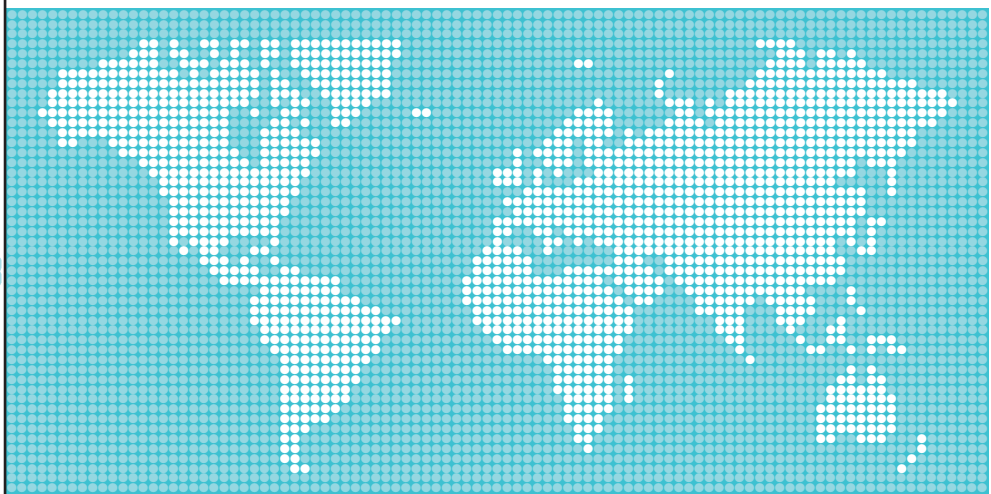


ENVIRONMENTAL
PERFORMANCE
REVIEWS

CZECH REPUBLIC



ENVIRONMENTAL
PERFORMANCE
REVIEWS

CZECH REPUBLIC

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 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:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996) and Korea (12th December 1996). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

Publié en français sous le titre :

EXAMENS DES PERFORMANCES ENVIRONNEMENTALES
RÉPUBLIQUE TCHÈQUE

© OECD 1999

Permission to reproduce a portion of this work for non-commercial purposes or classroom use should be obtained through the Centre français d'exploitation du droit de copie (CFC), 20, rue des Grands-Augustins, 75006 Paris, France, Tel. (33-1) 44 07 47 70, Fax (33-1) 46 34 67 19, for every country except the United States. In the United States permission should be obtained through the Copyright Clearance Center, Customer Service, (508)750-8400, 222 Rosewood Drive, Danvers, MA 01923 USA, or CCC Online: <http://www.copyright.com/>. All other applications for permission to reproduce or translate all or part of this book should be made to OECD Publications, 2, rue André-Pascal, 75775 Paris Cedex 16, France.

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 by establishing baseline conditions, trends, policy commitments, institutional arrangements and routine capabilities for carrying out national evaluations;
- to promote environmental improvements and a continuous policy *dialogue among Member countries*, through a peer review process and by the transfer of information on policies, approaches and experiences of reviewed countries; and
- to stimulate *greater accountability* from Member countries' governments towards public opinion within developed countries and beyond.

Programme efforts are directed at *promoting sustainable development*, with emphasis on developments in domestic and international environmental policy, as well as on the integration of economic and environmental decision making.

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, independent and periodic reviews are organised and conducted in a way similar to the OECD's economic reviews. The report is peer-reviewed by the Working Party on Environmental Performance, composed of officials from Member countries who have responsibility for national environmental policy development and implementation and a broad competence recognised at national and international levels. The conclusions and recommendations of the report are approved by the Working Party.

Joke Waller-Hunter
Director
Environment Directorate

GENERAL INTRODUCTION

This review of the Czech Republic's environmental performance *examines results to date* in the light of domestic objectives and international commitments. Three countries assisted with this review (Hungary, Sweden and Turkey), as well as the European Commission.

The report is organised in three parts according to the strategic goals identified by OECD Environment Ministers in January 1991:

- Part I is entitled “Pollution Control and Nature Conservation” and focuses on air, water and waste management and nature conservation, forests and biodiversity;
- Part II is entitled “Integration of Policies” and focuses on institutional aspects and on how policies concerning economics and industry are integrated with environmental policies;
- Part III is entitled “Co-operation with the International Community” and focuses on international environmental topics concerning the Czech Republic.

The OECD extends its most sincere thanks to all those who helped in the course of this review, and especially to the examining partners (Hungary, Sweden and Turkey, and the European Commission) and their experts. The OECD is particularly indebted to the Government of the Czech Republic for its co-operation in expediting the provision of information and the organisation of the experts' mission to the Czech Republic, 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 in November 1998 and approved its conclusions and recommendations. This report is published under the authority of the Secretary-General of the OECD.

OUTLINE OF THE REPORT

CONCLUSIONS AND RECOMMENDATIONS	19
---------------------------------------	----

REPORT:

1. THE CONTEXT	35
----------------------	----

Part I

POLLUTION CONTROL AND NATURE CONSERVATION

2. AIR MANAGEMENT	49
3. WATER MANAGEMENT	65
4. WASTE MANAGEMENT	81
5. NATURE CONSERVATION, FORESTS AND BIODIVERSITY	93

Part II

INTEGRATION OF POLICIES

6. ENVIRONMENT AND ECONOMIC POLICIES	113
7. SECTORAL INTEGRATION: INDUSTRY	145

Part III

CO-OPERATION WITH THE INTERNATIONAL COMMUNITY

8. INTERNATIONAL CO-OPERATION	161
ANNEXES	183

DETAILED TABLE OF CONTENTS

Foreword	3
General Introduction	5
List of Figures and Tables	13
Abbreviations and Signs	15
List of Team Members	17

CONCLUSIONS AND RECOMMENDATIONS	19
1. Implementing Environmental Policies	20
Environmental governance and democracy	20
From environmental effectiveness to economic efficiency	21
Air	23
Water	24
Waste	25
Nature, forest resources and biodiversity	27
2. Integrating Environmental Concerns in Economic Decisions	28
Decoupling and sustainable development	28
Industry and the environment	30
3. International Co-operation	31

REPORT

1. THE CONTEXT	35
1. The Physical Context	35
2. The Human Context	37
3. The Economic Context	37
4. The Institutional Context	40
Environmental administration	41
5. Development of Environmental Policy and Legislation	45

*Part I***POLLUTION CONTROL AND NATURE CONSERVATION**

2. AIR MANAGEMENT	49
1. The State of Atmospheric Emissions and Air Quality	49
Emissions of atmospheric pollutants	49
Ambient air quality	51
Effects on health and ecosystems	53
2. Responses	53
Objectives	53
Measures to prevent and control air pollution	54
Expenditure on air pollution prevention and control	56
Air management and energy policy	57
Air management and transport	60
3. Environmental Performance	62
Achieving large emission reductions	62
Ambient air quality	63
Energy and transport	64
3. WATER MANAGEMENT	65
1. The State of and Pressures on Water Resources	65
Current situation and trends	65
Pressures on water resources	69
2. Responses	71
Objectives	71
Management of water resources	72
3. Environmental Performance	75
Reforming the water management framework	76
Achieving water management objectives	76
Delivery of water services	77
4. WASTE MANAGEMENT	81
1. Current Situation and Trends	81
2. Responses	83
Objectives	83
Institutional and regulatory aspects	84
Waste minimisation and recycling	85
Treatment and disposal facilities	86
Use of economic and other instruments	87
Imports and exports of hazardous waste	88
Measures to remediate soil contamination	89
3. Environmental Performance	89

5. NATURE CONSERVATION, FORESTS AND BIODIVERSITY	93
1. The State of and Pressures on Nature	93
Status and trends	93
Pressures on ecosystems	96
2. Responses	97
Objectives	99
Institutional framework	99
Measures for protecting habitats and species	101
Forest management	103
Expenditure for nature conservation and forestry	104
International agreements	104
3. Environmental Performance	105
Management framework	105
Protected areas and species	105
Sustainable forestry	107
Conserving nature outside protected areas	108

Part II

INTEGRATION OF POLICIES

6. ENVIRONMENT AND ECONOMIC POLICIES	113
1. Sustainable Development	113
Environmentally sound economic development	113
Economic impacts of environmental policies	119
2. Instruments for Policy Implementation	126
Administrative and legislative instruments	126
European Union legislation	128
Economic instruments	129
Environmental impact assessments	134
Other instruments for policy integration	135
3. Environmental Performance	139
From central economic planning to a market economy	139
Strengthening institutional integration	140
Ensuring efficient and effective environmental expenditure	141
Strengthening the environmental democracy	142
7. SECTORAL INTEGRATION: INDUSTRY	145
1. Effects of Industrial Activities on the Environment	145
Development of the industrial sector	145
Environmental effects	147

2. Responses	150
Policy objectives	150
Implementation of environmental policies	151
Remedying past environmental damage	152
Environmental investment by industry	153
Integration of environmental concerns in industrial policies and management	154
3. Environmental Performance	156
Implementation of environmental policies and remedying past environmental damage	157
Environmental investments and integration of environmental concerns in industry	157

Part III

CO-OPERATION WITH THE INTERNATIONAL COMMUNITY

8. INTERNATIONAL CO-OPERATION	161
1. International Agreements and Organisations	161
Multilateral agreements	161
Membership in the Council of Europe and the OECD	162
Process of accession to the EU	162
2. Bilateral and European Co-operation	163
Relations with neighbouring countries	163
Bilateral co-operation with other countries	166
European co-operation	167
3. Global Co-operation	170
Climate change	171
Protection of the ozone layer	173
Biological diversity	173
Implementation of the Rio Declaration	174
Agenda 21 preparation at national and local levels	174
Development assistance	175
4. Environmental Performance	176
International environmental co-operation in a transition context	176
Co-operation in Europe	178
Climate change	179
Other global issues	179
Aid	181

ANNEXES

I. Selected environmental data	184
II. Selected economic data and trends	186
III.A Selected multilateral agreements (worldwide)	188
III.B Selected multilateral agreements (regional)	192
IV. Chronology of selected environmental events (prior to 1989, 1989-98)	197

LIST OF FIGURES AND TABLES

1. THE CONTEXT		35
Figure 1.1	Map of the Czech Republic	36
Figure 1.2	Economic structure and trends	38
Figure 1.3	Environmental administration	42
Table 1.1	Economic trends in transition countries	39
Table 1.2	Selected environmental legislation	44
2. AIR MANAGEMENT		49
Figure 2.1	Atmospheric emissions	50
Figure 2.2	Trends in air quality	52
Figure 2.3	Energy intensity and consumption	58
Figure 2.4	Transport sector	61
Table 2.1	Energy prices in selected OECD countries	59
3. WATER MANAGEMENT		65
Figure 3.1	Freshwater resources and withdrawals	66
Figure 3.2	Water quality of selected rivers	68
Figure 3.3	Pollution from point sources	70
Figure 3.4	Population connected to public waste water treatment plants	79
Table 3.1	Groundwater quality	68
Table 3.2	Waste water discharged by selected industries	70
Table 3.3	Water prices, selected cities	79
4. WASTE MANAGEMENT		81
Figure 4.1	Waste generation	82
Table 4.1	Waste generation	82
Table 4.2	Landfill fees	87
5. NATURE CONSERVATION, FORESTS AND BIODIVERSITY		93
Figure 5.1	Salvage felling of forests by cause	96
Figure 5.2	Agricultural inputs	98
Figure 5.3	Major protected areas	106
Table 5.1	State of flora and fauna	94
Table 5.2	Protected areas	101
Table 5.3	Protected species	103

6. ENVIRONMENT AND ECONOMIC POLICIES	113
Table 6.1 Economic changes and environmental pressures	116
Table 6.2 Environmental investment	120
Table 6.3 Environmental investment	121
Table 6.4 Environmental expenditure in the national budget	123
Table 6.5 State Environmental Fund	124
Table 6.6 Fines levied by the Czech Environmental Inspection	127
Table 6.7 Economic instruments	130
7. SECTORAL INTEGRATION: INDUSTRY	145
Figure 7.1 Trends in industrial activity	146
Table 7.1 Production and employment in industry	146
Table 7.2 Industrial activities and selected environmental pressures	148
Table 7.3 Selected information on the region of Northern Bohemia	154
8. INTERNATIONAL CO-OPERATION	161
Figure 8.1 CO ₂ emissions intensities	180
Table 8.1 Damage to forests in Central Europe	167
Table 8.2 Acid deposition	169
Table 8.3 Regional air agreements	169
Table 8.4 CO ₂ emissions in the Czech Republic	171
Table 8.5 Environmental assistance	176

ANNEXES

I. Selected environmental data	184
II. Selected economic data and trends	186
III.A Selected multilateral agreements (worldwide)	188
III.B Selected multilateral agreements (regional)	192

ABBREVIATIONS AND SIGNS

Abbreviations

AOX	Absorbable organically bound halogens
BOD	Biochemical oxygen demand
CEA	Czech Energy Agency
CEZ	Czech Power Company
CFCs	Chlorofluorocarbons
CHMU	Czech Hydrometeorological Institute
CITES	Convention on International Trade in Endangered Species
COD	Chemical oxygen demand
COMECON	Council for Mutual Economic Assistance
CSO	Czech Statistical Office
EIA	Environmental impact assessment
EMAS	Eco-management and Audit Scheme (European Union)
FCCC	UN Framework Convention on Climate Change
FDI	Foreign direct investment
GEF	Global Environment Facility
GHG	Greenhouse gases
HCFCs	Hydrochlorofluorocarbons
IEA	International Energy Agency
IPPC	Integrated Pollution Prevention and Control
ISIC	International Standard Industrial Classification
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
MIT	Ministry of Industry and Trade
MoE	Ministry of the Environment
Mtoe	Million tonnes of oil equivalent
NGO	Non-governmental organisation
NPF	National Property Fund
NPK	Nitrogen, phosphorus and potassium
ODS	Ozone depleting substances
PAC	Pollution abatement and control
PCBs	Polychlorinated biphenyls
Phare	Poland Hungary Assistance for Restructuring of the Economy (European Commission)
POPs	Persistent organic pollutants
PPP	Purchasing power parity
PRTR	Pollutant release and transfer register

SEF	State Environmental Fund
SEP	State Environmental Policy
SME	Small and medium-sized enterprise
TPES	Total primary energy supply
TSES	Territorial System of Ecological Stability
UNCED	United Nations Conference on Environment and Development
UN-ECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VOCs	Volatile organic compounds
VULHM	Forestry and Game Management Research Institute

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: Czech Koruna (CZK)

On average in 1998, 1 CZK = US\$0.029

Cut-off Date

This report is based on information and data available up to July 1998.

LIST OF TEAM MEMBERS

Mr. Saban Çimen	Expert from examining country: Turkey
Mr. Björn Ejner	Expert from examining country: Sweden
Ms. Patricia Maugain	Expert from examining country: European Commission
Ms. Terez Szabo	Expert from examining country: Hungary
Mr. Christian Avérous	OECD Secretariat
Mr. Eduard Goldberg	OECD Secretariat
Mr. Kees van Laarhoven	OECD Secretariat
Mr. Krzysztof Michalak	OECD Secretariat
Mr. Henri Smets	OECD Secretariat
Mr. Pierre Lieben	OECD Secretariat (Consultant)

CONCLUSIONS AND RECOMMENDATIONS*

The Czech Republic is undergoing two *major transitions*: a major economic transition while returning to democracy and preparation for entry into the European Union. In the wake of the collapse of its traditional export markets, Czech Gross Domestic Product fell by more than 20 per cent before recovery began in 1993. Inflation and unemployment remained much lower than in most other European countries in transition. Many industrial enterprises were privatised and land ownership changed significantly.

During this period, the Czech Republic has substantially reduced environmental pressures and achieved *tangible environmental results*, in addition to those attributable to the decline of economic activities such as industry and agriculture. It has also implemented major legislative and institutional changes concerning the environment. Notwithstanding these successes, much of the accumulated contamination of the past is still in place and current emissions and discharges remain high compared to OECD average levels. The *road towards environmental convergence* with other European OECD countries will be a long one.

The *challenge* is therefore to: i) maintain a high level of effort to implement environmental policies and strengthen environmental infrastructure; ii) better integrate environmental concerns in economic decisions; and iii) meet the country's international environmental commitments.

This OECD report establishes a baseline for assessing future environmental progress and examines the Czech Republic's environmental performance, i.e. the extent to which its *domestic objectives and international commitments* are being met, based on environmental effectiveness and economic efficiency criteria. A number of recommendations are put forward that could contribute to strengthening the country's environmental performance.

* Conclusions and Recommendations approved by the Working Party on Environmental Performance at its November 1998 meeting.

1. Implementing Environmental Policies

Environmental governance and democracy

A *set of new environmental laws* was adopted immediately after the Velvet Revolution of 1989. The Ministry of the Environment was created in 1990. It has relatively wide-ranging competencies and is in charge of preparing and implementing policies aimed at correcting many of the mistakes of the past and providing a healthier environment for citizens who used to live in some of the worst European “black spots”. The Ministry of the Environment is co-ordinating institutes, agencies and regional administrations; in addition, other ministries, among others the Ministry of Agriculture, the Ministry of Health, the Ministry of Regional Development, the Ministry of Transport, the Ministry of Industry and Trade, and the Ministry of Interior, play significant roles in environmental protection. The *environmental legal framework is now under revision*. Draft texts or bills are under discussion on polluted water standards, water management, waste, packaging, genetically modified organisms (GMOs), environmental impact assessment (EIA), industrial accidents, air, integrated pollution prevention and control (IPPC), protection areas, national parks, etc. Enactment of new environmental laws and the *approximation of EU legislation* are taking place at a slower pace than initially announced.

The *environmental protection policies* adopted and implemented in 1990 (Rainbow Programme) and 1995 (State Environmental Policy) have contributed to tangible results, such as large reductions in pollutant emissions and improvements in air and water quality. These policies were largely based on the effective use of regulatory instruments, associated to economic instruments and to sizeable environmental investment. The Czech Republic also uses a system of EIA that applies to a range of projects. Recently EIA has been applied to sectoral policies (e.g. energy and transport policies). Emissions and discharges from polluting installations must now satisfy national standards. A strong Czech *Environmental Inspection* is in place to improve further compliance with national laws. To make further progress, the new environmental policy under preparation should include more precise targets, concerning a large number of issues, than the earlier ones.

The quality of *public information* has very much improved: economic and environmental data are now obtainable, state of the environment reports are being published regularly, international environmental definitions and standards are increasingly used. Nevertheless, there remain serious information weaknesses (e.g. waste generation, environmental expenditure). Citizens’ *right of access to environmental information* was recognised in 1990, but it was necessary to enact a law in 1998 to reinforce this right, and its implementation will

require overcoming remaining inertia and continuing secretiveness inherited from past administrative practices. Formal implementation of the OECD Recommendation on pollutant release and transfer registers is under consideration. *Education* on environmental topics, as well as awareness-raising, will be essential elements of a long-term policy.

It is therefore *recommended* to:

- strengthen monitoring and *enforcement of laws and regulations* at national, regional and local levels, and further ensure that polluters are effectively sanctioned;
- finalise as soon as possible the preparation of a *new national environmental policy* with goals, quantitative *targets and deadlines*, taking into account EU environmental standards and the steps in the accession process to EU membership;
- strengthen the *capacity of the Ministry of the Environment*, especially for economic analysis for developing the laws and regulations necessary for transposition of EU legislation;
- develop closer and more sustained relations with key stakeholders such as Members of Parliament, local authorities, industry and NGOs, with a view *to raising environmental awareness and building stronger environmental constituencies*;
- continue to develop the system for providing *environmental information* and implement the principles of free and easy access to this type of information, citizen participation in environmental decision-making and access to justice on environmental issues.

From environmental effectiveness to economic efficiency

Very large efforts were needed to *remove visible scars* inherited from a period of disregard for the environment: highly polluted air and water bodies, derelict land and contaminated soil. The government which came to power just after the Velvet Revolution demonstrated a strong interest in protecting the environment. Large environmental investments were decided in the early 1990s and made subsequently, mostly in air pollution abatement, but also in water pollution abatement and clean-up of contaminated soils, including clean-up of former Soviet Army bases and uranium mining waste dumps.

As a result, *expenditure on environmental protection* has risen steadily over the period 1990-96, reaching the level of *3 per cent of GDP*; this included pollution abatement and control expenditure of about 2 per cent of GDP, which is sizeable

compared to other OECD countries. Most of this amount is financed by the private sector with relatively little support by the state. Very large expenditure was made for controlling air pollution from power stations. The overall level of environmental expenditure is not likely to decrease in the future owing to new requirements related to approximation of EU legislation.

Economic instruments have been implemented, in particular charges on water abstraction, water pollution, air pollution, noise and waste. Economic sanctions can be applied when standards are exceeded. Charges and fines are collected by the State Environmental Fund (SEF) and local authorities, which use the revenue to finance pollution abatement measures. The *economic instruments in use* contribute to the financing of environmental investment, but the rates of charges have mostly been either eroded by inflation or set too low to induce polluters to reduce their emissions. Charges are also used to conserve natural resources and protect the landscape.

In a transition period it is customary to make use of subsidies to improve environmental protection more rapidly. In the Czech Republic, “crash” programmes were put into place to respond to unacceptable situations; industry and privatised public bodies have received subsidies or soft loans to enable them to control pollution. Although the level of overall subsidisation of environmental investment is now around only 14 per cent, greater implementation of the *polluter pays principle* in all areas of environmental protection would be warranted. As large investment will be needed to better protect water, remove soil contamination and restore land, it will also be necessary to perform cost-benefit analyses to ensure that money is spent efficiently.

It is therefore *recommended* to:

- promote greater use of the *polluter pays principle* and of internalisation of environmental costs, especially concerning water resources;
- increase rates of *charges* on polluting activities; make greater use of *fines* and increase their rates so that they function as a disincentive;
- develop a *financing strategy* for implementing environmental policies, especially in the areas of urban water supply, waste water treatment and waste management, through broadening sources of funding, the use of a mix of instruments and the greater implementation of the user pays principle;
- in the process of adaptation to EU standards, pay special attention to the organisational aspects of the *inspectorate* related to sectoral integration, co-ordination and separation of powers.

Air

Considerable progress was made in *reducing emissions* of conventional air pollutants with, for instance, a 68 per cent decrease in SO₂ emissions and a 50 per cent decrease in NO_x emissions between 1987 and 1997. Apart from the effects of the sharp drop in economic output at the beginning of the 1990s, these emission reductions have mainly resulted from: i) some fuel switching from brown coal and heavy fuel oil to natural gas; ii) massive investment in the retrofitting of large coal/lignite-fired power plants with desulphurisation equipment. Revenue from emission charges has helped finance the reduction of emissions from smaller emission sources. The Czech Republic has met, or is likely to meet, all its commitments to reduce emissions of conventional pollutants. More than 98 per cent of major, and more than 90 per cent of medium-sized, stationary pollution sources will be able to comply with the 1991 Clean Air Act, which requires existing plants to meet emission standards by the end of 1998. Local air quality has improved significantly, especially in terms of SO₂ and particulate matter. The country's monitoring system covering the most polluted parts of cities and conurbations is comprehensive and well-established.

The success of the Czech Republic in meeting its main emission reduction targets should not obscure the fact that *emissions per capita or unit of GDP of traditional pollutants remain among the highest in the OECD* and that much work remains to be done. Estimates suggest that 23 per cent of the Czech population is exposed to air which does not meet quality standards for more than one parameter. Epidemiological studies have shown that air pollution is affecting human health and that acid deposition, although much reduced, still causes forest damage. Energy intensity has fallen but remains high. It is difficult to promote energy efficiency improvements and renewable energy sources when energy prices are relatively low. Continuing traffic growth will make it difficult to reduce NO_x emissions and to control NO_x and ozone concentrations.

It is therefore *recommended* to:

- review air quality priorities and make *cost-effective choices* of quantitative targets, including: i) further reducing emissions from small stationary sources; ii) tightening NO_x emission standards for large combustion plants; iii) reducing emissions of NO_x and VOCs from mobile sources; iv) focusing on emissions of VOCs in the fuel distribution chain;
- use a more cost-effective *mix of policy instruments*, including increasing the incentive function of emission charges;

- further integrate environmental concerns into *energy policies*, including through accelerating the reduction of energy price distortions that discourage energy saving and renewable energy use;
- develop, assess the environmental impacts of, and implement a comprehensive *sustainable transport strategy* incorporating land use and transport planning, as well as regulatory measures and pricing mechanisms that discourage car use, especially in urban areas;
- improve *data collection and reporting* on heavy metals and other toxic substances.

Water

Water resources in the Czech Republic are subject to moderately high pressures and need to be managed carefully. The approach to *water management has changed radically* over the past ten years; Czech water managers now take a more *integrated approach* and use a *range of policy instruments*. Among other reforms, the *ownership* of water supply and waste water disposal companies has been transferred to the regional/local level; *service charges* have been raised steadily and now cover the operational (but not the capital) cost of the services provided. These price rises contributed to a fall of about 30 per cent in water use from public supplies in 1989-96. Effluent discharges, particularly from larger municipal and industrial point sources, have been reduced markedly: overall, decreases have been 70 per cent for BOD₅, 54 per cent for suspended solids, 77 per cent for oil substances, 27 per cent for dissolved solids and 87 per cent for acidity/alkalinity between 1990 and 1996. In the 1990s, the population connected to a sewage treatment station increased from 50.3 to 59.2 per cent and now equals the OECD average. The share of the volume of waste water treated to secondary and higher standard rose from 84 to 90 per cent. All these efforts have already begun to yield results, and water quality in many rivers has improved, particularly in terms of organic pollution. With a sharp decline in output and in its use of commercial fertilisers and pesticides, pressures from agriculture on Czech waters have decreased somewhat.

Yet *the state of Czech water resources remains serious*. Water quality in many parts of the country, particularly water reservoirs and small watercourses, is still poor in terms of a number of pollutants, for instance nutrients and microbial contamination. Groundwater quality standards (organic pollution, petroleum products and nitrates) are still exceeded at a large proportion of measuring stations, despite improvement observed in recent years. Contaminated sediments will continue releasing toxic substances to aquatic ecosystems for a long time to

come. The connection rate for both drinking water and sewerage networks needs to be increased and the monitoring of drinking water extended. Almost 3 000 small municipalities (between 100 and 2 000 inhabitants) still lack waste water treatment facilities. There is slippage of various deadlines announced in the State Environment Policy (SEP) for the further evolution of the country's policy framework. Although a revised law on waste water charges announced for 1996 was adopted in March 1998, the revision of effluent limits (to meet targets of EU directives) and a substantial review of water management legislation had not been carried out as of June 1998. Large parts of the country suffered very high flood damages in 1997 (3 per cent of GDP) and remain vulnerable to flood hazards.

It is therefore *recommended* to:

- prepare and enact a *new water legislation* with revised effluent limits;
- set quantified *water management objectives* based on EU directives and on the agreements reached with respect to the protection of the Labe (Elbe), Morava, and Odra (Oder);
- connect more households to *water supply* networks and seek to reduce large differences in connection rates across the country in the most cost-effective way; extend the monitoring of and reporting on drinking water quality to all public systems;
- increase the number of people connected to sewerage systems and invest in *waste water treatment* plants;
- continue measures to establish a *water pricing* structure which encourages water conservation and takes account of social factors;
- continue to strengthen the *ecosystem approach*;
- reduce vulnerability to *flood hazards* by strengthening the integration of water management considerations in land use planning; further pursue physical measures to prevent flooding and reduce flood damage.

Waste

The *current situation* in the Czech Republic with regard to waste management can be characterised as follows: i) large quantities of waste produced and often accumulated on site by mining operations, manufacturing, industry, and utilities; ii) high proportion of hazardous waste to total waste produced; iii) predominance of landfilling as a waste disposal technique; iv) little use of waste as a source of secondary raw materials and energy; v) many sites still contaminated by previous industrial and military activities.

The number of inappropriately operated *waste disposal facilities* (landfills and incineration plants) has been dramatically reduced over the last few years. A cleaner production programme has encouraged companies to improve production process efficiency and reduce waste generation. A new *Waste Management Act* came into effect on 1 January 1998, replacing previous inadequate legislation. The Act is based on principles and approaches adopted in European Union waste regulations, OECD Council Acts and the Basel Convention; it also includes provisions for the creation of financial reserves for landfill reclamation and after-closure operations. The Act introduces the principle of producer responsibility with regard to packaging and packaging waste. *Fees for landfilling* have been introduced and their rate is to increase substantially over the next few years, especially as concerns hazardous waste. Decontamination of the sites of former Soviet military installations is well advanced and the remediation of contaminated industrial sites is proceeding as former state property is privatised.

However, the Czech Republic *is lagging behind many other OECD countries* in waste management. *Recycling* and utilisation technologies for secondary raw materials are inadequate, as is the capacity of the recycling industry. Waste management plans are, however, missing. Landfilling remains by far the most commonly used waste disposal method, including for hazardous waste. Landfill fees are too low to encourage the implementation of more environmentally sound waste management techniques. Existing *incineration capacity*, though small, is currently far from being fully used. Industrial waste is produced at high rates and has accumulated at industrial sites over the years. No central facility for hazardous waste treatment and disposal exists or is planned. Progress in rehabilitating the many inappropriate landfill sites which have been closed is slow, and a large number of illegal dumps are remaining. There is still too little reliable information on waste generation and management, despite an improvement generated by the new Waste Management Act.

It is therefore *recommended* to:

- elaborate, as soon as possible, action programmes for *implementing the Waste Management Act*, including the creation of a reliable information base and the definition of quantitative targets;
- gradually eliminate the differences which still exist between the Waste Management Act and relevant OECD and EU rules, in particular by reducing the number of exceptions to the “green” list of *wastes destined for recovery*;
- develop separate collection and recycling of *municipal waste*, introducing the appropriate economic instruments to serve as incentives;
- promote further use of *low-waste and cleaner technologies* in industry;

- develop the necessary facilities for proper disposal of *hazardous waste* and take the necessary regulatory and economic measures to ensure that these facilities are used;
- gradually raise the level of fees and charges to ensure full *application of the polluter pays and user pays principles*, for municipal as well as industrial and hazardous waste.

