 1 000, it publishes some 100 scientific reports on environmental topics every year. In the 1990s, the number of UBA press releases per year increased from 20 to about 100. Annual reports contain a detailed overview and references to all aspects of environmental protection in Germany. The UBA website ([www.umweltbundesamt.de](http://www.umweltbundesamt.de)) provides access to a wide range of environmental data and documents, and links to around 200 environmental sites. The *German Environmental Information Network (GEIN; <http://www.gein.de>)* was established in 2000 to improve access to environmental information. Its search engine emphasises public administration data and documents.

Since 1984, UBA has published the *German State of the Environment (SOE) report* (Daten zur Umwelt), initially every two years and now every four years. This report provides the basis for Federal Government reports on environmental policy, which are also required every four years. Many Länder governments or environment

ministries also produce their own SOE reports. Both federal and Länder ministries and agencies publish many more specific reports (e.g. on climate change, biodiversity, water management, sustainable development). Every two years the *German Council of Environmental Advisors (SRU)* publishes a comprehensive report, which has become a reference for environmental policy discussion in Germany. Annual reports of the *German Advisory Council on Global Change* focus on international and global environmental issues.

During the 1990s, efforts to conceptualise *environmental indicators* for different purposes remained scattered among various federal and Länder agencies, statistical offices and research institutes. The *Environment Barometer* has been a success (Chapter 5): it provides a set of indicators relating to specific targets, and facilitates assessment of and communication on environmental projects (Figure 5.3). The Environment Barometer has begun to be included in the annual economic report. However, the range of topics still appears somewhat imbalanced. In particular, biodiversity and nature conservation are not well covered. In connection with the development of the Environment Barometer, the StBA has established *material flow statistics* which can be associated with economic national account statistics.

Despite a new law on *environmental statistics* promoting better harmonisation and co-ordination of statistical efforts, the situation with regard to environmental data has not improved as much as would be desirable. Often data work is not driven by analytical and policy priorities, but by supply opportunities and traditions. For many statistics, the process of data collection, aggregation and provision is very slow. Germany therefore sometimes lacks timely data for national or international purposes. For example, by mid 2000 it was still not in a position to provide aggregate national figures on waste generated, treated and disposed after 1993, reducing the capacity to fully monitor and assess progress in a key area of German environmental policy. If delays in actual data compilation cannot be avoided, options for forecasting and “now-casting” based on models and/or estimates should be explored. The *spatial differentiation* of environmental statistics is often too limited. While most statistics are generated and used by the Länder and their regional administrations, few harmonised statistics are available on environmental conditions and trends at regional or local level. Since 1995, even for important environmental issues, differentiation between the Old and New Länder is no longer feasible; many longer-term time series have been discontinued; and there is a risk of misinterpretation of aggregate trends resulting from quite different conditions in the eastern and western parts of the country.

#### *Public access to environmental information*

The 1994 *Environmental Information Law* establishes the legal basis for granting access to the environmental information available to public authorities and related

bodies. It covers information not only on the state of the environment, but also on activities and measures that impact on it. Citizens and legal persons under private law are entitled to access to information without having to disclose their interests. Access may only be denied or limited on clearly defined grounds, such as national security, ongoing court procedures or business secrecy.

In two judgements (1998 and 1999) the European Court of Justice determined that some aspects of Germany's Environmental Information Law failed to meet the requirements of the EU Directive (90/313/EEC) on freedom of access to information on the environment. In particular, it criticised the lack of transparency in the scope of information entitlement, an excessively broad definition of grounds for exclusion, and deficiencies in the regulation of charges. Although Germany was the only EU Member State which did not sign the *Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters* at the June 1998 Aarhus Conference, it did sign the Convention in December of that year.

### *Participation*

*Citizen participation* in environmental matters has a long tradition in German administrative practice. It has evolved, in particular, in the context of local land use and construction planning; it has been further codified in *planning permit procedures* (Planfeststellungsverfahren) and *administrative licensing procedures*. Licensing of sites, establishments and operations is primarily carried out in the context of the Federal Immission Control Act and concerns several thousand cases annually, in one-third of which participation is required. Planning permits for construction of roads, airports, waterways, landfills and land consolidation schemes represent only about 100 cases per year.

Participation is generally accepted and recognised as a positive contribution to the planning and licensing process, making decisions more environmentally sensitive. Yet its impact is difficult to assess, as *in most cases participation concerns preventive measures*. Sometimes participation is misunderstood as formal consultation only, or even reduced to ex post information on plans and decisions already negotiated and agreed between investors and the administration in charge of permitting. Under such circumstances, participation risks degenerating to a confrontational exchange of views instead of encouraging communication and co-operation.

In the early 1990s, Germany passed several laws aimed at accelerating planning and licensing procedures. Initially justified by the need to rapidly improve transport infrastructure in the New Länder, *acceleration and simplification provisions* are now also applied to the Old Länder. This has reduced options for participation and objection (e.g. concerning road construction or waste treatment facilities). While

acceleration is desirable, restricting participation and limiting access to the courts is not. Moreover, causal links between administrative delays and participation have not been empirically demonstrated.

### *Access to the courts*

If objections to a project are not reflected in a decision by the permitting administration, citizens can appeal to *administrative courts*. There has been no systematic monitoring of the number of participatory processes and court cases, but citizen participation and the share of appeal procedures appear to have declined.

While the Federal Nature Conservation Act establishes participation rights for recognised environmental NGOs, it does not foresee *NGO standing in law suits* (Verbandsklage) as representatives of the common interest (i.e. “on behalf of nature”). At sub-national level, a majority of the Länder provide opportunities for NGO access to the courts. However, some of the large Länder, like Baden-Württemberg, Bavaria and North Rhine-Westphalia, have no such provisions. This is not consistent with the Aarhus Convention. Establishment of an NGO’s right to take legal action at federal level in the context of the new Environmental Code (Chapter 5) had been foreseen in Germany, but failure so far to agree on Part I of the new code raises questions as to when this will be achieved. The draft version of the new code foresaw NGO standing only in the case of planning permission procedures, limiting it to large projects. While offering better coverage of nature conservation concerns, this would still exclude important areas of environmental protection. It is intended to introduce the right for environmental associations to take legal action in the pending amendment of the Federal Nature Conservation Act.

### *Role of environmental NGOs*

Some 5% of the German population belongs to *environmental NGOs* (Chapter 6, Section 2.5). Many people support several organisations. Membership increases with educational status (low educational level 2%, high level 11%). While the share has declined in western Germany (from 6.1 to 4.5%), it has increased slightly (from 2.8 to 2.9% ) in the New Länder. The fall in membership of younger people should be noted: from 8% to less than 4% in the age group 18-30.

Most environmental NGOs have realised that they can best defend their cause by becoming involved in the design of environmental policies, and of other policies such as agriculture, energy, transport or trade. This implies the need to *co-operate with other economic and social organisations* (consumers, unions, business or churches) in order to achieve progress on environmental and nature protection and promote

sustainable development. Conservation and environmental protection knowledge alone is no longer sufficient. NGOs need to develop expertise in economics, law, public administration and communication.

The *financial base* of most environmental NGOs is insufficient to ensure systematic input to policy design and monitoring. Unlike other lobbying organisations which, if successful, tend to profit in monetary terms from their activities, environmental NGOs do not. Voluntary contributions can be obtained more easily for spectacular actions and projects with high visibility. This creates a clear disadvantage for policy work. Thus, the more environmental NGOs are requested to take part in general policy planning, decision-making and evaluation, the more such services should be adequately remunerated. Remuneration of NGOs' contributions to policy formulation, implementation and assessment should be based on clearly defined rates, to ensure that public payments do not erode their independence and credibility.

## 2. Focus on Selected Topics

### 2.1 Social context

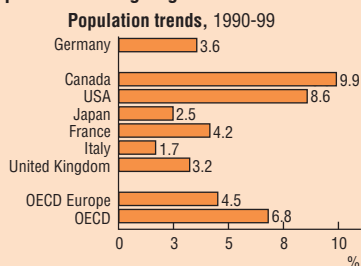
Germany's *population* of 82 million inhabitants grew by 4% in the 1990s (Figure 6.1). Since the natural balance was negative, this increase was entirely due to net immigration. Annual net immigration declined from about 1 to 0.1%. The share of foreign population living in Germany is close to 9%.

Germany faces a process of *rapid ageing*. In 1991, the number of those 65 years and older was still 10% less than the number of those under 15. Today there are 10% more of the former than the latter. This change will have consequences for consumption patterns, housing, infrastructure and service needs.

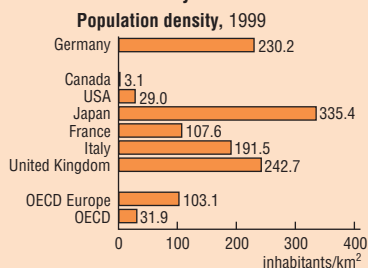
With 230 inhabitants per square kilometre, *population density* is comparatively high. Germany has only three cities with over 1 million inhabitants (Berlin, Hamburg, Munich). It is characterised by a rather *decentralised settlement structure*, with a large proportion of medium-sized towns well connected by a highly developed transport network. In the 1990s, car ownership increased to 51%. As passenger rail traffic increased as well, the overall road-rail balance remained unchanged.

*Per capita regional income*, measured for 49 territorial units (OECD territorial level TL3), varies by about 25% around the national average (variation coefficient: 27%). This demonstrates the integration challenge of German unification (Chapter 7). Disparities in disposable income are lower, thanks to massive transfers from western to eastern Germany. Since the first half of the 1990s, *unemployment has been high* at close to 10%; public attention and policy priorities have shifted towards employment issues.

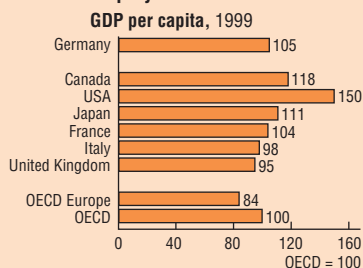
Figure 6.1 Social indicators

**Population and ageing**

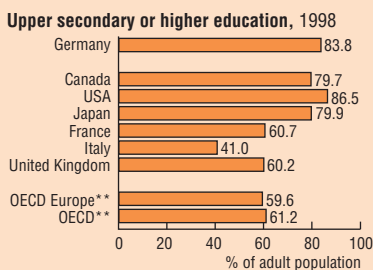
Population change		1991	1998
natural increase	‰	-0.9	-0.8
net migration	‰	9.6	0.6
Foreign population		%	7.4 8.9
Ageing			
over 65/under 15	rates	0.90	1.07

**Settlement and mobility**

Population by type of region		1995
urban (density 366)	%	31.8
intermediate (density 216)	%	62.0
rural (density 99)	%	6.3
Mobility		1991 1998
car ownership	veh./100 inh.	46 51
rail traffic	billion pass.-km	57 63

**Income and employment**

Regional disparities		1991	1997
GDP/inh.	variation coefficient	35	27
Labour force participation		1991	1998
total rate	%	71.6	71.4
female rate	%	61.2	63.1
Unemployment			
total rate	%	5.6	9.3
female rate	%	7.0	10.3

**Health and education**

Educational attainment		1991	1998
upper secondary	%	..	83.8
Life expectancy		1991	1997
at birth:	total	years	75.6 77.3
	female	years	78.7 80.3
at age 60:	total	years	20.1 21.2
	female	years	21.9 23.1

Source: OECD.

*Educational attainment* levels are high: 84% of the population has upper secondary education. *Life expectancy* at birth has risen to an average 77 years; for women, it is over 80 years.

## 2.2 Environmental disparities and health

Following unification, several research projects were initiated to analyse the *human health impacts of environmental degradation*. Studies focused on some of the most polluted “hot spots” in the New Länder (e.g. Bitterfeld, Dessau and Hettstedt in Saxony-Anhalt). In the 1980s, these had high concentrations of polluting activities (e.g. mining, metal processing and the chemical industry).

Comprehensive surveys have analysed links between ambient concentrations of pollutants and the health of school children (Table 6.1). *Highly significant correlations* have been shown between ambient environmental deterioration and several human health indicators (respiratory disease, heavy metal concentrations in blood, urine and milk teeth). People living at polluted and contaminated sites face significantly higher health risks. In the 1990s, economic restructuring and massive investment in environmental protection halted or significantly reduced pollutant emissions; most health indicators showed a clearly improving trend, and exceedance of relevant reference levels has become rare.

Table 6.1 Environment related health indicators at two locations in Saxony-Anhalt<sup>a</sup>

	High pollution location (Hettstedt)		Low pollution location (Zerbst)	
	1992/93	1995/96	1992/93	1995/96
Prevalence (%)				
Bronchitis <sup>b</sup>	61	46	50	38
Pneumonia	23	30	5	6
Allergy <sup>b</sup>	17	25	12	16
Blood test (µg/l) <sup>c</sup>				
Lead	51.8	34.0	40.3	26.9
Cadmium	0.24	0.08	0.29	0.08
Urine test (µg/l) <sup>c</sup>				
Cadmium	0.13	0.11	0.18	0.10

a) School children aged 5-7.

b) School children aged 5-14.

c) Males only.

Source: Ministry of Labour, Women, Health and Social Affairs, Saxony-Anhalt; UBA.

In 1995-96, 70% of blood tests showed *cadmium* concentrations below the measurement limit of 0.1 µg/l; none exceeded the reference level of 0.5 µg/l. In the case of *lead*, however, in Hettstedt 7% of blood tests for children five to seven years old exceeded the reference level of 60 µg/l. No children showed blood lead levels over 100 µg/l (the serious risk level). Concerning *allergies*, the picture is less clear. An increase was observed at both high and low pollution sites.

Based on a sample of 193 statistical areas in eastern and western Berlin, *ambient air concentration* data for four pollutants (NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub>, NMVOCs) were correlated with a social index covering income, education, life expectancy, and demographic and household variables (Table 6.2). This correlation was negative. The distribution was consistently more regressive in eastern than in western Berlin. While income levels in the east are lower than in the west, the distribution of the social index is more uneven in the west. Exposure to these substances was translated into estimated cancer risks. Uneven distribution of ambient air concentration data results in variations in cancer risks for low and high pollution areas: the number of additional cancer cases per 10 000 inhabitants varied from four (in low concentration areas in western Berlin) to 13 (in high concentration areas in eastern Berlin).

Table 6.2 Environmental pollution and social status in Berlin,<sup>a</sup> 1997

	Berlin	Environmental concentration (µg/m <sup>3</sup> )		Difference in		Distribution parameter <sup>b</sup>
		Low	High	Environmental concentration	Social index <sup>c</sup>	
NO <sub>x</sub>	East	36	72	36	-0.31	-114
	West	34	112	79	-1.02	-76
NO <sub>2</sub>	East	24	40	16	-0.35	-44
	West	24	39	15	-0.77	-20
PM <sub>10</sub>	East	210	261	52	-0.25	-204
	West	162	210	48	-0.57	-84
NMVOCs	East	190	308	122	-0.30	-407
	West	87	190	103	-0.84	-124

a) 193 statistical areas.

b) Ratio of difference in µg/m<sup>3</sup> to difference in social index.

c) Covering income, education and household characteristics.

Source: Wuppertal Institute.



### 2.3 Environmental protection and employment

In 1995, the Federal Environment Agency (UBA) commissioned four leading economic research institutes to study the importance of environment related employment. Information was compiled on *employment effects* deriving from: direct employment for immediate environment related tasks; indirect employment triggered by demand for environmental protection equipment; and indirect employment effects of demand for ancillary and operating materials, power, and repair and maintenance services associated with the operation of environmental protection facilities.

The results show that environment related employment in Germany is in the order of 1 million jobs (Table 6.3), almost 3% of *total employment*. Some 508 000 people (53%) were directly involved in such work in 1994. Regional and local public bodies, such as planning, administration and enforcement authorities, employed the greatest part, almost 200 000. Waste management and disposal represent another 100 000. A

Table 6.3 Environmental employment, mid-1990s

	Number (1 000)	%
Direct employment	507.8	53.1
of which:		
Regional/local authorities	193.5	20.2
Waste disposal	72.8	7.6
Waste material wholesale	21.2	2.2
Other services	32.5	3.4
Manufacturing industry	50.0	5.2
Non-profit organisations	9.5	1.0
Job promotion schemes	128.3	13.4
Indirect employment	448.1	46.9
Total environmental employment	955.9	100.0
By sector		
Agriculture and forestry	2.8	0.3
Mining	27.6	2.9
Construction	90.5	9.5
Steel, machinery, vehicles	107.9	11.3
Electronics, fine mechanics	37.7	3.9
Chemical	33.9	3.5
Other manufacturing	133.6	14.0
Services (private)	268.6	28.1
Services (public)	253.3	26.5

Source: UBA.

significant number of jobs (128 000), particularly in the New Länder, were created in the context of job promotion schemes, primarily in regard to environmental clean-up and remediation activities. While they have played an important role in easing adjustment problems in the New Länder, many of these jobs are temporary. An analysis of the training and activities of those directly employed in environmental protection has shown that these positions tend to require above average skills.

Besides directly related jobs, another 448 000 are indirectly related to environmental investment and activities. In regard to the *sectoral mix of environmental employment*, a majority were in the service sector (55%). In industry, environmental jobs were well represented in branches such as mining and chemicals.

*No significant increase* in the number of environmental jobs can be expected. On the contrary, with public and private environmental investment falling, and with the phasing out of employment promotion schemes in the New Länder, a decline should even be anticipated. With the shift towards integrated approaches, employment losses are to be expected in the areas of clean-up and end-of-pipe technologies. The effects of integrated pollution prevention and control on employment cannot easily be measured. However, these innovations are essential to maintain and strengthen overall economic competitiveness.

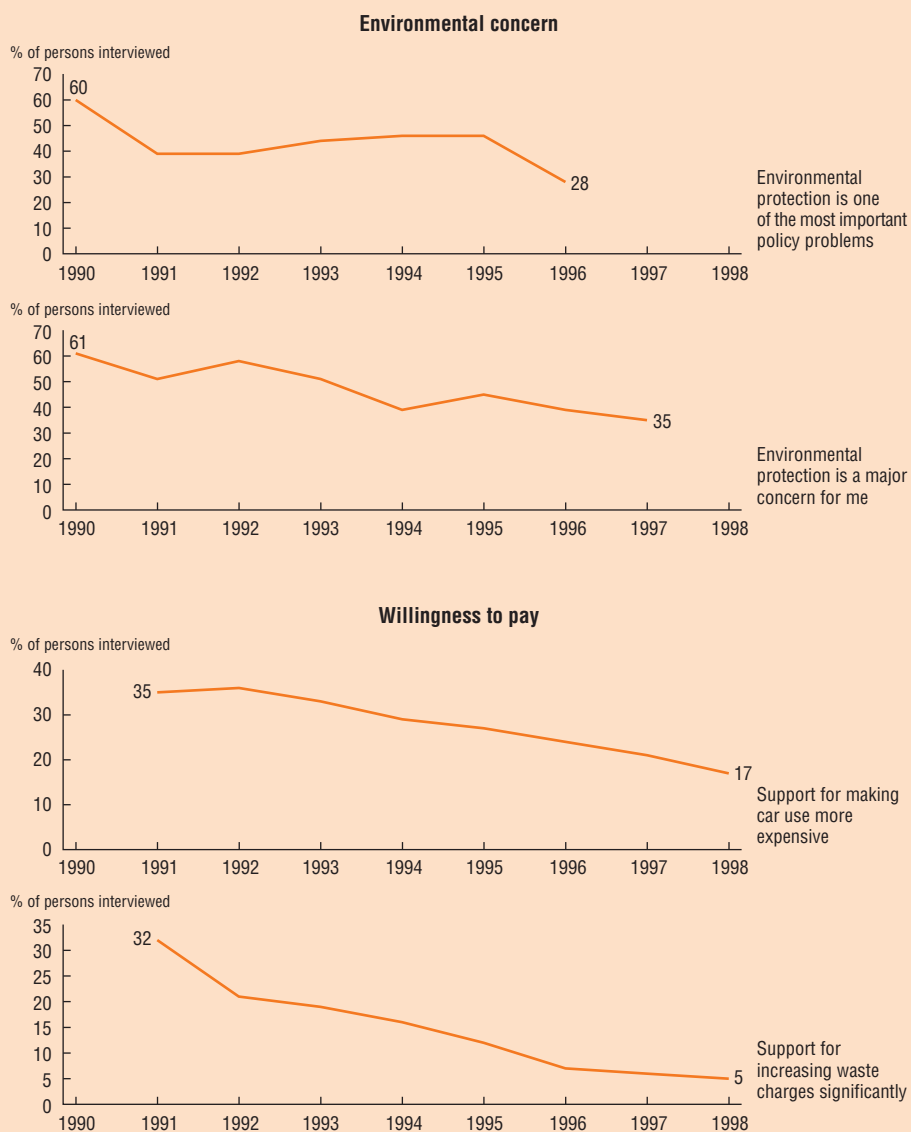
## 2.4 Environmental concerns and willingness to pay

General opinion polls and specific representative surveys concerning environmental awareness and behaviour show that Germans are less concerned about environmental protection than they were in the early 1990s, and that their willingness to pay for environmental protection measures has decreased substantially (Figure 6.2).

Whereas 60% of those interviewed in 1990 considered environmental protection one of the most important policy issues, only 28% felt this way in 1996. The German Socio-Economic Panel (GSOEP) has shown that, although in 1990 61% of the population worried about environmental quality, in 1997 only 35% did so. Compared to *other policy priorities* (e.g. reducing unemployment, preventing crime, strengthening competitiveness, preserving social cohesion), improving environmental protection has lost ground. New surveys indicate, however, that this negative trend has been halted.

In 1991, 31% of those interviewed supported the proposal to make car use more expensive; only 17% did so in 1998. Support for a significant increase in waste charges declined from 32 to 5%. It should be noted that during this period waste charges had increased significantly. The two main reasons for *decreasing environmental concern and willingness to pay* appear to be the deteriorating economic situation and improvements in environmental quality.