Nature, forest resources and biodiversity

There is a long tradition of nature conservation and forest management in the Czech Republic. Its rich *natural and cultural heritage* attracts many visitors and is therefore also a significant economic asset. Over the past ten years, some modern legal tools (e.g. the 1992 Act on Nature and Landscape Protection and the 1995 Forest Act) for conserving nature, maintaining biodiversity and managing forests sustainably have been introduced. About 15 per cent of Czech territory benefits from some form of protection and national parks and other protected areas are actively managed. Protection is given to a significant number of endangered and vulnerable species. Efforts are being made to safeguard the country's exceptional natural heritage in many rural areas as well as in the Czech cultural landscapes, some of which are on the UNESCO World Heritage list. *Forestry practices* have begun to change, in line with international trends towards greater species diversity and natural regeneration. The provisions for public participation found in nature legislation are the most effective in the country.

While some pressures on nature and on forest resources from agriculture and industry were reduced in the early 1990s, new pressures from current and future economic development (e.g. tourism, transport) need to be addressed. In order to avoid a gradual loss or deterioration of natural areas and valuable landscapes, a strategic approach to tourism should include means of containing the pressures from the growing number of tourists visiting national parks and other protected areas. The Czech National *Biodiversity Strategy* therefore needs to be completed and implemented as soon as possible. The link between nature and landscape protection activities and *land use planning* is still weak, although it was strengthened in the 1995 Forest Act. Also, nature conservation considerations have so far not been sufficiently integrated in economic and sectoral decision-making. In particular, the Territorial System of Ecological Stability could be more fully used in sectoral policies such as *transport* infrastructure planning. The environmental effectiveness of *agri-environmental support measures* could be improved.

It is therefore *recommended* to:

- urgently complete, adopt and implement the *National Biodiversity Strategy* and related action plans now under preparation;
- develop a *sustainable tourism strategy* for protected areas and consider ways in which visitor charges could contribute to financing maintenance and environmental costs;
- improve the application of *land use planning*, integrating nature conservation and landscape protection concerns and strengthening public participation;
- *create synergies* among the policies of relevant ministries (Regional Development, Agriculture, Environment, Finance) to encourage rural land owners to take nature and landscape into account in land use decisions;
- ensure that planning of road infrastructure takes account of the *Territorial System of Ecological Stability* (TSES); examine legislation in other domains to find ways that nature conservation considerations could be more effectively taken into account, and strengthen the enforcement capacity for the TSES;
- continue and extend the *nature-friendly forestry practices* indicated in the 1995 Forest Act;
- look for ways to enhance the environmental *effectiveness of agri-environmental support measures* and to integrate nature and biodiversity concerns in agricultural practices;
- strengthen *expertise* in nature conservation and biodiversity at district level.

2. Integrating Environmental Concerns in Economic Decisions

The *social and economic transformations* that began after 1989 have led to new democratic institutions and substantial progress towards creating a market economy in the Czech Republic. Overall, the economic transition did not present as high unemployment or inflation as in most other central and eastern European countries, and was encouraged by significant foreign direct investment and an effective privatisation process.

Decoupling and sustainable development

Nevertheless, in the period 1990-1997, GDP fell sharply and then recovered, coming close to its 1990 level. During the same period, pollutant emissions fell

considerably (e.g. –50 per cent for SO₂, –42 per cent for NO_x, –23 per cent for CO₂). This *decoupling* was the result of economic restructuring, changes in the energy supply and environmental efforts. However, pressures from sectors such as energy, industry, transport and tourism should be addressed in a cost-effective way.

The Czech Republic formally introduced the policy of sustainable development in its early environmental legislation. In more recent years, *integration of environmental considerations in economic policies* was not sufficiently reflected in the country's policies or its institutional structure, and the words "sustainable development" were not used. There is now *renewed support for sustainable development* and for stronger integration of environmental, economic and sectoral policies. Positive steps have been taken by the Ministry of the Environment and the Ministry of Industry and Trade to promote eco-labelling, environmental management systems, eco-auditing, etc. EIA provides an effective instrument for integrating environmental concerns in projects, plans and policies. However, much greater interministerial co-operation would be needed in order to ensure that vertically-minded administrations tackle horizontal problems such as environmental protection. Similarly, there would be a need to create an effective *interministerial body for sustainable development* and other interministerial commissions to address such urgent issues as energy and transport; this should be accompanied by increasing consultation with other stakeholders (industry, labour unions, NGOs, local authorities).

Production patterns have significantly improved, with reduced pollutant emissions and less use of natural resources. Nevertheless, the Czech economy still presents levels of pollution and energy intensities per unit of GDP that are among the very highest of OECD countries. Concerning *consumption patterns*, the use of economic signals such as prices in previously subsidised sectors had a very positive impact on water and electricity use by households. Although prices have been liberalised, there are still significant water and energy subsidies for households and the level of gasoline taxation remains low. Continuing its move towards *full pricing of natural resources* would enable the Czech Republic to further reduce pollution and its natural resource use, while recognising social constraints.

It is therefore *recommended* to:

- integrate *environmental concerns into policies* and practices concerning sectors such as energy, transport, industry and tourism;
- speed up *greening of the government* and promote further development of the environmental goods and services industry;

- promote discussion of a new *sustainable development strategy*, building on the new State Environmental Policy and with participation by stakeholders;
- promote the use of *cleaner technologies*, *energy saving* and alternative energy sources;
- pay special attention to integrating environmental concerns into *fiscal policy*;
- progressively eliminate or reform *cross-subsidies* in the energy sector, taking account of social factors.

Industry and the environment

A centrally planned economy giving low priority to the environment, and a concentration of industrial activities in areas close to “cheap” energy sources (e.g. open cast brown coal mining), resulted in some parts of the Czech Republic being among the black spots and *most heavily polluted areas of Europe* (Northern Bohemia and Northern Moravia). Since the beginning of the *transition period*, important structural changes have taken place in industry through privatisation, market liberalisation, and foreign trade restructuring. Decline in industrial output, the closing down of some plants, and the modernisation of others, as well as large environmental investments, have led to substantial environmental improvement. Through licensing and pollution charges, pollution control has been exercised over major and medium pollution sources. Overall, the rate of decrease in air and water pollution has been greater than that of the fall in industrial production. Through environmental investment, and the system of charges which provides revenue to the State Environmental Fund, industry is implementing the polluter pays principle. The Ministry of the Environment and the Ministry of Industry and Trade have recently started promoting *good housekeeping practices* and *environmental management* in companies. Major companies are showing increasing responsiveness to the need to address environmental issues. In the context of privatisation, arrangements have been made to deal with *past environmental damage*; there is, however, a considerable backlog of polluted industrial sites. Access to international markets and the prospect of EU membership are important incentives for industry to bring its environmental performance up to western European standards.

As *pollution and resource use intensities* are still very high, further major efforts will be needed to achieve improved eco-efficiency. A new law on the prevention and management of *industrial accidents* needs to be enacted, and the new law on the handling and labelling of chemical substances needs to be rapidly

implemented. In particular, a sufficient environmental risk assessment capacity should be installed. For this purpose, the environmental administration in charge of licensing of pesticides and biocides should be strengthened. Command and control approaches through permitting and large investments, mostly in *end-of-pipe technologies*, have proven environmentally effective and should now be supplemented by cost-effective *preventive and partenarial approaches* to waste management and minimisation, energy saving, and reduction of pollution intensities.

It is therefore *recommended* to:

- strengthen *co-operation between the Ministry of the Environment and Ministry of Industry and Trade*, with the aim of integrating and reinforcing the environmental dimension of industry policies and of taking cost-effectiveness more fully into account in environmental policy-making;
- promote *government-industry dialogue and partnership*, creating proper conditions for developing preventive and integrative approaches, and focusing on actual environmental progress;
- further use and develop policies directed towards the promotion of *integrated environmental management in companies* (e.g. stimulation of “good housekeeping”, use of environmental audits to identify low-cost solutions for improvements); give more attention to developing and implementing policies for *small and medium-sized enterprises*;
- elaborate a policy approach for industry including quantified environmental *objectives with medium and long-term time frames*; consider giving industry greater flexibility to choose *the most cost-effective means of reaching these objectives*;
- rapidly implement the new law on *chemical substances*;
- adopt a law concerning the prevention and management of *industrial accidents* and a law on the *compensation of environmental damage*;
- consider drawing up a nation-wide prioritised programme to accelerate the clean-up of *past environmental damage*, in particular polluted industrial sites which pose high risks to public health and the environment;
- further encourage the adoption of *cleaner technologies* by industry.

3. International Co-operation

Since the early 1990s, *great progress* has been made in international environmental co-operation. The Czech Republic became a party to most major international agreements on the environment; it became a member of the Council

of Europe and of the OECD; and it fulfilled related environmental commitments. In addition, it has started the *accession process for becoming a member of the EU*, which will require vast changes in its environmental laws and regulations as well as stricter enforcement. Concerning official development assistance, it has already become a *donor country* and is supporting the Global Environment Facility.

The Czech Republic has reduced very significantly the discharge of pollution in its three main *transboundary rivers* [Labe (Elbe), Morava, and Odra (Oder)]; it has entered into agreements with neighbouring countries on the protection of these rivers and started implementing national action programmes to further protect them. Concerning *transfrontier air pollution*, it has reduced its emissions of SO_x, NO_x and VOCs considerably and met all its international commitments in this area. In particular, it has equipped all its power stations with desulphurisation equipment. *Emissions of CO₂* which decreased significantly from 1990, partly due to the fall in economic output, are likely to be in 2000 at a level well below that of 1990. Although CO₂ emissions are likely to grow as a result of economic growth, by 2010 they could still be about 8 per cent below the 1990 level, *in line with the Kyoto target*. The production and consumption of ODS, regulated by the Montreal Protocol, are now banned; a strict national law was adopted to restrict ODS use.

Although progress during the transition period has been remarkable, there are still areas of concern. Lack of adequate national legislation has prevented the Czech Republic from ratifying important conventions on water management and on industrial accidents or implementing related OECD Decisions and Recommendations. Concerning transfrontier air pollution, *SO_x and NO_x emissions* per capita and per unit of GDP are generally well above those in other European countries. Furthermore, in spite of the measures taken and reductions achieved, some parts of the Black Triangle are still seriously polluted. Changes in the level of CO₂ emissions in the Czech Republic have been linked for the most part to economic changes. Steps could be taken to further reduce CO₂ emissions through energy savings or improvements in energy efficiency; indeed, at present *CO₂ emissions* per capita and per unit of GDP are also high compared to the average for OECD Europe. Although the Czech Republic supported the Rio Declaration, it has taken relatively few initiatives at national level to face pollution *liability* issues, to give legal force to the *precautionary principle*, to implement the principle of *sustainable development*, to prepare and adopt a national Agenda 21, or to increase *public participation*.

While it is understandable that a country in transition cannot deal early on with all environmental issues, future progress towards sustainable development

and European integration will require priority setting, because of the scarcity of means available, and a *wider democratic debate* with greater information provision and the participation of all stakeholders. The emphasis given to international environmental issues, to harmonising national legislation with EU legislation and to implementing international agreements should be supported by greater human and financial resources. At the same time, activities aimed at collecting and using foreign funds should be pursued in order to improve the country's environment and reduce transfrontier pollution.

It is therefore *recommended* to:

- ratify and implement relevant *international environmental agreements* (Annex III);
- enact *national laws* which would enable the Czech Republic to become a party to those significant international environmental agreements to which it is not yet a party;
- improve *public awareness* in relation to new environmental commitments associated with membership in the OECD and with EU accession;
- fully implement *recent OECD Recommendations* on environmental information and pollutant release and transfer registers;
- develop a national programme to *reduce greenhouse gas emissions*, improve *energy efficiency* and prepare for the adoption of appropriate legal measures;
- increase *resources* to carry out international commitments, to prepare accession to the EU and to enforce new legislation approximating that of the EU;
- make full use of opportunities *for foreign assistance*, with the aim of strengthening environmental infrastructure and contributing to the solution of priority international environmental problems.

1

THE CONTEXT

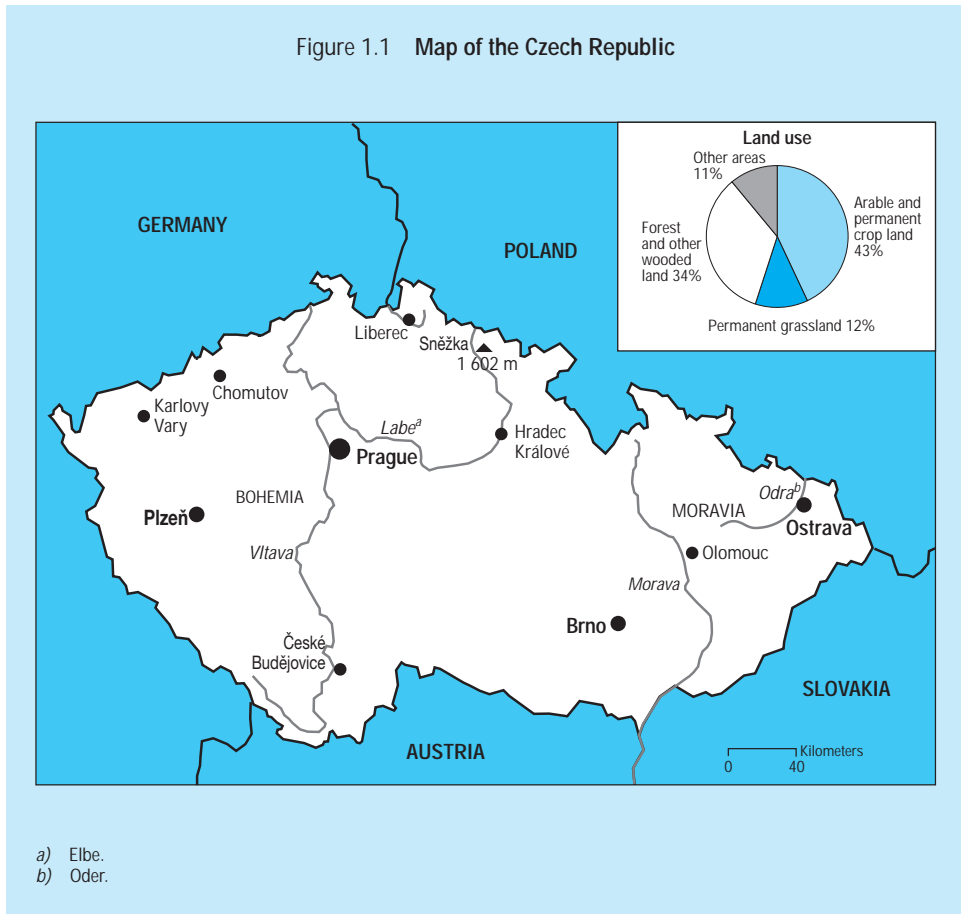
1. The Physical Context

The *Czech Republic* shares borders with Austria, Germany, Poland and the Slovak Republic, its former federal partner. This landlocked central European country is composed of the traditionally Czech regions of Bohemia and Moravia (sometimes known as the “Czech lands”) plus a small part of Silesia. The Bohemian Massif (Česká vysočina) makes up much of the country’s 78 864 km² area (Figure 1.1).

The entire country lies in the basins of three major *international river systems*: the Labe (Elbe), flowing towards the North Sea; the Odra (Oder), flowing towards the Baltic Sea; and the Morava, part of the Dunaj (Danube) system, which is bound for the Black Sea (Chapter 3). There are 455 natural lakes, most of them fairly small: the largest, Černé jezero, covers 18.4 hectares. Some 21 800 artificial ponds, chiefly used for fish farming, also dot the landscape. This part of Europe has long been known for its wealth of mineral springs.

As much as 55 per cent of the Czech Republic’s *land use* is agricultural; 43 per cent of its territory is covered in arable and permanent crop land. Much of the original forest cover has been cleared for farming, but around 34 per cent of the country is still wooded. Spruce, beech, pine and oak are the main species. Several decades of acid deposition have seriously weakened and damaged Czech forests (Chapters 2 and 5). Taiga and tundra vegetation is found above the timber line. Large areas of cultural landscapes have been preserved; a number are protected by law and several have been inscribed on UNESCO’s list of World Heritage Sites (Chapter 5).

Figure 1.1 Map of the Czech Republic



The country's *mineral resources* include black and brown coal, kaolin and other clays, and graphite. Indigenous brown coal, of fairly low quality, was the main source of energy as recently as 1993, though efforts to diversify energy sources have since been strengthened. *Black and brown coal* together still supply 52 per cent of primary energy. They represent almost 90 per cent of indigenous energy resources (Chapter 2).

2. The Human Context

The Czech Republic's population is estimated at *10.3 million and stable*. The birth rate is lower than the OECD Europe average and, as a result of long-standing trends, the population is comparatively aged. The overall population density is 131 inhabitants per square kilometre. There are densely populated industrial areas around Prague (Praha), the capital, and in Northern Bohemia and Moravia. Prague has about 1.2 million people. Other large cities include Brno (390 000), Ostrava (325 600) and Pilsen (Plzeň) (171 800). Of the country's 15 300 or so settlements, 98 per cent have 5 000 or fewer inhabitants; only about 23 per cent of the population lives in cities of 100 000 or greater. The Jeseníky Mountains and Southern Bohemian border areas are relatively sparsely settled.

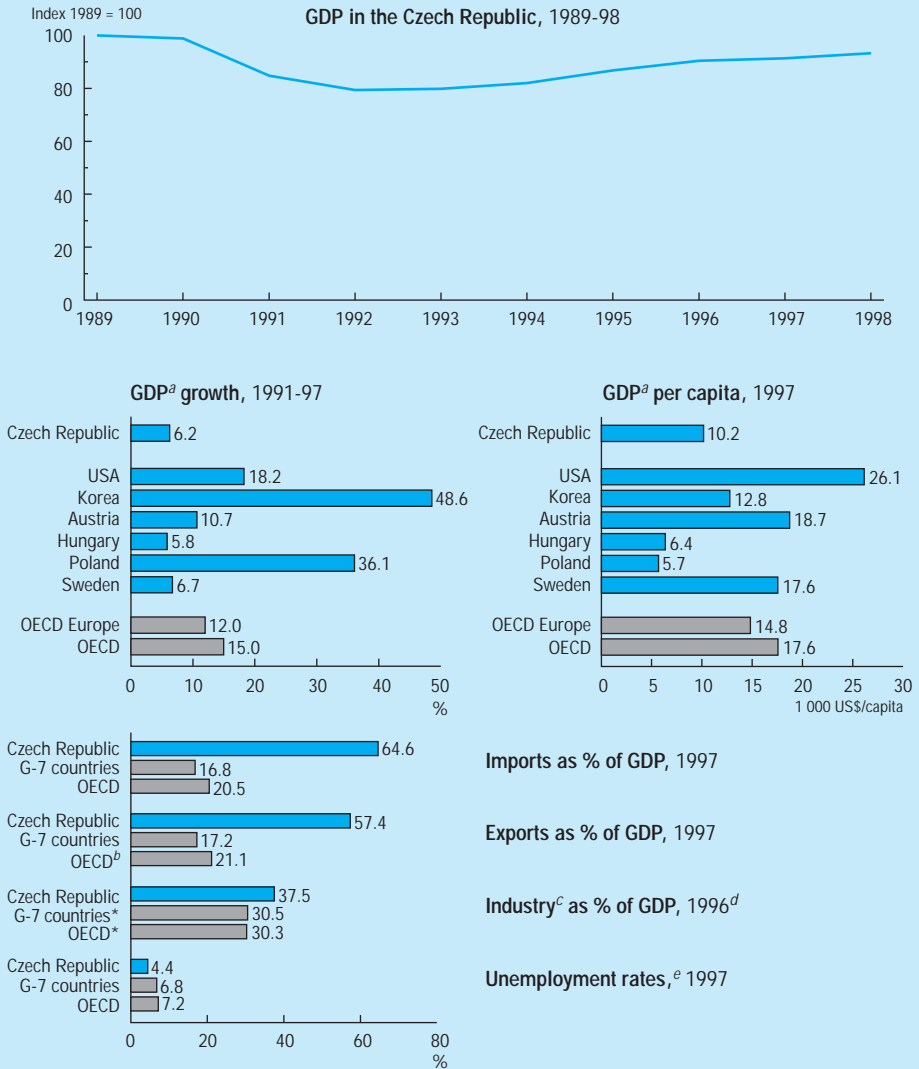
Almost *95 per cent of the population is Czech* (Moravians consider themselves a distinct Czech subgroup) and 3 per cent is Slovak. Many Slovaks have applied for and received Czech citizenship since the two countries formally separated in 1993. There are small minorities of Polish, German and Hungarian speakers. Gypsies (Roma) are a distinct ethnic group.

Per capita GDP is about 60 per cent of the OECD average (Figure 1.2), but is significantly higher than that of other transition countries (Table 1.1). Wages are relatively low by OECD standards, despite strong pressures resulting from high employment. Average wages per worker are about one-third of the OECD Europe average; average real wages rose by about 4 per cent in 1997. Income dispersion (measured as the ratio of the richest to the poorest decile) lies in the middle of the range observed in OECD countries, but it is becoming more pronounced.

3. The Economic Context

The economy of the new Czech Republic, *one of the strongest* in central and eastern Europe, is undergoing a period of transition. In 1990-93, GDP declined by 13.9 per cent (Figure 1.2). It began to stabilise in late 1992, with further improvement in 1993. Over the period 1993-97, the Czech economy grew by 14.6 per cent. GDP in 1997 reached CZK 1 675 billion (current prices). More recent economic developments have been dominated by the May 1997 exchange rate crisis, associated with economic growth slowing down to 1 per cent in that year (a similar figure was expected to be reported for 1998). The Czech Republic joined the OECD at the end of 1995.

Figure 1.2 Economic structure and trends



a) GDP at 1991 price levels and purchasing power parities.

b) Includes Secretariat estimates.

c) Value added by industry.

d) Or latest available year.

e) % of total labour force.

Source: IMF; OECD.

Economic transition has been fairly rapid and smooth compared to that experienced in some other former communist countries (Table 1.1), but unresolved issues are hampering economic performance. While the state retains a controlling share in some enterprises, more than 75 per cent of the economy has been privatised thanks to a determined privatisation policy. Ownership of privatised firms is now largely in the hands of Investment Privatisation Funds managed by state-owned banks. Further reforms are contemplated to resolve particular problems of corporate governance. Economic restructuring after 1989 involved *reductions in industrial production and mineral extraction*. Some parts of Czech heavy industry were found to be obsolete, but sectors such as iron and steel, chemicals, cement and electronics have remained strong. Industry's share of GDP still reaches almost 38 per cent. By 1995, services accounted for about half the jobs in the country and more than half of GDP. Tourism is estimated to represent 4-5 per cent of GDP. Agriculture is responsible for about 6 per cent of employment and more than 4 per cent of GDP.

Table 1.1 **Economic trends in transition countries**

	Change in GDP 1989-98	Cumulative fall in GDP before recovery	Consumer price index 1989-98	Foreign direct investment mean 1991-97	GDP/capita 94 PPPs 1994	Unemployment rate 1996
	(%)	(%)	(%)	(% of GDP)	(1 000 US\$)	(% of total labour force)
Czech Republic	-6.7	-20.7	263	3.1	9.9	3.5
Hungary	-5.6	-18.1	564	5.4	6.3	10.0
Poland	18.2	-17.8	5 727	1.1	5.0	12.3
Slovakia	-1.3	-25.0	255	0.7	6.7	12.6
Romania	-16.2	-25.0	51 567	0.9	3.9	7.8
Bulgaria	-34.6	-37.2	201 182	1.3	4.4	12.5
Slovenia	3.2	-17.1	9 786	1.0	9.9	13.9
Russian Fed.	-42.3	-43.1	629 250	0.3	7.3	3.5
Ukraine	-59.7	-60.0	14 002 995	0.2	..	1.5

Note: Data include preliminary (1997) and projected (1998) figures.

Source: IMF; OECD.

Imports and exports of goods and services represent 65 per cent and 57 per cent of GDP. Exports did not return to the 1989 level in real terms until 1996; exports to former COMECON countries dropped from 60 to 16 per cent between 1989 and 1994, but the Czech Republic still imports almost all its oil and gas from Russia. In recent years the largest share of trade has been with European Union countries, especially Austria and Germany. Energy exports, formerly a key component of Czech trade, have fallen since 1989. Tourism is estimated to account for 13 per cent of total exports of goods and services.

Inflation declined only slowly after peaking in 1991, when prices were liberalised; it was 8.5 per cent in 1997, more than twice the OECD average, and was expected to stay at about that level in 1998. Consumer prices increased by 263 per cent in 1989-98, a much smaller increase than was experienced by some other transition countries (Table 1.1). *Unemployment* hovered below 3.5 per cent for much of the 1990s, but exceeded 6 per cent in mid-1998. It remains low in comparison with that of most other OECD countries and most countries in transition, even though the public sector's role as employer has shrunk considerably.

General government revenue (i.e. central plus municipal governments) totalled 41 per cent of GDP in 1996: 43 per cent of this amount was tax revenue and 5 per cent was income from privatisation. Gross government financial liabilities as a share of GDP are low compared to most other OECD countries, though subject to medium-term risk (e.g. the possible need to bail out state-owned enterprises, uncertainty about local government indebtedness). Foreign direct investment was relatively high (at 3.1 per cent of GDP) over the period 1991-97 (Table 1.1). Central government environmental expenditure is financed from three sources: the state budget (about 60 per cent), the State Environmental Fund (33 per cent) and the National Property Fund (8 per cent). The latter is the privatisation agency, which is financially responsible for cleaning up contaminated sites before they can be sold.

4. The Institutional Context

The *Czech Republic* has existed in its current form since 1 January 1993. The Czech people have known several state systems in the course of this century. Czechoslovakia was created in 1918, following the disintegration of the Austro-Hungarian Empire. Reestablished at the end of the Second World War, it was part of COMECON. After 1989, the country became the Czech and Slovak Federal Republic. Efforts to preserve the federation were unsuccessful, and in 1992 the Czech and Slovak administrations agreed on an amicable "divorce".

There is a Czech *Constitution* as well as a *Charter of Fundamental Rights and Freedoms*. Article 7 of the Constitution imposes an obligation on the state to use natural resources prudently and protect "national wealth". Article 11 of the Charter recognises the right of ownership, but there are constraints on this right in order to limit damage to human health, nature and the environment. Similarly, Article 14 of the Charter places restrictions on freedom of movement in order to protect nature in demarcated areas. Article 35 of the Charter guarantees citizens the "right to live in a favourable living environment" and the "right to access to information on the state of the environment".

The Czech Republic is a *parliamentary democracy*. The Head of State is the President, who appoints a Cabinet on the recommendation of the Prime Minister as Head of Government. The Parliament is bicameral, with a Senate of 81 and a Chamber of Deputies of 200 members. At present there are only *two levels of elected government (national and municipal)*. An intermediate level of self-government, provided for in the Constitution and further detailed in a 1997 Act of Parliament, is scheduled to come into existence in 2000. For the moment, only Prague, Brno, Ostrava and Pilsen have a form of intermediate government.

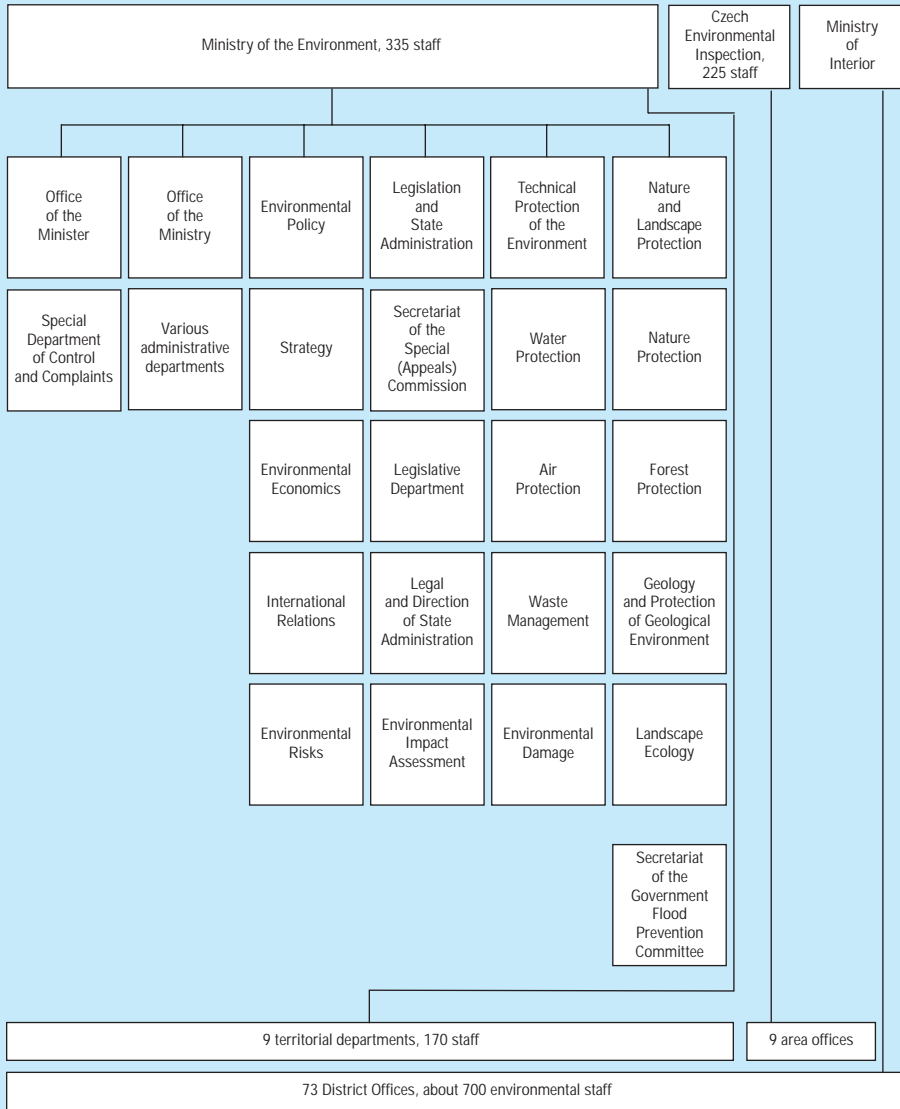
The country has *eight regional subdivisions (kraje)*: Prague, Central Bohemia, Northern Bohemia, Southern Bohemia, Eastern Bohemia, Western Bohemia, Northern Moravia and Southern Moravia. Each kraj is divided into *districts*. There are 77 of these, of which 73 are administered by District Offices. The District Offices are state administrative bodies with general competence and are part of the Ministry of Interior. Prague and the three other remaining districts (Brno, Ostrava and Pilsen) are self-governing.

Local government consists of as many as 6 234 municipalities (of which 57 per cent have fewer than 500 inhabitants). Except in the self-governing districts, half the tax revenue collected goes to the District Office; the other half is distributed among the district's municipalities according to population size. This tax revenue represents just under half the municipalities' total income; a further 20 per cent comes from grants out of the state budget, and the remaining 30 per cent comes from local sources (i.e. charges, fees, income on capital).

Environmental administration

Environmental administration in the Czech Republic is carried out by a variety of agencies and institutions (Figure 1.3). The *Ministry of the Environment* (MoE) is the central administrative body and supreme authority for environmental matters, as well as the highest authority for environmental policy. It co-ordinates

Figure 1.3 Environmental administration^{a)}



a) June 1998.
Source: Ministry of Environment.

international environmental co-operation. A 1993 law details the ministry's wide-ranging areas of responsibility:

- water and forestry management (shared with the Ministry of Agriculture);
- hunting and fishing in national parks;
- air protection;
- nature and landscape protection;
- protection of agricultural land;
- operation of the state geological services;
- protection of mineral resources;
- environmental monitoring of mining;
- waste management;
- environmental impact assessment (EIA), including for cross-border activities.

To implement national policy throughout the country, the *MoE has nine territorial departments* whose responsibilities include: oversight of the environment departments of the (Ministry of Interior's) District Offices, reviews and appeals of decisions made at district level, and provision for the training of district employees; administration of cross-border watercourses; EIA of construction projects. The MoE is also responsible for administering the three national parks: Krkonoše, Šumava and Podyjí.

Bodies operating *under the aegis of the Ministry of the Environment* include:

- *State Environmental Fund (SEF)* – collects environmental charges (e.g. air, water, waste) and is one of the main sources of financing for environmental protection;
- *Czech Environmental Institute* – a policy research institute serving the ministry and the public;
- other bodies (Agency of Nature Conservation and Landscape Protection, T.G. Masaryk Water Management Research Institute, Czech Hydrometeorological Institute, Czech Geological Institute, Horticulture Research Institute).

The *Czech Environmental Inspection* issues permits for large and medium-sized emissions to air and verifies compliance with legislation concerning air, water, waste, nature and forests. It has a head office and nine area offices.

The *Ministry of Interior* supervises the 73 District Offices, each of which has an environment department employing on average about ten persons. Environmental decision-making at district level concerns regulations which are to be

complied with at that level. The environment departments review decisions by municipal bodies pertaining to the environment, provide professional assistance to municipalities and help train municipal environmental authorities. They also assist with environmental education. The heads of the district environment departments meet monthly with Ministry of the Environment officials.

Apart from its eponymous functions, the *Ministry of Agriculture* is responsible for forestry (Chapter 5) and for the river basin corporations (Povodí), which deal with the Labe (Elbe), Vltava (Moldau), Ohře, Odra (Oder) and Morava watersheds (Chapter 3). *Other ministries* carrying out environmental functions include the Ministry for Regional Development, which has national responsibility for spatial

Table 1.2 **Selected environmental legislation**

138/1973	Water Act, as amended
130/1974	Act on State Administration of Water Management, as amended
50/1976	Construction Act, as amended
282/1991	Act on the Environment Inspection and its Jurisdiction in Forest Protection
309/1991	Clean Air Act, as amended
388/1991	Act on the State Environmental Fund of the Czech Republic
389/1991	Act on the State Administration of Air Protection and Charges for the Pollution of Air, as amended
17/1992	Act on the Environment
62/1992	Act on Charges for Deposit of Waste
114/1992	Act on Nature and Landscape Protection, as amended
244/1992	Act on Environmental Impact Assessment
211/1993	Act on Prohibition of the Production, Import and Use of Substances that Deplete the Ozone Layer of the Earth and of Products Containing such Substances
86/1995	Act on the Protection of the Ozone Layer of the Earth
289/1995	Forest Act
16/1997	Act incorporating the CITES Convention into Czech law
17/1997	Act on Peaceful Utilisation of Nuclear Energy and Ionising Radiation
125/1997	Waste Management Act
58/1998	Act on Payments for Discharge of Waste Water into Surface Waters
123/1998	Act on the Right of Access to Information on the Environment
157/1998	Act on Chemical Substances and Preparations

Source: Czech Government.

planning, and the Ministry of Health, which is responsible for the quality of drinking and bathing water.

Municipalities implement national laws (Table 1.2) at the local level, including environmental permitting for small emissions to air and discharges to water, and are responsible for local land use planning. They also have a role in collecting, sorting and disposing of municipal waste (Chapter 4).

5. Development of Environmental Policy and Legislation

The Czech and Slovak Federal Republic established a Ministry of the Environment in January 1990. The present territory of the Czech Republic was *one of the most polluted areas of central Europe* in the early 1990s, and environmental improvement was a major aim of the government. The fall in industrial output, and economic restructuring, helped reduce water and air pollution.

The main purpose of the new 1990 environmental policy, the “Rainbow Programme”, was to create a new *legislative framework*, strengthen *institutional capacity* and begin tackling the most seriously affected areas first. Individual programmes, financed by the state budget, by the State Environmental Fund, or through foreign assistance, made up the bulk of concrete environmental activities.

In August 1995, the Czech Government approved a *State Environmental Policy* (SEP). This concise document presents an analysis of the state of, and changes related to, the Czech environment since 1989 as well as fundamental principles underlying the country’s environmental policy. It also establishes short (up to 1998), medium (1999-2005) and long-term (post 2005) priorities. The five short-term policy priorities are:

- improving air quality by reducing harmful emissions;
- improving water quality by limiting polluting discharges;
- reducing waste generation, especially of hazardous waste;
- eliminating risks of harm to the population from noise, radon and toxic substances;
- remedying existing environmental damage.

In the late 1990s, much environmental policy development is driven by the prospect of *future membership in the European Union* and the need to harmonise Czech laws with EU legislation. In its January 1998 programme statement to the Chamber of Deputies, the third Government of the Czech Republic declared that

the “economic dimension of life must be in keeping with the environmental principle of sustainable development”. It acknowledged the “significance of an ecologically stable environment for the quality of human life” and stated that it would continue efforts to lower air and water pollution, revive the landscape and make use of renewable energy sources. A revised SEP being prepared in 1998 was scheduled for approval in the same year (Chapter 6).

Part I

**POLLUTION CONTROL
AND NATURE CONSERVATION**

2

AIR MANAGEMENT

1. The State of Atmospheric Emissions and Air Quality

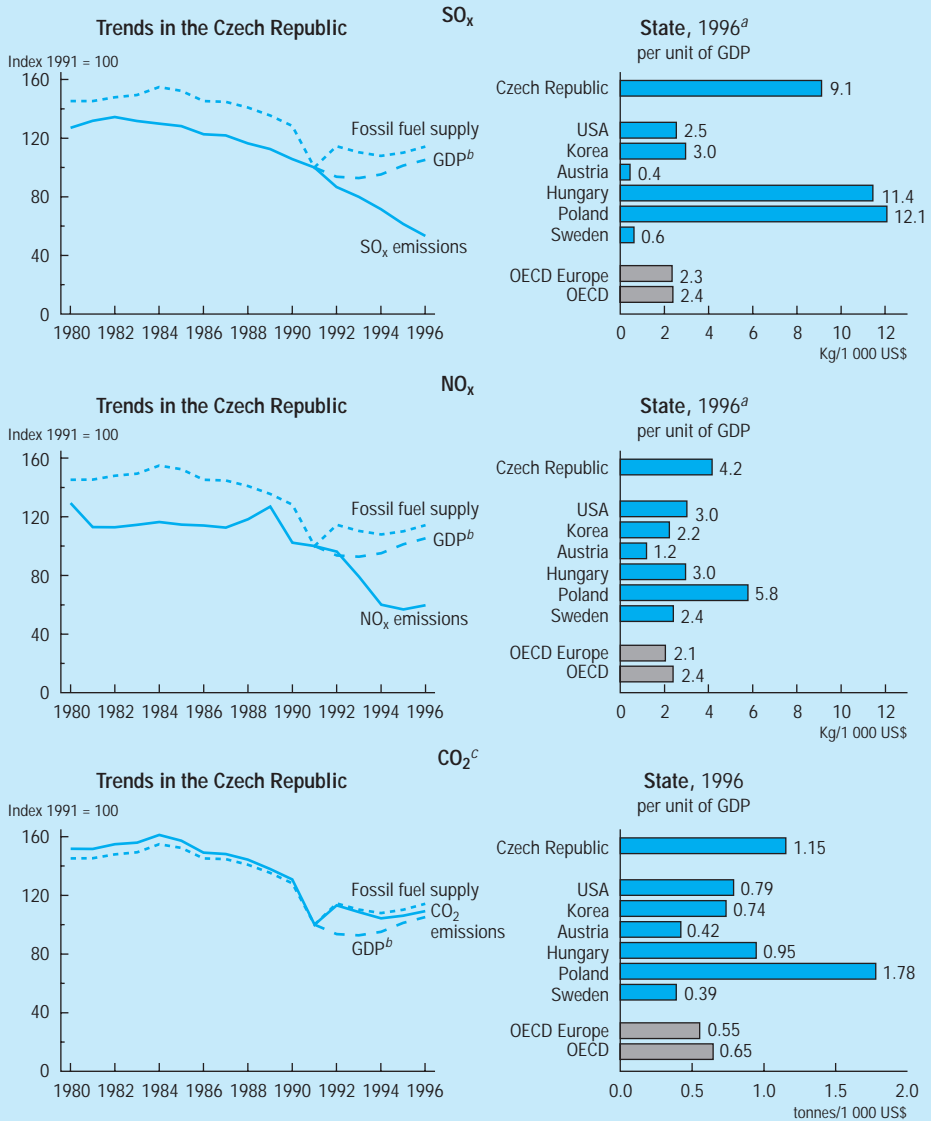
Emissions of atmospheric pollutants

SO_x emissions in 1997 were estimated at 700 000 tonnes, a 68 per cent reduction since 1987. A large part of this reduction was due to the decrease in emissions from large sources (power stations and industrial combustion), which remain responsible for 87 per cent of total emissions. Among the eight Czech regions, Northern Bohemia and Prague are by far the largest emitters. However, the emission intensity in the Czech Republic (9.1 kg of *SO_x* per \$1 000 of GDP) remains almost four times the OECD average and is among the highest in the OECD (Figure 2.1). Emissions of *particulate matter* were 141 000 tonnes in 1997, a reduction of more than 85 per cent since 1987.

NO_x emissions were 410 000 tonnes in 1997, a 50 per cent reduction since 1987. In spite of this reduction, the largest in the OECD over the period, *NO_x* emissions per unit of GDP are among the highest of any OECD country (Figure 2.1); calculated on a per capita basis, they are now just above the OECD average. *NO_x* emissions have been more or less stable since 1994.

Hydrocarbons emissions amounted to almost 177 000 tonnes in 1996, having peaked at around 227 000 tonnes in 1989-91. Transport accounts for 46 per cent, and two-thirds of stationary emissions are from small sources. *CO emissions*, amounting to 820 000 tonnes (1997), came 35 per cent from mobile sources and 65 per cent from stationary ones, reflecting the continuing importance of solid fuels in domestic heating. Non-methane *VOCs emissions* were about 284 000 tonnes in 1996, a 29 per cent decrease since 1989. Annual *lead* emissions fell from 291 to 149 tonnes in the period 1990-97; those of cadmium and

Figure 2.1 Atmospheric emissions



a) Or latest available year.

b) GDP at 1991 prices and purchasing power parities.

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

Source: IEA-OECD.

mercury, estimated at approximately 11 and 6 tonnes, respectively, in 1990, have fallen since then, although it is not known by how much.

Energy-related CO_2 emissions totalled 119.6 million tonnes in 1996; after reaching a maximum of 176.5 million tonnes in 1984, they fell to 109.5 million tonnes in 1991 but have been increasing since 1994 (Figure 2.1). Per unit of GDP, they remain over twice as high as the OECD Europe average. Model calculations show (base scenario) that emissions could increase to the 1990 level by 2010. The scenario of “favourable development” shows emissions in 2010 slightly higher than those in 1995 but well below the 1990 level. Anthropogenic CO_2 emissions that are not energy-related are in the order of 4 million tonnes.

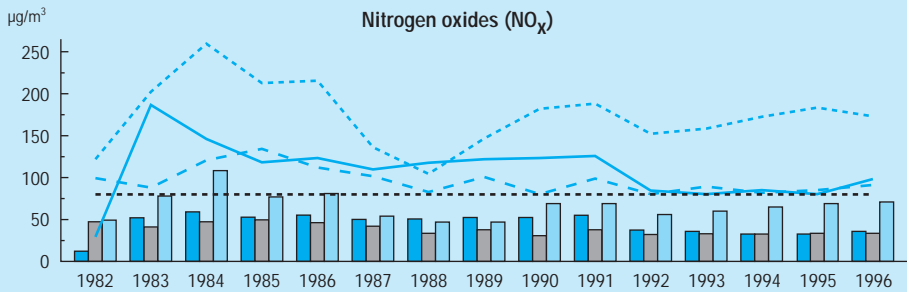
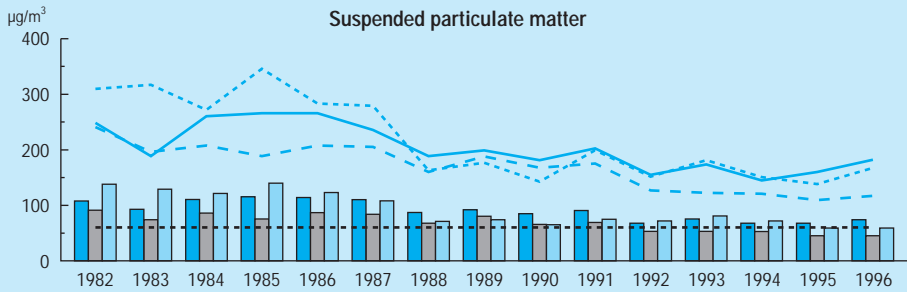
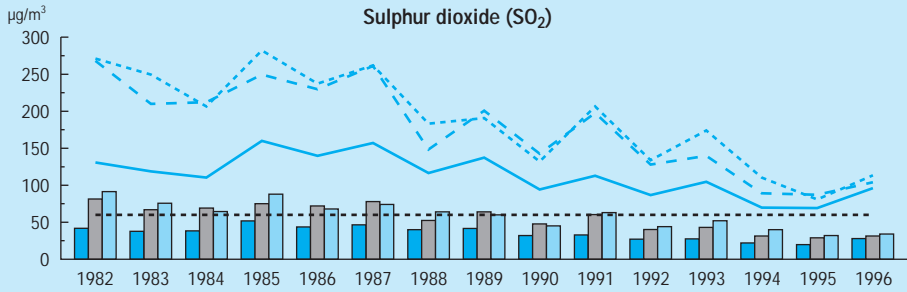
Ambient air quality

Air pollution maps of the Czech Republic show that the highest concentrations of all pollutants are located in a triangle extending north-west from Prague towards the border, and in the Ostrava area of Northern Moravia. Atmospheric SO_2 concentrations have decreased dramatically since the 1980s: annual averages have fallen at least 50 per cent and peak values even more (Figure 2.2). In 1996, annual averages were less than $20 \mu\text{g}/\text{m}^3$ on more than 80 per cent of the territory. Between 1994 and 1996, the average territorial concentrations of SO_2 satisfied the ambient standard (annual average of $60 \mu\text{g}/\text{m}^3$) in all districts, even though there were a few exceedences at individual stations.

Pollution by *suspended particulate matter*, which showed a downward trend between the mid-1980s and mid-1990s, appears to have stabilised since; in 1996, annual averages were below $30 \mu\text{g}/\text{m}^3$ on more than 55 per cent of the territory. Nevertheless, annual average values continue to be high in large cities. They exceed the standard ($60 \mu\text{g}/\text{m}^3$) in the Prague and Ostrava urban areas (Figure 2.2).

Concentrations of *nitrogen oxides* (reported in the Czech Republic as NO_x and hence not directly comparable with NO_2 values used elsewhere) fell in the mid-1980s. They have been more or less stable since 1992 (Figure 2.2). On more than 90 per cent of the territory, annual means are below $30 \mu\text{g}/\text{m}^3$. However, in some urban areas, particularly Prague, traffic growth is undoing the gains made in reducing emissions from stationary sources. Concentrations of the *toxic pollutants* arsenic, cadmium and lead exceeded health standards at some locations before 1989, but have fallen sharply since.

Figure 2.2 Trends in air quality



<p>Ostrava area</p> <p>■ average of daily means</p> <p>— 95% quantile</p>	<p>North-western area</p> <p>■ average of daily means</p> <p>— 95% quantile</p>	<p>Prague area</p> <p>■ average of daily means</p> <p>— 95% quantile</p>
---	---	--

----- Standard for annual average of daily mean concentration

Source: CHMU.

Effects on health and ecosystems

Results of a *health monitoring* study (“Teplice Programme”) show that the populations with the worst health problems in the Czech Republic are to be found in Northern Bohemia and Prague, where the frequency of chronic bronchitis is double that in other parts of the country. A lower birth weight, a higher incidence of allergies among children and higher consumption of medications are reported in polluted urban areas, where causative factors other than air pollution may play a role. However, the general situation has improved in recent years.

Problems related to *acid deposition* mainly exist in the forested area in the north-western part of the country, where the estimated critical load of sulphur deposition is 10-15 kg/ha.year. The exceedence of the critical load amounted to 20-40 kg/ha.year in 1996. Forest damage related to acid deposition in the Czech Republic is among the most serious in Europe (Chapter 5).

Ozone concentrations vary significantly from year to year, depending on the weather. In 1996, daily average values during the growing season (April to September) ranged between 33 and 94 $\mu\text{g}/\text{m}^3$. The information threshold (180 $\mu\text{g}/\text{m}^3$, 1-hour value) was exceeded at 39 stations (predominantly in rural areas at higher altitude) in the spring, but the warning level for notifying the occurrence of photochemical smog to the population (360 $\mu\text{g}/\text{m}^3$, 1-hour value) was not exceeded. An evaluation carried out using a vegetation exposure index (the so-called “AOT40”, which combines the intensity and duration of exposure measures) suggested that, even in the low-ozone year of 1996, a critical level above which forest damage could be expected was exceeded on 99 per cent of the territory; on the other hand, the same evaluation applied to agricultural crops showed that conditions in 1996 did not harm farm output.

2. Responses

Objectives

The 1991 *Clean Air Act* requires all existing large and medium-sized stationary pollution sources to meet the Act’s emission limits for new sources by the end of 1998. The principal short-term (up to 1998) air management objective of the 1995 *State Environmental Policy* (SEP) is to “improve the quality of the air through the reduction of harmful substances”. The main target for this priority is the continuous reduction of emissions of SO_x , NO_x , particulates, volatile and persistent organic compounds and heavy metals. The SEP also announces a

re-evaluation of existing emission limits on the basis of cost-benefit analysis, compulsory emission monitoring of stationary sources, and stricter limits on exhaust emissions from trucks. Longer-term (post 2005) priorities include climate change (reducing greenhouse emissions through changes in the energy structure, energy savings, etc.).

Whereas the SEP prescribes generic, narrative goals for emission reductions, along with various policy measures, the Czech Republic has also committed itself through the UN-ECE Convention on Long-Range Transboundary Air Pollution to the following *quantitative targets* at international level:

- reduction of total SO₂ emissions to 902 000 tonnes per year by 2005 and 632 000 tonnes by 2010 (Oslo Protocol);
- reduction of volatile organic compounds (VOC) emissions by 30 per cent, compared with 1988 levels, by 1999 (Geneva Protocol);
- stabilisation of NO_x emissions at 1987 levels (Sofia Protocol).

Measures to prevent and control air pollution

Legislation and regulation

The main components of air quality legislation are the *Clean Air Act* (309/1991) and the Act of the Czech National Council on the *State Administration of Air Protection and Charges for the Pollution of Air* (389/1991). The former defines citizens' and companies' rights and obligations in regard to the protection of air quality against emissions and lays down the concept of best available techniques not entailing excessive costs (BATNEEC), which forms the basis for setting emission limits. The Clean Air Act also distinguishes three categories of stationary sources (large, medium-sized and small) as well as mobile sources; a decree attached to the Act stipulates ambient air quality standards. Act 389/1991 attributes air management responsibilities to various governmental bodies and sets out emission charges.

Emission limits for new stationary sources were first issued in 1992 and last amended in 1997. They are classified according to the type of technology used and have been established for: i) fuel and energy production industries; ii) the metallurgy industry; iii) the chemical industry; iv) production of non-metallic mineral products; and v) waste incineration. Where limits are not established for a given technology, the general limits for individual pollutants apply. Emission limits for existing sources were set individually by the relevant air protection authority (with large and medium-sized sources also subject to the 1998 deadline). In

addition, there are limitations on the *sulphur content of solid and liquid fuels* supplied to small combustion plants and to the general population.

Institutions

The *Ministry of the Environment* (MoE) has the main policy-making function for air quality management, carries out overall supervision of lower authorities, and sets conditions for the emission permits of major projects. The *Czech Environmental Inspection* issues emission permits (according to conditions specified in the Clean Air Act) and, in the case of large and medium-sized pollution sources, monitors compliance with regulations and permit conditions; the Inspection also imposes penalties on operators violating permit conditions.

The 73 *District Offices* of the Ministry of Interior (Chapter 1) administer the provisions of the Construction Act relating to territorial planning and building, which include air quality aspects. The District Offices' functions include supervision of municipalities, enforcement of air protection regulations within their jurisdiction, dealing with local air quality issues (as agreed with the concerned municipal authorities) and setting of charges for medium-sized pollution sources.

Municipalities set charges for and enforce regulations concerning small pollution sources; they can impose non-compliance penalties and may also designate air protection zones within their jurisdiction, issue smog alerts and restrict the operation of pollution sources.

Economic instruments

Operators of pollution sources must pay *emission charges* calculated on the amount of certain pollutants emitted and the unit rate for each substance (Table 6.7); the overall levy is the total of the sums calculated for the individual pollutants (Chapter 6). Air management authorities may allow a rebate of 40 per cent to operators able to demonstrate that they plan to reduce emissions; they also impose penalties on operators not complying with the regulations. The revenue so collected (CZK 1 306.8 million in 1996) flows to the State Environmental Fund (SEF) and is then used to assist non-commercial organisations with grants and loans (limited to a maximum of 50 per cent of investment costs) to reduce their emissions.

Monitoring and reporting

Several well-established networks of *ambient air quality* monitoring stations operate throughout the Czech Republic. They are particularly dense in north-western and eastern parts of the country, where air pollution is most serious.

Stations measuring SO₂ in ambient air are the most numerous: there are 187 automatic and 356 manual ones. There are also many stations measuring particulates, NO_x, ground-level ozone and trace pollutants. A system of monitoring the *health effects* of air pollution has been developed and is being implemented in 30 cities including Prague.

Emission data are recorded in terms of the four categories defined, by the Clean Air Act, in the register of emissions and air pollution sources. Data from the 2 745 registered large pollution sources are collected by the Czech Environmental Inspection, and those from the more than 27 000 registered medium-sized sources by the District Offices. Emissions from small stationary and mobile sources are calculated with the aid of various models based, inter alia, on census and energy use data. Both ambient quality and emission data are processed and archived in the Air Quality Information System run by the Czech Hydrometeorological Institute (CHMU), which publishes timely and valuable annual summary reports of findings.

Expenditure on air pollution prevention and control

The crash programme to clean up existing stationary air pollution sources by the end of 1998 has required large investments to be made during a relatively short period of time. In the years preceding this deadline, air pollution-related expenditure has therefore constituted a *greater than usual share of total pollution prevention and control expenditure*. For example, 1.35 per cent of GDP (CZK 17.9 billion) was invested in air pollution control in 1995, more than half the total environmental investment of CZK 32.3 billion (Table 6.3). A large part of air pollution investment (CZK 9.3 billion, or 52 per cent, in 1995) is for desulphurisation at coal/lignite-fuelled power plants. Most of the investment is being made by privatised companies, particularly the Czech Power Company (CEZ), which generates more than 75 per cent of the country's electricity; the company estimates that it had spent CZK 21 billion (out of a total environmental investment of CZK 34.8 billion) by the end of 1997 and anticipates spending another CZK 6.2 billion before 2000. Private industry and district heating each accounted for an investment of over CZK 3 billion in 1995. The National Property Fund has also been a source of funding, contributing approximately CZK 6 billion to the State Environmental Fund, mainly for the Air Recovery Programme during 1994-97.

Air management and energy policy

Total primary energy supply (TPES) rose from 45.7 Mtoe in 1971 to a peak of 50.2 Mtoe in 1984; thereafter, it fell steadily to reach 38.9 Mtoe in 1995 but increased again to 40.4 Mtoe in 1996. More than 90 per cent of energy supply is derived from fossil fuels: solid fuels (mainly brown coal) account for 52 per cent (representing the second highest share in the OECD after Poland), oil 20 per cent and gas 19 per cent; over the last decade, there has been a gradual shift away from low quality solid fuels towards oil and gas. Coal is produced within the country, whereas crude oil and natural gas are imported, mainly from Russia. Nuclear energy accounts for 8 per cent and hydro 0.4 per cent. Total electric generating capacity is about 14 GW, mostly from coal/lignite-fuelled power plants. Total net electricity generation is approximately 60 TWh (1996). A small amount of biomass is used for heating purposes (2 200 GWh in 1996).

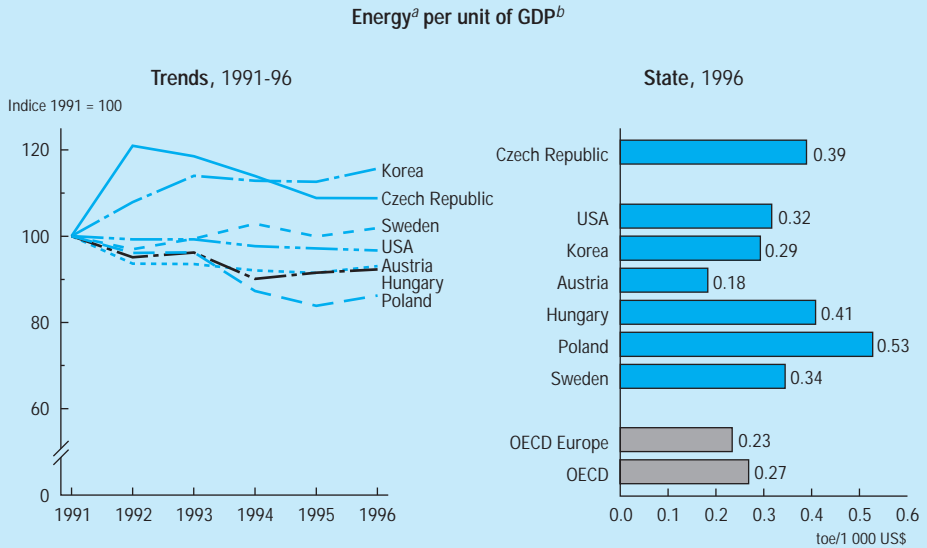
Total final consumption amounted to 27.7 Mtoe in 1996, much lower than the 1987 peak of 39.1 Mtoe, but has begun to grow again. Also in 1996, industry accounted for 51.8 per cent of the total, residential and commercial use for 30.3 per cent and transport for 13.8 per cent (Figure 2.3).

Energy intensity measured as TPES/GDP was 0.39 toe/US\$1 000 in 1996, among the highest in the OECD, although it had fallen sharply since 1992 (Figure 2.3). Per capita energy intensity, on the other hand, is much closer to the average for OECD countries.

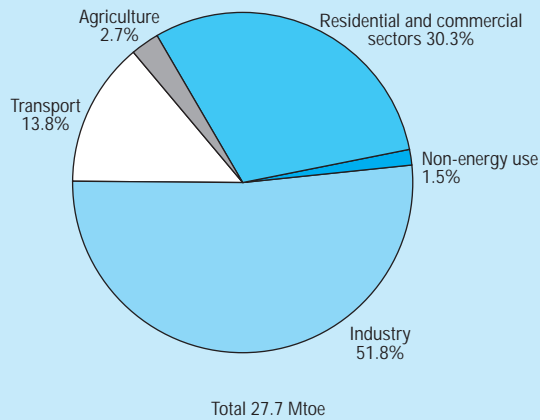
The Czech Republic's *energy policy objectives* include environmental requirements, e.g. i) energy conservation and greater use of renewables; ii) diversification of energy sources away from coal; and iii) promoting more efficient and cleaner consumption of coal and other energy sources. Harmonisation of Czech energy policies with those of the European Union will reduce dependence on solid fossil fuels and make possible a more open electricity market. A new energy policy document currently in preparation may be adopted in 1998. Privatisation of the energy sector led to the formation of 22 joint stock companies. Besides the CEZ, there are five coal companies, eight companies in electricity distribution and eight natural gas companies.