Figure 6.2 Environmental awareness, results from opinion polls, 1990-98



Source: EMNID; GSOEP; IPOS; GFM-GETAS.

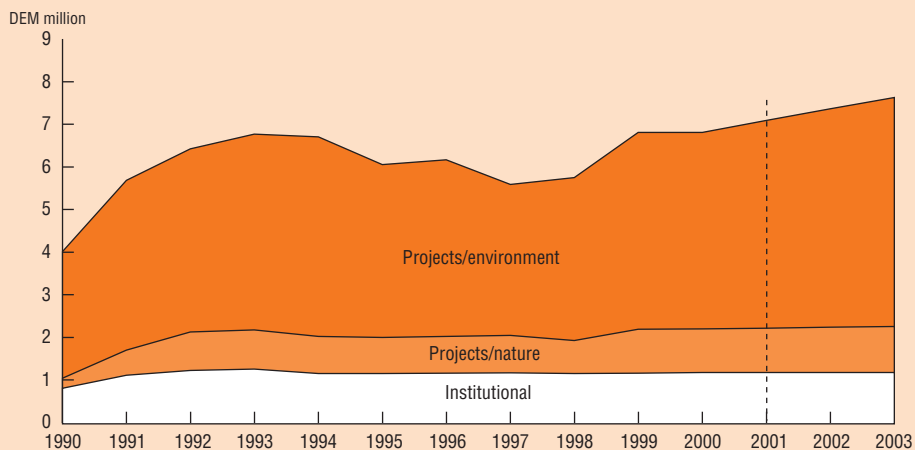
## 2.5 Environmental NGOs

Germany has a number of *strong environmental NGOs*, each with a specific profile (Table 6.4). As the national umbrella organisation for environmental NGOs, the Deutscher Naturschutzring (DNR) claims about 3 million members. The Naturschutzbund Deutschland (NABU), founded in 1899 as a bird protection organisation, is the oldest environmental NGO with today about 260 000 members in local and regional groups. Of its total staff of about 360, around 60 are at national and Länder headquarters, and the rest at regional offices, project sites, and training and information centres. NABU is the German branch of Birdlife International. The Bund für Umwelt und Naturschutz Deutschland (BUND) is the German counterpart of Friends of the Earth. It also has strong local roots and covers a wide and diverse range of topics; staff and funding are similar to those of NABU. The German branch of the World Wide Fund for Nature (Umweltstiftung WWF-Deutschland) is more focused on priority themes and has a strong international orientation. In addition to its traditional involvement in major nature conservation projects, WWF has developed policy related work, e.g. on agriculture and rural development as well as climate change. The Grüne Liga is a network of local initiatives in the New Länder which emerged from the former East German ecological movement. Greenpeace Germany, which focuses on major campaigns, has strong financial support although its local organisation is comparatively weak.

Despite often considerable differences in objectives and strategies, German environmental NGOs co-operate on many environmental policy issues. In the 1990s, most evolved from single-issue, partisan entities to lobbying organisations covering a broader range of activities. They have become important policy partners, often forming *alliances with other organisations* such as consumer groups, churches, development assistance groups, organic farming and other agricultural organisations, trade unions and business associations. German environmental NGOs increasingly act at the European level, through DNR and the European Environmental Bureau (EEB) or their own European offices (e.g. WWF and Birdlife).

The main *sources of funding* for environmental NGOs are membership fees, voluntary contributions and donations. There is also federal support for environmental NGOs. The DNR receives some federal support for its co-ordination efforts as an umbrella organisation, as do other NGOs for certain projects (Figure 6.3). Federal support increased from DEM 4 million to almost DEM 7 million in the early 1990s, but then stagnated. A gradual increase to about DEM 7.5 million in 2003 is foreseen.

Figure 6.3 Federal support environmental NGOs



Source: Bundestag.

Table 6.4 Environmental NGOs, membership and resources

Organisation	Founded in	Members (1 000)		Receipts (DEM million)		Permanent staff <sup>a</sup> (number)	
		1990	2000	1990	2000	1990	2000
Deutscher Naturschutzring (DNR) <sup>b</sup>	1950	..	3 000	..	..	7	10
Naturschutzbund Deutschland (NABU)	1899	139	261	10	29	60	65 (300) <sup>c</sup>
Umweltstiftung World Wide Fund for Nature (WWF) Deutschland	1963	84	230	21	43	70	110
Bund für Umwelt und Naturschutz Deutschland (BUND)	1975	158	367	11	30	41	65 (300) <sup>c</sup>
Greenpeace Deutschland	1980	100	500	65	70	90	150

a) Approx. at national and Länder levels.

b) National umbrella organisation for 95 environmental associations.

c) Approx. at local and regional levels.

Source: SRU; OECD.

# 7

## THE NEW LÄNDER\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- accelerate connection to *sewerage and waste water treatment* facilities, and explore more cost-effective ways of financing, building and operating such facilities;
- continue remediation of *contaminated sites* and abandoned landfills, setting priorities with the use of risk assessment and cost-benefit analysis;
- review land privatisation and land use practices in areas with high natural value, to guarantee effective management of *protected areas*;
- improve *integration of environmental concerns* in policies, plans and programmes for the New Länder, particularly with respect to transport, agriculture and regional development;
- ensure *better monitoring and assessment* of development plans, programmes and projects, and improve data bases for systematic indicator analyses;
- *facilitate participation of environmental NGOs and other stakeholders* in the design, implementation and evaluation of structural policies and other development initiatives;
- launch sustainable development *partnerships at the local and regional level*, using innovative mechanisms for granting support, and encourage networking of these initiatives.

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\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993.

In 1989, a peaceful opposition movement led to the fall of the German Democratic Republic (GDR) and of the Berlin Wall. In the spring of 1990, elections took place and, in October 1990, *five New Länder* acceded to the Federal Republic of Germany, joining the 11 Old Länder (Chapter 5). The New Länder represent 30% of Germany's total area, nearly 20% of its population and some 10% of its GDP. Environmental issues were prominent in political debate at the time of German unification. The opposition movement had strong roots in the East German environmental movement, and *environmental conditions* were recognized as needing to be improved with high priority. Democratic reform, economic restructuring, social progress and environmental improvements were seen as closely interrelated *development challenges*.

## 1. Evaluation of Performance

### 1.1 Environmental management performance

#### *Objectives*

The 1990 *Unification Treaty* specifies that the Federal Government and the Länder are to “protect the natural living conditions of the population in observance of the principle of precautionary action, the polluter-pays principle and the principle of co-operation, and to promote the uniformity of ecological living conditions at a high level, at least equivalent to that reached by the Federal Republic of Germany”. The aim was to close the gap in ecological conditions between the Old and New Länder by the year 2000.

Ecological rehabilitation and development programmes were devised by all three tiers of government (federal, Länder and local), reflecting their areas of competence. In 1990, the Federal Ministry for the Environment (BMU) presented “*Cornerstones of Ecological Rehabilitation and Development in the New Länder*”, which established the strategic context for a wide range of actions, including both mandatory requirements and recommendations: improving and securing *drinking water supply*; creating an early warning system for *smog in cities*; closing plants which present serious *human health risks*; substituting less polluting fuels for high-sulphur content *lignite*; securing and closing down *waste disposal facilities* that present acute risks; and rehabilitating areas with highly *contaminated soil and groundwater*.

#### *Air emissions and concentrations*

Levels of air pollution and of CO<sub>2</sub> emissions in the New Länder have fallen significantly (Table 7.1). After 1990, energy related emissions of CO<sub>2</sub>, *particulates*, SO<sub>x</sub> and NO<sub>x</sub> were cut over 50%, 80%, 80% and 60%, respectively. The main reasons for these sharp reductions were i) industrial decline, economic restructuring and population

loss; ii) improvement of energy efficiency, and a shift in energy mix from lignite to less CO<sub>2</sub>-intensive energy sources; and iii) environmental policies. Almost 75% of total SO<sub>2</sub> emission in the New Länder were from power plants (fired with high sulphur lignite) that lacked effective emission control equipment. Use of lignite briquettes for residential heating further contributed to these emissions. Whereas in 1990 around one-third of the population lived in areas where SO<sub>2</sub> concentrations were above acceptable limits, they are well below 25 µg/m<sup>3</sup> in most areas today. Even in industrialised parts of Saxony, Saxony-Anhalt and Thuringia, SO<sub>2</sub> concentrations are below critical thresholds; in Leipzig, they fell from over 100 µg/m<sup>3</sup> in 1990 to around 10 µg/m<sup>3</sup>.

Table 7.1 Environmental performance in the Old and New Länder: air

			Old Länder		New Länder	
			Absolute figure	Absolute figure	% of Germany	Ratio to Old Länder
<b>Context</b>						
Area	(1 000 km <sup>2</sup> )	1998	249	108	30	
Population	(million inh.)	1998	66.7	15.3	19	
GDP	(DEM billion)	1998	2 889	298	9	
<b>Emissions</b>						
CO <sub>2</sub>	(million t)	1990	709	305	30	
		1995	740	164	18	
SO <sub>2</sub>	(t/inh.)	1990	11	19		1.73
		1995	11	11		0.95
	(1 000 t)	1990	885	4 441	83	
		1996	662	881	57	
NO <sub>x</sub>	(kg/inh.)	1990	14	279		20.21
		1996	10	58		5.81
	(1 000 t)	1990	1 962	678	26	
		1996	1 592	267	14	
	(kg/inh.)	1990	31	43		1.39
		1996	24	17		0.73
<b>Concentrations</b> (annual average in rural areas)						
SO <sub>2</sub>	(µg/m <sup>3</sup> )	1990	5	18		3.60
		1995	3	12		4.00
NO <sub>2</sub>	(µg/m <sup>3</sup> )	1990	8	8		1.00
		1996	7	7		1.00
Particulate matter	(µg/m <sup>3</sup> )	1990	29	31		1.07
		1996	23	25		1.09
O <sub>3</sub>	(µg/m <sup>3</sup> )	1990	66	52		0.79
		1996	70	58		0.83

Source: OECD; UBA; StBA.



Compared with the reductions achieved in western Germany, progress is still needed on CO<sub>2</sub> and SO<sub>2</sub> emissions and on SO<sub>2</sub> concentrations. Convergence (or even better results than in western cities) has been achieved for NO<sub>x</sub> emissions, NO<sub>2</sub> and ozone concentrations. However, traffic growth has caused related CO<sub>2</sub> and NO<sub>x</sub> emissions to increase rapidly, especially in cities. Whereas in the early 1990s transport related pollution was much lower in the New Länder, levels are now approaching those in the Old Länder.

### Water

*Water consumption* in the New Länder has dropped (Table 7.2). Abstraction and public supply per capita have fallen, the latter from 139 l/inh. in 1991 to about 100 l/inh. This is over 25% below consumption levels in the Old Länder.

Table 7.2 Environmental performance in the Old and New Länder: water

			Old Länder	New Länder	
			Absolute figure	Absolute figure	Ratio to Old Länder
<b>Public water supply</b>					
Connection	(% inh.)	1995	99	95	0.96
Leakage	(%)	1995	12	30	2.48
Water consumption	(l/inh.)	1991	145	139	0.96
		1995	138	100	0.72
<b>Sewerage</b>					
Connection	( % inh.)	1991	94	75	0.80
		1997	96	83	0.86
By settlement size					
< 5 000 inh.	(% inh.)		90	57	0.63
> 100 000 inh.			99	90	0.91
By age of sewerage system					
> 50 years	(%)		23	53	2.28
> 75 years			13	29	2.26
<b>Treatment</b>					
Mechanical	(%)	1991	2	24	12.00
		1995	1	18	18.00
Biological	(%)	1991	89	37	0.42
		1995	91	54	0.59

Source: OECD; UBA; StBA.

*Watercourses* in the New Länder were severely polluted. Some tracks were even considered “ecologically dead”. As a result of investment in waste water treatment facilities, *river quality* has generally improved (Chapter 2). Almost 75% of the New Länder’s territory is drained by the Elbe. Following the 1990 agreement creating the International Commission for Protection of the Elbe (IKSE), a large number of municipal sewage treatment plants were established in the Elbe catchment area (more than two-thirds of these in Germany). Consequently, the Elbe’s pollution loads decreased considerably (phosphorous, chloride, cadmium, mercury) (Chapter 9). A similar co-operative agreement to protect the Oder was signed in 1996.

Despite these achievements, continued efforts are needed to meet national and international targets. The Elbe is still much more polluted than the Rhine (Figure 2.1). Equipment in sewerage networks is older and of much lower quality in the New than in the Old Länder; the quality of equipment for waste water treatment (e.g. biological treatment) is also much lower (Table 7.2). Overall, considerable investment is still needed if water related infrastructure in the New Länder is to achieve ambient water quality and water management capacity comparable to that in the Old Länder. Similar investment challenges apply to investments related to municipal landfills (Figure 3.2).

### *Rehabilitation*

Following unification, German environmental policy faced the challenge of rehabilitating in the New Länder: i) some 100 000 suspected contaminated industrial sites (“brownfields”) and old waste dumps; ii) over 1 000 km<sup>2</sup> of abandoned open cast mines; and iii) a great number of military camps and training sites. *Rehabilitation of contaminated sites* to address environmental and health hazards, and restoration of damaged habitats and landscapes, were vigorously launched and funded in the early 1990s. This was an essential precondition for promoting privatisation and investment for economic restructuring and development. Remediation has often required innovative methods and technology, and has generated environmental jobs, in particular during the initial transition phase (Chapter 7, Section 2.1).

### *Biodiversity and nature*

With unification, the Federal Republic inherited *large areas of great importance for nature conservation*. Many had been strictly controlled areas close to the inner German border (“Iron Curtain”), military bases and training facilities, or State-owned hunting areas. Most are significantly larger in size and much less fragmented than protected areas in the Old Länder. These habitats and landscapes are valuable assets not only for biodiversity conservation but also for regional economic development (e.g. tourism and recreation), as long as proper protection and management are ensured.

The share of unfragmented low traffic areas (UVZ) is 42% in the New Länder, compared with 14% in the Old Länder (Table 7.3). In the more rural Länder of Brandenburg and Mecklenburg-West Pomerania it exceeds 50%. The proportion of land covered by *national parks and biosphere reserves* is significantly higher in the New than the Old Länder. National parks cover only 0.4% and biosphere reserves only 1.9% of the Old Länder, compared with 0.7% and 5.6% of the New Länder. The percentage of land area covered by *nature parks* is greater in western than in eastern Germany, but the protection concept is different: the focus is more on recreational amenities and tourist attractions in the west, whereas in the east nature conservation is a prominent objective. *Nature conservation areas* are generally much larger in the east.

*Privatisation of federal land in protected areas* has been a major concern in recent years. Short-term financial gains may be much smaller than long-term ecological losses, to say nothing of the costs if the land were later bought back to support conservation efforts. The Federal Government halted land sales and agreed to hand over 100 000 hectares to nature conservation NGOs. More important than ownership is the issue of how to ensure proper management of protected areas. Appropriate funding mechanisms still need to be found (e.g. in the context of the local financial equalisation scheme).

Table 7.3 **Environmental performance in the Old and New Länder: nature, 1998**

		Old Länder	New Länder	
		Absolute figure	Absolute figure	Ratio to Old Länder
<b>Unfragmented areas</b>	(% land area)	14	42	2.99
<b>Protected areas<sup>a</sup></b>				
National parks <sup>b</sup>	(% land area)	0.4	0.7	1.75
Biosphere reserves <sup>b</sup>	(% land area)	1.9	5.6	2.95
Nature conservation areas	(% land area)	2.3	2.4	1.04
Nature parks	(% land area)	23.3	8.1	0.35
Landscape protection zones	(% land area)	24.9	25.1	1.01
<b>Nature conservation areas</b>				
Average size	(ha)	111	232	2.09
< 5 ha	(%)	11	2	0.17
> 100 ha	(%)	19	38	2.05

a) Many areas have more than one protection status. The figures therefore cannot be added.

b) Not including areas in the North and Baltic Seas.

Source: BfN.

Some local initiatives have succeeded in building on nature conservation assets and taking advantage of *synergies between protection and production*. They protect, promote and profit from natural amenities while attracting tourists and investors, designing new products and developing niche marketing strategies. The full potential of such sustainable development opportunities has not yet been systematically explored and exploited.

### *Summary performance*

Overall, *environmental progress in the New Länder has been impressive*. It ranges from reduced air emissions and concentrations to water and waste infrastructure investment, clean-up of contaminated sites and enhanced nature protection. This progress has translated into a significant change in public perceptions of environmental quality in the New Länder (Chapter 7, Section 2.2). However, ecological conditions are comparable to or better than those in the Old Länder (the explicit goal of the Unification Treaty) only for pollution related to transport and nature protection, areas where the New Länder were already performing better than western Germany in 1990. Concerning “industrial” air pollutants, water infrastructure (water supply, sewerage and waste water treatment) and waste management, there is still a gap in performance (although a progressively smaller one) and *environmental convergence will take much longer* than the ten years initially estimated.

## **1.2 Sustainable development performance**

### *Economic growth and restructuring*

If the New Länder have made good progress towards sustainable development with regard to environmental objectives, economic activity and social cohesion have not yet reached the desired levels (Table 7.4 and Figure 7.1). Following the collapse and restructuring of the former East German economy, *per capita GDP* is still 40% lower than in the Old Länder. Recent years have seen the gap increase. Such decoupling, although probably unavoidable, is not sustainable. Even if future GDP growth in the New Länder were significantly higher than in the Old Länder, it would take at least two more decades to close the gap. Wide disparities in regional productivity are therefore likely to remain.

Wage and income levels are close to 75% of those in the Old Länder. Unit labour costs are significantly higher in the east than in the west, a major obstacle to *job creation*.

Since unification, 80% of the *workforce* in the New Länder have lost their original jobs and over 18% (about 1.4 million people) are currently registered as unemployed, despite massive efforts to address labour market problems through publicly financed schemes promoting employment, training and early retirement.

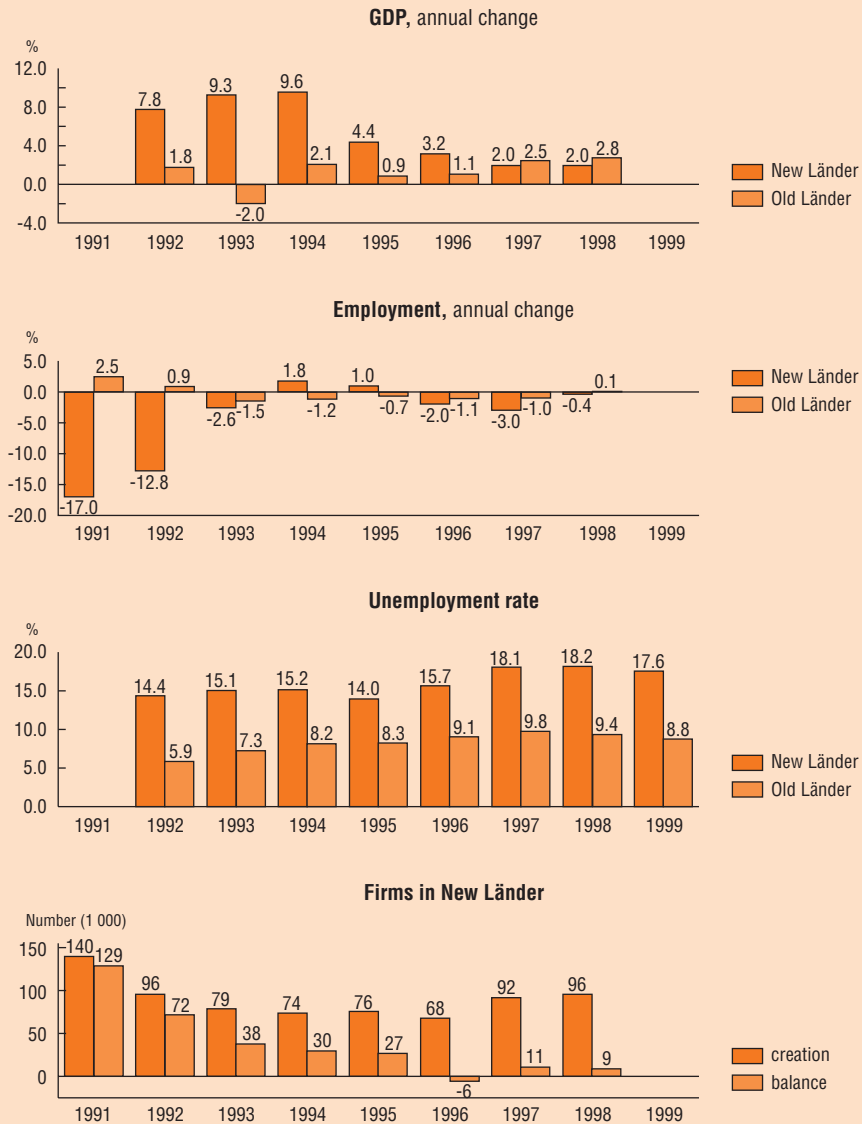
In the New Länder *direct environmental employment* is significantly more important than in the Old Länder (almost 4%, compared to 1%). Yet more than half these jobs in the New Länder have been generated through public employment schemes (e.g. involving rehabilitation of contaminated sites) (Chapter 6).

Table 7.4 **Economic performance in the Old and New Länder**

			Germany	Old Länder	New Länder		
			Absolute figure	Absolute figure	Absolute figure	% of Germany	Ratio to Old Länder
<b>Area</b>	(1 000 km <sup>2</sup> )	1998	357	249	108	30	
<b>Population</b>							
Total	(million)	1991	80.0	64.1	15.9	20	
		1998	82.0	66.7	15.3	19	
Density	(inh./km <sup>2</sup> )	1998	230	268	141	61	0.53
<b>GDP</b>	(DEM billion)	1991	2 854	2 648	206	7	
		1998	3 187	2 889	298	9	
Per capita	(DEM 1 000/inh.)	1991	35.7	41.3	12.9		0.31
		1998	45.8	49.9	28.0		0.56
<b>Disposable income</b>							
Per household	(DEM 1 000/inh.)	1991		33.1	17.8		0.54
		1995		35.7	27.2		0.76
<b>Export</b>							
Industrial export (turnover)	(DEM billion)	1998	753	725	28	4	
<b>Employment</b>	(million)	1989	37.4	27.7	9.7	26	
		1991	36.6	29.2	7.4	20	
		1998	34.0	27.9	6.1	18	
<b>Environmental employment (direct)</b>							
Total	(1 000)	1994	508	284	224	44	
	(% total empl.)	1994	1.5	1.0	3.7		3.65
Without public programmes	(1 000)	1994	380	284	96	25	
	(% total empl.)	1994	1.1	1.0	1.6		1.56
<b>Unemployment</b>							
Unemployed (registered)	(%)	1991	7.8	6.3	14.0		2.22
		1998	11.1	9.4	18.2		1.94

Source: OECD; StBA; BMWI; DBB; IWH; DIW.

Figure 7.1 Economic performance, 1991-99



Source: BMWI, IBA, IFW.

The balance of *firm creation and closure* in the New Länder deteriorated during the 1990s. Net creation gradually fell from 129 000 in 1991 to a negative figure in 1996. The situation improved slightly, with a positive balance of about 10 000 additional firms per year in the late 1990s (Figure 7.1). Attempts to create a specific business cluster of *environmental protection industries* in the New Länder have not succeeded so far. Hopes that eastern German firms could conquer foreign markets, e.g. in central and eastern European countries with similar problems of drastic economic restructuring and related needs for environmental clean-up and rehabilitation, have not been realised. The export ratio for environmental firms in the New Länder is below 8% (compared to 20% for those in the Old Länder). This is probably largely due to structural differences. While almost 60% of environmental employment in the Old Länder has been associated with manufacturing, this has been true of only 15% of that in the New Länder, where environmental jobs relate more to the service sector and are primarily focused on local markets.

### *Agriculture*

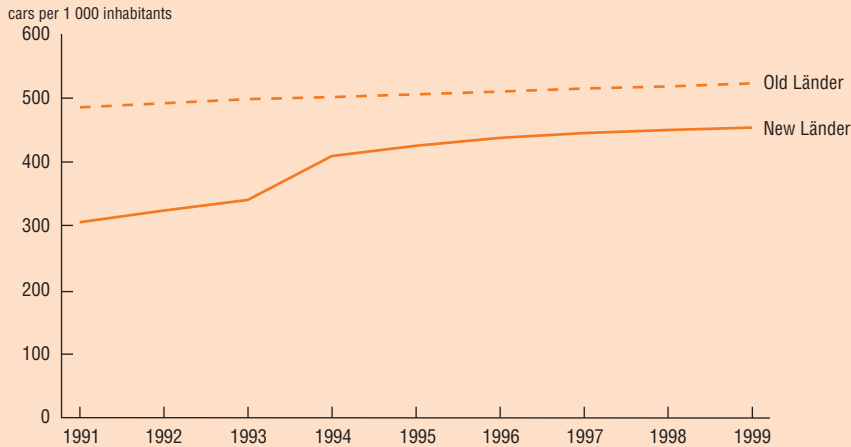
Most dramatic have been the changes in eastern Germany's agriculture. The number of persons employed in agriculture dropped from over 800 000 in 1989 to only 150 000 in 1992. Since alternative rural employment was not available, *massive out-migration*, particularly of young people, left behind not only economic difficulties but also problematic demographic and social structures for future rural development.

The break-up of State-owned collective and co-operative farms led to massive changes in farming patterns. Excessive pollution from a few highly intensive live-stock production units was halted immediately. Overall livestock density fell to less than half the original level. Most new farms embarked on labour extensive and *capital intensive development paths*. New environmental problems could result from excessive specialisation, intensification, soil erosion and drainage. However, it should be noted that the proportion of agricultural land managed by organic farms in Mecklenburg-West Pomerania (6.1%) and in Brandenburg (3.6%) are high compared to Germany's national average of 2.1%.

### *Transport and housing*

While changes in production patterns have generally reduced environmental pollution, changes in *consumption patterns* are creating new environmental pressures. Despite the economic crisis, *car ownership* has increased rapidly in the New Länder, from 31 to 45 per 100 inhabitants. Today the rate of car ownership is only some 15% lower than that in the Old Länder (Figure 7.2), stimulating road infrastructure demand and urban sprawl.

Figure 7.2 Car ownership in Germany, 1991-99



Source: BBR.

*Inner city rehabilitation* has often been delayed by complex planning, high costs and uncertain property rights. Many new shopping centres have been built on greenfield sites at the urban fringe; operated by large supermarket chains, they often hamper revitalisation of inner city cores since small businesses in city centres have difficulty competing.

*Renovation of the housing stock* (insulation, changes in heating equipment and shifts to other energy sources) has contributed significantly to reducing emissions of CO<sub>2</sub>, SO<sub>x</sub> and particulates. Investment in the housing sector (e.g. shifting from coal to oil or natural gas, modernisation of district heating systems) has also contributed to reductions in resource use and pollution. In the 1990s, more than 50% of dwellings in the New Länder were renovated and 600 000 new ones were built.

#### *Structural policies, EU funding and environmental integration*

The EU cohesion policy, financed by EU Structural Funds, has a *catalytic function* with regard to German discussions of ways and means to achieve progress towards sustainable development, particularly in the New Länder. The financial



weight of the Structural Funds may appear small compared to the overall amounts of funds transferred (Chapter 7, Section 2.3). However, they are of considerable importance in assessing *progress towards integration* of economic, social and environmental concerns in an overall development strategy.

Sustainable development and environmental integration are explicit objectives of EU policy. Member States must comply with commonly agreed rules for planning, programming, implementation, monitoring and evaluation, with substantial emphasis given to environmental opportunities and impacts. Germany has a *particular responsibility* for complying with the rules and standards established. It is not only the largest net contributor to the EU budget, but also the second largest recipient of Structural Fund support (together with Italy and behind Spain).

Despite progress achieved from the first (1991-93) to the third (2000-06) programming period for Structural Fund interventions, *environmental integration is still far from satisfactory*. Integration failures have been highlighted by environmental NGOs, scientific evaluations and the European Commission. Although primary responsibility for structural policies lies with the Länder, the regional development policy for the New Länder is characterised by a rather uniform, highly standardised top-down approach.

Co-funding of EU contributions is mostly provided by the so-called “*Common Task*” schemes, jointly financed by the federal budget and the Länder. Support is mainly targeted at individual projects that meet rather restrictive criteria: public infrastructure investment must be *closely related to business needs*, and private investment can only be supported if the activity promises to strengthen the regional export base. In practice, a large share of infrastructure investment has supported the creation of *new industrial sites*, about two-thirds in greenfield areas. Under the Common Task schemes, environmental infrastructure can only be financed if primarily devoted to business activities. This has created a built-in incentive to plan for overcapacity. To cope with municipal waste water problems, municipalities have been tempted to oversize treatment plants as well as connecting industrial sites for “potential” business acquisitions, so that projected treatment of municipal waste water would not exceed 50% of plant capacity. Costly *overcapacities* and high charges for environmental services result.

In the early stages of the unification process, standardised top-down programmes may have been an appropriate option to cope with development challenges in the New Länder. However, conditions there are no longer uniform. Development support should be more flexible, and should be targeted at specific local needs and regional priorities. Instead of primarily funding additional industrial sites, *infrastructure support should be further extended* to facilities and networks for training, research and development, or marketing. The range of options for supporting private sector

initiatives should also be broadened: investments that are part of an integrated concept and focus on better resource efficiency and environmental quality should be eligible for higher subsidy rates. Germany should also explore the benefits of *new and more flexible funding mechanisms* that provide local actors with greater latitude in setting priorities and financing projects and processes that best address the missing elements that could trigger integrated development processes.

Instead, a *massive shift in the emphasis of Germany's Structural Fund interventions* has been decided for the New Länder: away from private investment support and towards large-scale investment in *transport infrastructure*. Although transport conditions in the New Länder must be improved, particularly with regard to intra- and inter-regional connections, such investment is not likely to foster sustainable development initiatives. It should be based on strategic assessment of priorities related to establishing a sustainable transport system for the New Länder that considers the whole range of options and modal splits. This is especially important in light of the EU's anticipated eastern enlargement and the increase in vehicular traffic that is likely to result. The Federal Government recognises that its existing transport plan is no longer an appropriate basis for decision-making, and that a new transport concept is needed before further massive investment is undertaken.

## 2. Focus on Selected Topics

### 2.1 Rehabilitation of contaminated sites

The most important industrial *hot spots for soil and groundwater contamination* are at the sites of the chemicals industry and lignite mining/exploitation in the Leipzig/Bitterfeld/Halle/Merseburg region; copper mining and metallurgy in the Mansfelder area; lignite mining in the Niederlausitz region; and ship-building on the Mecklenburg-West Pomerania coast.

#### *Industrial brownfield sites*

To accelerate economic restructuring, clauses providing *exemption from liability* for residual pollution had already been adopted in 1990. This was intended to facilitate acquisition of formerly State-owned land and other property by private investors: under certain conditions, owners and purchasers could be exempted from liability for consequences of damage caused prior to 1 July 1990.

Responsibility for identification, evaluation and abatement of residual pollution – and hence also for implementing the exemption clause – lies with the Länder. However, in view of the scale of the problem, the New Länder called on the Federal

Government to bear some of the costs associated with rehabilitating sites where there is residual pollution. It was agreed that the Federal Government would provide *technical and financial support* for dealing with residual pollution in the New Länder, provided former State-owned land and installations were affected.

Rehabilitation costs are shared between the Federal Government and the Länder on a 60-40 basis for so-called “regular projects” and a 75-25 basis for “major projects”. In close collaboration between the Federal Government and the Länder, 23 *major projects* have been designated based on the following criteria: ecological risk potential; extent of anticipated remediation expenditure; area in need of rehabilitation; disproportionate burden on the Land, compared to other Länder; and anticipated workforce required. Total agreed funding is DEM 24 billion, of which DEM 17 billion is covered by the Federal Government. The federal contribution consists of DEM 10.5 billion for regular projects and DEM 6.5 billion for major ones. Initially planned to terminate in 2001, this funding mechanism has been extended beyond 2001.

### *Open cast lignite mines*

Lignite was the most important primary energy source in the former GDR. Since 1990, 39 mines have been closed; eight are still operating. The number of jobs dropped from 140 000 to fewer than 12 000. Large-scale lignite mining has been particularly environmentally destructive. Some 120 000 *hectares* was occupied by lignite mining operations. Mining has radically affected groundwater systems over an area of 200 000 hectares. Lowering the water table resulted in a sub-surface water deficit of over 13 billion cubic metres.

One of the most important rehabilitation tasks is *stabilisation of pit slopes*. About 50% of a total of approximately 1 000 km of slopes was stabilised by the end of the 1990s. Over 1 000 hectares was reconverted to agricultural land or afforested. Rehabilitation work will continue well beyond the year 2000. Today about 40 000 hectares requires substantial remediation. In about 160 former pits, 750 industrial waste deposits seriously endanger *groundwater*, particularly since water tables will rise once lignite mining and associated pumping of water cease. The main focus of future rehabilitation activities will be groundwater decontamination and raising the water table. Filling residual holes will create an additional water surface of 250 km<sup>2</sup>; some of the *new lakes* will be among the largest in Germany, providing opportunities for tourism and leisure activities in regions that previously had no access to lakes.

Lignite mine rehabilitation is also being financed on the basis of an *administrative agreement* between the Federal Government and the Länder. In the period 1993-97, DEM 7.1 billion was made available for rehabilitation projects, supplemented by

approximately DEM 1 billion from the Federal Employment Agency. Between 1998 and 2002, the Federal Government and the four lignite-mining Länder (Brandenburg, Saxony, Saxony-Anhalt and Thuringia) agreed to contribute DEM 6 billion. It is expected that an additional DEM 200 million per year will be spent on exceptionally labour-intensive measures.

### *Other sites*

Military activities of the former GDR's army and the Soviet Western Group of Forces, which took place on 5-10% of the New Länder's total land area, also caused environmental damage. According to preliminary evaluations, some *34 000 potentially contaminated military sites* have been identified, including former fuel storage facilities, military airports, and training and shooting grounds. On land used by the former Soviet army, around 3 million tonnes of waste (e.g. slag, construction waste, metal waste) has been found. Guidance for the systematic investigation of military waste sites has been prepared. It addresses problems of abandoned military waste and sets out a uniform approach to the rehabilitation process. A comprehensive country-wide evaluation programme is being carried out to identify former military areas which could be converted to other purposes (e.g. recreation, nature conservation and landscape rehabilitation).

Probably the most challenging and costly rehabilitation project in the New Länder concerns the former *Wismut uranium ore mines* in Saxony and Thuringia, which were exploited for the Soviet atomic programme. This large project, being executed under the responsibility of the Federal Ministry of Economy and Technology (BMWi), is expected to cost DEM 13 billion. By the end of 1999, DEM 6.2 billion had been spent. Rehabilitation work is planned to be completed by 2015.

## **2.2 Environmental perceptions, information and participation**

The improvement in environmental conditions in the New Länder is reflected in a significant change in the *public's perception of their environmental quality*. In 1991, only 4% of the New Länder's population considered environmental conditions where they lived as good or excellent; 49% of the population of the Old Länder responded positively to the same question. By 1996, respondents were generally equally satisfied with environmental conditions: 51% in the New Länder and 52% in the Old Länder. Perceptions of conditions existing in the other part of the country had also changed. While eastern Germans had become more knowledgeable about the quality of the environment in the Old Länder, however, western Germans did not fully realise the extent of the environmental progress achieved in the New Länder.

*Lack of relevant data* is a major obstacle to better integration of environmental concerns in development activities undertaken in the New Länder. This problem is repeatedly criticised by NGOs, academic institutes and the European Commission, particularly in the context of structural development policies for the New Länder. There is a lack of territorially disaggregated statistics on i) environmental assets, conditions and trends, ii) economic and social pressures, and iii) policy responses. For many issues, the most recent figures concerning the New Länder date to 1995. Individual Länder have begun working on data and *indicators for state of the environment reporting*, but there is scope for better co-ordination with regard to concepts and methods.

*Access to information* is needed to ensure horizontal integration and public participation. Democratic rights and participation opportunities have fundamentally improved, but considerable progress could still be made in using them. Within public administration, *horizontal co-operation and co-ordination* need to be improved. In some New Länder, environmental administrations were responsible for implementing the environmental portion of development programmes, yet they have often not been in a position to influence the design and implementation of other environmentally sensitive investment decisions. Environmental NGOs tend to lack the human and financial resources to monitor policy effectively. Some progress has been achieved: with support from the EU and the Federal Government, NGOs have become more active with regard to Structural Fund policies. While their input during the first programming phase and the preparation of the second was sporadic, they are now formally represented in monitoring committees in all the New Länder and can contribute to discussions on future priorities and measures.

At the strategic macro and structural policy level, it is still difficult to demonstrate progress with tangible results. However, *partnerships for sustainable development* have become much more visible at the local and regional level, where institutional structures and procedures are new and more open to innovative approaches and perceptions of development challenges are less polarised. Environmentalists generally recognise the need to improve economic and social conditions, while business representatives are increasingly aware that environmental quality and natural amenities are assets for regional development and marketing. In several cases, environmental NGOs have taken the lead in launching economic development initiatives at the local level. With the support of *EU community initiatives* (e.g. LEADER, URBAN and INTERREG) or *federal schemes* for innovative pilot regions (e.g. Inno-Regio, Zukunftregionen, EXPO-Regionen), networks of development partnerships have been created. Most explicitly address the need for sustainable development through integrating economic, social and environmental concerns. Such partnerships typically bring together local representatives of the business community, environmental NGOs, and local administrations and other local actors to develop

marketing of local products and tourism in sensitive areas. These partnerships are often organised around projects for village and town rehabilitation, nature conservation, transport management, energy saving or waste recycling.

### 2.3 Transfers to the New Länder and investment priorities

*Massive transfers* are closing the gap between regional productivity and income in the New and Old Länder. Annual net transfers are in the order of 30% of the New Länder's GDP (Table 7.5). The sources of gross transfers have been the Federal Government (74%), the Old Länder (6%), the EU (4%) and the social security system (16%, primarily in the form of unemployment assistance and pensions).

Table 7.5 Public transfers to the New Länder

		1991	1998	1991-98	%
<b>Public transfers</b>	(DEM billion)				
Gross transfers		139	189	1 370	100
Revenues		33	48	339	25
Net balance		106	141	1 031	75
<b>Gross transfers by source</b>	(DEM billion)				
Federal Government <sup>a</sup>		106	139	1 009	74
Old Länder		5	11	77	6
EU		4	7	48	4
Social security		24	32	236	16
<b>Gross transfers by type</b>	(DEM billion)				
Social		56	84	603	44
Subsidies		8	16	109	8
Investment		22	33	229	17
Other		53	56	429	31
<b>Net transfer to GDP</b>		0.51	0.33		
<b>Total infrastructure investment<sup>b</sup></b>	(DEM million)	18 645	15 702	146 339	100
<i>of which:</i>					
Water supply		1 582	1 406	10 460	7
Waste water		908	1 123	11 728	8
Other pollution abatement		155	173	1 551	1
Transport		9 300	9 800	74 800	51
Telecommunications		6 700	3 200	47 800	33

a) Including German Unification Fund.

b) As financed by all levels: EU, federal, Länder, municipal; 1997, instead of 1998.

Source: DBB; IfW.

Less than 25% of total transfers during the 1990s went towards public *investment and subsidies* to stimulate private business initiatives. Transport infrastructure received half of all infrastructure investment; telecommunications received one-third (Table 7.5). The remaining 16% was almost exclusively devoted to water supply and waste water infrastructure. There were no significant shifts in the shares of water supply and waste water investment during the 1990s.

Table 7.6 **Public expenditure on structural policies in the New Länder,<sup>a</sup> annual average**

		Total		National funding <sup>c</sup>	EU Structural Funds	
		EUR million <sup>b</sup>	%		National	EU
<b>Total expenditure 1994-99</b>	EUR million	31 548		27 811	1 758	1 979
	% expenditure		100	88	6	6
					(%)	
<i>of which:</i>						
Environmental infrastructure <sup>d</sup>		1 644	5.2	5.0	7.3	6.8
Transport		6 282	19.9	22.6	0.0	0.0
Human resources		14 762	46.8	48.3	31.8	39.5
Industry and services		3 719	11.8	8.4	42.5	31.6
Agriculture and rural development		1 372	4.4	2.2	18.5	22.0
Others		3 769	11.9	13.6	0.0	0.0
<b>Total expenditure 2000-06</b>	EUR million	30 108		25 207	2 171	2 731
	% expenditure		100	84	7	9
<b>Changes 1994-99</b>	1994-99 = 100		95.4	90.6	123.5	138.0
	EUR million	-1 440		-2 604	+413	+752
					Change (% points)	
<i>of which:</i>						
Environment infrastructure <sup>d</sup>		-444	-1	-2	-2	1
Transport		-793	-2	-4	16	17
Human Resources		717	5	6	11	-3
Industry and Services		-1 542	-5	-3	-24	-16
Agriculture and Rural development		32	0	0	-7	-4
Others		590	3	3	6	5

a) EU Objective 1 Regions.

b) EUR of 1999.

c) Above and beyond expenditure in the context of EU Structural Funds.

d) Including energy.

Source: BMWI.

In the period 1994-99, total annual expenditure on overall *structural development policies* in the New Länder was in the order of EUR 32 billion. Around 12% of this amount was financed in the context of the EU cohesion policy. The annual contribution of EU Structural Funds was in the order of EUR 2 billion (Table 7.6). Out of the Structural Funds, 7% was devoted to environmental infrastructure (including water supply), 33% to supporting private investment in industry and services, 20% to improving agricultural structures and stimulating rural development, and 40% to measures related to human resource development and the labour market.

In the new programming period (2000-06) *Germany's Structural Funds budget* will increase by around 30%. Germany plans a shift in priorities from investment aid to industry and services (from 37 to 17% of total investment), while increasing the share devoted to transport infrastructure (from 0 to 17%). This shift appears particularly problematic, as it is recognized that the existing federal transport plan no longer provides a valid basis for priority setting.



Part III

**INTERNATIONAL COMMITMENTS**

# 8

## INTERNATIONAL CO-OPERATION\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- develop internal procedures further in order to speed up *implementation of EU Directives* requiring action by the Länder;
- further address international environmental issues related to the *agricultural sector*, such as releases of nitrates to rivers and ammonia to air;
- implement action plans to cope with *flooding in international river basins*;
- continue international environmental co-operation with *central and eastern European countries*, with a view to facilitating early accession of EU candidate countries;
- increase the level of *official development aid*, particularly so as to facilitate the solution of global environmental problems.

### 1. Evaluation of Performance

*Most environmental issues in Germany have an international dimension through EU legislation, through bilateral or multilateral agreements, or simply because of its geographical location. Germany is a party to most global and regional environmental conventions or protocols. Very few environmental agreements are awaiting German ratification.*

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\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993.

Germany's policy on international co-operation concerning the environment has evolved *from addressing pollution issues, mainly in Europe, to promoting sustainable development in a global context*. Environmental and sustainable development issues are now considered by Germany to be closely associated. Harmonisation of German and European environmental policies has progressed markedly, while increasing emphasis is being given to co-operation with central and eastern European countries.

### 1.1 Germany as an EU partner

Germany, the *main net contributor to the EU budget*, is very active in developing EU environmental legislation. The success of German environmental policies has inspired some EU policies. Like all EU countries, Germany has found it difficult to implement certain Directives. It experiences delays due to its federal structure and the exclusive competencies of the Länder in certain areas. To alleviate these problems, a mechanism has been established to alert the Cabinet and Bundestag when deadlines for the implementation of Directives are approaching. Difficulties have been encountered in implementing the EIA, IPPC and Habitat Directives, as well as those on access to information and urban waste water. Progress in all these areas is likely to take place. However, it remains to be seen whether *further streamlining of Germany's internal operational rules and practices might be useful* to overcome legal or practical obstacles and bureaucratic delays in relation to implementation of EU environmental Directives at the federal and Länder levels.