Energy prices are set by the Czech Government and do not reflect real costs. Cross-subsidies permitting low prices for gas and electricity for households (e.g. CZK 180 per GJ of heat), which were due to be phased out gradually to stimulate energy savings, have so far been retained for social reasons. On 1 January 1998, however, the VAT on fuels was raised from 5 per cent to the general level of 22 per cent, and unregulated prices for heat were introduced. Energy prices for

Figure 2.3 Energy intensity and consumption



Total final energy consumption by sector, 1996



a) Total primary energy supply.
 b) GDP at 1991 prices and purchasing power parities.
 Source: IEA-OECD.

industry are at the lower end of the range found in OECD countries, as are prices of transport fuels (Table 2.1).

Several government programmes are aimed at *energy conservation and efficiency*. The Czech Energy Agency (CEA), founded in 1995, is a publicly funded organisation under the Ministry of Industry and Trade whose main mission is encouraging and carrying out energy savings activities and mitigating the negative environmental impacts of energy conversion and consumption. Total energy savings in 1991-95 resulting from CEA programmes are estimated at about 11 000 TJ. The not-for-profit, non-governmental Energy Efficiency Centre is an independent organisation whose purpose is to protect the environment and support economic development by finding more efficient ways to use energy; it is particularly active in the field of district heating and municipal energy projects.

Table 2.1 **Energy prices in selected OECD countries, 1997**
(US\$/toe)

	Electricity		Natural gas		Premium unleaded gasoline	PPP factor ^a
	Industry	Household	Industry	Household		
Czech Republic	601.6	429.2	169.1	143.0	848.2	2.18 ^b
Germany	1 000.5 ^c	2 096.1 ^c	210.9	462.9	1 194.1	0.86
Poland	420.8	725.7	145.1	253.1	661.5	1.80 ^b
Austria	939.8	2 255.2 ^c	206.6	478.7	1 162.2	0.87
Hungary	632.5	785.8	130.6	184.2	913.0	1.54 ^b
OECD Europe	867.9 ^c	1 739.3 ^c	..	410.8	1 196.4	..
Czech price/OECD Europe price	79% ^c	26% ^c	..	35%	71%	..

a) PPP factor to convert US\$ to PPP corrected US\$.

b) 1995.

c) 1996.

Source: IEA-OECD, 1998.

Air management and transport

The *structure of the Czech transport sector* has changed greatly in the 1990s due to privatisation in the freight sector and rapid growth (about 40 per cent between 1990 and 1996) in the total number of motor vehicles in operation. Nevertheless, private car ownership per capita remains below, and road traffic volume per capita and per unit of GDP are still well below, the OECD average (Figure 2.4). The modal split for freight transport shows that rail has a large share compared to some other OECD countries. However, demand for public freight transport (especially rail and road haulage) is falling and the number of private freight operators is growing. The density of the road and motorway networks is also well below the corresponding OECD averages. The average age of the car fleet is comparatively high; renewal is slowed down by the importation of second-hand vehicles from western Europe.

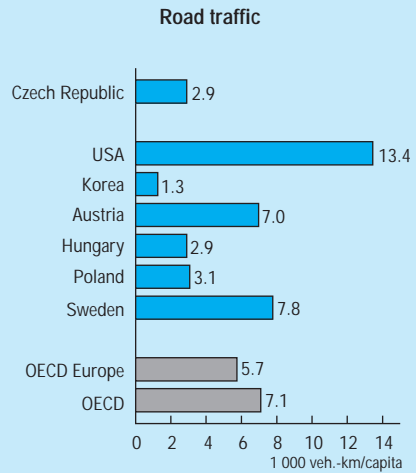
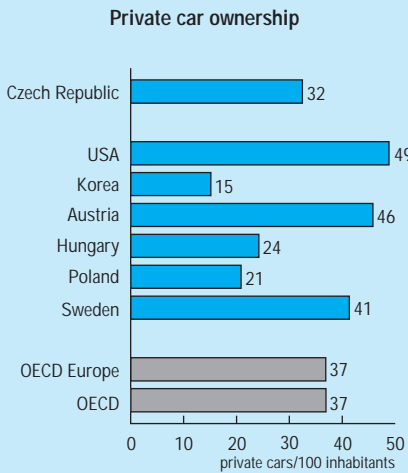
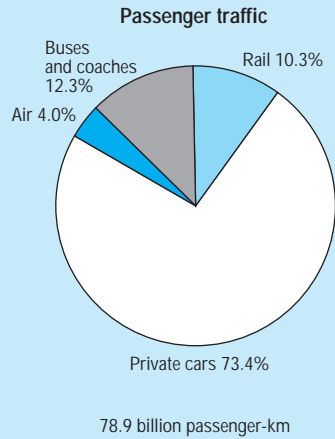
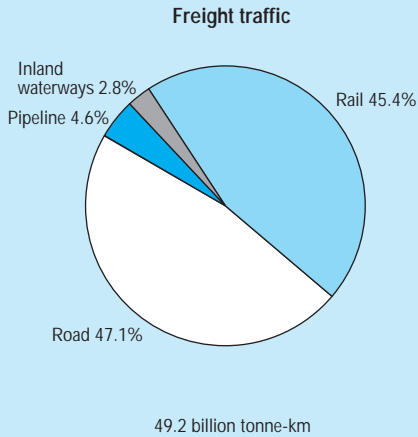
Since the beginning of the 1990s, *transport-related pollutant emissions* (other than of CO₂) have decreased slightly due to the combined effect of growth in traffic and a simultaneous fall in emissions per vehicle-kilometre. In 1996, as a share of total emissions, they amounted to approximately 52 per cent for NO_x, 33 per cent for CO, 37 per cent for hydrocarbons and 68 per cent for lead. Transport-related energy consumption and CO₂ emissions, on the other hand, have grown steadily since 1991. In 1996, they accounted for 13.8 and 9 per cent of the total, respectively; these shares, still low compared to other OECD countries, are expected to increase in the years ahead.

Implementation of *vehicle-related measures* based on European Union legislation began in 1994: for example, the regulation which in effect requires new gasoline-fuelled passenger cars to be fitted with catalytic converters. Accordingly, the share of cars so equipped rose from about 7.5 per cent in 1994 to 18.3 per cent two years later. The growing use of unleaded gasoline, and the reduction of the amount of lead in leaded gasoline, have contributed to a 75 per cent reduction of lead emissions between 1989 and 1994.

A *transport strategy* for the period up to 2000 and beyond was under discussion in 1998. It is likely to include broad objectives aimed at stabilising and reducing the transport burden on the environment: for example, favouring public over individual passenger transport; continuing subsidies for railway passenger transport; creating economic conditions encouraging long-range and heavy freight transport by rail; diverting traffic away from city centres; reviewing road taxes; supporting the development of integrated transport systems; and supporting the use of alternative fuels in transport.

Figure 2.4 Transport sector, 1996

Czech Republic



Source: ECMT; IRF; OECD.

3. Environmental Performance

Achieving large emission reductions

The urgent need to improve air quality in the early 1990s explains the requirement in the 1991 Clean Air Act that all large and medium-sized existing plants meet the emission limits for new installations by the end of 1998. Czech authorities expect that over 98 per cent of major and over 90 per cent of medium-sized stationary pollution sources will be in compliance by the deadline. Therefore, the requirement has largely been met, with a *large reduction of pollutant emissions* being achieved in the 1990s. The reductions calculated for 1997 have been particularly impressive. Moreover, from 1993 onward, emissions of traditional pollutants can be seen to have been decoupled from economic growth (Figure 2.1).

With annual *sulphur emissions* of 700 ktonnes in 1997, the Czech Republic has already gone beyond the targets for 2000 (1 128 ktonnes SO₂) and 2005 (902 ktonnes SO₂) to which it committed itself under the Oslo Protocol. Concerning NO_x, the obligation in the Sofia Protocol to stabilise emissions by 1994 was also met. In spite of the 50 per cent reduction between 1987 and 1997, NO_x emissions remain higher than the OECD average and growth in traffic will make it difficult to achieve further reductions. The 30 per cent reduction in *VOCs emissions* between 1989 and 1999 agreed to in the Geneva Protocol has already been met, the 1997 emissions of 275 ktonnes being below the 1999 target of 283 ktonnes.

These emission reductions have been achieved through the retrofitting of large coal/lignite-fuelled power plants with desulphurisation equipment, some switching of fuels from brown coal and heavy fuel oil to natural gas, and various other measures needed to comply with the Clean Air Act. The sharp drop in economic output at the beginning of the 1990s was also a major factor. From a *cost-effectiveness* point of view, the decision to require large plants to meet emission limits within a relatively short period of seven years, however desirable in itself, was certain to lead to non-optimal measures being taken, e.g. retrofitting old production facilities and resorting more often to end-of-pipe than to cleaner production technologies.

A 1997 decree amended the Clean Air Act's *emission limits*, thus carrying out one of the objectives of the State Environmental Policy. Czech emission limits for large new combustion plants are broadly comparable to those stipulated in EU rules for such installations (i.e. in the "large combustion plants directive"). How-

ever, as the Czech emission limits also apply to existing and smaller combustion plants, they are in effect more stringent.

Other policy measures that have contributed to emission reductions include the emission charge system. Revenue from these charges has played an important role in financing measures to reduce emissions from smaller emission sources, but as the charges were initially low and no subsequent corrections were made for inflation, the incentive effect has been small.

There are no quantitative objectives for reducing emissions of *heavy metals and other toxic substances*. Emissions are estimated to have been reduced since 1990, but actual data are not available. Improving the collection and regular reporting of policy-relevant information on emissions of these substances is therefore highly desirable.

Ambient air quality

The success of the Czech Republic in meeting its main emission reduction targets should not obscure the fact that *emissions of the traditional pollutants remain among the highest in the OECD* and that much progress remains to be made. The next step should be to continue reducing emissions from small stationary sources, and to focus on emissions of VOCs in the fuel distribution chain and on NO_x and VOCs emissions from mobile sources. There is also potential to further reduce NO_x emissions from large combustion plants.

Even though emission reductions have had a *positive impact on ambient air quality*, air quality standards for some parameters are still exceeded in some urban areas. Czech ambient air quality standards are about as strict as EU standards (although specified in somewhat different terms), and the air quality classification system designates air as “heavily polluted” when the ambient air quality standard is exceeded for more than one substance. Using this system, 23 per cent of the Czech population is exposed to “heavily polluted” air. The level of NO_x is still too high in some cities (e.g. Prague) and is not expected to decrease. High concentrations of ground-level ozone also persist, with the standard being exceeded at times. Although the public warning level was not reached in 1996, expected growth in traffic is likely to increase the frequency of episodes of high ozone and NO₂ levels, especially in and near large cities.

Reductions of emissions of sulphur and NO_x in the Czech Republic and surrounding countries have reduced *acid deposition*, but critical loads are still exceeded, particularly in the north-western part of the country. The impact of

tropospheric ozone on forests remains a serious concern, as the interim critical level is widely exceeded (Chapter 5).

Energy and transport

The large investment in emission reduction measures (e.g. desulphurisation installations) has resulted in a marked drop in the *relative share of the energy sector in overall pollutant emissions*. By 1999, for example, SO₂ and NO_x emissions from the CEZ's power plants will have been reduced by 92 and 53 per cent, respectively, compared to 1993. Flue gas desulphurisation facilities have been installed or are under construction at all large thermal power plants which will be in operation after 1998. In addition, new fluidised bed combustion boilers have been or are being built. When the Temelin nuclear power plant is completed, there will be a decrease in coal consumption accompanied by emission reductions.

Energy intensity in the Czech Republic is still high in comparison with other OECD countries. A study suggests that, in the absence of further measures, end-use energy consumption will start rising again by the year 2000. While the potential for *energy savings* is large, relatively low energy prices make it difficult to improve energy efficiency and develop renewable energy sources. A comprehensive, up-to-date energy policy integrating environmental concerns is therefore needed. Existing government and private energy conservation efforts must be strengthened. Further progress is needed in respect of the recent changes in energy pricing aimed at making it reflect real costs.

Statistics on traffic intensity, number of vehicles and pollutant emissions show that the transport sector in the Czech Republic is not yet as developed as in many other OECD countries. As the economy grows and the standard of living rises, transport-related environmental pressures are poised to increase as well. The question is whether the Czech Republic will be able to prevent transport becoming as dominant an environmental problem as it is in many other OECD countries. This will require a sustainable transport strategy. The transport strategy under discussion in 1998 already includes many of the elements required, but it still appears to be based to too great an extent on a "business-as-usual" scenario. A more ambitious, comprehensive strategy needs to be broadly discussed by all stakeholders, and final choices should be acceptable to the public at large. Much will depend on individuals' transport-related behaviour and on the extent to which central government policies (including regulatory measures and pricing mechanisms designed to limit car use, especially in urban areas) are complemented by actions at the municipal level (including land use and transport planning).

3

WATER MANAGEMENT

1. The State of and Pressures on Water Resources

Current situation and trends

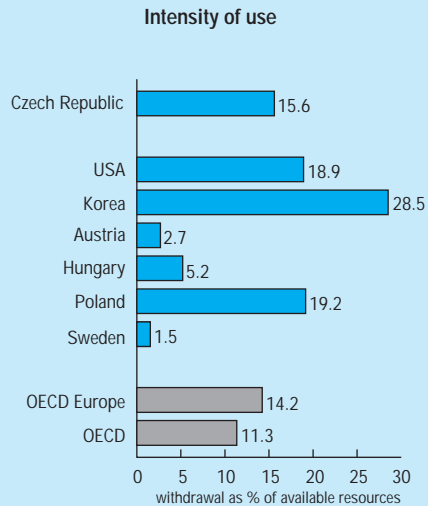
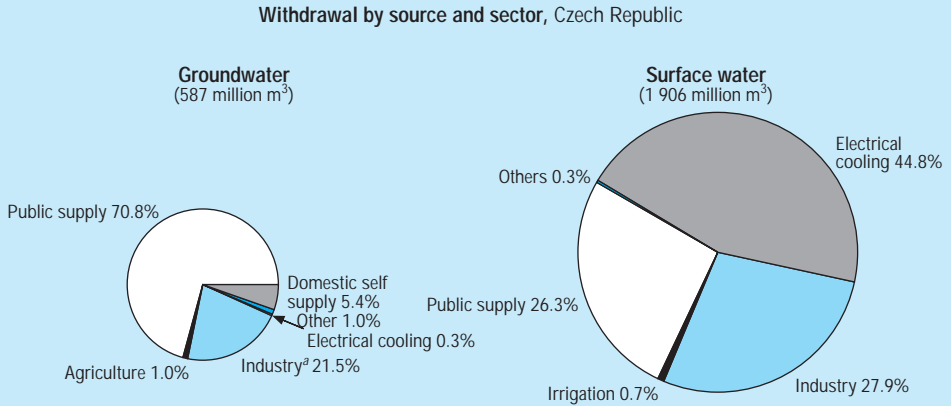
The Czech Republic straddles the hydrological divide between the North, Black and Baltic Seas. It lies in the most upstream part of *three transboundary rivers*: 64 per cent of the country's territory is in the Labe (Elbe) basin, 31 per cent in the Morava/Dyje basin, and 7 per cent in that of the Odra (Oder). There are few natural lakes, but the more than 24 000 reservoirs and fish ponds contain almost 4 000 million cubic metres of water.

Water quantity

Mean annual precipitation in various parts of the country is between 485 and 880 mm. The national average is 693 mm, representing a volume of 55 billion m³/year. Over 70 per cent goes to evapotranspiration and replenishment of groundwater resources, leaving the remainder for rivers and streams. Annual *streamflow* is 8-19 billion cubic metres, with an average of 16 billion cubic metres. At 1 550 cubic metres per capita, the Czech Republic is relatively poor in water resources (Figure 3.1). Estimated renewable *groundwater resources* amount to about 1.44 billion m³/year; 71 per cent of groundwater is used for public water supply.

The Czech Republic is *subject to moderate water stress*, as freshwater withdrawals represent around 16 per cent of available water resources (Figure 3.1). About 80 per cent of withdrawals is from surface waters. Annual water withdrawal per capita (240 cubic metres) is less than half the OECD Europe average. Withdrawals for electricity cooling have tended downward since the early 1980s. The same is true, since 1990, of withdrawals for municipal water

Figure 3.1 Freshwater resources and withdrawals, mid-1990s



a) Including mining and quarrying.
Source: OECD.

supply, industry and agriculture. However, recent figures suggest that overall annual withdrawals may now have stabilised at around 2.5 billion cubic metres, about 30 per cent less than in 1985. In 1997, 0.9 billion cubic metres (of which 45 per cent from groundwater) was withdrawn by water supply companies. Agricultural use, which has always been small compared to the other three categories, declined by more than 70 per cent in the period 1990-96.

Water quality

The state *water quality* monitoring network comprises 283 stations located on the main water courses, 339 groundwater boreholes and 137 stations that measure springs. In the Czech water quality classification system there are five classes: I and II (unpolluted), III (polluted), IV (highly polluted) and V (extremely polluted). Distinctions are also made among various groups of water quality parameters (e.g. group A concerns organic pollutants, dissolved oxygen, BOD₅ and COD; group B concerns the nutrients nitrate-nitrogen, ammonium-nitrogen, total phosphorus and suspended solids).

Water quality *in rivers* is still poor, but has improved in recent years in most major watercourses (Figure 3.2). For instance, between 1991/92 and 1995/96 the number of sites in quality classes IV and V fell from 77 to 32 for BOD₅, 181 to 112 for COD, 133 to 69 for ammonium-nitrogen and 168 to 79 for total phosphorus. The Vltava (Moldau), the tributary of the Labe (Elbe) that flows through Prague, has shown a marked decrease in organic pollution along most of its length, with most reaches moving up one quality class. In the Odra (Oder), concentrations of ammonium-nitrogen in particular have decreased. Nevertheless, many streams, notably small watercourses, remain highly polluted. In terms of microbial pollution, almost all watercourses are in classes IV or V. Moreover, sediments in streams and reservoirs are often seriously contaminated; in places, if they were classified in the same way as waste, they would be considered hazardous due to high concentrations of cadmium, mercury or PCBs. Water quality has also improved in reservoirs, but eutrophication (water discolouration, presence of diatoms and algae) and sometimes turbidity still seriously limit use for water supply and recreation.

Overall, *groundwater quality* deteriorated greatly in the 1970s and 1980s but has not changed very much over the last five years. Groundwater quality standards (applicable to the bottling of drinking water) are exceeded for several parameters (e.g. total minerals, ammonium, sulphates, nitrates, COD) at many locations, particularly in shallow aquifers; springs are less contaminated than aquifers (Table 3.1). Gradual improvement has been observed in levels of organic pollution, petroleum products and nitrites.

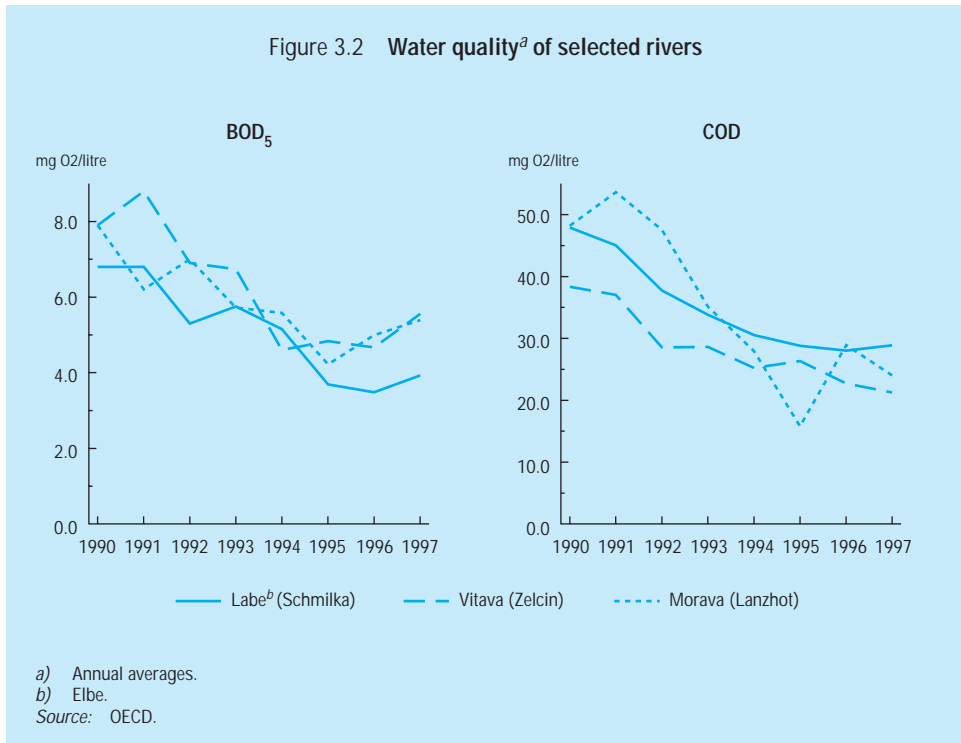
Figure 3.2 Water quality^a of selected rivers

Table 3.1 Groundwater quality
(% of measurements exceeding drinking water standards)

	Shallow aquifers		Deep aquifers		Springs	
	1991	1996	1991	1996	1991	1996
Total minerals	28.8	26.6	5.6	5.3	1.5	2.6
Ammonium	35.8	33.7	20.6	16.4	4.4	1.1
Sulphates	26.6	28.6	3.5	2.1	2.2	1.8
Nitrates	24.1	22.9	3.2	5.0	12.1	13.1
Nitrites	20.3	12.1	7.6	1.3	3.3	0.4
COD	45.9	21.7	15.7	4.2	16.9	4.0
Petroleum products	27.4	3.7	23.6	4.0	15.9	2.2
Alpha activity	30.1	30.6	34.2	40.2	29.8	20.4

Source: CHMU.

Drinking water quality

Drinking water quality is *monitored in public water mains* in 33 areas of the country. More than 40 per cent of the population is supplied with drinking water from these mains; in 1996, no acute problems (i.e. infection or poisoning) were recorded. For some parameters (free chlorine, hardness, calcium, aluminium, iron) standards are not always met, and in some places the limit values for trace elements (e.g. beryllium, boron) are being exceeded. Another means of assessing population exposure to pollutants is the "Acceptable Daily Intake" (ADI) index, based on an assumed daily consumption of one litre of water per person. Figures suggest that, in descending order, nitrates, trace elements (e.g. lead, barium, nickel, selenium) and chloroform are the substances of greatest health concern.

Pressures on water resources

The low priority given to environmental considerations in past economic decision-making led to large direct and indirect *pollution fluxes* into the aquatic environment, and to the *accumulation* of contaminants in groundwater and in the sediments of river beds and reservoirs. Aquatic biota have been affected by pollution and by hydraulic engineering works for shipping, water power and agricultural drainage. While point source clean-up can be achieved within a relatively short time, aquifers will remain contaminated much longer. Sediments will continue to release toxic substances to surface waters for decades to come.

Point source discharges of pollutants (e.g. BOD₅, suspended solids, petroleum products and dissolved inorganic salts) from urban areas and industry have declined markedly since 1990, but they remain a major problem in respect of receiving water quality (Figure 3.3). *Municipal waste water* is the largest source of organic pollutants: in 1996, a total of almost 2 400 sources released 49 744 tonnes of BOD₅ and 84 102 tonnes of suspended solids. *Industrial discharges* are a smaller source of some pollutants: BOD₅ (14 per cent), suspended solids (12 per cent), COD (21 per cent), total phosphorus (16 per cent) and cadmium (16 per cent). However, industry is the dominant source in terms of certain other pollution parameters (e.g. AOX). The chemical, pulp and paper, and metallurgy industries are the three largest industrial dischargers by far (Table 3.2).

Pressures from *agriculture* have seriously affected water quality, notably that of aquifers and the many man-made reservoirs. However, these pressures have diminished dramatically since 1989 (Chapter 5). Between 1989 and 1996, consumption of nitrogenous and phosphate fertilisers and of pesticides decreased substantially (Figure 5.2). The average application rate of nitrogenous fertilisers

Figure 3.3 Pollution from point sources

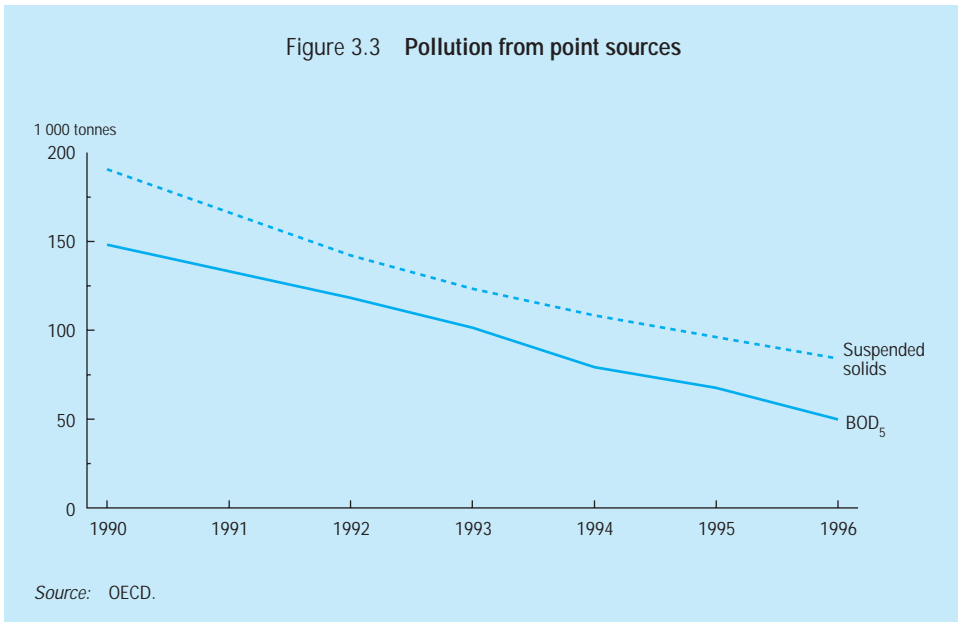


Table 3.2 Waste water discharged by selected industries, 1996

Industry	Amount (million m ³)	Amounts discharged (tonne/year)					
		BOD ₅	COD	SS ^a	DS ^a	OS ^a	NH ₄
Metallurgy	65.0	341.8	1 381.0	1 133.5	51 031.6	27.0	241.6
Chemical	93.0	3 549.9	15 890.0	5 672.5	163 882	46.1	1 848.4
Machine	15.0	162.9	528.5	326.6	28 862.4	3.6	14.3
Electro-technical	1.2	21.3	55.5	27.0	1 408.9	0.1	2.4
Wood processing	4.2	106.3	537.8	115.2	565.6	0.1	17.2
Pulp and paper	76.0	1 648.3	14 996	2 969.8	68 919.7	1.4	35.3
Glass	3.3	25.0	86.3	97.3	1 479.8	2.3	1.0
Textile	13.2	704.8	2 410.2	454.6	13 418.2	6.8	236.9
Food processing	18.1	1 485.4	3 214.0	687.5	10 466.5	0.8	49.6

a) SS = suspended solids, DS = dissolved solids, OS = oil substances.

Source: T.G. Masaryk Water Management Research Institute.

reached 5.8 tonne/km² in 1997, well below the OECD average of 8.8 tonne/km² of arable land. It is expected that as Czech agriculture adapts to new market conditions, fertiliser use will approach that in other EU countries. Even if the use of pesticides is now well below the OECD average (Figure 5.2), a legacy of contaminated soils and sediments will continue to threaten the health of water ecosystems for many years to come. In 1996, agriculture was responsible for most of the 44 per cent of ammonium-nitrogen originating from diffuse sources.

The Labe (Elbe) and Vltava (Moldau) are still used as *inland waterways* for goods transport, requiring the operation of 62 navigation locks; this type of shipping is the equivalent of about 1 per cent (in tonnes-km) of road transport and has been declining in recent years. However, *recreational use* of these waterways for sailing (on 60 selected stretches) and other activities is increasing. In addition, 54 reservoirs, 357 ponds and 44 former sand and gravel pits are used for recreation.

2. Responses

Objectives

The primary water-related objective of the 1995 *State Environmental Policy* (SEP) has been to improve water quality by limiting pollution discharges. The SEP's main aim in this respect has been the protection of drinking water resources and the further reduction of pollutant concentrations in surface waters. The approach chosen has been to focus on large point sources first and then consider diffuse pollution sources and waste water treatment in small towns, where alternative, lower-cost technologies could be applied. The SEP's short-term (1995-98) priorities have been to:

- incorporate property rights *vis-à-vis* water and the water environment in amendments to the existing legal norms and in the main elements of the new follow-up comprehensive law on water protection (to be achieved by 1997);
- modify permissible effluent limits so that they are in harmony with EU directives (by 1996);
- increase the efficiency and protection of the water resources system by verifying the system of hygiene protection zones, so that economic interests in these protection zones receive financial compensation (by 1996);
- reassess the level of charges for waste water discharge in relation to abatement costs, so that their incentive function is strengthened, and

- expand the practice of suspending payment of pollution charges where the producer has begun implementing corrective measures (by 1996);
- examine the feasibility of introducing water take-off charges in order to address the question of the costs of administration and care of surface and ground waters (by 1997).

In the *medium term* (1999-2005), the intention is to complete the comprehensive legal norms for water protection (implementation of the new provisions).

Management of water resources

Institutions

The *Ministry of the Environment* (MoE) is the highest state administrative body responsible for managing the quantity and quality of surface and ground waters; it is also responsible for flood control. The *Ministry of Agriculture* plays an important role in water management, as follows:

- through special purpose *river basin corporations*, which have the legal status of private companies but are wholly owned by the state and carry out various functions under contract to the ministry. By 1998, five such bodies had been established for the Labe (Elbe), Vltava (Moldau), Ohře, Odra (Oder) and Morava. Their activities include: i) management of (14 910 kilometres of) main watercourses; ii) setting of conditions for their use and development in terms of water quantity and quality; iii) protection and conservation of aquatic ecosystems; iv) monitoring of water quantity and quality; and v) exercising owner's rights and duties with respect to hydraulic infrastructure;
- through the *State Land Reclamation Authority*, which is responsible for small streams and reservoirs in the agricultural landscape and the maintenance of irrigation canals and systems;
- as the *main forestry organisation* managing small watercourses and torrents in public forests and enhancing forests' water regulation and erosion protection functions.

The 73 *District Offices* (of the Ministry of Interior) issue permits to abstract surface and ground waters, as well as to discharge waste water, for large and medium-sized sources. They are also responsible for applying the Water Act and other environmental legislation at the district level. The *Czech Environmental Inspection* carries out inspection and supervision for the purpose of protecting the water environment and has part of the administrative responsibility for dealing

with accidental pollution of surface and ground waters. If the Inspection discovers non-compliance with permit conditions, it can require corrective action or close down the offending activity altogether. The *Ministry of Health* is responsible for monitoring drinking and bathing water quality.

Municipalities are responsible for regulating the general use of surface water, including issuing abstraction and discharge permits for small sources.

In addition to meteorological and climatological activities, the *Czech Hydrometeorological Institute* (CHMU) carries out hydrological studies, including on the prevention of flood damage through flood plain management (flood control plans, forecasting, and warning service). The *T.G. Masaryk Water Management Research Institute* carries out water management research and formulates the Master Water Management Plan, which assists water management authorities and provides advisory, expert, consultancy and co-ordination activities.

The Czech *water industry* (water supply, sewerage reticulation and sewage treatment) has been restructured in recent years, with ownership of water infrastructure being transferred from the state to municipalities or groups of municipalities. A variety of arrangements concerning ownership and service delivery have been established in different parts of the country. Often the ownership of pipe networks and installations has remained public (municipalities, groups of municipalities or municipally owned companies) and service delivery has become the responsibility of public/private companies. New legislation is in preparation to better define the responsibilities of both owners and operators.

Regulatory instruments and enforcement

The 1973 Water Act and the 1974 Act of the Czech National Council on State Administration of Water Management are the principal water laws. A 1992 decree associated with the Water Act sets *waste water discharge limits* for treated sewage, and for about 25 industry-specific effluents, and establishes *receiving water standards* for 57 substances. Current Czech effluent limits for municipal waste water are more lenient than those in many other OECD countries, but proposed new values are similar to those the EU has adopted for sensitive areas. The permitting authority can impose more stringent effluent limits if local water quality conditions so require.

Permit holders can be obliged to monitor their discharges and report results to the *Czech Environmental Inspection*. The Inspection employs about 60 water inspectors, who carry out in the order of 4 000 inspections per year; one-quarter of

inspections, on average, result in a violation being detected. In 1997, 350 permit holders were *sanctioned* and in nine cases the non-complying activity was stopped.

Flood management

Part of Czech territory is *vulnerable to flooding*, with 1 520 km² lying in ten-year flood plains. The 1974 act on water management administration contains extensive provisions concerning flood prevention and control, including rules for cost-sharing and the creation of a national as well as basin-wide, district and municipal flood control commissions to co-ordinate emergency response when floods occur.

The most serious flood of the century occurred in July 1997, when Moravia and part of Eastern Bohemia were hit by severe rain storms. About 50 people were killed, 2 500 injured and 10 000 left homeless. Total damage was estimated in the order of CZK 60-80 billion or *about 3 per cent of GDP*. Of this amount, CZK 10.4 billion was covered by insurance, while the Czech Government paid out some CZK 22 billion in flood relief.

Economic instruments

The 1973 Water Act (supplemented in 1992 and 1998 by related pieces of legislation) enables water management bodies to *levy a variety of charges*:

- *surface water withdrawal* charges to finance the administration of water-courses (water use for agriculture, pisciculture, firefighting, swimming pools and skating rinks is exempted). These charges apply to anyone withdrawing more than 1 250 cubic metres per month or 15 000 cubic metres per year from surface waters; the rate is set by, and revenue accrues to, the river basin corporation (Table 6.7);
- charges for the *discharge of waste water* to surface or ground waters, calculated on the pollutant content of the effluent (BOD₅, suspended and dissolved solids, oil substances, alkalinity/acidity), with revenue accruing to the State Environmental Fund (SEF) (1996 revenue CZK 567.2 million). New legislation to take effect on 1 January 1999 will lead to a stepwise increase in this charge, with the amount to be set each year by the Ministry of Finance. In the first year, revenue of CZK 1.5 billion is expected;
- *groundwater withdrawal* charge of CZK 2/m³ (drinking water is exempted), with revenue accruing to the SEF (CZK 36.1 million in 1996);
- *water rates* and *sewage charges* to pay for water supply and sewage disposal services, with a rate of CZK 17 –40/m³; in mid-1996, the mean water rate was CZK 10.27/m³ (VAT included) and the mean sewage

charge was CZK 9.81/m³ (VAT included); for both types of charges, the rates for households are less than those paid by others.

Violations of the Water Act can result in *fin*es by the Czech Environmental Inspection and District Offices. Revenue collected by the Inspection is shared equally by the municipality and the SEF; District Offices can use the revenue from fines they collect.

Expenditure and funding mechanisms

Water-related *investment* in pollution abatement and control rose from 0.43 per cent of GDP in 1989 to a high of 0.95 per cent in 1994; it amounted to 0.71 per cent in 1996 (Table 6.2). This investment in sewerage and sewage treatment, as well as in drinking water supply, is financed from user charges (typically about 15 per cent) and from subsidies (about 60 per cent), loans (20 per cent) and other sources provided by the state budget and the SEF.

In 1996, combined *state budget and SEF investment expenditure* on water infrastructure (of which just over half for water supply) amounted to CZK 2.5 billion in direct financing and CZK 2.2 billion in loans. The SEF's revenue from water-related charges amounted to CZK 782.6 million in 1996, about 15 per cent of its total income. Water-related expenditure by the SEF was much higher in both absolute and relative terms: CZK 1 946.3 million, or 42 per cent of total expenditure. The SEF's share in overall investment has been falling as income from effluent charges decreased with the reduction of discharges. The trend will be reversed beginning in 1999, when charges per unit of pollution start to rise.

Much water infrastructure development will take place in the next ten to fifteen years. A decision has been made to continue state subsidies during this period on social grounds. A strategy has been adopted for gradually replacing direct subsidies with loans and raising prices on a region-by-region basis, as allowed by social conditions.

3. Environmental Performance

In the four decades *prior to 1989*, water management in the Czech Republic was characterised by centralised, top-down decision-making through statutory water management plans, with priority given to large investment in water infrastructure in the service of economic production and frequent exemptions from constraints on polluting activities. Maintenance of water supply and sewerage

systems (particularly smaller ones) was often neglected, and little attention was paid to impacts on ecosystems and landscapes.

Reforming the water management framework

The current decade has seen a radical change of approach, as the country faces the double challenge of remedying past environmental damage and preventing future water-related problems linked to renewed economic development. Czech water managers, who are rightly taking a *more integrated management approach*, are using a range of instruments. The process of bottom-up, integrated catchment planning begun in March 1998 is another positive development. Further, the Czech Republic is placing its water management in the context of *multilateral co-operation*, such as participation in activities for the protection of the Labe (Elbe), Morava and Odra (Oder).

The *reform of the water sector* carried out in the early 1990s (transfer of ownership to the regional/local level, a commercial structure for water services companies) and the simultaneous establishment of a new financing regime (Chapter 6) have contributed greatly to the country's water management achievements. Institutional reform still needs to be completed, and not all of the actors (e.g. municipalities) have as yet fully adjusted to their new roles. The choice of a company structure for the river basin corporations responsible for basin management is unique among OECD countries.

Another feature, which has perhaps received less attention to date, is the *relationship between water management and land use planning*, notably in respect of *reducing vulnerability to flooding*. The opportunity to fill this gap in the policy framework, and ensure appropriate use of floodprone areas, could be taken when implementing the SEP's medium-term land use objective, which promises to give more prominence to environmental considerations in land use planning.

Achieving water management objectives

The SEP's *short-term water management objectives* are either of a generic, strategic nature or aimed at creating a more incentive-based policy framework. They do not specify concrete environmental results or allocate funding. In general, there has been *substantial progress* in reducing pollution of surface and ground waters, protecting drinking water resources and cleaning up large pollution sources. Concerning the development of policy instruments, there has been some *slippage* of deadlines announced in the SEP: the revised law on waste

water charges announced for 1996 was adopted in March 1998, while the revision of effluent limits (in harmony with EU directives) and the substantial review of water management legislation had not yet been tabled in Parliament as of June 1998.

The state of Czech water resources remains serious. Although improvements are evident from monitoring of surface water quality (e.g. concentrations of organic pollution, ammonium and phosphates in the four main rivers have decreased), less progress appears to have been made in many watercourses which remain highly polluted (e.g. ammonium-nitrogen and microbial contamination of small watercourses has remained in quality class V or IV). *Contaminated sediments* will continue to release toxic substances to surface waters for a long time to come. Over the period 1990-96, although *groundwater quality* improved, no substantial change occurred in the indices of organic pollution, petroleum products and nitrites. Overall, the task still to be accomplished is a daunting one. However, the national action plans for the Labe (Elbe), Morava and Odra (Oder) already prepared (but not yet approved by the government) can provide the framework and driving force for the long-term, sustained effort that will be necessary.

One of the SEP's objectives concerns the *protection of water catchment areas*. To protect water quality and aquatic ecosystems, minimum river flows have been prescribed at 150 sites. Eighteen catchments (12 for surface waters, six for groundwater) with a combined area of more than 18 000 km² have been protected as a preventive measure, as have 2 700 km² in order to protect catchments used for drinking water withdrawal. Constraints can be placed on fertiliser application rates in catchment areas; legislation (as proposed in the SEP) was adopted in March 1998 requiring water users to compensate farmers for proven production losses, but initially at least there has been little demand for such compensation. The River System Restoration programme, being implemented since 1992 and aimed at re-establishing natural drainage patterns in agricultural areas (e.g. through clearing watercourses, cleaning out reservoirs), is an example of the attention being given in water management to ecosystem impacts (Chapter 5).

Delivery of water services

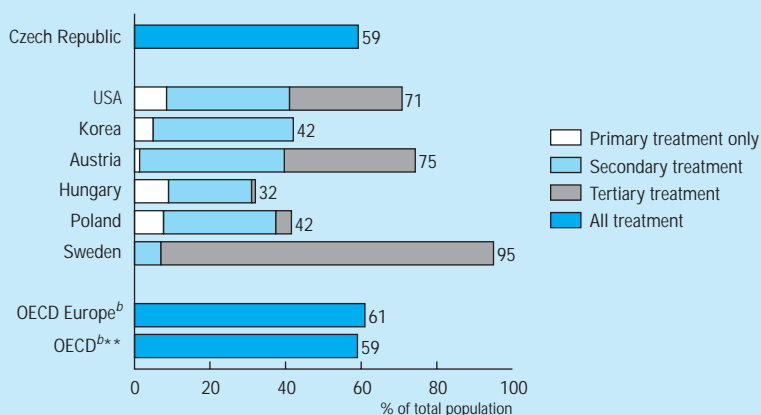
Public *water supply* systems served 86 per cent of the population in 1996. The connection rate varies among different parts of the country and is notably low (just over 70 per cent) in districts and municipalities close to the large urban areas of Prague, Pilsen and Brno. Drinking water in the systems monitored by the health authorities (that of about half the population) is reported to be generally safe in

terms of Czech standards (which are close to WHO standards), but no information is available on the quality of water consumed by the other half of the population. Drinking water quality assurance procedures clearly need to be extended to cover water supplied to all consumers. The private wells used by those not connected to a public system often present a health risk due to bacteriological contamination: the 7 per cent of the population potentially serviced should therefore be connected soon.

Both municipal and industrial *point source pollution* has been reduced substantially since 1989: overall, by 70 per cent for BOD₅, 54 per cent for suspended solids, 27 per cent for dissolved solids, 77 per cent for oil substances and 87 per cent for acidity/alkalinity. A survey of members of the Czech Business Council for Sustainable Development suggests that there was an 80 per cent reduction in COD and suspended solids at 11 major industrial point sources between 1989 and 1995. This figure is much higher than any emission reductions directly related to the fall in production after 1989. Beginning in around 1993, the *organic pollution load was decoupled from economic growth*. However, calculations assuming full compliance with EU or new Czech emission limits show that further potential discharge reductions are in the same order as those already achieved. Two-thirds to three-quarters of these reductions will have to be made by municipal treatment stations. This is not only a matter of installing new treatment capacity, but also of improving the operational efficiency of existing plants. In industry, further improvements will increasingly need to be made through the introduction of cleaner technology.

The share of the population connected to waste water treatment in the Czech Republic now equals the OECD average (Figure 3.4). Between 1990 and 1997, the share connected to a *sewerage network* and to a sewage treatment station increased from 72.6 to 73.5 per cent and from 50.3 to 59.2 per cent, respectively. Over the same period, the number of public sewage *treatment stations* grew by almost 40 per cent to 870 and the share of the volume treated to secondary standard from 84 to 90 per cent. In 1996 alone, treatment plants with a capacity of 1.2 million inhabitant-equivalent were completed and existing plants with a combined capacity of 0.4 million inhabitant-equivalent were rehabilitated. Larger plants have been equipped with nutrient removal technology. Almost all district administrative centres now have a functioning waste water treatment plant with an efficiency of at least 75 per cent in terms of BODs; however, almost 5 000 municipalities of between 100 and 2 000 inhabitants still do not have sewerage systems and waste water treatment facilities.

Figure 3.4 Population connected to public waste water treatment plants, mid-1990s^a



a) Or latest available year.

b) Secretariat estimates.

Source: OECD.

Table 3.3 Water prices,^a selected cities, 1996
(US\$/m³)

Czech Republic	Prague	0.37	Belgium	Brussels	1.80
	Brno	0.29		Antwerp	0.97
	Ostrava	0.38		Liege	1.50
United States	Washington	0.80	Hungary	Budapest	0.28
	New York	0.88		Debrecen	0.55
	Los Angeles	0.60		Pécs	0.69
Austria	Vienna	1.75	Sweden	Stockholm	0.86
	Salzburg	1.59		Göteborg	0.58
	Linz	1.11		Malmö	0.99

a) Data for households (two adults and two children) consuming 200 m³ per year. VAT excluded, current exchange rates.

Source: AIDE; NUS.

Total *water supply rates and sewage disposal service charges* for domestic and other users have increased at a rate higher than inflation for several years in a row. As from 1993, revenue from charges fully covered operating costs, but not capital costs. A gradual decline (30-35 per cent overall between 1989-96) in the volumes invoiced to domestic and other users may at least partly be ascribed to these price increases (Table 3.3). Per capita water consumption from public water supply was down to 195 litres/day in 1996, while per capita domestic consumption had dropped from 171 to 116 litres/day since 1989. Both figures are among the lowest in the OECD. Actual water use may be somewhat higher than is suggested by these figures, however, as it has been reported that greater use is being made of private wells for service (i.e. non-drinking) water.

4

WASTE MANAGEMENT

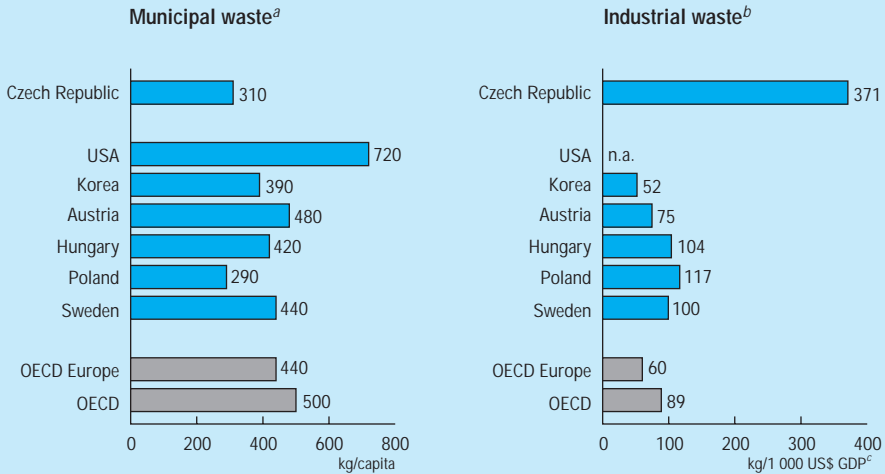
1. Current Situation and Trends

Czech legislation *defines* waste in much the same way as do European Union regulations, but this definition does not correspond exactly to that of the EU: waste in the Czech Republic is a movable object which its owner discards with the intention of disposal, or which is to be discarded according to a special legal regulation. Hazardous waste is defined as having one or more hazardous characteristics corresponding to the list adopted in the Basel Convention and in EU directives.

Since 1 January 1998, the *classification* of waste includes two categories: hazardous and other. Previous classification based on 1991 regulations included a “special waste” category which was eliminated in the latest legislation. The waste catalogue now in force lists 668 types of waste, organised according to groups and subgroups based on the nature of the waste, and indicates those which are considered hazardous. For the purpose of transfrontier movements, an annex to the catalogue includes the so-called “green, amber and red” lists contained in the OECD Council Decision concerning the Control of Transfrontier Movements of Wastes destined for Recovery Operations (C(92)39 Final).

Before 1998, there was *no duty to report on waste generation*. All available information was based on voluntary data collection. Figures are therefore not accurate; for instance, the fact that more waste is shown to have been generated in 1996 than in 1995 (Table 4.1) is mainly the result of improved registration procedures. The amount of *municipal waste* (3.2 million tonnes in 1996, i.e. about 310 kg per inhabitant) is quite low compared to other OECD countries (Figure 4.1). The ash content of municipal waste has been decreasing over the last few years, due to reduced use of coal for heating, while the packaging portion has been rapidly increasing.

Figure 4.1 Waste generation, mid-1990s



a) When interpreting national figures, it should be borne in mind that the definition of municipal waste and the survey methods may vary from country to country. According to the definition used by the OECD, municipal waste is waste collected by or for municipalities and includes household, bulky and commercial waste and similar waste handled at the same facilities.

b) Manufacturing industries (ISIC 3).

c) GDP in 1991 prices and purchasing power parities.

Source: OECD.

Table 4.1 Waste generation, 1995 and 1996

	1995		1996 ^a	
	(1 000 tonnes)	(%)	(1 000 tonnes)	(%)
Industrial waste	27 000	37	38 500	43
Waste from power generation	10 600	14	17 100	19
Waste from mining and quarrying	2 400	3	5 000	6
Waste from agriculture and forestry	6 200	8	5 500	6
Municipal waste	2 000	3	3 200	4
Other waste	25 900	35	19 800	22
Total	74 100	100	89 100	100

a) Qualified estimate.

Source: CEU.

The amount of *industrial waste* generated in 1996 is assessed at 38.5 million tonnes by Czech authorities; this figure, however, appears unrealistically high as it is more than four times the OECD average when calculated per unit of GDP. In 1996, 6.7 million tonnes of *hazardous waste* is estimated to have been generated.

Mining waste (mostly deposited in sludge beds or piles at the mining site) is covered by separate legislation and, with few exceptions, does not appear in the waste management statistics of the Ministry of the Environment. Uranium mining in the Česká Lípa area poses a special problem, with some 46 million cubic metres of sludge containing 4 500 tonnes of uranium having been deposited on sludge beds; CZK 650 million was spent in 1996 on decontamination and related projects. Radioactive waste is also subject to specific legislation and does not fall under the Waste Management Act.

The *import* of waste into the Czech Republic for the purpose of disposal is banned by law. Imports of waste for recycling and further processing amounted to 250 000 tonnes in 1996, of which about 1 per cent was hazardous. Half the imported waste was iron scrap and plastic residues. About 1 million tonnes was exported in 1996, mostly metal scrap. Some 1 700 tonnes of hazardous waste was exported in 1996, essentially used oils and waste containing PCBs.

Between 10 000 and 15 000 sites, including waste dumps, industrial sites and sites which had been occupied by Soviet military installations, have been assessed as potentially contaminated. Studies carried out at the 73 sites used by the Soviet army indicate that 60 were highly contaminated. The chief pollutants were petroleum substances, chlorinated hydrocarbons, PCBs and toxic metals. Environmental audits carried out in the framework of the second wave of privatisation pointed to some 550 industrial sites showing signs of significant environmental pollution.

2. Responses

Objectives

The main objective of waste management, as stated in the 1995 *State Environmental Policy* (SEP), is to reduce the *generation of waste*, especially hazardous waste, and improve the *waste management* system. The SEP further states that “conditions should be created to encourage recycling and biological or thermal *processing*, and discourage *dumping* as a waste disposal method”. It also

aims to regulate much more strictly the handling of waste with hazardous properties and to liberalise the handling of secondary raw materials which do not have such properties (including their transboundary movements). With regard to *technological developments*, low- and non-waste technologies, technologies which utilise secondary raw materials and technologies for treating hazardous waste are considered to be of fundamental importance. Concerning environmental burdens from the past, the main objective is *remediation of previous damage* which poses an acute risk for human health and the environment.

No quantitative targets are fixed in the State Environmental Policy, but *priority measures* in the short term (1995-98) are defined as follows:

- to ensure that unlawful handling of hazardous waste is punishable under penal law, and to introduce mechanisms to this effect;
- to introduce an objective system for measuring waste toxicity, to harmonise waste classifications with the EU system and to introduce a differentiated approach to the handling of hazardous waste;
- to increase local authorities' competence and responsibility for municipal waste management, to ensure that the regime for transboundary movements of secondary raw materials and waste complies with EU and OECD rules, and to provide a legal framework for packaging and packaging waste;
- to resolve liability questions with respect to previous environmental damage, to provide environmental risk assessments for such damage, and to define priorities for action;
- to reassess the rate structure of charges for landfilling, so that producers are encouraged to utilise waste management techniques that are more efficient and environmentally friendly, and to increase the competence of local authorities as concerns charges for waste;
- to encourage environmentally friendly products and activities, to support the recycling of waste and packaging materials using economic measures, and to consider the feasibility of creating a fund to ensure that closed landfills do not pose environmental or health risks.

Institutional and regulatory aspects

Laws concerning waste management adopted in the 1990-92 period often had very inadequate provisions or did not even consider some important topics. The 1998 *Waste Management Act* focuses on waste prevention as the main waste management technique, followed by recycling, incineration and finally landfilling. It improves waste management record-keeping, expands the powers

and duties of municipalities relating to municipal waste management, and introduces a system by which authorisation to manage hazardous waste is given. The Act also imposes special responsibilities on manufacturers and importers that bring products or packaging onto the Czech market, as regards their further use, recovery and disposal.

Four of the six *implementing provisions* of the Waste Management Act took effect together with the Act. They deal with the keeping of waste records, technical requirements for waste management facilities, and which types of hazardous waste are banned from landfills; the introduction of a waste catalogue compatible with the European catalogue, and the adoption of the green, amber and red lists of recyclable waste; the evaluation of the dangerous properties of waste; and the amount of financial reserves required for landfill reclamation and aftercare.

Apart from the Ministry of the Environment, which is the central state administrative body for waste management, *waste administration* is carried out by the Czech Environmental Inspection, customs, the District Offices (of the Ministry of Interior) and the municipalities. The Environmental Inspection is responsible for controlling how the legal provisions of waste management are observed and for levying fines in case of violations. Customs checks shipments which have been declared at the border as waste for use as secondary raw materials or for other purposes. District Offices are responsible for granting permits for hazardous waste management. Municipalities determine the rate of charges for collection, sorting and disposal of municipal waste; it is their responsibility to establish secure sites where citizens may discard dangerous components of municipal waste.

Waste minimisation and recycling

Since 1992, the Ministry of the Environment has promoted *cleaner production* in a number of industrial branches through training and demonstration. Some 70 demonstration projects or case studies concerning the reduction of waste generation (hazardous and non-hazardous) and of VOCs emissions and waste water have been completed. Reductions in waste generation over four years (1993-96) amounted to some 20 000 tonnes of non-hazardous waste and 18 000 tonnes of hazardous waste. Total financial savings attributable to the demonstration projects over the same four years (including VOCs, waste water and solid waste reduction) amounted to more than CZK 200 million.

The long tradition of reclamation and *recycling* of waste which prevailed before the 1990s has rapidly deteriorated in recent years due to changes in the

market for recyclable materials. Massive imports of low-cost waste from neighbouring countries have contributed to the problem, especially in regard to waste paper. Improvement is very slow. Prague and other large cities are gradually introducing a system for collecting sorted components of municipal waste (paper, glass and plastics). Networks of waste collection sites which also accept hazardous components of municipal waste are being developed; figures are not yet available on quantities collected or cost-effectiveness.

Treatment and disposal facilities

Landfilling is by far the most common type of waste disposal. More than 10 000 landfills were in operation before 1991; under the first waste management legislation, insecure ones have been progressively closed down. At the end of 1996, some 380 technically secure landfills were in operation and about 20 per cent of the closed landfills had been recultivated. The total number of protected landfills in operation has now stabilised at about 300.

The total *capacity of landfills* for municipal and other kinds of waste is sufficient at present. Solid municipal waste can be deposited at about 150 sites; thus, on average there are two landfills per district, which is adequate if waste collection is well organised. Other landfills are mostly for industrial waste.

The only *municipal waste incineration plant* in operation was built in 1989 and has a capacity of 240 000 tonnes per year. It is presently being operated at about 70 per cent of total capacity. This plant, located in Brno, is also used as a source of energy. A modern incinerator is beginning a trial run in Prague. Its capacity is planned to reach 310 000 tonnes per year, and it should start to operate at full capacity in 1998. A municipal waste incinerator is also under construction in Liberec.

Hazardous waste is incinerated in small and medium-sized incineration plants operated by the industrial waste producers themselves. Many of the initial 150 or so installations have been closed down because they could not satisfy the emission limits set in the Clean Air Act. By mid-1997, 87 incinerators remained in operation; 20 of these (hospital incinerators with a capacity of 30-60 kg/hour) are not equipped with the required gas cleaning equipment and are due to close down by the end of 1998. The capacity of those hazardous waste incinerators which do meet air emission limits is about 100 000 tonnes per year; they are operating at about 60-70 per cent capacity at present. No plan exists for the disposal of sludge from waste water treatment plants.

Use of economic and other instruments

The *economic instruments* used in the Czech Republic for waste management are essentially fees for landfilling waste and fines for not complying with specific laws (Table 6.7). Their use is reinforced in the Waste Management Act, which also introduces duties intended to have an economic impact on landfill operators and on producers and importers of products and packaging.

A *fee for landfilling* is to be paid by the waste producer. It is also to be paid by producers who operate landfills on private property. The landfilling fee has two components; the basic component is paid according to the quantity of waste disposed of, and the risk component is paid for the disposal of hazardous waste. A reduced fee can be applied to municipal waste from which hazardous or usable components have been separated. The basic component provides revenue for the municipality where the landfill is situated, and the risk component for the State Environmental Fund. The amount of the fee will increase with time (Table 4.2).

Operators of landfills are now required by law to create a *financial reserve* for clearance, reclamation and aftercare once the landfill operation closes down. The amount has been set at CZK 60 per tonne of dumped hazardous or municipal waste, and CZK 20 per tonne of other dumped waste.

Stricter sanctions have been introduced for serious infringement of the law. The amount of the *fine* depends on the threat to health and the environment.

Table 4.2 **Landfill fees**
(CZK per tonne)

Waste category	1998	1999-2000	2001-2002	2003 and beyond
Municipal and other	20	30	50	80
Hazardous				
Basic component	200	250	350	450
Risk component	300	500	750	1 000

Source: Waste Management Act, 1998.

Fines are imposed by the competent municipalities, District Offices or the Czech Environmental Inspection and range from CZK 10 000 to CZK 10 million.

Tax breaks have also been introduced. Pursuant to the law on value added tax, products made from recycled paper (i.e. containing a minimum of 70 per cent recycled paper) benefit from the lower tax rate of 5 per cent instead of being taxed at the basic rate of 22 per cent. Property and structures used exclusively for waste recycling are also exempt from real estate tax.

The principle of *producer responsibility* has been incorporated in the new Waste Management Act as regards packaging and packaging waste. Manufacturers and importers of packaging and packaging materials must ensure that, by the end of the year 2000 at the latest, packaging waste is used and recycled to the extent determined by a decree of the Ministry of the Environment.

Imports and exports of hazardous waste

The Czech Republic has acceded to the *Basel Convention* on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, with effect from 1 January 1993. It is also bound by the OECD Council Decision concerning the Control of Transfrontier Movements of Wastes destined for Recovery Operations. The essential provisions of these two instruments are incorporated in the new Waste Management Act. In particular, the export of hazardous waste to countries which are not members of the OECD is banned even if it is destined for recycling.

A decree of the Ministry of the Environment which entered into force at the same time as the Waste Management Act includes the three lists (green, amber, red) of waste destined for recovery in accordance with the OECD Decision. In keeping with paragraph 4 of this Decision, the Czech Republic has introduced a number of *exceptions to the lists*. Several types of waste originally on the green list are treated by the Ministry of the Environment as if they were on the amber list, thus requiring notification instead of being freely marketable. These exceptions concern 43 waste types, including a number of types of metal waste, all plastic waste, used tyres, all waste arising from tanning and all waste listed under the heading "other waste containing principally organic constituents".

Measures to remediate soil contamination

Remediation of contaminated soil is carried out in one of two ways, according to the provision which has been made for payment.

Firstly, in 1992 clean-up work was gradually begun at the most highly contaminated sites which had been occupied by the *Soviet army*. By the end of 1995, decontamination had been completed at 47 sites out of a total of 60. It is continuing at the others. Remediation is paid for by the state. Total costs are currently estimated at about CZK 1 200 million. So far, about CZK 700 million has been spent. This work is expected to be completed by the year 2008.