Concerning agriculture and transport pollution policies, which are dependent on decisions at EU level, there appears to be a need to *develop an EU wide policy* that would enable all Member States to meet their commitments on *nitrates, ammonia and GHG emissions*.

### 1.2 Bilateral co-operation

*Bilateral co-operation* on environmental issues with Germany's *nine neighbouring countries* was very successful during the 1990s. Special mention should be made of the adoption and implementation of environmental agreements addressing transfrontier water pollution (the Oder and Elbe) and air pollution (the Black Triangle Area) (Chapter 8, Section 2.1).

*Technical as well as financial assistance has been provided* to help reduce emissions in some neighbouring countries. Economic contractions, as well as strong action, in the New Länder have contributed to considerable reductions of emissions to water and air. Nevertheless, all transfrontier problems are not yet resolved. Additional investment in pollution control in neighbouring countries is still required in order to meet the environmental objectives of relevant international agreements.

Germany has provided support to EU “*twinning projects*” that assist countries in meeting the environmental conditions for accession. During 1999, it provided six long-term advisors (to Bulgaria, the Czech Republic, Hungary, Poland and Slovakia) and about 50 short-term experts. These experts will contribute to institution building and incorporation of EU environmental law “*acquis*” in the national legislation of candidate countries prior to accession.

*Bilateral environmental co-operation with non-neighbouring European countries* (Albania, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Romania, Russia, Slovakia and Ukraine) has increased. In particular, Germany has furnished considerable environmental assistance to Russia. Environmental co-operation in Central and Eastern Europe is declining, however, both because of progress made in the economies in transition and because of the difficult economic and political conditions in some of the New Independent States. Bilateral environmental co-operation with 11 non-European countries has begun.

### 1.3 Regional co-operation

#### *Protection of the Alps*

Germany took numerous initiatives during the 1990s to *protect sensitive Alpine ecosystems*. The 1991 Convention concerning the Protection of the Alps came into force in 1995. Germany has signed protocols concerning mountain agriculture, regional planning, nature protection, mountain forests, tourism, energy and soil protection; a protocol on traffic was recently finalised. No permanent secretariat has yet been established, and the procedure for settling disputes is still being negotiated.

#### *Air pollution*

The high rates of acid deposition in parts of Germany, including the New Länder, in 1990 had fallen by the end of the decade. Dying forests are no longer a major concern with regard to environmental policies. Germany’s success in *reducing air pollution* is due partly to economic and industrial collapse in the New Länder during transition to a market economy, and partly to replacement of old polluting plants by more modern ones with gas desulphurisation and other pollution control technologies.

Reduced air pollution is also the result of progress in other countries. Trans-frontier pollution contributes much of total acid deposition. Some 56% of SO<sub>2</sub> and 51% of NO<sub>x</sub> deposited come from outside Germany. Implementation of the Geneva Convention and its protocols by other countries has had significant effects within Germany. At the same time, the very large reduction of German emissions has had positive effects, especially in Scandinavia and the central and eastern European

countries, as over 70% of the SO<sub>2</sub> and NO<sub>x</sub> emitted in Germany is exported. *All objectives concerning SO<sub>2</sub>, NO<sub>x</sub> and VOCs emissions established by international agreements have been rapidly met and even exceeded by Germany (Table 8.1).* It has signed the Gothenburg Protocol, which further strengthens these objectives.

### *International rivers and land-based pollution of the seas*

During the 1990s, Germany succeeded in considerably reducing pollution of its *main rivers* (Chapter 8, Sections 2.1 and 2.2) by traditional pollutants, in particular phosphate and persistent organic pollutants. *Agreed international reduction targets (50% or 70%) were generally exceeded.* Consequently, biological diversity has increased considerably.

Significant progress has been made in reducing municipal and industrial effluents in the *Elbe basin*, where 177 major sewage plants have been built or extended since 1990 to treat waste water from 20 million inhabitants (DEM 7.8 billion). The

**Table 8.1 Air protection: Germany's international commitments**

	Agreement	Commitments		Results	
		Target period	Target reduction (%)	Observed period	Observed reduction (%)
Sulphur dioxide (SO <sub>2</sub> )	Helsinki Pr. (1985)	1980-93	30	1980-93	61
	Oslo Pr. (1994)	1980-2000	83	1980-98	83
	Gothenburg Pr. (1999)	1990-2010	90	1990-98	76
Nitrogen oxides (NO <sub>x</sub> )	Sofia Protocol (1988)	1987-94	0	1987-94	39
	Sofia Declaration (1988)	1987-98	30	1987-98	46
	Gothenburg Pr. (1999)	1990-2010	60	1990-98	34
Non-methane volatile organic compounds (NMVOCs)	Geneva Pr. (1991)	1988-99	30	1988-98	48
	Gothenburg Pr. (1999)	1990-2010	69	1990-98	47
Ammonia (NH <sub>3</sub> )	Gothenburg Pr. (1999)	1990-2010	28	1990-98	18
CO <sub>2</sub>	National goal (1995)	1990-2005	25	1990-98	18
GHG <sup>a</sup>	Kyoto goal <sup>b</sup> (1997)	1990-2008/12	21	1990-98	13

a) CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFC, PFC, SF<sub>6</sub>.

b) EU burden sharing.

Source: OECD.

chemical and cellulose industries have reduced pollution loads in the Elbe by 96% for mercury, 94% for nitrogen and 93% for organic pollution (COD). The number of vertebrate species in the Elbe increased from 52 in 1989 to 83 in 1998.

Concerning *nitrates*, however, progress has been uneven and inadequate. While *nitrate loading* of the Danube, Rhine and Weser has decreased, that of the Elbe has increased (Table 8.3 and Figure 2.1). The international target set for the North Sea and Baltic Sea (50% nitrate reduction between 1985 or 1987 and 1995) was not met (Chapter 8, Sections 2.2 and 2.3). As other countries also failed to meet this target, greater efforts are being made to address the problem of nitrates in an international context. German industry and municipalities did their part of the job, but much remains to be done, in particular by the agricultural sector.

While German progress in reducing *Baltic Sea* pollution has been significant, its pollution by economies in transition has on the whole been increasing. BOD and phosphorous releases declined between 1991 and 1997, but the total amount of untreated or partially treated waste water released increased by 35%; total release of nitrates also increased.

## 1.4 Global co-operation

### *Ozone depleting substances*

Germany is implementing the Montreal Protocol and its amendments through a series of EU regulations and national measures. *Production and consumption of CFCs and halons in Germany ceased* at the end of 1993 or of 1994, as agreed within the EU. While HCFC production and use increased from 511 tonnes in 1989 to 805 tonnes in 1997, production of equipment using HCFCs (R22) ceased in 1999 and R22 consumption will gradually be reduced. Germany favours use of natural refrigerants.

Steps have been taken to *collect existing CFCs* from old refrigerators, which were banned for export as of July 2000. Collection and decommissioning of old refrigerators and destruction of existing CFCs is carried out, although a significant fraction of CFCs in existing equipment is not recuperated. Thus, Germany has contributed its fair share to the Montreal Protocol. Worldwide production of CFCs had been reduced at the end of 1999 by over 80%, compared with 1988.

### *Follow-up to Rio*

Germany has given considerable support to *implementation of the Framework Convention on Climate Change* (UNFCCC), whose secretariat is located in Bonn (Chapter 7). It played a significant role in negotiating the *Convention on Biological Diversity*. Germany established a Clearing House Mechanism (CHM) to promote

technical and scientific co-operation between contracting parties. It supports 12% of the Global Environmental Facility (GEF) (USD 2.75 billion), which awarded some USD 450 million in biodiversity funding from 1995 to 1997.

Consistent with the Rio Declaration, Germany has adopted a far-reaching federal law on *environmental liability*. Rarely used so far, it served as a model in the development of the Lugano Convention on civil liability for damage resulting from activities dangerous to the environment. Germany's position on a EU-wide liability instrument is under discussion.

*Local Agenda 21s* have been developed by 10% of local governments, including in large towns. The Länder support and strengthen the Local Agenda 21 process. This process generates more support locally for changes in consumption patterns concerning transport, urban development and tourism. Sustainable development was the theme of the 2000 Hannover World Exhibition.

Neither the very considerable support given by Germany in the follow-up to the Rio Conference, nor its participation in UNCSD, have led to the preparation of a *national sustainable development strategy* with targets, deadlines and contributions from all stakeholders. The 1997 Government report "Towards Sustainable Development in Germany" has not yet been transformed into an operational set of precise objectives for all economic sectors. Creation of the German Committee on Sustainable Development, some eight years after Rio, is a positive step. However, much remains to be done before a strategy is adopted integrating environmental and other concerns, notably those of the Ministries of Economy, Transport, Agriculture and Finance.

### 1.5 Trade and environment

In recent years, Germany has proposed that environmental protection targets be given greater consideration with regard to *international trade and investment* issues. It has taken numerous initiatives to integrate ecological standards in the trade system. Of particular significance are multilateral environmental agreements, eco-labelling, integration of the precautionary principle in WTO regulations, and the role of foreign direct investment in sustainable development. Thanks to the German initiative, the G8 meeting of environment ministers (Schwerin, 1999) explicitly called for environmental aspects to be integrated in WTO regulations. While the stage for trade and environment discussions has been prepared, progress towards concrete results is still needed.

Germany is a large *exporter of environmental technology, chemical products, equipment for hazardous plants and hazardous waste*. It exports roughly twice the amount of hazardous waste it imports, mostly for recycling (Table 3.5 and Figure 3.3). In 1996, Germany supplied 17.5% of the world market for environmental

technology. It will soon ratify the PIC Convention (Rotterdam, 1998) and prohibit the export of equipment which can be used for chemical warfare. A German company which had exported problematic equipment to Libya was expelled from the Federation of Chemical Industries (VCI).

The *Export Credit Agency* has created an interministerial working group to review the political suitability of proposed exports from Germany (30 000 export proposals per year). A few nuclear projects were recently supported, although they were opposed by some members of the Government. The Ministry for the Environment does not participate in this review. Proposals are being made to request an EIA for certain projects likely to damage the environment, and to prohibit granting of export credits to certain projects because of their potential environmental effects.

## 1.6 Aid

During the 1990s, *Germany decreased official development aid* and increased aid to central and eastern European countries. At the same time, it allocated considerable funds to facilitate the economic transition of the New Länder. This internal transfer was about seven times greater than the total external transfer for development.

In 1992, a decision to increase international assistance from 0.4% to 0.7% of GNP as soon as possible was announced; however, it was only 0.26% in 1999 (Figure 8.1). There is no clear indication when the expected increase might begin. Germany is nonetheless the main donor to central and eastern European countries and provides significant foreign direct investment. In absolute terms, *German aid is considerable and ranks fourth* among OECD countries. A large fraction (nearly 30% of ODA) is for resource management and environmental protection (Chapter 8, Section 2.4).

## 2. Focus on Selected Topics

### 2.1 Co-operation with Poland and the Czech Republic

Germany co-operates with *Poland and the Czech Republic* on common border issues and transfrontier pollution, with all central and eastern European countries which are candidates for EU accession, and with other countries in transition.

#### *Poland*

Co-operation with Poland, based on agreements adopted in 1991 and 1994, is implemented by a commission for co-operation on environmental protection and by a boundary water commission. The *main issues for co-operation* are management of



the Oder (pollution and flood protection), construction of joint sewage treatment plants at Swinemünde and Gubin, development of transboundary EIAs, transboundary accidents, exchange of information, consultation and mutual assistance, effects of chemical plants, and creation of an International Park in the Lower Oder Valley.

The *Oder basin* lies mostly in Poland (90%), but also in the Czech Republic (6%) and Germany (4%). In 1996, an *international agreement to protect the Oder* from pollution was signed by Germany, Poland, the Czech Republic and the EU Commission. The Oder Commission adopted an Action Plan for 1997-2002 calling for construction of 138 waste water treatment plants, of which seven are in Germany.

### *Czech Republic*

Environmental co-operation with the Czech Republic is based on agreements adopted in 1995 and 1996. The main issues are protection of the Elbe, transnational nature parks, open cast mines, the safety of chemical plants, and conversion of power stations to gas. Germany signed two agreements (1990 and 1995) concerned with *improving the quality of the Elbe* and setting up an International Commission. It also provided funds to the Czech Republic to build waste water treatment plants, co-generation units and fluidised bed combustion units. The objectives of the first action programme (1992 to 1995) were met (30% reduction of many types of pollutant releases between 1989 and 1995) and a second programme was launched. Although its pollution level decreased considerably during the 1990s, as a result of economic changes and measures taken in the Czech Republic and the New Länder, *the Elbe is still much more polluted than the Rhine*.

### *Black Triangle*

During the 1980s, damage to health and to forests by air pollution in the Black Triangle area, near Germany's border with Poland and the Czech Republic, was very severe due to *combustion of large amounts of lignite* in the three countries and lack of pollution control measures. Following German reunification and political changes in Poland and the Czech Republic, international environmental co-operation was initiated with regard to air pollution measurement and control. An international air pollution measurement network with 43 stations was established in 1998. Environment ministers agreed to take immediate steps to control air pollution using flue gas desulphurisation units or fluidised bed combustion. *Obsolete lignite fired power plants would be shut down*. As this 1991 agreement was not fully implemented, further efforts are needed. The EU has supported these activities with funds under its PHARE programme, but this funding is now being discontinued. Through measures already taken, a very significant reduction of air pollution has been achieved (85% for SO<sub>2</sub> and 50% for NO<sub>x</sub> between 1990 and 1998). Over DEM 5 billion was spent in Saxony, but the air is there still polluted.

## 2.2 Protection of the Rhine

During the 1990s, efforts to protect the Rhine made considerable progress as a result of measures taken in all riparian countries. A *new Convention* on the Protection of the Rhine was adopted in Bern in April 1999, replacing the 1963 Convention. It sets out long-term objectives for protecting the river and its ecosystems and for flood protection. The main lines of a programme on sustainable development, adopted in 1998, should soon lead to a New Action Programme. The new objectives are: i) to improve water quality; ii) to implement the action plan concerning flooding; iii) to rehabilitate the Rhine ecosystem; and iv) to improve groundwater protection. Target dates are 2005 and 2020. As a result of the new Convention's implementation, the International Commission for the Rhine has agreed to invite nine NGOs to its annual meetings and working groups as observers.

The *1987 Rhine Action Programme* was very successful, leading to quantified reduction targets for pollution releases between 1985 and 1995 being met (50% reduction for most substances; 70% for mercury, cadmium, lead and dioxins). *Germany has met its commitments on all substances except nitrogen.* Nitrogen releases are higher than targeted, despite measures taken to remove nitrates from waste water treatment plants. As in other North Sea and Baltic Sea States, the main cause of this insufficient performance is nitrates from diffuse agricultural sources (Table 8.2).

The Salmon 2000 programme, launched in 1987, aimed to promote the return of salmon to the Rhine through improving water quality and implementing many measures

**Table 8.2 Total nitrogen pollution immissions to the North Sea from agricultural production**

	1985 (tonnes)	1995 (tonnes)	1985-95 change (%)
Belgium	39 580	< 35 350	> -11
Denmark	59 000	50 000	-15
France	200 000	180 000	-10
Germany (western)	324 000	270 000	-17
Netherlands	137 000	116 000	-15
Norway	12 640	9 827	-22
Sweden	21 000	15 000	-28
Switzerland	10 800	8 700	-19

Source: OSPARCOM, 1995.

intended to enable the salmon to negotiate obstacles associated with hydraulic works. The programme has been successful; there are now *salmon in the middle and upper Rhine*. Further co-operative efforts have been agreed by ministers of the riparian countries.

Abatement of *chloride* releases to the Rhine by France and Germany was achieved with the entry into force of the Supplementary Protocol adopted in Brussels in 1991. The targets set in the Brussels Protocol were met in 1998. Although the Protocol expired in that year, France has proposed extending it to 2004.

Measures have been taken to improve *accident prevention and emergency planning* following the Basel accident in 1986. The frequency of accidental releases to the Rhine has decreased. Concerning deliberate releases of oily products from barges, a Convention was adopted in 1996, in the framework of the Central Commission for Navigation on the Rhine, to organise efficient waste oil collection and avoid illegal releases.

An action plan against *flooding* in the Rhine basin was elaborated following the very high floods in 1993, 1994 and 1995. This plan, which should be implemented until 2020, may cost up to DEM 24 billion; DEM 18 billion is attributable to measures in Germany. The plan includes quantified targets, such as reduction of the maximum flood level by 30 cm before 2005 and by 70 cm before 2020.

### 2.3 Protection of the North Sea and Baltic Sea

Some 76% of Germany's rivers discharge into the North Sea, 8% into the Baltic Sea and 16% into the Black Sea (via the Danube). The *most polluted rivers are the Elbe and the Oder*; the least polluted is the Danube (Table 8.3).

Table 8.3 Trends in the pollution load of Germany's main rivers, 1985-95<sup>a</sup>

	(%)	
	Phosphorous	Nitrogen
Danube	-50	-13
Oder	-46	-18
Rhine	-68	-30
Elbe	-62	-33
Weser	-55	-20

a) Annual average: 1985 = 1983-87; 1995 = 1993-97.

Source: UBA.

### North Sea

The pollution reduction targets for the North Sea have been a 50% decrease in air and water emissions of most hazardous substances and nutrients, and a 70% decrease in mercury, cadmium, lead and dioxin emissions, between 1985 and 1995. *These targets have been met by Germany* and even exceeded, with the exception of that for nitrates (26% reduction). As total nutrient loading of the North Sea increased between 1990 and 1995, all parties concerned will need to take additional measures. The increase in concentrations of some heavy metals in the Rhine between 1994 and 1998 (Table 8.4 and Figure 2.1) is significant.

North Sea countries have adopted the political objective of reducing discharges of *hazardous substances* over 25 years, until concentrations approach background levels or zero. To meet this objective, it will be necessary to use BAT for point sources and best available environmental practices for diffuse sources. The distribution of heavy metal pollutants among diffuse, urban and industrial sources in 1996 shows that industrial sources have become very insignificant, with most releases originating from diffuse sources (Chapter 2, Section 1.1). This will be a challenge for the future.

**Table 8.4 Heavy metal concentrations in suspended particulate matter, 1997**  
(mg/kg dry matter)

Substance	River	Concentration	Change 1990-97 (%)
Mercury	Rhine	0.6	+3
	Elbe	5.1	-76
	Oder	1.5	..
	Danube	0.2	-50
Cadmium	Rhine	1.3	-28
	Elbe	9.3	-19
	Oder	7.8	..
	Danube	0.3	-57
Lead	Rhine	83	-25
	Elbe	156	-27
	Oder	140	.
	Danube	40	-64

Source: BMU; BML.

### *Baltic Sea*

Co-operation with regard to the Baltic Sea is based on the 1992 Helsinki Convention for the Protection of the Marine Environment of the Baltic Sea and implementation of the *Baltic Sea Joint Comprehensive Environmental Action Programme* (JCP). Pollution abatement targets are similar to those for the North Sea, but cover the period 1987 to 1995. Because the targets were not reached, in 1998 the deadline for 1995 was extended to 2005. The HELCOM report on the state of the Baltic Sea (1998) shows that there was a reduction of releases to water, but that this was insufficient to meet the target. Lead emissions to air have been reduced, leading to a 60% reduction of atmospheric lead inputs. For NO<sub>x</sub> the reduction has been 20 to 30%.

Within the programme for Baltic Sea remediation, a total of 132 hot spots requiring priority action have been identified in the Baltic countries. Of *nine hot spots* identified in Germany, three have already been remediated (sewage treatment plants at Rostock, Greiswald and Stralsund) and work is in progress on the other six. Completion of modernisation of a waste water treatment station in Lübeck is scheduled for 2004, but no date has been given for reducing important German agricultural run-off to the Baltic.

## **2.4 Aid**

Germany is the *fourth largest aid donor* in absolute terms among DAC countries, providing USD 5.58 billion in 1998. Its relative level of aid is just above the average DAC level of 0.24% GNP and is exceeded by that of 15 other DAC countries. During the 1990s, German aid decreased from a peak of 0.42% GNP in 1990 to 0.26% GNP (Figure 8.1). The figure for 2000 could be even lower. This decrease has mostly affected bilateral aid, which has been reduced significantly. The main beneficiaries of German bilateral aid are China, Egypt, Nicaragua, Bosnia and India. The Rio target of reaching 0.70% GNP for ODA has been confirmed by the current Government, but without any date for implementation.

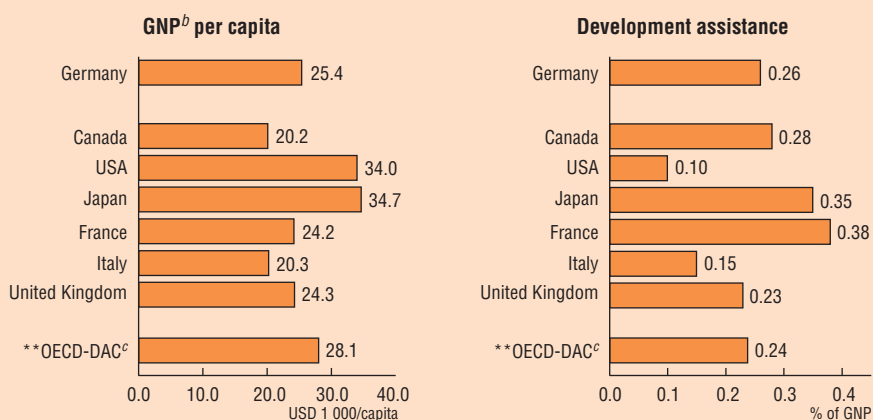
The 1996 Development Policy Concept adopted by the Ministry for Economic Development identifies poverty alleviation, *environmental and resource protection*, and education and training as the three *priority areas* of German development co-operation. According to the Ministry's internal guidelines, at least one-quarter of bilateral ODA, on average, should be used for projects which primarily and directly contribute to protecting the environment and resources (i.e. forestry, energy efficiency, renewable energy, soil). This target was met between 1990 and 1996, with aid commitments of about 30% devoted to such projects. Between 1995 and 1996,

6.5% of bilateral aid was for water supply and sanitation. Environmental projects address air pollution, sewage, garbage disposal, biological plant protection, ecological agriculture, environmentally compatible power stations, irrigation systems, industrial plants, desertification and reforestation, among other areas.