Secondly, remediation of contaminated *industrial sites* is based on the law concerning the transfer of state property to the private sector. Pursuant to this law, enterprises are obliged to submit an environmental audit during privatisation. Both remediation and the preparation of a risk analysis are paid for out of funds obtained during privatisation and administered by the National Property Fund. So far, more than 300 concrete agreements have been signed between the National Property Fund and new owners concerning payments for environmental damage. By the end of 1997, a total of CZK 3 300 million had been paid out.

3. Environmental Performance

The *current situation* in regard to waste management in the Czech Republic can be characterised as follows:

- large quantities of waste have been produced by industrial, mining and power generation activities and have often accumulated on site;
- there is a high proportion of hazardous (as compared with total) waste production;
- landfilling is the predominant waste disposal technique;
- only a small percentage of secondary raw materials and energy are provided by waste utilisation;
- a large number of sites have been contaminated by previous military and industrial activities.

The main objectives defined in the 1995 State Environmental Policy were concerned with reducing the amount of waste to be disposed of and remediating contaminated sites.

The new Waste Management Act, which replaced the previous inadequate legislation, is the first essential step towards accomplishing these objectives. It entered into force on 1 January 1998, together with the most important implementation decrees. The new Act is concerned primarily with increasing transparency in waste generation and management, and with limiting waste production, including through support for separate collection and recovery of materials. It improves waste management record-keeping, extends the obligations of municipalities in regard to the handling of municipal waste, and defines more clearly the district authorities' competencies to authorise facilities to handle hazardous waste. Approaches of the EU, the OECD and the Basel Convention are adopted.

Enforcement of the new legislation should be a priority task in the near future. In particular, major efforts need to be devoted to improving transparency in waste management record-keeping and developing a reliable information base. Waste management programmes will have to be introduced, in consultation with all the actors involved, to give effect to the provisions dealing with the reduction of the amount of waste generated and the stated preference for material and energy reclamation over landfilling. It is not clear whether district authorities will have the necessary staff and financial means to properly manage the authorisation system for hazardous waste disposal. Even if the Waste Management Act and the accompanying waste catalogue are in line with EU regulations, further efforts will be needed to resolve the remaining differences, especially concerning the list of waste which can be freely imported for use as secondary raw materials.

The number of *inappropriately operated waste disposal facilities* has been dramatically *reduced* over the last few years. Unsuitable landfills have been closed and replaced by newly constructed ones which comply with legislative and technical standards compatible with those in other OECD countries. The present total landfill capacity for municipal and other types of waste is sufficient. Progress in rehabilitating closed sites should, however, be accelerated. So far, only some 20 per cent of closed landfills have been recultivated. In addition, a large number of illegal dumps are still in operation.

The number of *hazardous waste incineration plants* not operating in accordance with air pollution legislation has been gradually reduced. It is expected that, by the end of 1998, all hazardous waste incinerators (including hospital units) will be in compliance with the Clean Air Act. Present total incineration capacity is only 100 000 tonnes per year, but only 60-70 per cent of this capacity is used. Most incinerators in operation are too small to be cost-effective. There is an urgent need for some large central facilities for the treatment and disposal of hazardous waste.

The duty to prepare waste management programmes, introduced by law in 1991, led municipalities and enterprises to start keeping records of waste generation, and subsequently to implement *waste minimisation*. This trend has been promoted by a cleaner production programme supported by the Ministry of the Environment. Reduced waste generation is, however, mainly due to increased process efficiency in industry. Pollution charges, as of now, are not strong instruments in this respect. Separate collection and recycling of municipal waste is just beginning to be organised in some of the larger localities, but the absence of a co-ordinated state programme is a particular problem. Current recycling and utilisation technologies for secondary raw materials are inadequate, as is the capacity of the recycling industry. Despite measures introduced to reduce the quantity of waste to be managed, available data indicate an increase of about 30 per cent in total waste generation between 1995 and 1996; this may be partly due to uncertainties about the registration system.

The Czech Republic's current system of *economic instruments* relating to waste management is primarily based on the use of charges (i.e. fees for landfilling) and fines. Apart from tax relief applying to recycled paper, no other type of instrument is being used to promote waste recycling. The rate of landfill fees is currently too low, with the effect of discouraging the implementation of more environmentally sound waste management techniques such as recycling, composting and incineration. A gradual increase in these fees over the next five years is specified in the legislation. Municipal taxes on waste are levied on a per capita basis; they do not cover the full cost of municipal waste collection and disposal. Landfilling remains by far the least expensive method of waste disposal, and the most commonly used (including for hazardous waste). The new Waste Management Act contains a provision requiring landfill operators to create a financial reserve for reclamation and aftercare. Also introduced in this legislation is the principle of producer responsibility regarding packaging waste, although the implementing regulation is still to be promulgated and the producers or importers will have three years in which to fulfil the relevant provisions on the recovery of used products and packaging.

The *remediation of environmental burdens* from the past is now addressing the decontamination of land previously occupied by the Soviet army and by industrial sites. Major progress has been made at the former military installations, the cost of which is paid out of the state budget. Decontamination has been or is in the process of being completed at most of the 60 highly contaminated sites, at a cost of CZK 700 million; another CZK 500 million is to be spent between now and 2008 to complete remediation in the most difficult cases. Regarding contaminated industrial sites, environmental audits carried out in the framework of

privatisation have been completed at about half the sites that presented a potential threat to the environment. A rough estimate indicates that remediating all contaminated industrial sites would cost more than CZK 60 000 million. About 5 per cent of this amount has been paid so far out of funds obtained through privatisation, according to agreements between the Czech National Property Fund and the new owners. There is presently no particular programme aiming at the assessment and remediation of closed landfills where hazardous waste has been inappropriately deposited.

5

NATURE CONSERVATION, FORESTS AND BIODIVERSITY

1. The State of and Pressures on Nature

Status and trends

Flora and fauna

There are 47 000 plant and animal species estimated to be present in the Czech Republic. This includes 90 known species of mammals, 220 of birds and 65 of fish. Game is both native (lynx, fox, red and grey deer, spotted fallow deer, roe deer, chamois, wild boar, hare, pheasant, partridge, duck) and introduced (Japanese sika deer, Virginia deer, elk, rabbit, mouflon). Nevertheless, species *biodiversity* in the Czech Republic appears comparable to that in surrounding countries, with similar numbers of species. Overall knowledge is still incomplete, particularly concerning invertebrates (Table 5.1).

In general terms, biodiversity has been well conserved in central Europe (including the Czech Republic), perhaps better than in western Europe. Partial data on particular taxa suggest that more than half the 748 *bryophyte* species (mosses, liverworts and hornworts) classified are considered threatened, a situation comparable to that in other central European countries. The most recent atlas of *breeding birds* suggests that 21 species are decreasing considerably in number and 54 are decreasing slightly. Nineteen species are increasing considerably and 24 are increasing slightly; for 80 species no trends could be detected.

Some recent positive trends can probably be attributed to the cessation of certain agricultural practices at the end of the communist era; for instance, there has been an increase in the number of butterflies and of grassland birds such as

the corn bunting and corncrake. The number of breeding pairs of partridge is estimated to have doubled to 9 000-18 000 in the period 1989-95, albeit this is still far from the 750 000 pairs present in the mid-1960s.

Habitats and landscapes

Most of the territory of the Czech Republic lies in the biogeographical province of the *Central European Highlands*, embracing two subprovinces (Hercynian in Bohemia and Western Moravia, Carpathian in Eastern Moravia) characterised by many common, but also some distinct, plant and animal species. Southern Moravia is the northernmost extension of the Pannonic province, which has quite different biota distinguished by thermophilic and forest steppe. The Krkonoše (Giant) Mountains, the only peaks in the Sudetes above the timber line, form an exceptional alpine/subalpine ecological island.

The tributaries and main upstream stems of the three transboundary rivers – the Labe (Elbe), Odra (Oder) and Dunaj (Danube) – are the principal *aquatic*

Table 5.1 **State of flora and fauna, mid-1990s**

	Total number of species known	Threatened		Decreasing	
		Number	%	Number	%
Vertebrates					
Mammals	90	30	33	2	2
Birds	220	123	56	36	16
Reptiles	10	10	100	3	30
Amphibians	20	18	90	9	45
Fish	65	19	29	..	..
Invertebrates ^a					
Insects	43 000	154	..	32	..
Crustacea	500	8	..	6	..
Molluscs	200	3	..	2	..
Vascular plants	2 500	727	29	185	7

Note: "Threatened" refers to the total number of species in the "critically endangered", "endangered" and "vulnerable" categories.

a) As all known species have not been studied, percentages of threatened and decreasing species cannot be calculated.

Source: OECD.

ecosystems. Pollution has significantly affected the diversity of aquatic biota, although various species that have disappeared from most European water bodies survive in brooks and streams in some parts of the country (e.g. pearl mussel, brook lamprey, stone crayfish). Smaller aquatic ecosystems include lakes, fen wetlands in flood plain areas and raised-bog mires in mountain areas.

In terms of *landscape diversity*, 55 per cent of the total territory is agricultural land, of which as much as three-quarters is arable or permanent crop land (43 per cent of the land area) and most of the remainder (12 per cent of the land area) is permanent grassland (meadows and pastures). The area used for cropping has decreased by almost 3 per cent since 1990. One-third of the country is forested.

Forests

For more than a century, *forested area has been slowly increasing*. Czech forests now occupy 2 631 000 hectares. *Conifers* predominate in the species composition, occupying almost two million hectares, of which 1 410 000 hectares (54 per cent of the total forested area) is planted in spruce. Pine (458 000 hectares) and larch (92 000 hectares) are the other main species. As a result of efforts to increase the species diversity, the area of *broadleaf forest* has doubled to almost 560 000 hectares since 1950, with Oak and beech are the dominant species.

The *growing stock volume has increased faster* than forested area through *improved management* (e.g. decrease in unstocked area, improved forest species), reaching about 600 million m³ in 1996. The growing stock volume per hectare, 254 m³/ha, is the fourth highest in Europe after Switzerland, Austria and Germany. The average rotation period has also increased steadily over many years; it was 115 years in 1996, with the average medium age of trees being 63 years.

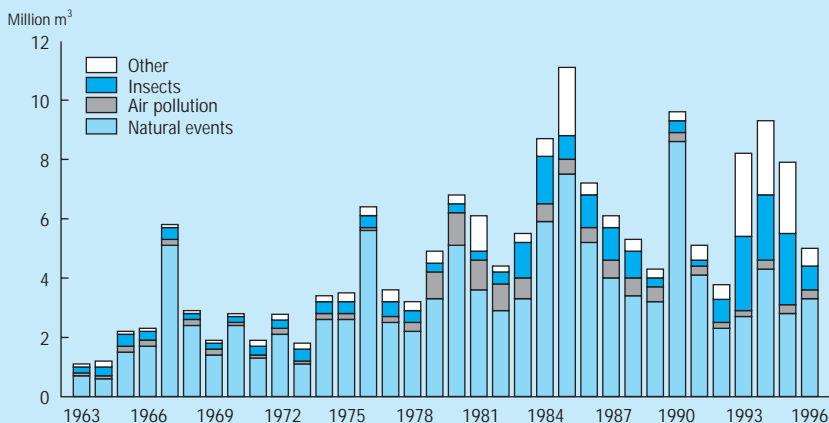
Forestry represents *0.6 per cent of GDP* and employs 0.8 per cent of the national workforce. Removals amounted to 14.3 million m³ in 1997, of which almost 90 per cent was conifers. Logs constituted 47.3 per cent, and pulpwood and other industrial wood 47.9 per cent, with the remainder being used for domestic firewood. *Non-wood benefits* (e.g. mushrooms, berries, recreational) are substantial; berry picking is practised by 80 per cent of Czech households. Nearly three-quarters of forest land is under various forms of state ownership (state enterprises, army, national parks); 12 per cent is owned by municipalities and 16 per cent by private individuals.

Pressures on ecosystems

During the transition period a *shift in pressures on ecosystems has taken place*, with decreased pollution pressures from industry, urban areas and agriculture, but increased pressures from current and future development (e.g. tourism, transport).

Industrial air pollution and inappropriate silvicultural systems (e.g. poor species composition, inadequate pruning and thinning) have increased the vulnerability of forests to extreme weather, insect pests (e.g. pine bark beetle), fungal diseases and other types of damage, with the result that Czech forests are among the most heavily damaged in Europe. Observations show that 50 per cent has suffered moderate and 5.9 per cent has suffered severe damage (Table 8.1). High concentrations of SO₂ and other pollutants due to prolonged inversion conditions in the winter of 1995-96 seriously affected the health of 20 000 hectares of spruce forest in the Ore Mountains, causing estimated damage of CZK 1 billion. Stands are also older than those found in most healthy forests. Consequently, more than half of all harvesting since 1980 has consisted in salvage felling, i.e. felling of windbreaks and removal of fallen and dead standing trees (Figure 5.1).

Figure 5.1 Salvage felling of forests by cause, 1963-96



Source: Institute for Economic Forest Management.

Improvement in forest conditions resulting from the reduction of acid deposition in recent years is likely to be slow; early information suggests that broadleaf species may be responding more quickly than conifers.

Discharges of *effluents from industry and municipalities into water ecosystems* have led to heavy pollution of both water bodies and sediments (Chapter 3). With the reduction of discharges and some progress in waste water treatment, some progress is being observed. Overall aquatic ecosystems are still too often in precarious condition.

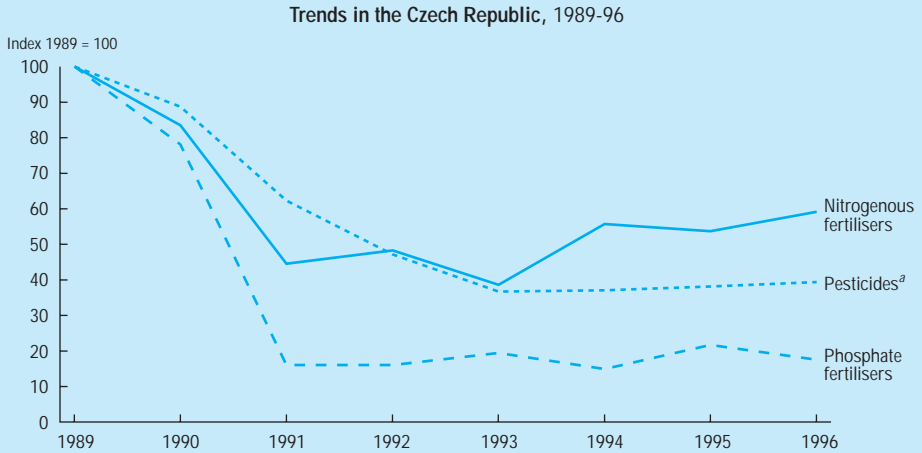
Pressures from *agriculture* have diminished dramatically since 1989. The collectivised agriculture of past decades affected land and water ecosystems through excessive inputs of fertilisers and pesticides, the creation of large fields suitable for heavy machinery and the use of hillsides for cropping, causing soil erosion on more than half of all agricultural land. An estimated 465 000 hectares (out of just over 3 million hectares of arable land) is affected by pesticides or heavy metals. Land privatisation to many small landowners, and the drop in external and internal demand for agricultural products, relating respectively to the collapse of COMECON markets and to food price liberalisation, caused gross agricultural output to fall by almost one-quarter between 1990 and 1996. The number of livestock units (cattle, pigs, sheep, poultry) fell by 36 per cent over the same period. The use of NPK fertilisers fell from about 186 to 81 kg per hectare of agricultural land between 1990 and 1996; nitrogenous fertilisers use is now below the OECD Europe average (Figure 5.2) and about half what it was in the late 1980s. A shift in land use from cropping towards less intensive pastoral use may occur in the near future; production on the remaining arable land is likely to increase and to reach the same intensity as in comparable western European countries.

Current and future development of *tourism in sensitive areas* and extension of *transport infrastructure*, increasing the fragmentation of ecosystems, are likely to raise concerns for nature and biodiversity protection.

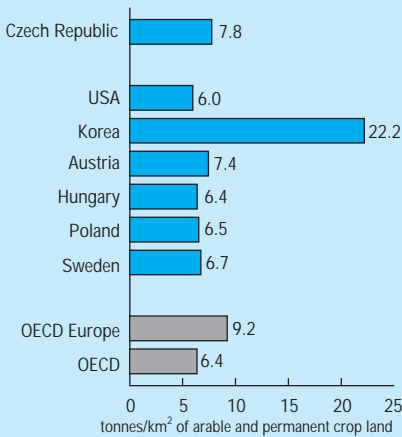
2. Responses

Nature conservation and forest management have a *long tradition* in what is now the Czech Republic. The first rule concerning hunting can be traced back to the year 950. From as early as 1348, when the Bohemian Code “*Maiestas Carolina*” included several articles on forest protection, there have been public rules defining land owners’ rights and obligations with regard to forests. There is

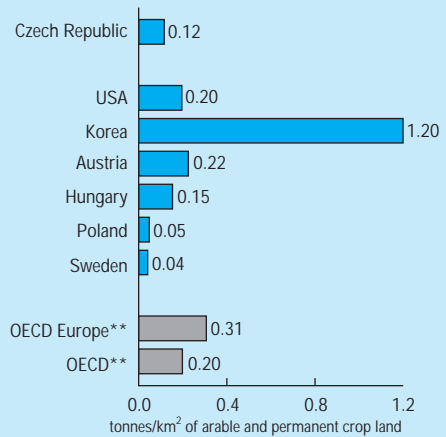
Figure 5.2 Agricultural inputs



Use of nitrogenous fertilisers, 1996



Consumption of pesticides,^a mid-1990s



a) Based on values expressed as tonnes of active ingredients.
Source: FAO; UN-ECE; UNEP; OECD.

also a long tradition of protected areas, beginning in 1838 when two forest reserves were created in Southern Bohemia. The local heritage movement with its concern for nature conservation, present in many European countries early in the 20th century, also existed in the Czech lands: the Trust for Enhancement and Protection of Native Country was founded in Prague in 1904. Active species management began in the 1920s, and promotion of the concept of ecological networks predates similar work in other OECD countries.

Objectives

The *State Environmental Policy* does not include any nature or forestry goals among its short-term (i.e. up to 1998) priorities, but it lists the “reconstruction of forest growth in areas damaged by air pollution” as a mid-term (1999-2005) objective and the protection of biological diversity as a long-term one. A National Biodiversity Conservation Strategy, as required by the UN Convention on Biological Diversity, was in preparation in 1998. A National Strategy of Wetland Protection and Wise Use has been drawn up.

The principles of the *State Forest Policy*, approved by the government in May 1994, are aimed at i) restoring and preserving forest ecosystems; ii) increasing diversity of forest tree species; iii) maintaining and regenerating forest stands in regions damaged by air pollution; and iv) maintaining and developing the gene pool of forest tree species.

Among *long-term agricultural policy goals*, the following can be mentioned: striving to ensure that agriculture fulfils its productive ecological function in the countryside and, in particular, working for i) improved care of natural and non-renewable resources; ii) encouragement of the production and exploitation of renewable energy and raw material resources; and iii) encouragement of the creation of a high-quality rural environment and maintenance of the natural face of the landscape.

There are *no quantitative targets* or objectives for nature conservation/biodiversity or forestry.

Institutional framework

Legislation

The 1992 *Act on Nature and Landscape Protection* generally extends legal protection to all plants and animals (except pests and economically significant

species) which must be protected from destruction, damage, collection or catching/trapping. The law distinguishes large and small-scale specially protected territories. In the former category there are national parks and protected landscape areas; in the latter i) national nature reserves, ii) national natural monuments, iii) nature reserves and iv) natural monuments. In addition, the law acknowledges that biodiversity, ecosystems and natural processes must be maintained in landscapes outside strictly protected areas. Law 16/1997 sets conditions for the import and export of endangered species of wild flora and fauna.

The 1995 *Forest Act*, which recognises forests as a “national heritage and an irreplaceable part of the environment”, incorporates the principles of sustainability, nature-friendly management and enhancement of forest biodiversity into Czech law. The Czech Republic is a signatory state of the Resolutions of the Strasbourg and Helsinki Conferences.

Organisations

The *Agency for Nature Conservation and Landscape Protection of the Czech Republic* (AOPK CR), attached to the Ministry of the Environment (MoE), is a technical organisation with a staff of almost 350 people providing technical support for nature management through research, inventory surveys (e.g. Red Lists) and the formulation of management plans for national nature reserves and monuments. The ministry's head office and its nine territorial departments, which together have a staff in charge of nature and biodiversity conservation of about 30 people, are responsible for formulating management plans for (non-national) nature reserves and monuments. Each of the three national parks has its own administration, responsible for implementing the associated management plan; overall almost 900 people, mostly forest workers, are employed in the national parks. In addition, 24 administrations manage protected landscape areas (staff of 250). A national committee and an expert panel for the Biodiversity Convention were created in 1997 and began the preparation of the *Czech National Biodiversity Strategy*.

The *Ministry of Agriculture* is responsible for forest management (except in the three national parks). The Forestry and Game Management Research Institute (VULHM) is a government institution funded by the Ministry of Agriculture.

Citizens groups for nature conservation were relatively prominent under the previous political system. The Czech Union for Nature Conservation (CSOP) is now a leading voluntary conservation body, with 6 000 adult and 3 000 child members; it participates in the formulation of the National Biodiversity Strategy.

Measures for protecting habitats and species

Protected areas

About 15 per cent of the Czech Republic benefits from some type of legislative protection; this includes 24 protected landscape areas, occupying just over 13 per cent of the country's territory (Table 5.2). More than 90 per cent of all protected areas fall in IUCN category V (protected landscapes) and 6 per cent in category II (national parks); 1 per cent each belongs to categories Ia (strict nature reserve) and IV (managed nature reserve/wildlife sanctuary).

The three *national parks* of Krkonoše (established in 1963), Šumava (1991) and Podyjí (1991) have a combined area of 110 304 hectares, or 1.4 per cent of the national territory. Almost 90 per cent of the area covered by national parks is forest (96 700 hectares), managed with the objective of becoming protected in the long term. Each park has a counterpart on the other side of the border: Krkonoše has the Polish Karkonosze Mountains national park, Šumava the Bayerische Wald national park in Germany, and Podyjí the proposed Thayatal national park in Austria. About 1 750 *small-scale specially protected territories* together cover just over 1 per cent of the country's total area. More than half of these are also part of a national park or protected landscape area. One, the Hojná Voda (Abundant Water) national nature reserve, is the oldest European virgin forest reserve. It has been protected since 1838.

Table 5.2 **Protected areas, mid-1990s**

Category	Number	Area in hectares	% of territory
National parks (NP)	3	110 304	1.40
Protected landscape areas (PLA)	24	1 041 565	13.21
Small-scale specially protected areas	1 757	82 351	1.05
<i>of which in NP or PLA</i>	537	46 515	0.59

Source: Ministry of the Environment.

Habitats outside protected areas

Both the general environment act and the nature and landscape act refer to the concept of ecological stability, which is defined as an ecosystem's ability to absorb and withstand external pressures while maintaining its natural functions and properties. The latter act provides for using the *Territorial System of Ecological Stability* (TSES) as a key policy instrument to conserve nature across the Czech Republic. TSES, first formulated in the late 1970s, is conceived as an ecological network of bioregions and biocorridors. Most of the country has been classified using ecological and landscape criteria, and TSES areas of local, regional and supraregional importance have been identified. The TSES system is intended as the basis for the Czech component of the Pan-European Ecological Network (as proposed by the Council of Europe).

The programme of *River System Restoration*, established in 1992, is aimed at re-establishing a near-natural drainage regime of streams in areas (particularly those identified as biocentres under the TSES) disturbed by previous agricultural practices (Chapter 3). Activities involve re-aligning and clearing watercourses and cleaning out reservoirs. In the first five years of the programme more than 150 projects were carried out benefiting aquatic biota in streams, wetlands and spring areas, with an overall contribution from the state budget of more than CZK 800 million (current prices).

A Joint *Landscape Care* programme of the Ministries of Agriculture and Environment to support non-productive functions of agriculture and maintain landscape diversity began in 1994, involving about 300 projects (e.g. maintenance of unfarmed areas, weed clearance, erosion prevention) and an annual expenditure of about CZK 150 million. A similar programme was financed through the State Environment Fund. In addition, agri-environmental subsidies made available through the Ministry of Agriculture totalled CZK 1.7 billion in 1997.

Protected species and hunting

In addition to the general protection given to all *species* by the 1992 Act on Nature and Landscape Protection, there are a total of 827 specially protected species (plants and animals) under a specific decree of the same year (Table 5.3).

Hunting is popular: the Czech-Moravian Hunting Union has 112 000 members who, apart from hunting, engage in game breeding and conservancy. Hunting areas can be designated by individual owners (if they own more than

500 hectares) or by hunting communities. A hunting season has been declared for most types of game; some (e.g. marten, crow, magpie, fox and wild boar) can be hunted all year round.

Table 5.3 **Protected species, mid-1990s**

	Protected ^a	With management plan
Mammals	38	25
Birds	115	42
Reptiles/amphibians	28	20
Fish	17	3
Invertebrates	147	10
Vascular plants	436	150
Fungi	46	16

a) Designated specially protected species under Decree 395/1992.

Source: Agency for Nature Conservation and Landscape Protection.

Forest management

Whereas timber production remains an important aspect of forest management in the Czech Republic, since the beginning of the 1990s increased emphasis has been placed on *other forest functions* such as nature protection, water conservation and recreation. The share of forests categorised as “commercial” diminished from about 78 per cent in 1980 to just over 61 per cent in 1996. The category “special purpose” (e.g. water management, soil conservation and recreational) grew from just under 18 per cent to almost 36 per cent, whereas protected forest land declined from 4 to just under 3 per cent. Planning of both short- and long-term forestry operations is based on a detailed forest classification system. Forest owners are responsible for implementation. Owners of forests larger than 50 hectares must formulate a ten-year forest plan; for smaller forests, more simple management guidelines are to be followed.

Expenditure for nature conservation and forestry

MoE expenditure of CZK 214.6 million on national parks and nature conservation in 1998 was less than the CZK 268.5 million (current value) allocated in each of the two previous years. In 1997, CZK 20 million was spent on direct management of small-scale specially protected areas, of which CZK 7 million on those located outside national parks. In addition, there are two main grant programmes: the River System Restoration programme (CZK 254.8 million) and the Landscape Management programme (CZK 143.8 million). The Ministry of Agriculture makes available grants for forest regeneration and protection totalling CZK 323 million. A further CZK 273 million for non-wood functions was allocated to private and public (municipal and state) forest owners in 1996; calculated per hectare, subsidies were CZK 136 on average but amounted to CZK 469 for private forest land.

International agreements

During the current decade, the Czech Republic *has become a party to all relevant international nature conservation conventions*: Ramsar in 1990, World Heritage Convention in 1992, CITES in 1992, Bonn Convention (including the Agreement on the Conservation of Bats in Europe) in 1994, Convention on Biological Diversity in 1994, Bern Convention in 1998. Since 1995, *preparatory work* has been under way to harmonise Czech nature laws with EU directives; by April 1998, identification of legal and administrative gaps in nature protection had been largely (though not fully) completed. Sites are being identified for inclusion in the Emerald Network of Areas of Special Conservation Interest under the Bern Convention and, eventually, the Natura 2000 Network of Special Areas of Conservation.

As of March 1998, the Czech *Ramsar list* included 13 sites, of which three (Trebonské rybníky/Novozámecký; Břežný fishponds; Litovelské Pomoraví) are Montreux Record sites. Sites on the Montreux Record must receive positive national and international conservation attention and priority in applications of the Management Guidance Procedure (if requested) and assistance from other bodies. Six sites, among them the Krkonoše and Šumava national parks, have been accepted as biosphere reserves on the list of UNESCO's *Man and the Biosphere* programme. Several Czech sites have been inscribed on the UNESCO list of *World Heritage Sites*; the latest is the 200 km² Lednice-Valtice Cultural Landscape in Southern Moravia, one of the largest man-made landscapes in Europe.

3. Environmental Performance

Nature conservation and forest management have a long tradition in what is now the Czech Republic. Despite some forest damage and badly affected aquatic ecosystems, the country's rich natural (and cultural) heritage attracts many Czech and foreign visitors and is therefore also a significant economic asset. During the transition period pressures from industrial and agricultural pollution have decreased, whereas new pressures from current and future economic development (e.g. tourism, transport) are increasing.

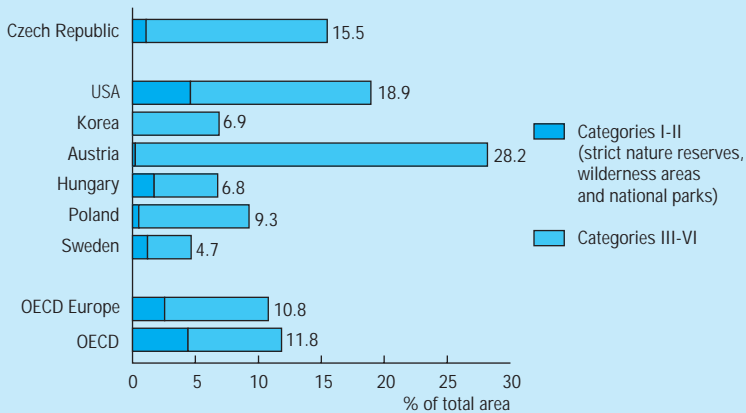
Management framework

The Czech Republic has equipped itself with some *modern tools for nature conservation*, such as the 1992 Act on Nature and Landscape Protection, with its provisions for public participation, and the 1995 Forest Act, which provides the means to achieve *sustainable forestry* management practices. However, some other pieces of legislation with an impact on nature, such as the 1976 Construction Act (amended in 1992), could still be changed to allow nature considerations to be taken into account.