Germany provides *funds for environmental protection* through UNDP, the World Bank and the Global Environment Facility, to which it is the third largest donor (10% of USD 2.75 billion between 1998 and 2002). It offers many developing countries the possibility to be forgiven part of their debt if this amount is spent on environment related projects (USD 133 million in 1996). Germany finances 10.7% of the multilateral financing facility that supports developing countries' implementation of the Montreal Protocol.

Since 1988, Germany has provided approximately DEM 250 million per year for forest conservation programmes in other countries. It is the largest contributor to protection of *tropical rainforests*, contributing approximately USD 150 million per year. In 1992, it launched an International Pilot Programme for the Conservation of

Figure 8.1 Official development assistance, 1999<sup>a</sup>



a) Provisional data.

b) GNP in USD at current exchange rates.

c) Member countries of the OECD Development Assistance Committee.

Source: OECD-DAC.

Tropical Rainforest in Brazil. However, this programme has not yet succeeded in slowing down the destruction of the Amazonian rainforest.

*Environmental objectives and concerns*, which are taken into account at the earliest possible stage of the project design phase, are monitored during the implementation phase through regular reports. Germany uses the DAC Guidelines on Aid and Environment as the common frame of reference for partnership co-operation. Implementing these guidelines is the responsibility of the Ministry for Co-operation.

In 1996, official German aid to *central and eastern European countries* amounted to USD 1.27 billion. Between 1990 and 1996, *Germany was the main donor* to these countries among OECD members, providing USD 17.7 billion (39.2%) out of USD 45.3 billion. The main beneficiaries of German aid were Russia (37.5%), Poland (21.6%), Ukraine (9.5%) and Belarus (4.3%). In 2000, the total amount of assistance devoted to environmental projects was only about to DEM 3 million.

# 9

## CLIMATE PROTECTION\*

### *Recommendations*

The following recommendations are part of the overall conclusions and recommendations of the Environmental Performance Review of Germany:

- *implement agreed measures* concerning climate change, taking into account the phase-out of nuclear energy, and specify related schedules;
- speed up the ongoing gradual *elimination of subsidies for coal* production;
- further encourage development of *renewable energy* and *greater energy savings*;
- more vigorously address issues related to CO<sub>2</sub> emissions from *the transport sector*, going beyond voluntary agreements; encourage use of *public transport*;
- develop measures to enhance *carbon sinks* and to reduce emissions of *non-CO<sub>2</sub> GHGs*;
- develop and implement *additional policies and measures* to enable national and international emissions targets to be met and energy efficiency to be increased;
- make *greater use of cost-effectiveness analysis* in determining the components of climate policies.

\* The present chapter reviews progress in the 1990s, and particularly since the previous OECD Environmental Performance Review of 1993. This chapter also takes into account the latest IEA energy review of Germany.



## 1. Evaluation of Performance

### 1.1 Objectives and policy

#### *National objectives*

Climate change has long been a priority issue with regard to Germany's environmental policies. In 1990, it adopted a *25% national CO<sub>2</sub> emissions reduction target* (compared with 1987 levels), *to be achieved by 2005*. This target was modified in 1995, to be consistent with international targets using 1990 as the base year. The shift in base years made the target more difficult to reach, since CO<sub>2</sub> emissions were already lower in 1990 than in 1987. *Few countries have adopted national emissions targets as strict as Germany's.*

#### *International objectives*

Under the 1992 UN *Framework Convention on Climate Change*, industrialised countries agreed to reduce emissions of CO<sub>2</sub> and other GHGs to 1990 levels by 2000. Germany, which ratified the Convention in 1993, took active measures to reduce its CO<sub>2</sub> emissions. In 2000, its GHG emissions were lower than in 1990, in line with this commitment. Germany is therefore one of the very few countries that has been able to meet the stabilisation commitment adopted in 1992.

In 1995, Germany convened the first Conference of the Parties to the UNFCCC in Berlin. This meeting led to the *Kyoto Protocol* (December 1997), which reinforced the Climate Change Convention's GHG emission reduction targets. Under the Kyoto Protocol, Germany and other EU Member States are committed to limit total emissions of CO<sub>2</sub> and five other GHGs in the period 2008/12 to 8% below those in 1990. Through the burden sharing agreement within the EU, Germany has committed itself to a *21% reduction* of GHG emissions by 2008/12, the *second largest reduction within the EU*.

#### *Policy focus*

The *German climate change policy* (Chapter 9, Section 2.2) has been developed by the Government through the work of a series of high level bodies. A Parliamentary Commission proposed the ambitious national target of reducing CO<sub>2</sub> emissions by 25-30% by 2005. An interministerial working group on CO<sub>2</sub> reduction (IMA) was created in 1990 to formulate measures aimed at realising this target. IMA is supported by five working parties concerned with energy supply, transport, agriculture and forestry, buildings and new technologies. The Government adopted IMA's reports in 1990, 1991, 1994, 1997 and 2000. The German Environmental Council (SRU) and

the German Advisory Council on Global Change (WBGU), both independent bodies, have provided advice and recommendations on policy action and research.

Germany's emissions reduction commitments are mainly expected to be achieved by *reducing national emissions*, i.e. through domestic measures. This reflects the policy goal of the EU and of Germany to achieve the industrialised countries' Kyoto commitments. Climate change policy is *focused on CO<sub>2</sub> emissions reduction*. The Kyoto Protocol mechanisms such as Joint Implementation, the Clean Development Mechanism and emission trading, have not been considered practical options for Germany at this time, although they could meaningfully supplement national climate protection measures. These mechanisms should nonetheless be reviewed, as significant opportunities exist to use German technology to reduce CO<sub>2</sub> emissions in Eastern Europe. Recently the Environment Ministry has set up a working group to explore the options for a national system of emission trading.

## 1.2 CO<sub>2</sub> emission trends

### CO<sub>2</sub> emissions so far

Total CO<sub>2</sub> emissions have decreased in Germany since 1990, while GDP has been growing. There has thus been a *strong decoupling* from GDP (Chapter 1 and Chapter 9, Sections 2.1 and 2.2). In 1998, CO<sub>2</sub> emissions were 13% lower than in 1990; in 1999, according to recent estimates, they were 15.3% lower than in 1990. Between 1995 and 1999, the decrease was about 1.2% per year.

In the Old Länder, CO<sub>2</sub> emissions *increased by around 2%* between 1990 and 1995, mainly due to shifts in population and economic activities from the New Länder following reunification. In the New Länder, CO<sub>2</sub> emissions *decreased by around 44%*, mainly because of economic collapse after reunification but also reflecting the new climate change measures. As a whole, CO<sub>2</sub> emissions fell by 12% between 1990 and 1995, mostly in the New Länder (this represents so-called "wall-fall" profits). By the end of 1995, per capita emissions in the New Länder were very close to those in the Old Länder.

During the period 1990-99, most CO<sub>2</sub> emissions reduction was achieved in the energy supply and industry sectors. In the *energy supply sector*, they fell by 16.1%, principally as a result of the decline in use of lignite (brown coal), which was once the main energy source in the New Länder. In the *industry sector*, emissions fell by 31%, due above all to decreased production in the New Länder but also to improved energy efficiency in these Länder.

Also between 1990 and 1999, CO<sub>2</sub> emissions in the *residential and institutional sectors* fell by around 10%, reflecting warm winters in the last two years and improvements in building insulation as a result of new regulations. Emissions from private households increased by 6%, due to growth in the number of households and in use of electric appliances.

Emissions from the *transport sector* increased between 1990 and 1999 by 11.1%. There was an increase in the number of privately owned vehicles (greater motorisation) and in average distance travelled (greater mobility). Increased freight transport, stimulated by reunification and globalisation, has also contributed to emissions from this sector.

### *Prospects*

According to official statements, the CO<sub>2</sub> emissions reduction to be achieved in 2005 through measures already adopted would be about 17%. Additional measures are therefore needed to reach the national target (25% reduction). According to a 1997 projection, CO<sub>2</sub> emissions in 2005 and 2010 were likely to be around 14-16% below their 1990 level; they could decrease by some 16% in the energy transformation sector, 35% in the industry sector, and 20% in the residential and institutional sectors; emissions from the *transport sector* were expected to *increase by some 28%* during the same period. This projection is based on policies and measures already implemented in 1999, but does not take into account some of those decided upon in 1999 and 2000.

The Government is aware that policies and measures planned or announced are subsequently implemented rather slowly, and that the costs of achieving further reductions of CO<sub>2</sub> emissions are likely to be higher than those incurred so far. It expects that the new eco-tax and the renewable energy act will soon show positive effects. To achieve the 2005 national CO<sub>2</sub> target and the 2008-12 Kyoto targets, a new comprehensive Climate Protection Programme was adopted in October 2000. It takes account of Germany's progressive phase-out of nuclear reactors as from 2002.

### **1.3 Energy trends**

CO<sub>2</sub> emissions are mostly related to *energy production*, which in Germany is highly dependent on use of fossil fuels. Between 1990 and 1998, there was a decrease in use of lignite and an increase in that of natural gas. In the future, it is foreseen i) to reduce overall energy consumption, ii) to increase use of renewable energy and natural gas, iii) to phase out nuclear energy, and iv) to decrease use of coal (Chapter 9, Sections 2.1 and 2.2).

*Energy intensity* in Germany is similar to the OECD Europe average. In the 1990s, it fell by 10%. As part of the Environment Barometer, the energy productivity (the inverse of energy intensity) of the German economy is monitored; there is a target of doubling productivity by 2020 (Chapter 5).

#### 1.4 Other greenhouse gas emissions trends and sequestration by sinks

Between 1990 and 1998, emissions of *methane* (CH<sub>4</sub>) (5.6 Mt in 1990) decreased by around 37%. Fugitive emissions from brown coal mining and emissions from the agricultural sector declined during this period in the New Länder. Emissions from landfill sites and waste water treatment installations have decreased, since less waste is being sent to landfills. This trend is likely to continue, although more slowly than in the 1990s. Phasing out disposal of organic waste to landfills by 2005 will contribute to further reduction of CH<sub>4</sub> emissions from this source. Total emissions from the agricultural sector have not yet begun to be reduced.

In the period 1990-97, emissions of *nitrous oxide* (N<sub>2</sub>O) (0.2 Mt in 1990) were stable. They dropped suddenly in 1998 due to a change in adipic acid production processes. Emissions from fertiliser use have been decreasing slightly, while those from transport have been increasing.

Use of *HFCs* as a substitute for CFCs in cooling equipment has grown considerably. HFCs emissions in 1998 were 2 884 tonnes, about 15 times those in 1990. *PFCs emissions* are primarily attributable to aluminium smelting and to etching in the electronics industry. Further reduction of PFCs emissions is expected through a voluntary agreement by the primary aluminium industry. SF<sub>6</sub> emissions increased by nearly 50% between 1990 and 1998, due to use of SF<sub>6</sub> as filling gas for soundproof windows and automobile tires.

Germany's *forest area* of around 10.7 million hectares is expanding. Carbon removal takes place at the rate of about 30 Mt of CO<sub>2</sub> annually. Germany basically considers that carbon sink enhancement should not be the main way to achieve the CO<sub>2</sub> emissions reduction target.

#### 1.5 Performance of German climate change policy

Germany has *very ambitious climate change objectives* (Chapter 9, Section 2.2). It has adopted a number of laws, regulations and economic instruments to support policy in this area, including ordinances whose purpose is to save energy, ecological tax reform, and laws on renewable energy and co-generation. The *recent ecological tax reform* introduced a green tax based on a "win-win" strategy; it is a first step

towards adoption at EU level of an energy/CO<sub>2</sub> tax, which is strongly advocated by Germany (Chapter 5). *Use of renewable energy* is promoted and is supported financially (e.g. through the “100 000 solar roofs” initiative). Such measures give considerable credibility to German climate policy, but the pace of implementation of new laws and regulations should be further improved.

During the 1990s, German industry’s performance in the area of climate change was fully satisfactory. It benefited in this respect from industrial contraction in the New Länder. However, as the “easy” steps have now been taken and “wall-fall” profits have been realised, further CO<sub>2</sub> emissions abatement implies more costly steps. One challenge stems from the *decision to phase out nuclear power* progressively. It is unlikely to be replaced by renewable energy sources alone. Analysing all measures implemented or contemplated for their *cost-effectiveness* would therefore be appropriate, in order to select a mix of policies enabling Germany to meet its targets at minimal cost.

In the case of *past emissions*, there is a need for detailed analysis of the relative effectiveness of implemented climate policy in view of socio-economic factors and policies. For *future emissions*, detailed analysis is also needed of the effects of new climate policies on labour markets and on investments. Subsidisation of hard coal, lignite-fired power stations, renewable energy, photovoltaic roofs, etc. should be evaluated in terms of consistency and costs. Fiscal measures designed to support insulation of buildings, renewal of oil burners and other initiatives could be strengthened.

New measures will be required in order to abate CO<sub>2</sub> emissions from the *residential and transport sectors*, which are still increasing. In particular, stronger measures may be needed to promote greater use of rail to carry freight. More generally, there is a need for more meaningful measures in the *transport sector*. This would include determining a set of measures whose purpose would be to stabilise CO<sub>2</sub> emissions in this sector (encouraging greater use of public transport and of vehicles with lower fuel consumption, discouraging use of private vehicles, e.g. through road pricing, and improving railroads). Greater co-ordination among different administrative levels (i.e. municipalities, Länder, the Federal Government and the EU) is necessary so as to develop a comprehensive climate policy for the transport sector. A multi-stakeholder rather than a top-down approach is required.

The *energy tax*, which is being introduced progressively, should produce significant results by 2003 (Chapter 5). Tax abatement and exemptions should be further investigated, with a view to transforming an energy tax on final consumption into a balanced energy tax, with exemptions limited to the non-polluting sectors. *Subsidisation of hard coal and lignite-fired power stations* should be reduced more rapidly.

Reduced *net GHG emissions* could also result from further decreases in emissions of greenhouse gases other than CO<sub>2</sub> and from carbon sinks.

## 2. Focus on Selected Topics

### 2.1 Energy supply and intensity

#### *Energy supply*

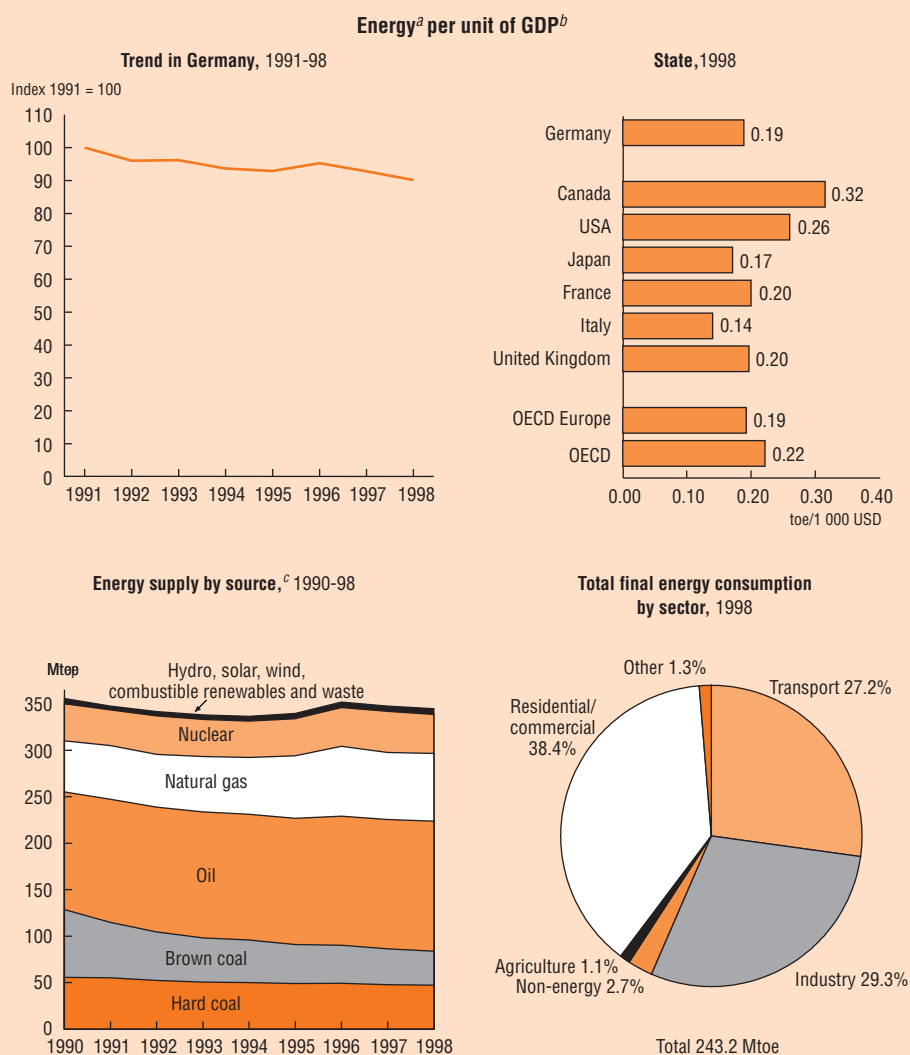
Germany's energy supply is essentially based on oil (40%), coal and lignite (25%), gas (22%) and nuclear power (11%) (Figure 9.1). Germany is the largest *hard coal* producer and consumer in the EU, and the largest producer and consumer of *lignite* in the world. Domestic coal is heavily subsidised in order to bring the price down to international coal price. This is being done to maintain energy security as well as employment. The cost of this hard coal is over three times that of imported coal; *subsidisation* of domestic hard coal production amounts to DEM 12 billion, or DEM 100 000 per worker per year. A 1997 law progressively lowers the ceiling on hard coal subsidisation for the period 1998-2005. In the New Länder, where lignite has been the major source of energy, lignite-fired power plants have been subsidised. One very new such plant has received subsidies. Between 1990 and 1997, coal and lignite use dropped by 33% while use of gas increased by 31%.

In 1999, electricity generation was based on hard coal (26.1%), lignite (24.4%) and natural gas (9.7%) as well as nuclear power and renewable energy (hydro and other). *Nuclear power* currently accounts for around 30% of total electricity generation. The Government agreed with electricity producers in May 2000 that *19 nuclear power plants would be phased out* progressively up to 2021. Nuclear reactors will be dismantled after 32 years of operation. The first of these reactors (Obrigheim) will cease to operate at the end of 2002. To replace electricity generated by nuclear power, it is likely that electricity production using *renewable energy* and natural gas, and electricity imports, will all need to be increased. In 1999, 4.3% of power generation was due to hydropower and 4.1% to other renewable sources (e.g. wind power). The Government currently seeks to *double the share of renewable energy between 2000 and 2010*. The rate at which Germany's 21 000 MW nuclear energy capacity is phased out will strongly influence its CO<sub>2</sub> policy, as renewable sources are unlikely to provide the total amount of electricity required.

#### *Energy intensity*

The German economy's *energy intensity* (i.e. energy use per unit of GDP), which equals the OECD Europe average (Figure 9.1), has decreased by almost 10%

Figure 9.1 Energy structure and intensity



a) Total primary energy supply.

b) GDP at 1995 prices and purchasing power parities.

c) Breakdown excludes electricity trade.

Source: OECD; IEA.

since 1991. The greatest energy efficiency improvements occurred in the industry, residential and commercial sectors shortly after reunification; in these sectors energy intensity nearly stabilised. The energy efficiency of the transport sector has remained stable over the past two decades, paralleling its average energy efficiency in other OECD Europe countries.

Germany's *total final energy consumption* (TFC) was 243.2 million tonnes (toe) in 1998, having changed little since 1990 (Figure 9.1). However, final energy consumption according to source changed considerably. Between 1990 and 1997, there was a 13% decrease in TFC by industry, 12% in that by agriculture and 11% in that by the service sector. TFC by the residential sector increased by 9%, and that by the transport sector by 8%. Final energy consumption by transport (excluding electricity) has increased more rapidly in Germany than in most OECD Europe countries. These sectoral changes are reflected in corresponding variations in CO<sub>2</sub> emissions.

CO<sub>2</sub> emissions in buildings will be reduced through implementation of *energy conservation ordinances* and reinforcement of current laws and regulations concerned with energy saving. By 2005, the implementation of new regulations (Amendment to the Thermal Insulation Ordinance, Amendment to the Heating Installation Ordinance, Amendment to the Small Firing Installations Ordinance) is expected to reduce total CO<sub>2</sub> emissions by 2%.