In addition to up-to-date legislation, the protection of nature and landscapes demands that nature managers have a *long-term vision*, so that decisions and inevitable trade-offs at national and local level can be made in a coherent strategic framework. Hence, the National Biodiversity Strategy (and associated Action Plan), in preparation for some time, urgently need to be completed, adopted and funded.

Protected areas and species

The Czech Republic *more than meets the 10 per cent IUCN criterion* for protected areas; at about 15 per cent, the total territory protected also exceeds the OECD average (Figure 5.3). Together, these protected areas appear fairly representative of the diversity of Czech ecosystems, but it might be useful to draw up a strategic overview of what has already been protected in relation to what still deserves to be. As of April 1998, management plans (or guidelines) had been drawn up for more than half of all national parks and protected landscape areas. However, other than for national parks, their implementation has proved problematic. Often they are too formal, give little practical management guidance and lack a clear funding source (just CZK 7 million of central funding in 1997).

Figure 5.3 Major protected areas,^a 1996

a) IUCN management categories; includes only areas above 10 km²; national classifications may differ.
Source: IUCN; OECD.

The *three national parks* are actively managed by permanent administrations. The largest, Krkonoše, with its alpine tundra, peatbogs, mountain meadows and forests, contains some strictly protected areas but is mostly a protected landscape area. It has a multidisciplinary staff of almost 100, engaged in day-to-day management as well as various projects to control visitor impact (e.g. a GEF-supported study of carrying capacity and sustainable development) and enhance the park's nature value (e.g. restoring forest and mountain meadow ecosystems, alleviating the effects of acid deposition). The park, which provides extensive accommodation facilities (72 000 beds) and many ski lifts and tows, has eight million visitors per year; there are pressures to further expand tourism facilities into a strictly protected area. Šumava (1.75 million visitors) and Podyjí (80 000) also have an important tourism function which must be balanced with nature conservation considerations. To strike a balance, individual proposals for further tourism development are best considered with the help of a sound decision-making framework such as an explicit protected area/sustainable tourism strategy. Such a strategy should include consideration of ways park visitors could be made to pay for the considerable maintenance and environmental costs they impose on park management.

National implementation of the Council of Europe's Pan-European Biological and Landscape Strategy, adopted in Sofia in 1995, has commenced. The global significance of *Czech cultural landscapes* – as recognised by UNESCO – and their tourism value justifiably make their protection a high priority for Czech policy-makers. With such a significant part of the country having been declared protected landscapes, it is crucial that inevitable conflicts of interest (e.g. limestone quarrying in the Czech Karst and Moravian Karst protected landscape areas) be resolved through transparent and robust land use planning procedures accessible to local and national interest groups. These procedures still need to be improved, notably through the strengthening of local constituencies for landscape and nature conservation.

Legislative provisions for *Specially Protected Species* are implemented through management plans, which are drawn up for a good proportion of them (Table 5.3). Actions have also been taken to protect particular vulnerable or endangered species, such as relocation from threatened sites or the introduction of individuals bred in captivity (e.g. river crayfish, capercaillie, apollo butterfly). The beaver has been successfully reintroduced in several areas and is reproducing; other reintroduced species include the Ural owl, Peregrine falcon and Saker falcon. The elk has returned to the Czech Republic after being reintroduced in Poland during the 1980s. The country is also co-operating in Europe-wide efforts to save the black poplar, threatened by habitat loss and hybridisation; more than 200 individual trees have been identified and selected for use in restoring local populations.

Sustainable forestry

Although Czech forests have been managed for sustained yield for almost 250 years, the new direction taken in the 1995 Forest Act requires a significantly *different management approach*. A beginning has been made through implementing more nature-friendly forest management practices: for instance, clear-cutting has been limited, broadleaf species now represent almost one-third of replanting and about 1 900 hectares have been allowed to regenerate naturally (out of a total of 30 000 hectares replanted). The new practices must be continued and extended to achieve the intended long-term results.

The transition to more natural forests envisaged by the new forest legislation also demands that *damage by hoofed game* (notably red deer) through browsing and bark stripping be controlled. At present, game populations are about twice what they should be. Measures are being implemented to reduce numbers, particularly of exotic species (e.g. sika and mouflon), through culling or the introduction

of predators. For instance, the lynx is being encouraged and is now extending its territory and increasing in number (with an estimated population of 160 animals). Further effort to control game populations is required, including through intensified co-operation among the responsible agencies, the Ministry of Agriculture and the MoE.

Conserving nature outside protected areas

Rural development and land use planning

The Czech Republic possesses an *exceptional natural heritage* in its rural areas (for example, in areas that were wholly or partly depopulated after the Second World War) which is often particularly valuable owing to the degree to which they have retained their natural character. Good integration of landscape, rural development, and agricultural and biodiversity policies is paramount if this asset is to be safeguarded and maintained, now that land has been privatised and landowners are often demanding compensation for any constraint on the exercise of their property rights. The Ministries of Regional Development (responsible for zoning, tourism, investment policies), Agriculture, Environment, Interior and Finance should develop mutually reinforcing policies to encourage landowners to take these factors into account in their land use decisions, notably in areas designated as buffer zones for the proposed ecological network.

Another prerequisite for conserving nature and landscapes outside protected areas is an effective system of *land use planning and control*. However, at present land use plans are not compulsory and only 70 per cent of the country is covered (Chapter 6). Moreover, the link between land use and nature conservation is still weak. While completed TSES documents identifying valuable natural areas and corridors covered almost the entire country as of early 1998, only a few – notably in Southern Moravia and Western Bohemia – have so far come into effect because they have not been formally attached to a land use plan. The TSES system clearly needs to be integrated with a comprehensive land use planning system, as a tool for resolving differences between private property rights and community interest. This would, *inter alia*, require sufficient capacity at the district level in terms of expertise in nature conservation and biodiversity. It is equally important that TSES documents be fully considered in development plans for road and highway infrastructure.

Agriculture

Czech agriculture is currently experiencing *profound changes*, with the further prospect of becoming subject to EU agricultural policy, which itself is

expected to change. The general long-term agricultural policy goals adopted in the mid-1990s by the Czech Government (e.g. taking account of the “productive ecological function of the countryside”) represent a decisive break with the heavy production bias of the past and are fully compatible with sustainable development. Some of the financial support measures taken in order to allow the sector to adjust to the fall in demand for agricultural products are also used to achieve an extensification of production methods. These measures, administered by the Ministry of Agriculture, resemble certain EU policies (e.g. on agri-environmental production methods, organic agriculture, measures for Less Favoured Areas). In practice, a large part of the agri-environmental subsidies paid out is for maintaining (i.e. mowing) grassland. Farmers have not been very receptive to the new approach to agriculture. Even though the main purpose of these grants is agricultural restructuring, their environmental effectiveness should be improved through better monitoring of the environmental results and closer follow-up with farmers.

Part II

INTEGRATION OF POLICIES

6

ENVIRONMENT AND ECONOMIC POLICIES

1. Sustainable Development

Environmentally sound economic development

Legacy of central planning and economic transition after 1989

The Czech Republic has been *highly industrialised* and urbanised since the beginning of the industrial revolution. It was considered one of the richest European countries in 1938. After the Second World War its economy was characterised by central economic planning, regulated allocation of resources, and high energy and material intensities. This led to *inefficient production patterns* with negative effects on the environment. The low priority given to environmental protection has had a negative effect on the potential for longer-term economic growth. However, *macroeconomic policies* during this period *remained prudent*, avoiding the significant imbalances experienced in several other central and eastern European countries; little public debt was created, and inflationary pressures were relatively subdued.

The transition to a market economy that began in November 1989 has proceeded rapidly (Table 1.1). It has included *price and trade liberalisation*, reduction of subsidies to enterprises, internal currency convertibility, restrictive monetary and fiscal policies, and a rapid and comprehensive privatisation programme. Transfers to enterprises have been reduced substantially since 1989 and are now quite low (around 2.2 per cent of GDP in 1997).

Price liberalisation started in January 1991, and by the end of the year most prices had been deregulated. In 1994, coal prices were freed. Heating prices, corrected annually between 1991 and 1997, were freed by June 1998. Inflation over the period 1989-98 has been relatively low, compared to other countries in

transition (Table 1.1). *Some controls* nevertheless remain on utility prices (e.g. gas, electricity and heating), residential rents, public transport fares, and prices of selected agriculture products. These administered prices have a significant effect on household expenditures. In particular, the cost of electricity and natural gas for households is relatively low (Table 2.1); the government is gradually increasing regulated prices and removing the remaining cross-subsidies (Chapter 2).

Almost complete liberalisation of quantitative controls on *imports and exports* was undertaken in 1991. *Structural adjustment, higher competitiveness and improved resource allocation* have followed. The trade regime is now virtually free of non-tariff barriers and export restrictions. Exports of goods and services in 1996 accounted for over 50 per cent of GDP; trade with developed market economies represented over 60 per cent of trade. The imposition of rigorous budgetary constraints and bankruptcy provisions has stimulated *major changes in the management of enterprises*. Restructuring programmes, especially in the mining and metallurgy industries, have led to the closure of non-profitable companies and a shift to modern and more efficient technologies. *Foreign direct investment* (FDI) has been relatively strong (Table 1.1), with a total cumulative value of ECU 5.3 billion between 1989 and 1996. In several cases, such as in the car industry, FDI has also been responsible for the introduction of new and more environmentally friendly technologies.

Privatisation of state-owned enterprises took place relatively early in the transition process. Large amounts of state assets were sold off through direct sales, public auctions and public tenders. Significant amounts were also distributed among the population using a voucher system, under the *mass privatisation* scheme completed in March 1995. The Czech Republic's radical privatisation drive has led to a dramatic increase in the role of the private sector, which accounted for almost *three-quarters of total output* in 1996. The non-state sector's share of total output was greatest in agriculture, construction and trade, followed by industrial production. Among the fastest growing parts of the economy have been small enterprises (fewer than 99 employees), estimated to have accounted for 20 per cent of industrial output in 1997. As the majority shareholder, however, the state still controls (through the National Property Fund) the four large banks as well as the utilities and the iron and steel, coal mining and telecommunications industries.

Economic and environmental trends

The previous absence of pollution control, associated with heavy reliance on fossil fuels (mostly brown and hard coal), large mining activities, and emphasis on

heavy and chemical industries made the Czech Republic one of the most polluted countries in Europe. Particularly in *Northern Bohemia* (Chomutov), *Northern Moravia* (Ostrava) and *Prague*, pollution posed a serious threat to human health and had caused severe environmental damage. The most significant problems were: high emissions of air pollutants (particulates, NO_x, SO_x), high generation of industrial waste, and discharges of largely untreated industrial and municipal waste water. Intensive agricultural practices also contributed to the environmental burden. Costs to decontaminate 73 sites formerly occupied by Soviet military installations have been estimated at CZK 1.2 billion; so far, CZK 700 million has been spent on decontaminating 60 of these sites (Chapter 4).

Between 1990 and 1993, following the shocks due to economic liberalisation and the collapse of trade with members of the former Council of Mutual Economic Assistance (COMECON), GDP fell by 14 per cent, industrial production by 32 per cent and agricultural production by 22 per cent (Table 6.1). Between 1993 and 1996, GDP and industrial production each grew by 13 per cent.

Overall in the *period 1990-96*, GDP decreased by only 2.5 per cent while industrial production dropped by 23 per cent. Agricultural production decreased by 23.7 per cent, pesticide use by 55.7 per cent and phosphate fertiliser use by 77.5 per cent. Air pollutant emissions (SO_x, NO_x, CO₂) decreased significantly due to the fall in industrial production and economic restructuring, as well as to significant new investment in pollution abatement and control technologies in the energy sector and in industry. The decrease in the share of solid fuels in energy and fuel consumption, from 51 per cent in 1990 to 33 per cent in 1993 and 22 per cent in 1996, was another important factor in reducing pressures on the environment. Road freight traffic increased by over 44 per cent and road passenger traffic by 21 per cent. There was a very substantial increase in tourism, and exports to OECD countries increased by 88.5 per cent.

Production and consumption patterns

Production and consumption patterns have altered drastically during the transition period as a result of changes in the industrial structure, in private demand and in relative prices. *Public transportation* (trams, buses, railways, metro) now carries fewer passengers, while gasoline consumption has grown considerably. The increase in *tourism* applies to both foreign visitors and Czech tourism abroad. On the other hand, use of NPK fertilisers, pesticides and lime in agriculture has decreased. Use of drinking water by households decreased from 174 litres/inh. in 1990 to 116 litres/inh. in 1996, reflecting pricing. The low level of consumption in the 1980s resulted in relatively low municipal waste generation per inhabitant,

which subsequently increased rapidly. A national programme of *eco-labelling*, called “Environmentally Friendly Products”, should contribute to more environmentally friendly consumption patterns.

Table 6.1 Economic changes and environmental pressures

	1990	1993	1996	Change (%)		
				1990-93	1993-96	1990-96
Economic development						
GDP (billion CZK, 1994 constant prices)	1 292.7	1 112.9	1 260.3	-13.9	13.2	-2.5
Population (1 000)	10 363	10 331	10 316	-0.31	-0.15	-0.45
GDP/capita (CZK)	124 742	107 724	122 169	-13.6	13.4	-2.1
Agricultural production ^a	100	78.3	76.2	-21.7	-2.6	-23.7
Industrial production ^{a, b}	100	68.1	77.0	-31.9	13.1	-23.0
Production of cement (1 000 t.)	6 434	5 393	5 011	-16.2	-7.1	-22.1
Goods exported to OECD countries ^c	73.1	100.6	137.7	37.6	36.9	88.5
Goods exported to former COMECON countries ^c	66.5	64.2	65.6	-3.5	2.3	-1.2
Total primary energy supply (Mtoe)	44.7	38.8	40.4	-13.2	4.1	-9.6
Energy intensity (toe/1 000 US\$)	0.40	0.42	0.39	5.7	-8.2	-3.0
Total final consumption of energy (toe/cap)	3.3	2.6	2.7	-19.5	2.1	-17.8
Road freight traffic (million tonne-km)	..	..	23 170	..	..	..
Road passenger traffic (billion veh.-km)	20	23	24.2	15	5.2	21.0
Number of passenger cars (1 000)	2 411	2 747	3 349	13.9	21.9	38.9
Selected environmental pressures						
Energy-related CO ₂ emissions (million t.)	143.3	118.9	119.6	-17.0	0.6	-16.6
SO _x emissions (thousand t.)	1 876	1 419	946	-24.4	-33.3	-49.6
NO _x emissions (thousand t.)	742	574	432	-22.6	-24.8	-41.8
CO emissions (thousand t.)	1 055	967	886	-8.3	-8.3	-16.0
Nitrogenous fertilisers (kg/ha)	86.3	39.9	61.3	-53.7	53.5	-29.0
Phosphate fertilisers (kg/ha)	52.5	13.1	11.8	-75.1	-9.8	-77.5
Pesticides (tonnes of active substance)	8 812	3 645	3 908	-58.6	7.2	-55.7
Drinking water invoiced (million m ³)	900	743	631	-17.4	-15.1	-29.9

a) Index 1990 = 100.

b) Data refer to mining, manufacturing, electricity and gas and construction; includes estimated production of small enterprises (less than 25 employees).

c) As of 1994, billion CZK at 1990 prices.

Source: OECD; CSO; Czech Ministry of Agriculture.

Public sector consumption, which is low by OECD standards, is regulated by a Law on Public Procurement. Although *greening of public procurement policies* is believed to have a positive influence on public and private consumption patterns, no visible change has yet been observed.

Despite changes in the economic structure and investments in pollution abatement and control, *energy efficiency* is still very low and *emission levels of the main air pollutants* remain much higher than the average for OECD Europe. SO_x emissions per unit of GDP are four times and those of NO_x and CO₂ are twice the OECD average. Although energy intensity fell by 6 per cent between 1990 and 1995, it is still among the highest in OECD countries.

Economic development and strategic environmental planning

During the early stages of the economic transformation, a new environmental strategy was prepared based on an assessment (drafted by independent experts before 1989) of the environmental impacts of the centrally planned economy. This strategy consisted in a two-year *programme for environmental recovery*, endorsed by the government in December 1990. Called the “Rainbow Programme”, it formulated environmental policy goals and introduced several legislative, administrative and institutional instruments whose purpose was to reverse negative environmental trends. Particular emphasis was placed on taking immediate actions in the most seriously affected areas.

The Rainbow Programme gave considerable attention to changing consumption patterns. Together with the implementation of economic and legal instruments, this was seen as necessary if pressures on the environment were to be reduced. A powerful political and intellectual message was thus addressed to society, helping build consensus on the importance of environmentally sustainable development. As a result, *several new institutions* such as the Czech Environmental Inspection and the State Environmental Fund (SEF) were established in 1991. Five of the important *laws* enacted in 1991-92 were the Act on the Environment, the Clean Air Act, the Waste Management Act, the Act on Environmental Impact Assessment, and the Act on Nature and Landscape Protection (Table 1.2). *Economic instruments* were introduced, including tax relief and tax differentiation for environmentally friendly products and activities.

The philosophy of socio-economic transformation changed by 1992, as priority was given to promoting *liberal approaches to market reforms*. Such approaches aimed at minimising the state’s involvement in economic development. A number of legal changes relating to fiscal, monetary, trade and competition policies were carried out in order to provide structural conditions under which

market forces would be influential. Privatisation and restructuring of enterprises and banks continued. There were no explicit short- or long-term policies with regard to industry, energy or the economy, as market forces were expected to determine economic behaviour and attempts at strategic planning were perceived as potentially distorting market-based relations. This policy no longer recognised the concept of *sustainable development*.

Upon completion of the Rainbow Programme, the preparation of a *State Environmental Policy (SEP)* was begun in 1992 under the new government. This new policy aimed at furthering environmental improvements and introducing environmental management compatible with the country's economic policies; improving interactions between the Ministry of the Environment and other ministries; and defining implementation schedules for environmental legislation. In successive drafts of the SEP, less weight was gradually given to planning, public participation, market stimulation, changing consumption patterns, public environmental education and internalisation of externalities in production costs. The phrase "sustainable development" was removed in the final version. Following three years of preparation, the SEP was adopted by the Czech Government in August 1995. In addition to several principles of environmental management, it presented criteria for priority-setting and policy objectives corresponding to three time horizons: short-term (1995-98), medium-term (1999-2005), and long-term (beyond 2005).

Short-term policy objectives included improving air and water quality through corrective and preventive measures; reducing waste (including hazardous waste) generation; reducing risks from handling chemical substances, transport and radiation; and remedying past environmental damage. *Medium-term objectives* concerned developing effective land use planning; increasing water retention and improving water management; renewing forests damaged by air pollution; and rehabilitating areas affected by mining activities. *Long-term objectives* included achieving goals established in international environmental agreements on climate change and biodiversity.

The SEP described *several instruments* necessary for achieving these policy objectives and provided several recommendations for economic sectors such as energy, industry, transport, agriculture, forestry, health care, research and development, and education. Every year a *report assessing progress in implementing the SEP* has been prepared by the Ministry of the Environment; each of these reports has been subject to Cabinet discussion and Parliamentary approval.

In 1997, after a change of government, the Ministry of the Environment began the *revision of current environmental policy*. The main objectives of the

new policy are to evaluate progress made in meeting the short-term objectives set out in the SEP, to take account of changes in environmental conditions, to set more concrete goals and quantitative environmental targets, and to integrate environmental concerns into sectoral policies more vigorously. Another key objective of the SEP revision is to respond to the necessity to *prepare for membership in the European Union*, as outlined in a March 1998 statement of the EU Council. The new policy will lay the ground for faster and comprehensive convergence with EU environmental requirements. Experts and policy representatives from other ministries and agencies and from the private sector are to be actively involved.

Mechanisms for promoting institutional co-ordination and co-operation

Discussions on principles and strategic directions of environmental policy have been carried out at *cabinet level*. Although the Ministry of the Environment has primary responsibility for the development of environmental policy and policy instruments, experts from various ministries, research institutes and the private sector are invited to *discuss instruments* related to a particular sector. Several examples of such discussions exist in the energy area, especially regarding the development of measures to reduce greenhouse gas emissions. In this case, the Ministry of the Environment initiated the establishment of an interministerial committee which included representatives of the Ministries of Industry and Trade, Agriculture, Transport, Economy, Foreign Affairs and Finance.

Preparation of programmes on *eco-labelling* and *environmental audits*, as well as a programme to promote Environmental Management Standards in Industry, have been carried out jointly by the Ministries of the Environment and of Industry and Trade.

Economic impacts of environmental policies

Public and private environmental expenditure

Environmental investment expenditure in the Czech Republic *gradually increased* from 1 per cent of GDP in 1990 to 2.4 per cent in 1996, or approximately CZK 37 billion (Table 6.2). This figure includes several "integrated environmental projects", e.g. technological changes and new and more environmentally benign facilities, but excludes investment related to drinking water. Environmental investment in 1996 was close to 7 per cent of total investment (compared to 1-3 per cent in other OECD countries). Whereas the level of public investment in environment in the Czech Republic is similar to that in a number of other OECD countries (0.8 per cent of GDP), the level of private investment is very much higher (1.6 per cent of GDP for investment only). Since 1994, the level

of environmental investment has stabilised at around 2.4 per cent of GDP. *Environmental operational expenditure* is not well known, but is estimated to exceed 0.6 per cent of GDP (mostly related to water pollution and waste collection and disposal).

When only *pollution abatement and control (PAC) expenditure* is considered in total environmental expenditure (i.e. eliminating expenditure on energy saving, process modernisation, change of fuels and nature protection), investment is likely to be no more than 1.5 per cent of GDP. When a corresponding operational expenditure of 0.5 per cent is added, total PAC expenditure in the Czech Republic should *reach approximately 2 per cent of GDP*. This figure, higher than in most OECD countries, can be explained by the unusually large expenditure on air pollution abatement and control and by the urgent need to cope with the environmental burden from the past. Related activities are concentrated in several “black spots”, including Northern Bohemia and Northern Moravia.

Environmental investment has focused mainly on *combating air and water pollution*. For example, out of CZK 32.3 billion spent in 1995, CZK 17.9 billion was for air pollution and CZK 10.2 billion for water pollution (Table 6.3). Environmental investment was made by utilities (CZK 11.9 billion), public administration

Table 6.2 **Environmental investment,**^a 1990-96
(% of GDP)

	Air		Water		Waste		Air + water + waste		Share of Air + water + waste in total invest. (%)
	Total	Business	Total	Business	Total	Business	Total	Business	
1990	0.29	..	0.56	..	0.19	..	1.04	..	4.39
1991	0.43	..	0.62	..	0.19	..	1.24	..	5.98
1992	0.68	..	0.85	..	0.37	..	1.90	..	8.01
1993	0.76	0.60	0.85	0.55	0.28	0.22	1.89	1.37	7.61
1994	1.18	0.90	0.95	0.48	0.27	0.19	2.40	1.57	8.26
1995	1.35	1.06	0.78	0.32	0.21	0.16	2.34	1.54	7.64
1996	1.41	1.12	0.71	0.26	0.23	0.17	2.35	1.55	7.48

a) Estimate based on modelling and the 1997 economic structure. Environmental investment was 2.43 per cent in 1988 and 2.98 per cent in 1989. Investment concerning air pollution, water pollution and waste management only.

Source: CSO.

(CZK 9.8 billion) and industry (CZK 9.2 billion). A large part of investment is aimed at combating air pollution, mostly in electric utilities (CZK 7.9 billion investment in 1996).

Table 6.3 **Environmental investment, 1995**
(CZK billion)

	Air pollution	Water pollution	Waste management	Land rehabilitation	Other	Total
Total environmental investment	17.9	10.2	2.8	0.4	1.0	32.3
<i>of which:</i>						
Business sector	14.0	4.1	2.1	0.3	0.8	21.3
<i>Public corporation</i>	10.6	2.3	1.3	0.1	0.5	14.8
<i>Private corporation</i>	3.2	1.7	0.7	0.2	0.2	6.0
Public sector	3.9	6.1	0.7	0.1	0.2	11.0
<i>Local government</i>	3.3	5.7	0.6	0.1	0.1	9.8
<i>of which:</i>						
Electricity and gas companies	9.3	0.2	1.0	0.0	0.4	10.9
Water distribution companies	0.0	1.0	0.0	0.0	0.0	1.0
Public administration	3.5	5.6	0.6	0.0	0.1	9.8
Mining	0.3	1.1	0.1	0.0	0.0	1.6
Manufacturing industry	3.6	1.6	0.6	0.0	0.1	5.9
<i>Paper</i>	0.2	0.3	0.1	0.0	0.0	0.6
<i>Chemicals^a</i>	0.4	0.3	0.3	0.0	0.0	1.0
<i>Basic metals</i>	0.8	0.1	0.1	0.0	0.0	1.0
<i>Machinery and metal products</i>	0.3	0.2	0.0	0.0	0.0	0.5
Other industries	0.8	0.4	0.3	0.1	0.2	1.8
<i>Financed by:</i>						
Internal sources	10.3	3.9	1.9	0.3	0.7	17.1
Loans	2.8	1.4	0.3	0.0	0.1	4.6
State budget	1.2	3.0	0.4	0.0	0.1	4.8
SEF	1.1	1.2	0.1	0.1	0.0	2.5
From abroad	1.9	0.0	0.0	0.0	0.0	1.9
Other	0.6	0.6	0.1	0.0	0.1	1.4

a) Refineries, rubber and plastic industries not included.

Note: 1 per cent GDP = CZK 13 billion in 1995.

Source: CSO.

Yearly investment in combating air pollution in large facilities will decrease from 1999 onwards. Expenditure on *water pollution* is sizeable and mostly occurs in municipalities; it *should grow in the future*.

Financing of public expenditure

The *state budget* is the largest public source of financing for environmental projects. It provided CZK 4.8 billion in 1995, i.e. 14 per cent of total environmental investment (drinking water excluded). The state budget provides subsidies for various environmental projects – combating air and water pollution, rehabilitating mining areas, soil decontamination, cleaning up the legacy of the past (former Soviet military bases, uranium mining) – as well as measures related to energy-saving, agriculture and forestry (Table 6.4). However, the overall level of public subsidies is fairly small. Indeed, out of CZK 32.3 billion investment, only 14 per cent is not paid by polluters (Table 6.3). In 1997, the total state environmental budget was calculated on a new basis. This brought down total expenditure on environmental protection to CZK 4.4 billion, with considerably less expenditure on agriculture and forestry and removal of expenditure on drinking water. In the state budget of 1997, pollution abatement and control measures amounted to a total of CZK 1.7 billion (i.e. 1 per cent of GDP).

The second largest public source of environmental investment expenditure is the *State Environmental Fund*, established in 1991 and mostly financed by pollution charges (Table 6.5). The normal revenue of the SEF in 1996, when it reached the level of CZK 3.3 billion (plus CZK 2 billion from the National Property Fund), was obtained from charges and fines. SEF expenditure in 1996 was CZK 4.6 billion, of which 44 per cent was loans. Between 1992 and 1996, the SEF financed 442 waste water treatment plants, 1 142 programmes to switch heating of apartments to gas, and 375 projects to improve nature and landscape. Overall, the SEF organised a financial transfer from air polluters to water pollution abatement.

A third source is the *National Property Fund* (NPF), which was established under the privatisation act to collect payments generated from the sale of state properties. In 1992, a programme of financial support for new owners to remedy the environmental burden from the past was launched. It included *provisions for environmental audits of privatised facilities*. When the damage was significant, the new owner of the purchased properties could apply to the NPF for financing of the *environmental clean-up*. On the basis of an audit and additional risk assessment studies, clean-up costs are agreed between the owner, NPF and the Ministry of the Environment, which supervises the work. The total amount actually spent on clean-up is estimated at CZK 1.9 billion until the end of 1996 (Chapter 7). Financial guarantees for payment of environmental obligations amounted to

CZK 110 billion for 273 sites. A full-fledged clean-up programme may cost up to CZK 150 billion.

In addition to these clean-up activities, the Czech Parliament decided in 1994 to use some of the resources of the National Property Fund to *improve air quality*

Table 6.4 **Environmental expenditure in the national budget**
(CZK million current)

	1995 ^a		1997 ^b	
	Investment	Operation	Investment	Operation
Environmental projects of local governments ^c	1 360	405	400	130
Environmental protection programmes and measurements	122	197	40	250
Water pollution	1 230	–	869	–
Water and river management, revitalisation of water courses	606	4	750	55
Drinking water	1 367	–	1 861	–
Mining	185	–	200	–
Nuclear-related expenditure ^d	1 076	42	100	22
Soviet military bases – Ministry of Defence	–	139	78	125
Combined transportation	–	37	115	81
Energy saving, insulation, heating technology	–	200	–	350
Landscape preservation	–	–	–	150
Zoo and botanical garden	–	25	–	45
Forestry management	–	850	–	900
Agricultural subsidies	–	1 345	–	1 500
Total ^e	5 945	3 243	4 413	3 608
of which: pollution abatement and control expenditure ^f	2 897	602	1 309	380

a) Financed by: Ministry of Finance CZK 2.2 bn; Ministry of Agriculture CZK 5.1 bn; Ministry of Industry CZK 1.4 bn; Ministry of the Environment CZK 0.36 bn; other CZK 0.1 bn.

b) Budget proposal.

c) Including Northern Bohemia and Sokolov Basin.

d) Radiation measurements, nuclear waste, antiradon measures, decontamination of uranium mines.

e) Other public expenses to be added: State Environmental Fund (CZK 4.9 bn) and National Property Fund (CZK 0.8 bn), adding up to CZK 14.9 bn for publicly financed expenditure (environment and drinking water).

f) Excluding radiation-related activities.

Source: CSO.

in cities and municipalities. A high-priority measure was to switch from burning brown coal, briquettes and coal dust to using natural gas, electricity or other more environmentally friendly energy sources to heat apartments and in municipal and industrial heat generating units of up to 50 MW and distribution networks. A total of CZK 6.2 billion has been transferred to the SEF for this purpose (CZK 1 billion in 1994, CZK 1.6 billion in 1995, CZK 2 billion in 1996, and CZK 1.6 billion in 1997).