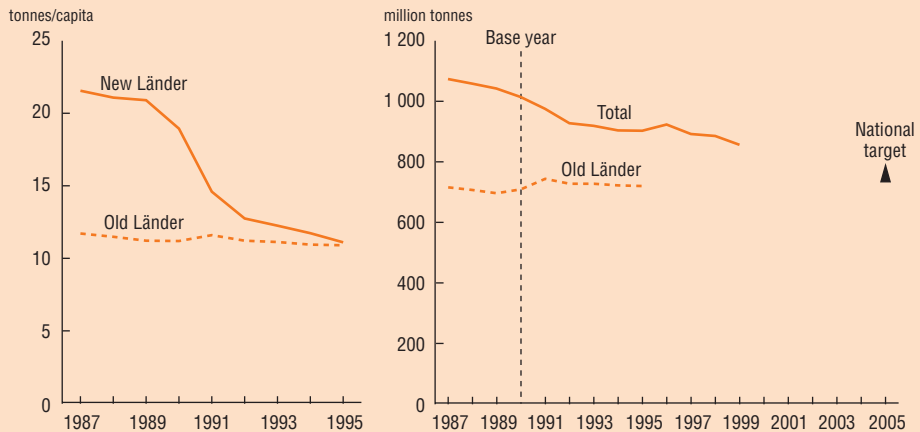
## 2.2 Climate change policy

Given Germany's ambitious domestic and international targets for reducing CO<sub>2</sub> and GHG emissions, and its current CO<sub>2</sub> emissions trends (Table 9.1 and Figure 9.2), it has developed a climate change policy consisting in a large number of actions, either mandatory or voluntary, at various levels which are carried out with varying degrees of actual implementation. Policy at the federal level is supported by many *initiatives at the regional and local levels*. Local governments with responsibilities for city planning, energy policy and transport policy are developing programmes to support the federal climate change policy. Over 500 local communities have developed climate protection programmes. Many Länder, cities or communities have also established their own reduction targets. Loans and grants for energy saving in industry and commerce are provided by Länder governments and municipalities. These expenditures are comparable to those of the Federal Government.

### *Ecological tax reform*

In line with the coalition agreement of October 1998, Germany introduced an *ecological tax reform* (ETR) in 1999 which consists in progressively raising energy



Figure 9.2 German CO<sub>2</sub> emissions<sup>a</sup>

a) Including emissions from industrial processes.  
Source: OECD.

Table 9.1 CO<sub>2</sub> emissions by source, 1990-98<sup>a</sup>  
(million tonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Energy supply	413	399	376	366	363	357	358	342	344
Industry	196	173	160	148	149	149	145	147	142
Transport	162	166	172	177	173	176	177	178	181
Others <sup>b</sup>	215	213	195	203	192	194	218	201	194
Industrial processes	28	25	25	25	27	26	25	25	25
Total	1 015	976	928	918	904	903	923	892	886
International bunkers	20	18	18	20	20	20	20	20	20
Sinks	-34	-34	-34	-34	-34	-33	-33	-33	-33

a) Preliminary data for 1995-98.

b) Includes commercial, residential, institutional and military sectors.

Source: BMU.

taxes without increasing the overall tax burden (Chapter 5). The first step was to raise the fuel tax (by DEM 0.06 per litre of petrol or diesel, DEM 0.04 per litre of fuel oil) and to introduce an electricity tax (DEM 0.02 per kWh). Further steps have also been adopted by Parliament for the period 2000-03.

These tax increases, which will *increase energy costs*, should help improve resource efficiency by reducing energy use. Revenue from the eco-tax (DEM 8.4 billion in 1999) will help lower the cost of statutory pension insurance, and thus the *cost of labour* (by 0.8%). This reduction may in turn promote higher employment. In view of the mechanism used, however, the tax's *distributional effects* are such that retired people on low incomes bear a heavier burden proportionately (Chapters 5 and 6).

The new energy tax is subject to two types of *exemption*: one for coal and nuclear energy and the other for industry and agriculture, which pay only 20% of the standard tax rate. The new tax will also be used to subsidise renewable energy (DEM 200 million per year) and public transport.

The energy tax is *not a CO<sub>2</sub> tax*. CO<sub>2</sub> emissions from heavy oil and diesel are taxed more heavily than those arising from use of natural gas, fuel oil and electricity (Table 9.2). Although subsidies for hard coal and for lignite-fired power plants are due to decrease, there remains a certain degree of inconsistency in subsidising energy sources that are large emitters of CO<sub>2</sub> and other pollutants.

Table 9.2 **Tax burden**  
(DEM/t CO<sub>2</sub>)

	1998	Increase since April 1999 <sup>a</sup>	Total 2000
Petrol	398	24	422
Diesel	217	21	238
Fuel oil	27	13	40
Natural gas	18	16	34
Electricity	–	36	36

a) Date of introduction of first step in the ecological tax reform.

Source: OECD.

### *Renewable energy and co-generation strategy*

The Government has consistently supported renewable energy use. Hydropower increased from 3.4% of power generation in 1991 to 4.3% in 1999; other renewable sources, such as wind power, increased from 2.9 to 4.1% during this period. Renewable energy sources nonetheless account for a low proportion of primary energy and electricity generation (2% and 5%, respectively). The new national target is to *expand the use of renewable energy* sources, with 10% of electricity produced by renewable energy sources in 2010 and 50% by the year 2050.

The 1990 Act on the Sale of Electricity to the Grid has been highly successful. In 1999, Germany also adopted a Renewable Energy Act specifying the *obligations of network operators concerning purchase of electricity from renewable energy sources at a premium*. This Act sets out minimum compensation levels for suppliers, according to type of energy source (e.g. wind, photovoltaic, biomass). Electricity production from renewable sources, particularly wind energy, has therefore increased rapidly. The Renewable Energy Act entered into force in 2000, replacing the 1990 Act. Network operators are obliged to purchase electricity from renewable energy sources and pay compensation to suppliers, according to real generation cost (e.g. DEM 0.99/kWh for photovoltaic power). In 2000, Germany adopted an Act that promotes co-generation in the public sector, in the framework of a deregulated electricity market. As a result of deregulation in 1998, German electricity prices have dropped by 30% and sometimes as much as 60%. The Co-generation Act obliges network operators to purchase electricity produced through co-generation in the public sector at a price of at least DEM 0.09/kWh.

Installed *wind power* capacity reached 4 444.5 MW (7 879 operating units) by the end of 1999. Germany is now the world's largest producer of wind power. However, total electricity generation by wind power is only 1.7% of total electricity production.

The current *federal programme for promoting renewable energy* includes the "100 000 roof solar power programme", which began in January 1999. It is intended to install 300 MW of photovoltaic power by 2005 (funding: DEM 1 billion). This programme also supports solar-thermal, biogas-biomass, geothermal and small hydropower projects (DEM 200 million in 1999).

### *Voluntary commitments*

In 1995, *German trade and industry* issued a declaration on climate protection measures that included a *voluntary commitment* to reduce CO<sub>2</sub> emissions per unit of output, as well as energy consumption, by 20% (compared with 1990 levels) by 2005. This declaration was supported by five major associations, and by 14 associations representing specific process industries.

It was agreed with the Federal Government that implementation would be *reviewed by an independent institute*, the Rhine-Westphalia Institute for Economic Research (RWI). In 1999, the RWI presented its second monitoring report: CO<sub>2</sub> emissions from industry had been reduced by 27%, and those from electricity supply by 17%, between 1990 and the end of 1998. This voluntary programme has been criticised by NGOs, which have pointed out the lack of sanctions for non-compliance and the difficulty of verifying individual companies' performance in the framework of voluntary commitments.

The transport sector's CO<sub>2</sub> *emissions* increased by 11% between 1990 and 1999 (Table 9.1). The main initiative taken so far in this sector has been a voluntary agreement. In 1995, the German automobile industry undertook to reduce new cars' nominal *fuel consumption* by 25% between 1990 and 2005. This reduction may not be sufficient to produce a decrease in total emissions, however, since larger cars are being driven longer distances by more people.

## ANNEXES

I.A Selected environmental data

I.B Selected economic data

I.C Selected social data

II.A Selected multilateral agreements (worldwide)

II.B Selected multilateral agreements (regional)

III. Chronology of selected environmental events (1990-2000)

IV. The physical context

## ANNEX I.A: SELECTED ENVIRONMENTAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN
<b>LAND</b>													
Total area (1000 km <sup>2</sup> )		9971	1958	9364	378	99	7713	270	84	31	79	43	338
Major protected areas (% of total area)	2	9.6	8.2	21.2	6.8	6.9	7.7	23.5	29.2	2.8	16.2	32.0	8.4
Nitrogenous fertiliser use (t/km <sup>2</sup> of arable land)		4.1	4.4	6.2	11.5	23.1	1.7	37.3	7.6	18.8	6.8	12.3	7.1
Pesticide use (t/km <sup>2</sup> of arable land)		0.07	0.13	0.21	1.50	1.29	0.23	0.85	0.25	0.92	0.12	0.15	-
<b>FOREST</b>													
Forest area (% of land area)		45.3	33.4	32.6	66.8	65.2	19.4	29.5	47.6	22.2	34.1	10.5	75.5
Use of forest resources (harvest/growth)		0.4	0.2	0.6	0.3	0.1	..	0.6	0.6	0.9	0.7	0.6	0.8
Tropical wood imports (USD/cap.)	3	0.8	0.1	1.6	18.4	11.1	4.6	2.6	0.2	12.3	0.1	4.4	1.9
<b>THREATENED SPECIES</b>													
Mammals (% of species known)		19.2	33.2	10.5	7.7	17.0	14.9	15.2	35.4	31.6	33.3	24.0	11.9
Birds (% of species known)		10.8	16.9	7.2	8.3	15.0	6.4	25.3	37.0	27.5	66.1	10.6	6.7
Fish (% of species known)		6.4	5.7	2.4	11.1	1.3	0.4	0.8	65.5	54.3	29.2	18.2	11.9
<b>WATER</b>													
Water withdrawal (% of gross annual availability)		1.7	17.4	19.9	20.8	35.6	4.3	0.6	2.7	42.5	15.6	15.7	2.2
Public waste water treatment (% of population served)		78	22	71	55	53	..	80	75	27	59	87	77
Fish catches (% of world catches)		1.0	1.6	5.4	6.3	2.4	0.2	0.6	-	-	-	2.0	0.2
<b>AIR</b>													
Emissions of sulphur oxides (kg/cap.)		89.7	24.4	69.3	7.2	32.9	100.6	12.3	7.1	23.6	68.0	20.7	19.5
(kg/1000 USD GDP)	4	3.7	3.3	2.3	0.3	2.3	4.7	0.7	0.3	1.1	5.3	0.9	1.0
% change (1990-1998)		-19	..	-14	..	-7	-3	3	-37	-25	-63	-50	-61
Emissions of nitrogen oxides (kg/cap.)		67.8	17.2	80.2	11.3	27.6	118.3	45.9	21.3	32.8	41.1	46.9	50.5
(kg/1000 USD GDP)	4	2.9	2.3	2.7	0.5	1.9	5.5	2.7	1.0	1.5	3.2	2.0	2.5
% change (1990-1998)		-5	..	-	..	36	-4	23	-12	-3	-43	-12	-13
Emissions of carbon dioxide (t./cap.)	5	15.9	3.7	20.5	9.3	9.2	16.5	8.8	7.9	12.0	11.7	11.8	12.5
(t./1000 USD GDP)	4	0.66	0.50	0.68	0.38	0.62	0.74	0.51	0.36	0.53	0.91	0.49	0.61
% change (1990-1997)		12	14	12	10	81	16	31	8	12	-15	18	18
<b>WASTE GENERATED</b>													
Industrial waste (kg/1000 USD GDP)	4, 6	..	50	..	49	56	107	29	65	62	292	22	119
Municipal waste (kg/cap.)	7	500	310	720	400	400	690	350	510	480	310	560	410
Nuclear waste (t./Mtoe of TPES)	8	6.5	0.1	0.9	1.8	2.3	-	-	-	2.8	1.0	-	2.2
<b>PAC EXPENDITURE</b> (% of GDP)	9	1.1	0.8	1.6	1.6	1.7	0.8	..	1.7	0.9	2.0	0.9	1.1

.. not available. - nil or negligible. x data included under Belgium.

UKD:

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates.

Partial totals are underlined. Varying definitions can limit comparability across countries.

2) Data refer to IUCN categories I to VI; AUS, HUN, LUX, TUR: national data

3) Total imports of cork and wood from non-OECD tropical countries.

4) GDP at 1995 prices and purchasing power parities.

Source: OECD Environmental Data, Compendium 1999.

## OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD*	OECD*
549	<b>357</b>	132	93	103	70	301	3	42	324	313	92	506	450	41	779	245	34728
10.1	<b>26.9</b>	2.6	9.1	9.5	0.9	7.3	6.5	11.6	24.2	9.4	6.6	8.4	8.1	18.0	3.8	20.4	12.6
13.4	<b>14.8</b>	7.8	5.4	8.9	43.2	8.4	x	37.7	12.3	6.1	4.0	5.4	7.3	12.8	4.3	19.5	6.4
0.59	<b>0.29</b>	0.29	0.14	..	0.25	0.78	x	1.06	0.08	0.07	0.43	0.18	0.06	0.37	0.13	<i>0.58</i>	0.25
31.4	<b>30.1</b>	22.8	18.9	1.3	8.8	23.3	34.4	9.2	39.2	29.7	37.9	32.3	73.5	31.7	26.9	10.5	33.8
0.7	<b>0.4</b>	0.6	0.6	-	0.6	0.3	0.5	0.6	0.4	0.6	0.8	0.5	0.7	0.5	0.4	0.7	<u>0.6</u>
7.1	<b>2.0</b>	3.4	0.1	4.0	10.1	6.6	x	17.3	4.5	0.2	19.9	6.2	2.0	0.5	0.9	3.3	5.1
20.2	<b>36.7</b>	37.9	71.1	-	6.5	32.2	51.6	15.6	5.9	15.5	17.3	21.2	18.2	34.2	22.2	<i>22.2</i>	..
14.3	<b>29.2</b>	13.0	18.8	13.3	21.8	24.7	50.0	27.1	6.3	16.6	13.7	14.1	8.6	42.6	6.7	<i>6.8</i>	..
6.6	<b>68.2</b>	24.3	32.1	-	33.3	..	27.9	82.1	-	27.1	18.6	29.4	12.7	44.7	9.9	<i>11.1</i>	..
23.9	<b>24.4</b>	12.1	5.0	0.1	2.6	32.2	3.4	4.9	0.7	18.7	11.9	36.8	1.5	4.9	15.2	<i>14.6</i>	<i>11.8</i>
77	<b>89</b>	45	22	16	61	61	88	97	67	47	21	48	93	94	12	<i>88</i>	<i>59</i>
0.6	<b>0.3</b>	0.2	-	2.4	0.3	0.4	-	0.5	3.1	0.4	0.2	1.2	0.4	-	0.5	1.0	30.9
16.2	<b>15.8</b>	48.3	64.7	32.1	48.7	23.1	8.4	8.0	6.9	61.3	36.2	49.1	10.3	4.6	29.8	34.5	39.2
0.8	<b>0.7</b>	3.6	6.7	1.3	2.2	1.2	0.2	0.4	0.3	8.3	2.7	3.2	0.5	0.2	4.8	1.8	2.0
-24	<b>-76</b>	-	-35	6	-3	..	-76	-38	-42	-26	..	..	-33	-24	..	-46	-24
29.1	<b>21.7</b>	35.2	19.4	105.6	33.9	30.9	39.6	28.5	50.6	29.9	37.6	31.7	38.1	18.2	14.5	35.0	40.6
1.4	<b>1.0</b>	2.6	2.0	4.3	1.5	1.5	1.1	1.3	2.0	4.1	2.8	2.1	1.9	0.7	2.3	1.9	2.0
-10	<b>-34</b>	8	-17	9	6	..	-27	-23	2	-10	..	..	-13	-22	37	-25	-5
6.2	<b>10.8</b>	7.7	5.7	8.9	10.3	7.4	20.5	11.8	7.8	9.1	5.2	6.5	6.0	6.3	2.9	9.4	11.2
0.29	<b>0.50</b>	0.57	0.59	0.36	0.49	0.36	0.57	0.53	0.31	1.15	0.37	0.40	0.29	0.24	0.47	0.48	0.55
-4	<b>-10</b>	12	-14	8	13	4	-21	14	15	-	25	18	-	1	35	-5	9
84	<b>38</b>	47	72	1	66	19	136	26	27	73	3	24	86	8	87	53	71
590	<b>460</b>	370	490	650	560	460	590	560	630	320	380	390	360	600	330	480	500
4.6	<b>1.3</b>	-	3.2	-	-	-	-	0.2	-	..	-	0.9	4.5	2.4	-	3.7	1.6
1.4	<b>1.5</b>	0.8	0.7	..	0.6	0.9	..	1.8	1.2	1.1	0.7	0.8	1.2	1.6	..	1.0	..

pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment: England and Wales.

5) CO<sub>2</sub> from energy use only; international marine bunkers are excluded.

6) Waste from manufacturing industries.

7) NZL: household waste only.

8) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

9) Household expenditure excluded; HUN, POL: investments only.

**ANNEX I.B: SELECTED ECONOMIC DATA (1)**

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN
<b>GROSS DOMESTIC PRODUCT</b>												
GDP, 1999 (billion USD at 1995 prices and PPPs)	769	755	8681	3005	703	449	66	186	240	129	132	115
% change (1990-1999)	23.2	27.8	32.3	12.8	64.8	36.3	21.7	21.1	17.8	-9.8	25.3	17.4
per capita, 1999 (1000 USD/cap.)	25.2	7.7	32.0	23.7	15.0	23.6	17.5	23.0	23.5	12.5	24.8	22.2
Exports, 1999 (% of GDP)	43.2	31.8	10.8	10.2	44.6	18.4	30.3	43.8	74.1	61.0	35.2	38.1
<b>INDUSTRY</b> 2												
Value added in industry (% of GDP)	27	26	26	37	43	26	26	30	28	37	24	30
Industrial production: % change (1990-1998)	23.0	34.0	32.7	-4.8	59.7	17.1	15.1	25.0	9.4	-24.2	26.5	42.2
<b>AGRICULTURE</b> 3												
Value added in agriculture (% of GDP)	2	6	2	2	6	3	7	1	1	4	4	4
Agricultural production: % change (1990-1999)	26.2	23.9	18.2	-8.3	-1.4	20.0	18.2	5.8	9.3	..	3.7	-14.4
Livestock population, 1999 (million head of sheep eq.)	102	266	795	56	29	289	101	18	30	16	25	9
<b>ENERGY</b> 4												
Total supply, 1998 (Mtoe)	234	148	2182	510	163	105	17	29	58	41	21	33
% change (1990-1998)	12.1	19.0	13.3	16.3	78.7	20.5	21.3	12.3	20.5	-13.4	13.8	16.1
Energy intensity, 1998 (toe/1000 USD GDP)	0.32	0.20	0.26	0.17	0.25	0.24	0.27	0.16	0.25	0.32	0.16	0.30
% change (1990-1998)	-5.7	-3.7	-11.1	4.5	18.2	-8.2	2.3	-5.2	4.2	-4.5	-8.0	2.6
Structure of energy supply, 1998 (%)												
Solid fuels	16.5	10.0	27.1	18.0	21.6	48.1	10.9	22.3	15.7	52.5	33.7	35.5
Oil	34.7	62.3	39.9	51.1	56.2	33.6	38.4	43.4	42.2	20.2	45.2	32.9
Gas	28.9	21.3	22.8	11.7	7.6	16.9	24.2	23.3	21.4	18.6	19.9	10.2
Nuclear	7.9	1.6	8.5	17.0	14.3	-	-	-	20.7	8.3	-	17.4
Hydro, etc.	12.1	4.7	1.8	2.2	0.2	1.4	26.5	11.1	0.1	0.4	1.2	4.0
<b>ROAD TRANSPORT</b> 5												
Road traffic volumes per capita, 1998 (1000 veh.-km/cap.)	9.2	0.6	15.7	6.1	1.6	10.0	7.9	7.5	8.3	3.0	8.3	8.7
Road vehicle stock, 1998 (10 000 vehicles)	1804	1389	21443	7082	1047	1126	216	471	499	377	219	231
% change (1990-1998)	9.0	40.6	13.6	25.4	208.4	15.2	16.9	27.6	17.1	45.5	15.7	4.4
per capita (veh./100 inh.)	60	15	80	56	23	60	58	58	49	37	41	45

.. not available. - nil or negligible. x data included under Belgium.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction;  
production: excludes construction.

Source: OECD Environmental Data, Compendium 1999.



## OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	OECD
1306	1842	151	107	7	91	1203	17	374	114	330	152	681	192	190	400	1198	23585
14.9	17.0	20.6	2.5	28.0	76.5	11.6	58.8	26.7	34.6	36.8	24.9	22.4	12.6	5.1	35.4	19.5	24.2
22.1	22.4	14.4	10.6	26.6	24.3	20.9	38.9	23.7	25.6	8.5	15.2	17.3	21.6	26.6	6.1	20.2	21.3
25.4	28.6	18.1	51.7	34.6	82.1	25.1	114.0	60.5	38.9	24.5	30.9	27.2	43.3	40.8	23.1	25.4	20.9
26	29	20	32	22	39	31	21	27	32	39	35	32	27	..	31	28	29
8.3	5.1	7.9	16.6	..	128.2	10.9	11.9	16.7	37.8	45.3	13.1	15.4	32.4	12.6	55.0	9.6	17.2
2	1	12	7	9	5	3	1	3	2	8	4	3	2	..	14	2	3
5.2	-6.8	9.6	-21.7	-7.3	6.4	10.0	x	-5.8	-6.0	-12.4	-4.7	3.9	-7.8	-5.3	11.6	0.3	..
165	128	21	14	1	56	71	x	47	10	64	18	93	14	12	118	131	2698
256	345	27	25	3	13	168	3	74	25	96	22	113	52	27	73	233	5097
12.3	-3.2	22.3	-11.3	25.3	26.6	9.5	-7.1	11.7	18.4	-3.6	33.1	24.5	9.9	6.4	38.1	9.3	13.4
0.20	0.19	0.18	0.25	0.38	0.16	0.14	0.21	0.21	0.22	0.30	0.15	0.17	0.28	0.14	0.18	0.20	0.22
0.2	-16.1	4.8	-10.2	3.7	-22.1	-0.9	-38.5	-9.2	-11.6	-27.1	9.8	5.5	1.4	2.6	-0.3	-6.9	-6.1
10.8	25.5	36.8	17.8	2.6	23.3	8.2	5.2	13.4	9.3	71.0	19.4	18.6	19.9	5.9	40.1	18.4	23.9
35.5	40.6	58.8	28.9	31.2	54.9	56.9	72.3	37.5	34.0	18.9	72.0	54.7	30.5	49.8	42.0	35.9	41.9
12.8	21.1	2.7	38.8	-	21.2	31.1	22.2	47.6	17.1	9.8	3.2	10.3	1.3	8.7	12.4	34.2	20.6
38.8	12.2	-	14.4	-	-	-	-	1.4	-	-	-	13.7	36.2	24.9	-	11.3	10.9
2.1	0.5	1.7	0.1	66.2	0.7	3.8	0.4	0.1	39.5	0.2	5.5	2.7	12.1	10.7	5.5	0.2	2.8
8.3	7.3	5.6	2.7	6.5	8.1	8.6	9.0	6.9	7.0	3.3	5.5	4.1	8.2	7.1	0.8	7.7	7.9
3230	4427	365	273	16	138	3433	28	732	221	1055	425	1927	415	367	516	2997	56468
13.5	18.7	44.8	24.3	17.8	45.3	12.3	33.6	27.7	13.9	64.9	93.4	33.4	5.6	11.2	118.5	14.0	20.1
55	54	35	27	58	37	60	66	47	50	27	43	49	47	52	8	51	51

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Japan and Italy, which include three-wheeled goods vehicles.

## ANNEX I.C: SELECTED SOCIAL DATA (1)

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN
<b>POPULATION</b>												
Total population, 1999 (100 000 inh.)	305	975	2713	1267	469	190	38	81	102	103	53	52
% change (1990-1999)	9.9	18.1	8.6	2.5	9.3	11.2	12.4	4.9	2.6	-0.7	3.6	3.6
Population density, 1999 (inh./km <sup>2</sup> )	3.1	49.8	29.0	335.4	471.8	2.5	14.0	96.5	335.0	130.4	123.5	15.3
Ageing index, 1998 (over 64/under 15)	62.4	14.9	53.6	107.6	29.9	58.2	51.4	90.4	91.3	79.3	82.5	79.1
<b>HEALTH</b>												
Women life expectancy at birth, 1998 (years)	81.4	77.3	79.4	84.0	78.1	81.5	80.4	80.9	81.1	78.1	78.6	80.8
Infant mortality, 1998 (deaths /1 000 live births)	5.5	15.8	7.2	3.6	7.7	5.0	6.8	4.9	6.0	5.2	4.7	4.2
Expenditure, 1998 (% of GDP)	9.5	4.7	13.7	7.6	5.0	8.5	8.1	8.3	8.8	7.6	8.3	6.9
<b>INCOME AND POVERTY</b>												
GDP per capita, 1999 (1000 USD/cap.)	25.2	7.7	32.0	23.7	15.0	23.6	17.5	23.0	23.5	12.5	24.8	22.2
Poverty (% pop. < 50% median income)	10.3	21.9	17.1	8.1	..	9.3	..	7.4	7.8	..	5.0	4.9
Inequality (Gini levels)	2	28.5	52.6	34.4	26.0	..	30.5	25.6	23.8	27.2	..	21.7
Minimum to median wages, 1997	3	39.6	..	38.1	30.8	24.4	x	45.6	x	50.4	21.2	x
<b>EMPLOYMENT</b>												
Unemployment rate, 1999 (% of total labour force)	7.6	2.5	4.2	4.7	6.3	7.2	6.8	5.3	9.0	8.8	5.5	10.2
Labour force participation rate, 1999 (% 15-64 year-olds)	76.9	56.8	78.0	78.1	64.2	74.4	65.3	77.5	63.7	80.4	80.5	74.0
Employment in agriculture, 1998 (%)	4	3.7	19.4	2.7	5.3	12.2	4.8	8.5	6.6	2.4	5.5	3.6
<b>EDUCATION</b>												
Education, 1998 (% 25-64 year-olds)	5	79.7	21.2	86.5	79.9	65.4	56.0	72.7	73.3	56.7	85.3	78.4
Expenditure, 1997 (% of GDP)	6	6.5	5.5	6.9	4.8	7.4	5.6	..	6.5	5.2	5.2	6.8
<b>OFFICIAL DEVELOPMENT ASSISTANCE</b>												
ODA, 1999 (% of GNP)	7	0.28	..	0.10	0.35	..	0.26	0.27	0.26	0.30	..	1.00
ODA, 1999 (USD/cap.)		56	..	34	121	..	52	35	65	74	..	324

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD Environmental Data, Compendium 1999.

## OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	OECD
591	<b>822</b>	105	101	3	37	577	4	158	44	387	100	394	89	71	659	594	11086
4.2	<b>3.6</b>	4.4	-2.8	8.3	6.6	1.7	12.3	5.6	4.8	1.5	1.3	1.5	3.7	6.4	17.3	3.2	6.8
107.6	<b>230.2</b>	79.8	108.3	2.7	53.1	191.5	167.0	380.0	13.7	123.8	108.7	77.9	19.7	172.9	84.6	242.7	31.9
82.6	<b>107.1</b>	95.2	83.3	49.0	50.4	106.6	76.1	73.0	79.3	56.8	90.3	105.2	93.3	86.0	16.8	81.7	60.5
82.2	<b>80.5</b>	80.5	75.2	81.5	78.5	81.6	80.0	80.7	81.3	77.3	78.8	82.4	81.9	82.5	71.3	79.7	..
4.7	<b>4.7</b>	6.7	8.9	2.6	6.2	6.2	5.0	5.2	4.0	9.5	6.0	5.0	3.6	4.8	36.3	5.7	..
9.6	<b>10.5</b>	8.3	6.8	8.4	6.1	8.4	5.9	8.6	8.9	6.3	7.8	7.1	8.4	10.4	4.0	7.0	..
22.1	<b>22.4</b>	14.4	10.6	26.6	24.3	20.9	38.9	23.7	25.6	8.5	15.2	17.3	21.6	26.6	6.1	20.2	21.3
7.5	<b>9.4</b>	13.9	7.3	..	11.0	14.2	..	6.3	8.0	..	..	..	6.4	..	16.2	10.9	..
27.8	<b>28.2</b>	33.6	28.3	..	32.4	34.5	..	25.5	..	..	..	..	23.0	..	49.1	31.2	..
57.4	<b>x</b>	..	37.4	x	x	x	..	49.4	x	44.6	..	32.4	x	x	..	x	..
11.1	<b>9.0</b>	10.7	7.1	1.9	5.5	11.5	2.9	3.2	3.2	12.0	4.4	15.9	5.6	2.7	7.3	5.9	6.6
68.0	<b>71.1</b>	61.9	58.4	77.5	68.1	59.3	63.3	65.5	81.2	68.6	70.6	63.9	75.9	81.3	55.7	75.6	71.0
4.4	<b>2.8</b>	17.7	7.6	8.6	9.1	6.6	2.3	3.3	4.7	19.2	13.6	8.0	2.6	4.6	42.3	1.7	7.8
60.7	<b>83.8</b>	44.1	63.3	54.8	51.3	41.0	..	64.3	83.0	54.3	20.1	32.9	76.1	81.5	17.7	60.2	<u>61.2</u>
6.3	<b>5.7</b>	4.9	5.2	5.7	5.0	4.8	..	4.7	..	..	5.8	5.7	6.9	6.0	..	..	<u>5.8</u>
0.38	<b>0.26</b>	0.21	..	..	0.31	0.15	0.64	0.79	0.91	..	0.25	0.23	0.70	0.35	..	0.23	0.24
93	<b>67</b>	25	..	..	65	30	266	199	308	..	27	34	184	136	..	55	67

4) Civil employment in agriculture, forestry and fishing.

5) Upper secondary or higher education; OECD: average of rates.

6) Public and private expenditure on educational institutions; OECD: average of rates.

7) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

**ANNEX II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1946 Washington	Conv. - Regulation of whaling	Y	D	R	R
1956 Washington	Protocol	Y	R	R	R
1949 Geneva	Conv. - Road traffic	Y	R		R
1954 London	Conv. - Prevention of pollution of the sea by oil	Y	R	R	R
1971 London	Amendments to convention (protection of the Great Barrier Reef)		R		
1957 Brussels	Conv. - Limitation of the liability of owners of sea-going ships	Y	S		
1979 Brussels	Protocol	Y			
1958 Geneva	Conv. - Fishing and conservation of the living resources of the high seas	Y	S	R	R
1960 Geneva	Conv. - Protection of workers against ionising radiations (ILO 115)	Y		R	
1962 Brussels	Conv. - Liability of operators of nuclear ships				
1963 Vienna	Conv. - Civil liability for nuclear damage	Y		R	
1988 Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y			
1997 Vienna	Protocol to amend the Vienna convention				
1963 Moscow	Treaty - Banning nuclear weapon tests in the atmosphere, in outer space and under water	Y	R	R	R
1964 Copenhagen	Conv. - International council for the exploration of the sea	Y	R		R
1970 Copenhagen	Protocol	Y	R		R
1969 Brussels	Conv. - Intervention on the high seas in cases of oil pollution casualties (INTERVENTION)	Y		R	R
1973 London	Protocol (pollution by substances other than oil)	Y		R	R
1969 Brussels	Conv. - Civil liability for oil pollution damage (CLC)	Y	R	D	S
1976 London	Protocol	Y	R	R	
1992 London	Protocol	Y	R	R	
1970 Bern	Conv. - Transport of goods by rail (CIM)	Y			
1971 Brussels	Conv. - International fund for compensation for oil pollution damage (FUND)	Y	R	D	S
1976 London	Protocol	Y	R	R	
1992 London	Protocol	Y	R	R	
1971 Brussels	Conv. - Civil liability in maritime carriage of nuclear material	Y			
1971 London, Moscow, Washington	Conv. - Prohib. emplacement of nuclear and mass destruct. weapons on sea-bed, ocean floor and subsoil	Y	R	R	R
1971 Ramsar	Conv. - Wetlands of international importance especially as waterfowl habitat	Y	R	R	R
1982 Paris	Protocol	Y	R	R	R
1987 Regina	Regina amendment	Y	R	R	
1971 Geneva	Conv. - Protection against hazards of poisoning arising from benzene (ILO 136)	Y			
1972 London, Mexico, Moscow, Washington	Conv. - Prevention of marine pollution by dumping of wastes and other matter (LC)	Y	R	R	R
1996 London	Protocol to the Conv. - Prevention of marine poll. by dumping of wastes and other matter				S
1972 Geneva	Conv. - Protection of new varieties of plants (revised)	Y	R	R	R
1978 Geneva	Amendments	Y	R	R	R
1991 Geneva	Amendments	Y			R
1972 Geneva	Conv. - Safe container (CSC)	Y	R	R	R

**OECD EPR / SECOND CYCLE**

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	R	R			R	R	R	R			D	R	R		R	R			R	R	R		R	
R	R	R	R				R		R	R			R	R			R	R			R	R	R		R	
R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	
R	R	R	R	R	R		R	R	R	R	R		R	R	R		R	R	R	R	R	R	R		R	
		R	R				R	R	R	R	R			R			R					R	R		R	
D		D			D		D	D	D	D			R		S	R	D	D	R	R	R		D	R		D
		R			R			S		S						R			R	R	R		R		D	
		R	S		R		R	R	R				S	S			R				R	R		R		R
R					R	R	R	R	R	R	R	R			R		R	R	R	R	R	R	R	R	R	R
					S					S				S			R			R						
						R						R								R	S				S	
					S	R	R	R	S	S	S	R			R		R	R	S	S	R	S	S	S	S	
					S							S			S				S							
R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R
					R		R	R	R	R			R	R			R	R	R	R	R	R			R	
					R		R	R	R	R			R	R			R	R	R	R	R	R			R	
R	S	R	R		R		R	R	R	R	S		R	R	R		R	R	R	R	R	R	R	R	R	R
		R	S		R		R	R	R	R				R	R		R	R	R	R	R	R	R	R	R	R
D	D	D	R		R		D	D	D	D	D		R	D	R	R	D	D	R	R	D	D	D	D	D	D
R	R	R			R		R	R	R	R	R		R	D	R	R	R	R	R	R	R	R	R	R		D
R	R	R	R		R		R	R	R	R	R		R	R			R	R	S		R	R	R		R	
				R	R	R	R	R	R	R	R	R			R	R	R	R	R	R	R	R	R	R	R	R
D	D	D	R		R		D	D	D	D	D		R	D	R		D	D	R	R	D	D	D	D	D	D
R		R			R		R	R	R	R	R		R	D	R		R	R	R	R	R	R			D	
R	R	R	R		R		R	R	R	R	R		R	R			R	R	S		R	R			R	
					R		R	R	R	R				R			R	R		S	R	R			S	
R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R			R	R	R	R	R
					R		R	R	R	R	R			R							R	R				
R	R	R	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	
		S	S		S		R	S		R			S				S	S			R	S	S		R	
R		R	R	R	R	R	R	R	R	R		R		R	R		R	R	R	R	R	R	R		R	
R		R	R	R		R	R	R	R	R		R		R	R		R	R	R	R		R	R		R	
R		R				R			R								R								R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	S	S	R	

**ANNEX II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1972 London, Moscow, Washington	Conv. - International liability for damage caused by space objects	Y	R	R	R
1972 Paris	Conv. - Protection of the world cultural and natural heritage	Y	R	R	R
1973 Washington	Conv. - International trade in endangered species of wild fauna and flora (CITES)	Y	R	R	R
1974 Geneva	Conv. - Prev. and control of occup. hazards caused by carcinog. subst. and agents (ILO 139)	Y			
1976 London	Conv. - Limitation of liability for maritime claims (LLMC)	Y		R	
1996 London	Amendment to convention		S		
1977 Geneva	Conv. - Protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (ILO 148)	Y			
1978 London	Protocol - Prevention of pollution from ships (MARPOL PROT)	Y	R	R	R
1978 London	Annex III	Y			R
1978 London	Annex IV				
1978 London	Annex V	Y		R	R
1997 London	Annex VI				
1979 Bonn	Conv. - Conservation of migratory species of wild animals	Y			
1991 London	Agreem. - Conservation of bats in Europe	Y			
1992 New York	Agreem. - Conservation of small cetaceans of the Baltic and the North Seas (ASCOBANS)	Y			
1996 Monaco	Agreem. - Conservation of cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area				
1982 Montego Bay	Conv. - Law of the sea	Y	S	R	
1994 New York	Agreem. - relating to the implementation of part XI of the convention	Y	S		S
1995 New York	Agreem. - Implementation of the provisions of the convention relating to the conservation and management of straddling fish stocks and highly migratory fish stock:		R		R
1983 Geneva	Agreem. - Tropical timber	Y	R		R
1994 New York	Revised agreem. - Tropical timber	Y	R		R
1985 Vienna	Conv. - Protection of the ozone layer	Y	R	R	R
1987 Montreal	Protocol (substances that deplete the ozone layer)	Y	R	R	R
1990 London	Amendment to protocol	Y	R	R	R
1992 Copenhagen	Amendment to protocol	Y	R	R	R
1997 Montreal	Amendment to protocol	Y	R		
1986 Vienna	Conv. - Early notification of a nuclear accident	Y	R	R	R
1986 Vienna	Conv. - Assistance in the case of a nuclear accident or radiological emergency	Y	S	R	R
1989 Basel	Conv. - Control of transboundary movements of hazardous wastes and their disposal	Y	R	R	S
1995 Geneva	Amendment				
1999 Basel	Prot. - Liability and compensation for damage				
1989 London	Conv. - Salvage	Y	R	R	R
1990 Geneva	Conv. - Safety in the use of chemicals at work (ILO 170)	Y		R	
1990 London	Conv. - Oil pollution preparedness, response and co-operation (OPRC)	Y	R	R	R

**OECD EPR / SECOND CYCLE**

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	EU	
R	R	R	R	R	R		R	R	R	R	R	R	S	R	R	R	R	S	R		R	R	R		R		
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R					R	R	R	R	R	R		R	R	R	R			R		R		R	R				
R		R	R		R		R	R	R	R	R			R			R	R	R		R	R	R	R	R	R	
							S	S	S	S							S	S				S			S		
					R	R	R	R	R	R		R			R			R		R	R	R			R		
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	
R				R	R	R	R	R	R	R	R	R			R	R			R	R	R	R	R	R		R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
																	S					S					
		R			R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R		R	R
					S	R	R		S	R		R		R		R	R	R		S		R			R	R	
					S		R		S	R							R					R			R	S	
									S		S				S					S	S			S		S	
R	R	R	R	R	R	R	S	R	R	R	R	S	R	R	R	S	R	R	R	R	R	R	S		R	R	
R	R	R	R	R	R	R	S	R	R	R	R		R	R	R	S	R	R	R	R	R	R	S		R	R	
S	S	S	S	S	S		S	S	S	S	S		R	S	S	S	S	R		S	S	S			S	S	
R	R	R	R	R	R		R	R	R	R	R			R	R	R	R	R		R	R	R	R		R	R	
R	R		R	R	R		R	R	R	R	R			R	R	R	R	R		R	R	R	R		R	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
	R	R	R		S				R		R					R		R			R	R					
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	
R	R	R	R	R	R	R	S	R	R	R	R	R	S	R	R		R	S	R	S	R	R	R	R	R	R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
				R		R	R	R								R		R		R	R	R			R	R	
																S							S				
		R					R	S		S	R			R	R		R	R	S		S	R	R		R		
																	R					R					
R		R					R	R	R	R	R		R	R	R		R	R	S		R	R	R		R		

**ANNEX II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1992 Rio de Janeiro	Conv. - Biological diversity	Y	R	R	S
2000 Montreal	Prot. - Biosafety			S	
1992 New York	Conv. - Framework convention on climate change	Y	R	R	R
1997 Kyoto	Protocol		S	S	S
1993 Paris	Conv. - Prohibition of the development, production, stockpiling and use of chemical weapons and their destruction	Y	R	R	S
1993 Geneva	Conv. - Prevention of major industrial accidents (ILO 174)	Y			
1993	Agreem. - Promote compliance with international conservation and management measures by fishing vessels on the high seas		R	R	R
1994 Vienna	Conv. - Nuclear safety	Y	R	R	R
1994 Paris	Conv. - Combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa	Y	R	R	S
1996 London	Conv. - Liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea		S		
1996 The Hague	Agreem. - Conservation of African-Eurasian migratory waterbirds				
1997 Vienna	Conv. - Supplementary compensation for nuclear damage				S
1997 Vienna	Conv. - Joint convention on the safety of spent fuel management and on the safety of radioactive waste management		R		S
1997 New York	Conv. - Law of the non-navigational uses of international watercourses				
1998 Rotterdam	Conv. - Prior informed consent procedure for hazardous chemicals and pesticides (PIC)				S

Source: IUCN; OECD.



OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced																										
JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	S		S	S	S	S	S	S	S	S	S	S		S	S	S	S	S	S	S	S	S	S	S	S	S
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
S	S	S	S	S	S	S	S	S	S	S	S			S	S	S	S	S	S	S	S	S	S		S	S
R	S	R	R	R	R	R	R	R	R	R	R	R	S	R	R	S	R	R	R	R	R	R	R	S	S	
					S												R					R				
																		R				R			R	
R	R	R		R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	S		R	R		R	R	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R
							S	S		S							S	S				S			S	
					S					S		S		S			S									
	S	S			S					S		S			S		S									
										S		R				S	S	R		S		R				
S	S	S	S	S	S	S	S	S	S	S	S	S		S	S	S	S	S	S	S	S	S	S	S	S	S

**ANNEX II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1885 Berlin	Treaty - Regulation of Salmon Fishery in the Rhine River Basin	Y			
1933 London	Conv. - Preservation of fauna and flora in their natural state	Y			
1940 Washington	Conv. - Nature protection and wild life preservation in the Western Hemisphere	Y		R	R
1946 London	Conv. - Regulation of the meshes of fishing nets and the size limits of fish	Y			
1958 Dublin	Amendments	Y			
1960 London	Amendments	Y			
1961 Copenhagen	Amendments	Y			
1962 Hamburg	Amendments	Y			
1963 London	Amendments	Y			
1950 Paris	Conv. - Protection of birds	Y			
1957 Geneva	Agreem. - International carriage of dangerous goods by road (ADR)	Y			
1975 New York	Protocol	Y			
1958 Geneva	Agreem. - Adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipments and parts	Y			
1958 Bucharest	Conv. - Fishing in the waters of the Danube	Y			
1959 Washington	Treaty - Antarctic	Y	R		R
1991 Madrid	Protocol to the Antarctic treaty (environmental protection)	Y	S		R
1960 Paris	Conv. - Third party liability in the field of nuclear energy	Y			
1963 Brussels	Supplementary convention	Y			
1964 Paris	Additional protocol to the convention	Y			
1964 Paris	Additional protocol to the supplementary convention	Y			
1982 Brussels	Protocol amending the convention	Y			
1982 Brussels	Protocol amending the supplementary convention	Y			
1988 Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y			
1960 Steckborn	Agreem. - Protection of Lake Constance against pollution	Y			
1966 Bern	Regulation (water withdrawal)	Y			
1961 Paris	Prot. - Constitution of an int'l commission for the protection of the Mosel against pollution	Y			
1990 Brussels	Complementary protocol (int'l commi. for the protection of Mosel and Sarre)	Y			
1992 Maria Laach	2d compl.prot. (to int'l commi. protec. of Mosel and Sarre, and to first compl. prot.)	Y			
1962 Stockholm	Agreem. - Protection of the salmon in the Baltic Sea	Y			
1972 Stockholm	Protocol	Y			
1963 Bern	Agreem. - International commission for the protection of the Rhine against pollution	Y			
1976 Bonn	Supplementary agreement	Y			
1976 Bonn	Conv. - Protection of the Rhine against chemical pollution	Y			
1976 Bonn	Conv. - Protection of the Rhine from pollution by chlorides (modified by exchanges of letters)	Y			
1991 Brussels	Protocol	Y			
1964 Brussels	Agreem. - Measures for the conservation of Antarctic Fauna and Flora	Y			R
1964 London	Conv. - Fisheries	Y			
1967 London	Conv. - Conduct of fishing operations in the North Atlantic	Y	S		S
1968 Strasbourg	Agreem. - Restriction of the use of certain detergents in washing and cleaning products	Y			
1983 Strasbourg	Protocol	Y			
1968 Paris	Conv. - Protection of animals during international transport	Y			
1979 Strasbourg	Protocol	Y			
1969 London	Conv. - Protection of the archaeological heritage	Y			
1969 Rome	Conv. - Conservation of the living resources of the Southeast Atlantic	Y			

**OECD EPR / SECOND CYCLE**

Y = in force S = signed R = ratified D = denounced

[illegible]

**ANNEX II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL) (cont.)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1972 Oslo	Conv. - Prevention of marine pollution by dumping from ships and aircraft	Y			
1983	Protocol	Y			
1972 London	Conv. - Conservation of Antarctic seals	Y	R		R
1973 Oslo	Agreem. - Conservation of polar bears	Y	R		R
1973 Gdansk	Conv. - Fishing and conservation of the living resources in the Baltic Sea and the Belts	Y			
1982 Warsaw	Amendments	Y			
1974 Paris	Conv. - Prevention of marine pollution from land-based sources	Y			
1986 Paris	Protocol	Y			
1992 Paris	Conv. - Protection of North-East Atlantic marine env. (replace Oslo-1972 and Paris-1974)	Y			
1974 Helsinki	Conv. - Protection of the marine environment of the Baltic Sea area	Y			
1992 Helsinki	Conv. - Protection of the marine environment of the Baltic Sea area (amendment)				
1978 Ottawa	Conv. - Future multilateral co-operation in the Northwest Atlantic fisheries (NAFO)	Y	R		
1979 Bern	Conv. - Conservation of European wildlife and natural habitats	Y			
1979 Geneva	Conv. - Long-range transboundary air pollution	Y	R		R
1984 Geneva	Protocol (financing of EMEP)	Y	R		R
1985 Helsinki	Protocol (reduction of sulphur emissions or their transboundary fluxes by at least 30%)	Y	R		
1988 Sofia	Protocol (control of emissions of nitrogen oxides or their transboundary fluxes)	Y	R		R
1991 Geneva	Protocol (control of emissions of volatile organic compounds or their transboundary fluxes)	Y	S		S
1994 Oslo	Protocol (further reduction of sulphur emissions)	Y	R		
1998 Aarhus	Protocol (heavy metals)		R		S
1998 Aarhus	Protocol (persistent organic pollutants)		R		S
1999 Gothenburg	Protocol (abate acidification, eutrophication and ground-level ozone)		S		S
1980 Madrid	Conv. - Transfrontier co-operation between territorial communities or authorities	Y			
1995 Strasbourg	Additional protocol	Y			
1998 Strasbourg	Second protocol				
1980 Canberra	Conv. - Conservation of Antarctic marine living resources	Y	R		R
1980 Bern	Conv. - International carriage of dangerous goods by train (COTIF)				
1980 London	Conv. - Multilateral co-operation in North-East Atlantic fisheries	Y			
1982 Paris	Memorandum of understanding on port state control	Y	R		
1982 Reykjavik	Conv. - Conservation of salmon in the North Atlantic Ocean	Y	R		R
1983 Bonn	Agreem. - Co-operation in dealing with poll. of the North Sea by oil and other harmful subst.	Y			
1989 Bonn	Amendment	Y			
1989	Agreem. - Co-operation in environmental protection				
1989 Geneva	Conv. - Civil liability for damage caused during carriage of dangerous goods by road, rail, and inland navigation vessels (CRTD)				
1991 Espoo	Conv. - Environmental impact assessment in a transboundary context	Y	R		S
1991 Salzburg	Conv. - Protection of Alps	Y			
1994 Chambéry	Prot. - Nature protection and landscape conservation				
1994 Chambéry	Prot. - Town and Country Planning and Sustainable Development				
1994 Chambéry	Prot. - Mountain agriculture				
1996 Brdo	Prot. - Mountain forests				
1996 Brdo	Prot. - Tourism				
1992 Helsinki	Conv. - Transboundary effects of industrial accidents		S		S

Y = in force S = signed R = ratified D = denounced

[illegible]

**ANNEX II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL) (cont.)**

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1992 Bucharest	Conv. - Protection of the Black Sea against pollution	Y			
1992 Bucharest	Protocol (combatting pollution by oil and other harmful substances in emergency situation)	Y			
1992 Bucharest	Protocol (protection of the Black Sea marine Environment against pollution from dumping)				
1992 Bucharest	Protocol (protection of the Black Sea marine Env against poll. from land based sources)				
1992 Helsinki	Conv. - Protection and use of transboundary water courses and international lakes	Y			
1999 London	Prot. - Water and health				
1992 La Valette	European Conv. - Protection of the archaeological heritage (revised)	Y			
1992 Vienna	Agreem. - Forecast, prevention and mitigation of natural and technological disasters				
1993 Lugano	Conv. - Civil liability for damage resulting from activities dangerous to the environment				
1994 Lisbon	Treaty - Energy Charter	Y			
1994 Lisbon	Protocol (energy efficiency and related environmental aspects)	Y			
1994 Sofia	Conv. - Co-operation for the protection and sust. use of the Danube river				
1990 Magdeburg	Agreem.-International commission for the protection of the Elbe river				
1996	Agreem. - Transfrontier co-operation with Saarlorlux-Rhineland-Palatinate regions				
1996 Karlsruhe	Agreem. - Transfrontier co-operation	Y			
1996	Agreem. - Exchange of immissions data in the Black Triangle				
1996 Strasbourg	Conv. - Disposal of waste and waste water generated from navigation on the Rhine				
1996 Wroclaw	Agreem.-International commission for the protection of the Oder river against pollution				
1998 Aarhus	Conv. - Access to env <sup>tal</sup> information and public participation in env <sup>tal</sup> decision-making				
1998 Strasbourg	Conv. - Protection of the environment through criminal law				
1999 Bern	Conv. - Protection of the Rhine				
2000 Florence	Conv. - European lanscape convention				

Source: IUCN; OECD.

OECD EPR / SECOND CYCLE

Y = in force   S = signed   R = ratified   D = denounced																										
JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	EU
																								R		
																								R		
																								R		
																								R		
				R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R		S	R
				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		S	
					S	S	R	R	S	S	R		R	S	S	S	R	R	R	S	R	R	S	S		
	S										S		S		S				S							
							S				S		S		S	S			S							
S		S		R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	S	R	R	R	R	S	R	R
S		S		R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	S	R	R	R	R	S	R	R
				S					S		R															
					R				R																	R
				S					S	S						S										
									S	S						S							S			
					S				S	S						S	S		S				S			
					S				S	S						S	S		S				S			
				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
				S	S		S	S	S	S	S		S			S						S				
									S	S						S	S						S			S
				S		S	S	S	S					S	S		S		S	S		S	S			

### **Annex III**

## **CHRONOLOGY OF SELECTED ENVIRONMENTAL EVENTS (1990-2000)**

### **1990**

- German environmental union: German Democratic Republic (GDR) adopts key provisions of west German environmental law. Maximum transition period for technically outmoded plants: to 30 June 1996.
- Nature conservation in east Germany: 14 new national parks and biosphere reserves designated by GDR Council of Ministers.
- German reunification: A pivotal objective of Unification Treaty between Federal Republic of Germany (FRG) and GDR is ensuring a uniformly high standard of ecological living conditions, at least matching level in FRG.
- Exemption from residual pollution: In accordance with Unification Treaty, purchasers of commercial installations and properties in the new Federal States (Länder) may be exempted from responsibility for environmental damage discovered (the “exemption clause”). According to Administrative Agreement on financing clean-up of contaminated sites in the New Länder, Federal Government is to spend about DEM 35 billion between 1992 and 2002.
- German Federal Environment Foundation: Europe’s largest environmental foundation created from proceeds of privatisation of Salzgitter AG, with capital of DEM 3 billion. It primarily targets small and medium-sized enterprises.
- National CO<sub>2</sub> reduction programme: Federal Government adopts national CO<sub>2</sub> reduction programme and establishes Inter-Ministerial CO<sub>2</sub> Working Group. Objective is to reduce national CO<sub>2</sub> emissions by 25-30% over period 1987-2005. In 1995, target is set at 25% over period 1990-2005.

### **1991**

- Act on Sale of Electricity to the Grid: This Act enters into force. Suppliers of electricity must obtain it from renewable sources at fixed prices. Wind power in particular shows high growth rates.



- “Environment for Europe”: Environmental co-operation initiative for Central and Eastern Europe launched at Conference of Environment Ministers of OECD countries in Dobris, Czechoslovakia.
- Packaging Ordinance: First phase enters into force. Ordinance regulates return of transport and retail packaging, and collection and recycling of used packaging. Packaging Ordinance is first step towards closed substance cycle.

### **1992**

- Technical Instructions on Waste from Human Settlements: From 2005, all household waste must be recycled or combusted at high temperatures. Measure designed to eliminate future residual soil pollution.
- UNCED: UN Conference on Environment and Development in Rio draws greater attention to global environmental problems. UN Framework Convention on Climate Change (UNFCCC) and Convention on Biological Diversity (CBD) signed. Principle of sustainability introduced into environmental policy debate and becomes part of German Constitution in 1994 (Article 20a).

### **1993**

- Exhaust emission limits for cars: New private cars in Europe subject to stringent US exhaust gas emission standards (EURO 1). Limits tightened again in 1996/97 (EURO 2) and 2000 (EURO 3).
- Summer smog: Public concern over high concentrations of irritant gas ozone (“summer smog”). Government initiates programme to measure precursor substances from which it is produced.
- EEA: European Environment Agency established in Copenhagen.
- Monitoring of environmental radioactivity: Integrated Radioactivity Information and Decision Support System (IMIS), with over 2 000 measurement stations, begins to operate. Similar system (IRIS) installed in Russia, with Germany’s help, in 1994.
- Green Freeze: East German company FORON launches new refrigerator based on hydrocarbon technology, which does not use ozone-depleting CFCs or the substitute refrigerant and greenhouse gas 134 a (today hydrocarbon technology is standard throughout Europe).

### **1994**

- Closed Substance Cycle and Waste Management Act: Adoption of this Act. Closing of substance cycles becomes the norm and waste disposal is confined to justified exceptional cases. Entered into force 7 October 1996.

- Halt of CFC production: Production of this ozone-damaging refrigerant/propellant is discontinued altogether in Germany.
- Environmental protection as government objective: Protection of natural sources of life incorporated as national objective in constitutional Basic Law (Article 20a).
- Residual military pollution: Following withdrawal of Soviet troops from Germany, former military areas, including over 30 000 sites suspected of being polluted, are transferred to Federal Government ownership.

### 1995

- Illegal export of special waste: Germany becomes a Party to Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. Waste disposal industry assumes co-responsibility for illegal exports of special waste with creation of “solidarity fund for return of waste”. An effective barrier is therefore created against illegal special waste exports.
- World climate conference: First Conference of the Parties to UNFCCC in Berlin. “Berlin Mandate” is basis of agreement on concrete CO<sub>2</sub> reduction targets preceeding Third Conference of the Parties in Kyoto, 1997.
- Voluntary industry commitment on climate protection: Federal Association of German Industry (BDI) issues “Declaration by German industry on global warming prevention” on behalf of member organisations. Specific CO<sub>2</sub> emissions to be reduced 20% (1990-2005) and monitored by independent institute.
- “Brent Spar”: Following occupation by Greenpeace and boycott of Shell stations, plans to sink the platform are cancelled (international ban on sinking oil platforms in the North Sea and North-East Atlantic has been in force since 1998).
- North Sea: In Esbjerg, Environment Ministers of North Sea littoral states agree to eliminate its contamination by synthetic materials within 25 years.
- Eco-audit: EU Eco-Audit Directive translated into German law (by the end of 1999, some 2 500 production sites in Germany had undergone plant inspections, accounting for two-thirds of all EU certifications).

### 1996

- Salmon in the Rhine: Salmon previously released in headwaters are caught for the first time in the Sieg, a tributary of the Rhine. Return of the salmon seen as an indicator of the river system’s successful rehabilitation.
- Environmental technology: Creation of ITUT (Institute for the Transfer of Environmental Technology) in Leipzig by the Federal Government, in collaboration with the government of Saxony and industry.

- Dialogue “Towards Sustainable Development”: Federal Environment Minister initiates comprehensive dialogue with major groups. Industry, NGOs and the government discuss environmental targets in working groups. Based on this process, a “Draft Programme of Key Environmental Measures” is submitted in 1998.
- Black spots in tidal flats: Black spots in tidal flats (Wattenmeer) of Lower Saxony, below which all forms of life are extinguished, demonstrate susceptibility of this ecosystem (marine biologists have yet to determine the causes).
- Climate Convention Secretariat: UNFCCC Secretariat begins operations in Bonn.

### 1997

- Electromog Ordinance: Ordinance on Electromagnetic Fields (“electromog”) enforces precautionary limits for electromagnetic fields surrounding transmitters and high-voltage power cables.
- Amsterdam Treaty: European Council in Amsterdam includes principle of sustainable development in preamble to EU Treaty.
- Emission-based motor vehicle tax: On 1 July, this tax enters into force. Tax rates linked to compliance with emission standards; there are concessions for energy-saving vehicles.
- Flooding: Up to 15 000 soldiers tackle flood of the century on the Oder. The 1925-26 record had previously been matched only on the Rhine (Christmas 1993 and January 1995). It is hoped that designation of flood plains and a soil conservation act will help mitigate the problem.
- Kyoto Protocol: At the Kyoto climate conference, industrialised countries agree on binding targets to reduce GHG emissions.

### 1998

- Federal Soil Conservation Act: Binding regulations drawn up for effective soil protection and rehabilitation of contaminated sites. It is suspected that about 240 000 sites in Germany are contaminated.
- Unsafe transport of nuclear materials: For a number of years, containers used to ship reprocessed fuel rods back to Germany from La Hague (France) have exceeded prescribed radiation limits up to 100-fold. Shipments suspended until further notice.
- Red-Green coalition government: Greens and Social Democrats form government following general election. Environment Ministry taken over by Greens. Key components of government’s agenda include introduction of an eco-tax and regulated phase-out of nuclear power.

## 1999

- Ecological tax reform: First phase of ecological reform of taxes and charges enters into force. Taxes on fuels, heating oil, gas and a newly created electricity tax to be increased in phases, reaching over DEM 30 billion in revenue by 2003. This revenue will be channelled into the pension insurance scheme, with contribution rates reduced accordingly.
- Promotion of renewable energy sources: Revenue from taxes on electricity produced from regenerative sources (approximately DEM 200–300 million per year) will be used to promote market launch of regenerative energy. “100 000 roofs” photovoltaic campaign also being launched. The aim is to increase the proportion of these energy sources from 2 to 5% by 2005. By 2050, it is hoped that regenerative energy sources will provide half of all energy consumed.
- Exhaust emission standards for trucks and buses: European Parliament and Council adopt stringent soot and NO<sub>2</sub> limits for trucks and buses, with effect from 2006 (95% reduction in soot levels compared with EURO 1 in 1993).

## 2000

- Renewable Energy Act: This Act enters into force on 1 April. It specifies cost-covering remuneration for supply of energy from renewable resources and makes regenerative energy attractive to investors.
- Nuclear power consensus: Federal Government and energy supply companies agree to discontinue use of nuclear power in Germany gradually. For each of its 19 nuclear power stations, a total life span of 32 years from date of commissioning has been specified. Any nuclear power which has not yet been exhausted may be transferred to more profitable plants where applicable.
- Nature conservation areas: 100 000 hectares of previously State-owned forest and agricultural land in the New Länder is excluded from privatisation and reserved for nature conservation. Half will be handed over to environmental protection associations free-of-charge, the other half under especially favourable conditions.
- Climate Protection: Federal Government adopts comprehensive, cross-sectoral programme to meet the ambitious national targets for reducing CO<sub>2</sub> and other GHG emissions. A new agreement on climate protection is signed by the Federal Government and German industry.

## Annex IV

### THE PHYSICAL CONTEXT

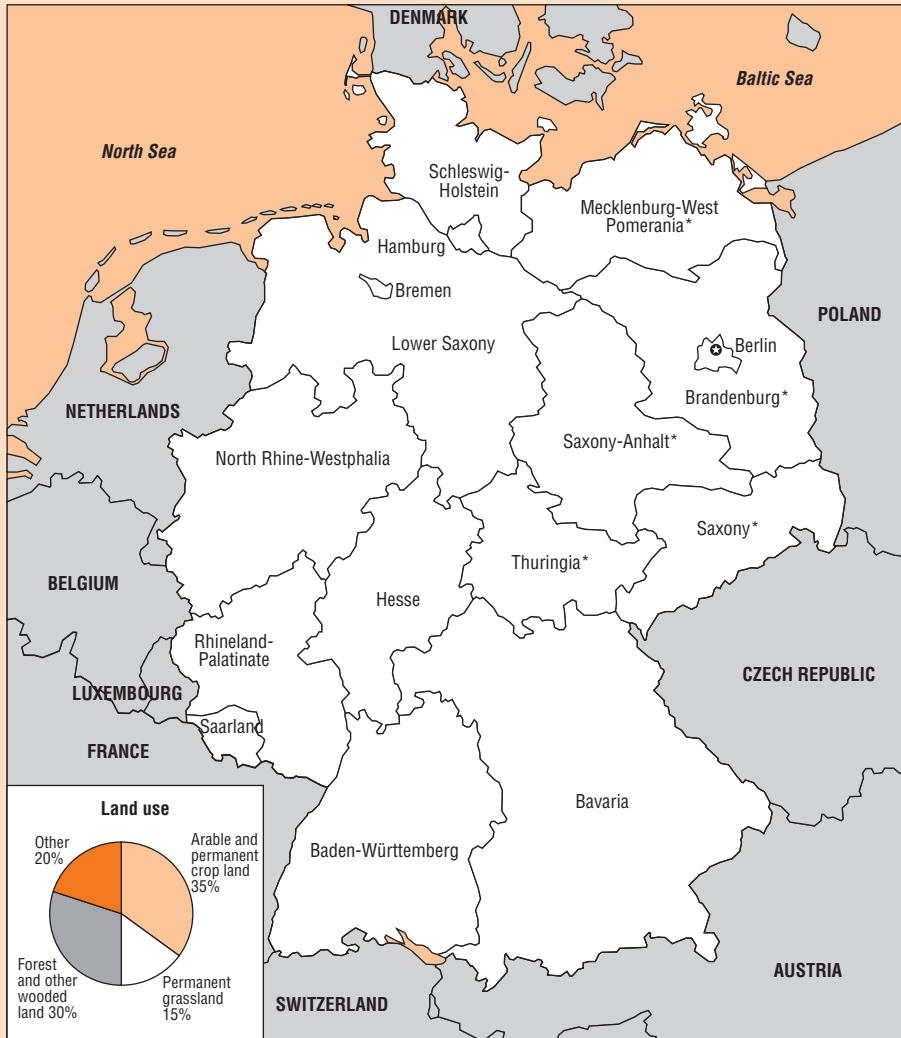
Located in the heart of Europe, Germany shares borders with nine other countries. Its coastline stretches from the North Sea to the Baltic Sea. Total land area is 356 000 km<sup>2</sup>, of which 70% is in the western part of the country. Topographically there are three major zones: the north German flatlands, south of the North and Baltic Sea coastline, which contain a substantial number of lakes and wetlands; the central uplands, with hills and mountains rising to 1 000 metres; and a mountainous southern area with hills, large lakes and the Alps, where elevations reach 3 000 metres. Land is primarily used for agricultural purposes (half the total area). Approximately 30% of land consists of wooded areas dominated by softwood trees, accounting for about two-thirds of the overall forest. Areas devoted to housing and traffic amount to 12% of total surface area (the remainder is covered by water, wetlands and undisturbed land).

Germany's climate is moderate, with frequent changes in weather conditions. Westerly winds and precipitation throughout the year are typical. Rainfall averages 760 millimetres per year. It varies significantly between the north German flatlands (500-700 mm), the central uplands (700-1 500 mm) and the Alpine area (over 2 000 mm). There is a transition between climate zones from oceanic (northern) to continental (southern and central). Temperatures range from a monthly average of -6° C in January to +20° C in July.

The greatest part of Germany drains through the Rhine, Ems, Weser and Elbe rivers to the North Sea. Some areas of southern Germany are linked to the Danube basin, where drainage is directed towards the Black Sea. The Oder in the east drains into the Baltic Sea. Germany is rich in groundwater resources, which provide over 85% of drinking water. Overall, Germany is not rich in non-renewable natural resources. Resources of importance include reserves of brown coal and hard coal, iron ore, some petroleum and natural gas, and mineral salts.

Germany has a population of about 82.0 million. Approximately 65 million live in the western part (Old Länder), 17 million in the New Länder of eastern Germany. It is one of the densely populated OECD countries (230 people per km<sup>2</sup>), yet population is distributed very unevenly. The western part of Germany is much more densely populated than the eastern part, where about 20% of the population lives on roughly 30% of the national territory. The Berlin region, which has grown rapidly since Germany's

Map of Germany



\* New Land.

unification, presently has over 4.3 million inhabitants. More than 11 million people (about 1 100 per km<sup>2</sup>) live in the Rhine-Ruhr industrial region. Other concentrations exist in the Rhine-Main area around Frankfurt, Wiesbaden and Mainz, the Rhine-Neckar industrial region around Mannheim and Ludwigshafen, the industrial area around Stuttgart, and the agglomerations of Hamburg, Munich, Cologne and Leipzig. These densely populated regions contrast with very thinly populated areas such as Brandenburg and large parts of Mecklenburg-West Pomerania in the north-east, parts of the Eifel Mountains in the west, and the Bavarian Forest and Upper Palatinate in the south-east.

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