Table 6.5 **State Environmental Fund, 1992-96**
(million CZK ^{a)})

	Income	Expenditure
Water	5 027	8 719
Air ^b	10 982	3 867
Waste	1 821	798
Management of landscape	1 873	521
Total	19 702	13 906

a) CZK of 1996.

b) Income includes over CZK 4.9 billion transferred from NPF during 1994-96.

Source: CSO.

Foreign financial resources have played a relatively small role (5 per cent) in environmental expenditure, accounting for CZK 1.5 billion in 1996. The main source has been the European Commission, through the Phare programme for reducing air pollution (see below).

Financing of private expenditure

Industry has played a major role in financing environmental improvements, based mostly on end-of-pipe technologies (only 8 per cent of expenditure in 1994 was on technology innovation). Ministry of the Environment data on the 112 largest enterprises in various sectors (transport, energy, metallurgy, chemicals, food and manufacturing) show an environmental investment expenditure in 1996 of CZK 23 billion, to which operating costs of CZK 5.7 billion must be added. The electricity sector is shown to have spent CZK 7.9 billion in investment and CZK 0.6 billion in operating costs in 1996. On the other hand, data on environ-

mental investment in industry from the Central Statistics Office (CSO) show a maximum expenditure of CZK 17 billion in 1995, most of which was in the electricity sector (Table 6.3).

Future expenditure

The level of *expenditure foreseen in the future* should take into account: the discrepancy between the current state of the environment and the goal of reaching average emission levels for OECD countries; the weight of ecological burdens (uranium mines, leaking hazardous waste dumps, the sites of former Soviet bases which still need to be cleaned up); the lack of infrastructure (over 25 per cent of the population is not connected to a sewage system, over 15 per cent of sewage is not sent to a waste water treatment plant, over 35 per cent of water-courses are classified as strongly or very strongly polluted). If the needed investment is estimated at CZK 400 billion (as of 1996) to cope with existing problems and comply with existing laws, and is to be carried out over 20 years, this would require *spending CZK 20 billion per year* (1.3 per cent of GDP) *in addition to normal environmental expenditure in a steady state situation.*

Competitiveness and the role of eco-industry and environmental technology

Several industrial companies have given importance to *environmental protection* in order to improve their image and *increase their competitiveness*, especially on international markets. A number of large companies, especially in the energy and chemicals sectors, have developed their own environmental policies and introduced environmental management systems (including EMAS and ISO 14 001) as tools for promoting their activities.

Work to catch up with the environmental backlog has created *business opportunities* for many companies. Some geological companies now perform environmental audits of contaminated sites. Several new companies focus on environmental clean-up, development of environmental control and abatement technology, and environmental services in environmental management. A recent OECD study shows that *environmental goods and services enterprises* in the Czech Republic are mainly active in markets for the treatment of water and waste water (23 per cent) and solid waste (23 per cent). About 18 per cent of these enterprises produce air pollution control goods and services, and the same percentage provide goods and services to remediate polluted water, groundwater and soil. Most are concerned with more than one environmental compartment. These are mainly firms created after 1990 whose clients include polluting industrial sectors, local and regional authorities and governments. Only some 30 per cent are affiliated to foreign firms, and only 14 per cent are active in foreign environmental markets.

2. Instruments for Policy Implementation

Administrative and legislative instruments

Administration

The Czech Republic has organised its *environmental administration* (Chapter 1) with a largely *centralised Ministry of the Environment* and largely decentralised Czech Environmental Inspection (Figure 1.3). The Ministry of the Environment is represented at regional level through territorial departments, which are responsible for implementing and co-ordinating environmental policy and act as an appeal body for decisions taken by District Offices (of the Department of Interior) and municipalities. All levels of administration play a role in professional training and in educating the public. District Offices and municipalities implement environmental policies at regional and local levels and have the largest number of environment personnel. The environmental administration is supported by various scientific institutes.

Other ministries concerned with environmental policy are Agriculture (drinking water supply, waste water and forest management), Industry and Trade (minerals, energy), Regional Development (physical planning), Health, Transport and Communication.

Legal framework

Citizens have a constitutional right to a favourable environment. Further to the legislation adopted in 1991-92, a set of new acts provides a *comprehensive legal framework for environmental protection* (Table 1.2). The basic principles are: sustainable development, prevention and the precautionary principle, limit values for environmental pollution, the duty to protect the environment, the obligation to remedy damage to the natural ecosystem, environmental impact assessment (EIA) and the right to information.

This *legal framework is under revision*. Draft texts or bills are in discussion on polluted water limits, water management, waste, packaging, genetically modified organisms (GMOs), EIA, industrial accidents, air, Integrated Pollution Prevention and Control (IPPC), protected landscape areas, national parks, geology, etc. Adoption of all relevant laws may take a few years.

Compliance and enforcement

Compliance has been a serious problem for a long time, as environmental laws under the communist regime were not always implemented due to

exemptions being granted. Opinion polls in 1996 showed that a large majority of citizens considered *environmental laws to be too weak and sanctions of offenders to be inadequate*.

The *Czech Environmental Inspection*, which operates in Prague and eight other areas, controls compliance with environmental legislation (air, water, waste, nature and forests, accidental pollution) and decides on charges for depositing waste in landfills. It deals with complaints from individuals and may impose penalties and remediation measures and even stop production. After a peak in the number of decisions on emissions limits in 1994 due to the implementation of new legislation, the number of inspections and interventions by this agency has remained stable. In 1996, the Environmental Inspection (225 inspectors) made *14 505 inspections* and issued 10 940 decisions; it assessed 4 652 fees (total: CZK 1.9 billion) and 1 870 fines (total: CZK 63 million). In that year, 225 recorded *cases of accidental pollution* of surface and groundwaters generated CZK 5.7 million of damage with remediation costs estimated at CZK 14.3 million. Of these accidents, 112 cost more than CZK 30 000; total fines reached CZK 4.3 million, that is, less than remediation costs. Most of the accidents involved petroleum (48.9 per cent) or chemical products (12.9 per cent).

The level of *fines* for non-compliance with environmental laws is set in legislation. Maximum fines are CZK 1 million for nature and water protection and

Table 6.6 **Fines levied by the Czech Environmental Inspection**

	1994		1995		1996	
	Number	CZK ^a million	Number	CZK ^a million	Number	CZK ^a million
Air	199	19.64	473	24.79	502	21.37
Water	424	22.91	566	20.71	448	14.17
Waste	436	38.52	595	33.58	552	17.6
Nature	90	1.69	158	2.32	186	2.36
Forest	135	3.29	242	3.05	182	7.88
Total	1 284	86.05	2 034	84.45	1 870	63.38

a) CZK of 1996.

Source: CSO.

CZK 10 million for air and waste problems, but the heaviest fines rarely exceed CZK 1 million. The amount levied by the Czech Environmental Inspection decreased between 1995 and 1996 (Table 6.6). Furthermore, only part (approximately 60 per cent) were actually paid. *Plant shut-down* was ordered in 33 cases in 1996. The number of complaints from the public has grown (from 421 in 1993 to 628 in 1996), while the number of reported accidents decreased from 598 in 1990 to 225 in 1996.

European Union legislation

As a result of recent changes undertaken in preparation for joining the European Union, Czech environmental legislation is becoming closer to that of the EU. There are still *many inconsistencies*, but they could be eliminated rapidly. Although current legislation includes systems for permitting and for technology assessment at installations requiring an EIA, a new system is needed for integrated permitting of industrial installations which would include a definition of Best Available Technologies (BAT) and of risk prevention measures to be taken at dangerous installations (EU IPPC and "Seveso II" directives).

It is estimated that full implementation of environmental *acquis* could be achieved within about ten years if present commitments were met in areas such as air quality, EIAs, industrial risks and chemicals control. In some other areas, such as urban waste water treatment, drinking water and integrated pollution control, this could take longer. It is also estimated that the Czech Republic will need to spend ECU 10-13 billion over the next ten to 20 years to satisfy the requirements of EU environmental legislation, including ECU 3.5 billion to implement the urban waste water directive alone. Hence, environmental *priorities have been set* in the National Programme for Preparation of the Czech Republic for EU Accession (March 1998) and appropriate additional funding has been mobilised (CZK 400 billion for environmental protection).

Financial assistance from the EU has so far been granted through the Phare programme. This includes:

- *Phare national* programmes concerning SMEs, screening of legislation, development of economic instruments, development of information systems and support for public participation activities, with six projects that address the legal and administrative framework, strengthening of the inspectorate system to assist implementation of the IPPC directive;
- *transboundary co-operation*: development of water infrastructure and transportation in border areas;

- *multi-country co-operation* in the Black Triangle area with Poland and Germany: support for investment in pollution control and for air quality monitoring.

Economic instruments

Charges

The Czech Government has established an *extensive system of charges* relating to the environment. They are mostly *used in association with regulatory instruments*. These charges mainly have a financing function and occasionally have an incentive function. They include emissions and user *charges for water and air pollution, noise, waste, use of natural resources* such as water and minerals, and change in use of agricultural land (Table 6.7). A surcharge of 50 per cent of the basic rate is applied in case of non-compliance with emissions standards. In cases where abatement projects whose effectiveness is certain are being developed, 40 per cent of the charge is deferred during project construction.

Most pollution charges are paid into the *State Environmental Fund (SEF)* (Table 6.7). The major components are waste water charges, air pollution charges and charges for changing the use of agricultural land. The *charge system has provided the possibility to raise money* for investment projects in municipalities and industry. Between 1992 and 1996, the total revenue in real terms provided from water and air charges decreased because emissions decreased, and also because the rates of many charges were not adjusted for inflation (between 1991 and 1996, prices increased by 93 per cent). However, in the case of water pollution charges the increase in rates exceeded inflation during 1994-96. Municipalities receive revenue from a user charge for sewerage, a waste charge, a share of charges for removal of agricultural and forest land from its original use, and a share of fines and mining fees.

The basic rates of these charges were initially based on an estimate of average abatement costs, but these charges were set several times lower than the marginal abatement costs. Polluters have therefore not been motivated to invest in cleaner processes, and insufficient funding is generated to support investment. On the other hand, charges for water supply and sewage treatment do seem to have affected behaviour. Under the new environmental policy, the *rate of charges* may be tripled; such an increase would be a step towards greater use of the incentive functions of charges.

Table 6.7 Economic instruments

Instrument	Rate	Remarks
Water		
Waste water effluent charge		Total income: CZK 567.2 million in 1996.
BOD ₅	10-35.5 CZK/kg	Revenue goes to SEF for financing water protection projects.
Suspended solids	0.1-2.6 CZK/kg	
Oily substances	120-400 CZK/kg	
Alkalinity and acidity	270 CZK/kmol	
Dissolved solids	240-1 200 CZK/t	
User charge for water supply and for sewerage and sewage treatment	17-40 CZK/m ³	Payment for the service of municipal plants.
Surface water withdrawal charge	Each river basin corporation has a different rate	Total income: ECU 32 million in 1993 (approx. equivalent to CZK 1 088 million). Payment for the services of river basin corporations, which must cover their costs including environmental expenditures. No charge for agriculture and pisciculture.
Groundwater withdrawal charge	2 CZK/m ³	Total income: CZK 36.1 million in 1996. Revenues go to SEF for financing groundwater protection. No charge for drinking water. Payment for withdrawing groundwater in volumes exceeding the standard limits – more than 15 000 m ³ /year or 1 250 m ³ /month.
Air and noise		
Air pollution charge		Total income: CZK 1 306.8 million in 1996.
SO _x	1 000 CZK/t	Revenue goes to SEF for financing programmes related to air protection.
NO _x	800 CZK/t	
CO	600 CZK/t	
Particulates	3 000 CZK/t	
Hydrocarbons	2 000 CZK/t	
Selected heavy metals and organic pollutants:		
Class I (asbestos, Cd, Hg, etc.)	20 000 CZK/t	
Class II (As, Mn, Cu, Pb, etc.)	10 000 CZK/t	
Class III (NH ₃ , acetone, etc.)	1 000 CZK/t	

Table 6.7 **Economic instruments** (cont.)

Instrument	Rate	Remarks
Charge on hard freons (ozone depleting substance: CFCs)	200 CZK/kg	Total income: CZK 38.9 million in 1996. Revenue goes to SEF. It is used to finance the creation of a system for recycling and eliminating ozone depleting substances and introducing harmless substitutes.
Noise pollution charge	0-1 US\$/t	Total income: CZK 25 million in 1996. From 1996 the charge is levied on airplanes based on weight and corresponds to four categories of noise.
Waste		
Waste disposal charge	Rate I Rate II	Imposed on landfill operators.
Soils and rubble	0 6 CZK/t	Rate I for depositing waste in a landfill which complies with legal conditions; the revenue is given to the municipality. Total income from Rate I waste: CZK 521 million in 1996. Rate II for depositing waste in landfills which do not comply with legal conditions; the revenue is given to SEF. Total income from Rate II waste: CZK 91.3 million in 1996. Total revenue to SEF: CZK 323 million in 1996.
Other wastes	10 140 CZK/t	
Solid municipal waste	20 210 CZK/t	
Special waste	40 640 CZK/t	
Hazardous waste	250 5 000 CZK/t	
Municipal waste charge	..	Revenue goes to waste collection and treatment plant operators.
Deposit-refund system for glass and polyethylene bottles	3-5 CZK/glass bottle 5-10 CZK/polyethylene bottle	
Non-compliance charges and fines		
Exceedance of standards	Up to 50% of standard charge	Revenue goes to SEF.
Fine for infringement of specific environmental laws		Revenue goes to SEF and municipalities.
Land and minerals		
Charge for removal of land from agricultural production		Total income: CZK 717.8 million in 1996. 60% goes to SEF, 40% to the municipality (to support actions for rural revitalisation and environmental protection).

Table 6.7 **Economic instruments** (cont.)

Instrument	Rate	Remarks
Charge for removal of land from forestry use		Total income: CZK 29 million in 1996. 60% is paid to SEF, 40% to the municipality.
Fee for use of mining area	10 000 CZK/km ² /year up to 2 ha: 2 000 CZK/year	Total income: CZK 24 million in 1996. Revenue goes to the municipality concerned.
Fee for exploitation of mineral resources	10% of market value of extracted raw material	Total income: CZK 460.6 million in 1996. 50% to the municipality, 50% to the state budget, to be used for remedying environmental damage caused by mining.

Source: OECD; Ministry of the Environment.

The new Waste Management Act (1998) includes *waste charges* which will be used to finance maintenance of disposal sites and site rehabilitation. Mining companies are required to rehabilitate land on which their operations have taken place and must also participate in a financial reserve for the future.

Deposit-refund scheme

This system of *deposit-refund* is used for *glass bottles*. A broader system is under preparation. Under the 1998 law on waste management, importers and producers will be responsible for the collection and disposal of certain products and types of packaging.

Liability and insurance

Legislation on *liability for pollution* has not yet been fully developed and liability is not sufficiently enforced. Compensation for damages can arise under the 1992 Act on the Environment. There is no compulsory *insurance* system, except for certain types of activities and the transport of hazardous products. Environmental damage from past activities is managed within the privatisation process (with support from the state budget and the National Property Fund).

Fiscal instruments

The Czech Republic taxes *use of road vehicles* with a road tax (CZK 4.3 billion of revenue in 1996), a fee for *road and motorway use* (CZK 0.9 billion) and an *excise tax* on gasoline (CZK 16 billion) and diesel fuel (CZK 16 billion). The VAT is 5 per cent on heavy fuel oil, coal and district heating and 22 per cent on light fuel oil, automotive fuels, natural gas and electricity. The taxation rate for fuels is the second lowest in OECD Europe for both unleaded gasoline and diesel. As a whole, these fiscal measures provide revenues of over CZK 35 billion per year, which is greater than total environmental investment. The prices of gasoline and diesel fuel (in PPP-corrected units) are the highest in Europe; prices of leaded and unleaded gasoline are not differentiated.

The road tax imposed on business vehicles allows *exemptions* for vehicles with efficient catalysers, electric-powered vehicles, combined transportation, and vehicles used in a public urban transportation system. Bio-diesel is free from VAT since 1996. There are exemptions from income and corporate taxes for small hydroelectric power plants and alternative energy sources. Further tax exemptions are planned to stimulate energy saving, but are not yet in force. A lower VAT rate (5 per cent) is applicable to ecologically friendly products (e.g. recycled paper) and commodities. There are no property taxes on environmental infrastructure (treatment and recycling plants).

The *integration of environmental concerns in fiscal policy* will need to be further developed, and the current system of tax differentiation will need to be adjusted towards EU requirements. In 1998, an important step was taken when the VAT on electricity and gas was increased from 5 to 22 per cent.

Subsidies

Czech legislation has not yet given legal force to the polluter pays principle. Although overall only 14 per cent of environmental investment is not paid by polluters, there are still many situations in which *public subsidies for environmental investments are provided* to private firms or local bodies. Sizeable direct subsidies were given to industry in 1990-92. This is no longer being done. However, the SEF gives firms financial aid in the form of soft loans and over 60 per cent of water-related investment by privatised public bodies is still financed directly from the state budget. *Formal adoption of the polluter pays principle* may take place in 1998 or 1999, when new laws on water and industrial accidents are adopted.

Public *subsidisation of sectoral activities* (e.g. energy, agriculture, transport) is likely to have detrimental effects on the environment. For example, the *prices of*

district heating, electricity and gas for households do not reflect their true cost nor include external costs. Total energy sector subsidies in 1996 were CZK 40 billion. Electricity companies complain that they are not allowed to recover the cost of their environmental investments in the price they charge for electricity. Due to price distortion, there is little energy saving. The Czech Republic has one of the highest energy intensities among OECD countries. State aid to increase energy efficiency in 1996 was CZK 204 million, part of a total national investment in energy efficiency of CZK 927 million. Environmentally beneficial agricultural subsidies amounted to CZK 15 billion in 1996, mostly for mowing of grasslands. The Production Subsidy Equivalent was 14 per cent in 1995 (as compared to 49 per cent in the EU).

Environmental impact assessments

The Act on Environmental Impact Assessment (1992) provides a *powerful instrument*. It applies to a *wide range* of construction activities, technologies, concepts (including policies and physical planning) and products (those which require pre-marketing certification). The EIA process includes discussion of the documentation and, possibly, a public hearing. Public examination of the documentation is possible for 30 days; within this period, a written opinion on this documentation may be submitted to the competent authority.

The *competent authorities* in this area are the Ministry of the Environment, the Czech Environmental Inspection and the District Offices. The MoE is responsible for the assessment of major projects and activities (e.g. railroads, roads, energy, waste, mining); District Offices are responsible for that of other projects (e.g. agriculture, food industry, metallurgy, infrastructure). In every case, expert opinions are requested. The Czech Environmental Inspection can impose penalties pursuant to the EIA Act.

Five hundred projects were submitted for EIA between 1992 and 1997; 10 per cent were refused or withdrawn (e.g. road construction, 30 per cent; waste management, 22 per cent; chemicals and energy, 13 per cent; mining, 9 per cent). An EIA information system has been established which contains the records and characteristics of projects that have been or are being subjected to the EIA process. The legislation is being revised to include a list of "concepts" which will be subject to EIA, in order to be consistent with the EU directive on EIA and the Espoo Convention.

Nine territorial plans and eight transportation plans have been subject to an environmental impact assessment. In April 1998, the government started an *EIA*

on energy policy, including public hearings. Definitions of various energy policy options are to be prepared. A similar procedure is foreseen prior to the adoption of the new transportation policy.

Other instruments for policy integration

Territorial planning and land use planning

In the past, centralised planning was carried out by sector. However, there is now little comprehensive planning at state level and no regional policies make use of regulatory and financial instruments. The elaboration of *territorial plans* includes a procedure for EIA involving participation by representatives of regional and local administrations and the public. In practice, public participation is very low. The Ministry of the Environment takes part in assessments of the compatibility of proposed territorial plans with the protection of natural parks and sensitive areas, and with expected pressures on the environment. Although *land use plans* are not compulsory, they are legally binding where adopted; to date, about 80 per cent of Moravia and 60 per cent of Bohemia are covered by land use plans.

Integration of nature conservation and territorial planning is formally achieved through the Territorial System of Ecological Stability (TSES) and TSES plans (Chapter 5). TSES documents identify ecological core areas and corridors. They must be attached to, or be part of, land use plans to become operative. TSES documents have been prepared for almost the entire country, but only a few municipalities have actually incorporated them in their land use plans. The link between rural development and environmental policies is nevertheless receiving increasing attention. A regional development policy began in 1996; the Ministry for Regional Development (formerly the Ministry for Economics) could play an important role in enhancing interministerial co-operation at district level or at that of the regions, once they have been formally established.

Environmental information and participation

Information concerning the *state of the environment at national or regional level* is regularly disseminated to the public. The MoE publishes an annual "Report on the Environment in the Czech Republic" containing information on the state of air, water, soil and nature, trends in waste management and the environmental impacts of various economic sectors. The quality of the environment has become an important concern for many local authorities. Improving it is now a condition for sustainable development, particularly in the tourism sector. Prague, one of the most visited cities in the world, publishes an annual state of the

environment report which contains information on the quality of air, water, landscape and noise.

In 1993, an information centre was established within the MoE for the purpose of issuing information materials. Due to lack of financial and human resources, however, it has not yet become operational. While the overall information system elaborated at the beginning of the 1990s has not yet been created, there are *information systems on air quality and waste*. Others on nature protection and environmental education are under preparation.

The Environmental Inspection also has an information system providing *data on emission limits, fines and charges*. The government is seeking to implement the OECD Council Recommendation on pollutant release and transfer Registers (PRTRs). Implementation will be linked to new legislation on chemicals and on IPPC; progress in implementation has been slow so far. The information system of the State Environmental Fund collects data on the fund's revenues and on *environmental investment*. Despite these efforts, information collection is not transparent and in some cases information is not very reliable.

The Czech Constitution and the Charter of Fundamental Rights and Freedoms recognise the *right to information on the environment*. In a recent case concerning disposal of nuclear waste, the Constitutional Court recognised that this right could be claimed by individuals in a court case. Public *access to environmental information* is still restricted since, according to current interpretation of past legislation, most emission data could be considered confidential in order to protect so-called "commercial secrets" (i.e. all information about a firm which is not commonly accessible). The *new Act on the Right of Access to Information on the Environment*, adopted in July 1998, may help solve this problem and provide access to data which have not been disclosed as a result of a long tradition of bureaucratic confidentiality.

The public's interest in environmental issues decreased after 1992, as can be seen in opinion polls. Efforts are needed to increase *public participation* regarding environmental issues, which has been hampered by the lack of a "participation culture". For this reason, there is a great need to increase public awareness.

Environmental education

Numerous governmental and non-governmental organisations play an active role in *environmental education*. The goal of environmental teaching, education and public awareness is to *influence the public's behaviour and consumption patterns*.

The Ministry of Education, Youth and Sports has launched a programme in primary schools called "Green School". At the end of 1996, 75 primary schools were already included in the network of *environmentally oriented primary schools*. In 1996-97, five secondary schools teaching environmental protection and ecology were included in the state network of higher vocational schools. Universities are offering 40 fields of study related to the environment.

The Czech Republic participates in several *international educational programmes*, for example the Globe and Blue from the Sky programmes. Numerous nation-wide projects are supported financially by the MoE. Despite the above mentioned results, there are several problems including the lack of integration of environmental considerations into other educational subjects, financial constraints and lack of teachers.

Role of industry

Industry (large firms in particular) is very actively expressing its concerns about the relationship between environmental protection regulations and competitiveness. In 1992, the *Czech Environment Management Centre* (CEMC) and the *Czech Business Council for Sustainable Development* (BCSD) were established by major industrial companies (Chapter 7).

Czech companies have achieved very positive results in reducing pollution by means of high pollution control investments (e.g. on SO₂ emissions). They promote the use of clean technologies and of instruments such as *eco-auditing*. In early 1998, three firms were ISO 14 001 certified and 41 were preparing for certification. EMAS, already applied by a number of big companies, is to be established as a general system in order to comply with EU legislation. So far, few *voluntary agreements* have been made. One such agreement by soap manufacturers led to a 1 000 tonne reduction in their use of phosphates in 1996 compared with the year before (Chapter 7).

Eco-labels have been issued since 1994 on the basis of product life cycle analysis, with the tests being paid for by applicants (CZK 20 000). The system operates along the lines of that used in EU and other western European countries. So far, 262 labels in 21 product categories (mainly industrial products, boilers, paint and paper) have been granted. They involve 30 companies, of which more than 30 per cent are foreign producers.

Green business has great potential because of the priority given to pollution abatement and the high level of environmental investment. Producers of

environmental technologies and equipment have set up an association, and an annual International Environmental Fair called "EnviBrno" takes place in Brno.

Role of NGOs

Several environmental NGOs, both legal and illegal, existed before 1989. These organisations played an important role during the "Velvet Revolution" in November 1989. Many key members then joined the Ministry of the Environment or obtained parliamentary positions. Today the major NGOs are the Czech Union of Nature Conservation (over 4 800 members), the Society for Sustainable Living, the Rainbow Movement, Children of the Earth and Greenpeace (800 members). In the period 1990-92, a *permanent communication was initiated between the government and NGOs*, resulting in active NGO participation in policy-making and strong feedback on the government's environmental policy. The Green Circle of NGOs was established to co-ordinate the role of NGOs in Czech society. Furthermore, the first Czech Minister of the Environment initiated the "Green Parliament" in order to establish good communications and obtain feedback.

After the 1992 elections, the situation changed and co-operation between NGOs and the government became weaker. Most NGOs had little or no chance to influence the 1995 State Environmental Policy. In general, the media gave more attention to NGOs advocating radical approaches. Less radical and more specialised organisations therefore had very limited opportunity to make their positions known. The Society for Sustainable Living issues statements on the country's most important or urgent environmental problems, but they provoke little or no reaction from the government.

Recently, co-operation between the MoE and NGOs has improved in terms of access to information and public involvement in decision-making. The MoE provides financial support to some non-profit associations, based on a call for tenders related to various environmental protection activities (CZK 17.3 million in 1996). The new act on access to information should contribute to increased NGO involvement in policy-making and policy implementation.

Role of R&D in environmental technology development

The Czech Republic, which has a long tradition of *research and development*, restructured its scientific institutions after 1989. Expenditure on R&D represented 1.21 per cent of GDP in 1996. The priorities are university research, international co-operation, environmental concerns in regard to SMEs, nuclear energy and transport infrastructure. A Commission for Environment within the Academy of Science promotes and supports scientific progress in the area of environment.

The MoE supports *environmental institutes* and *funds research projects* on priority issues (CZK 90 million was awarded in 1996 for 125 projects related to environmental policy and CZK 126 million for 18 R&D projects). Other ministries provided over CZK 250 million for environment-related research. However, research is lagging behind because of a lack of resources and faces the problem of massive drop-outs from university institutes because of low salaries.

3. Environmental Performance

From central economic planning to a market economy

During the 1990s the Czech Republic has been undergoing the *transition from central planning to a market economy*. The *legacy* of severe environmental problems from the past and the strong expression of environmental concerns by the new democratic society helped place the *environment high on the political agenda in the early 1990s*. The 1990 Rainbow Programme stimulated public awareness and generated political support for environmental issues.

Pollution abatement efforts, together with the *decline in industrial production*, have contributed to a reduction of pollution, especially in the most polluted areas of Northern Bohemia and Northern Moravia. The restructuring of industry, particularly in the case of large companies, has produced positive results through the adoption of production processes that consume less energy and natural resources. The political importance of improving the environment has helped ensure that significant *financial resources for pollution abatement and control* were allocated to the most polluting sectors, such as mining, energy and chemicals. A framework of new economic instruments has been established as well as an effective system for financing environmental infrastructure. This has led to a high level of investment by the private sector and considerable progress in terms of pollution abatement.

Although pressures on the environment have been significantly reduced, many environmental indicators are still much higher than in most European OECD countries, and very *serious challenges* remain to the achievement of environmental convergence with EU countries. To move *towards sustainable development* and to address these challenges in a *cost-effective way*, there will be a need to i) strengthen institutional integration, ii) ensure efficient and effective environmental expenditure and iii) strengthen the environmental democracy.

Strengthening institutional integration

Following the early successes mentioned above, economic concerns overrode environmental ones. Activities whose purpose was to integrate environmental concerns into sectoral policies have slowed down. The State Environmental Policy adopted in 1995 defined specific environmental goals and included a few quantitative targets. A *new national environmental policy* is now being prepared. The revised policy is likely to include many concrete environmental goals and targets. It is expected to be adopted in 1998. This process of updating the 1995 environmental strategy should involve all administrations, local authorities and the private sector and lead to a country-wide discussion of the new sustainable development priorities. Such an approach should reflect Agenda 21, as well as the orientations of the EU's Fifth Environmental Action Programme.

The concept of *sustainable development* is somewhat difficult to introduce in a rapidly transforming economy with relatively short-term priorities. A progressive environmental policy was developed as one of the country's first cross-sectoral policies, and a commission was set up at national level immediately after UNCED. However, at present there is no effective mechanism to follow up on the Rio process, prepare activities related to Agenda 21 and develop long-term sectoral policies that take environmental considerations fully into account. Creation of an *effective consultative interministerial commission on sustainable development* should be considered.

So far, environmental problems have been addressed mainly on a *sectoral basis, according to the media affected and the type of environmental instruments to be used*. The division of competencies among various administrations, and the long tradition of vertically oriented bureaucracies, have been responsible for delays in addressing environmental issues. Although the Ministry of the Environment and other ministries have already co-operated on particular programmes and projects (for example, eco-labelling, environmental management systems, environmental auditing), permanent mechanisms should be established to ensure continuous dialogue on *strategic policy development* among government agencies and to integrate *environmental considerations in other policies*. For example, in *transport and energy policies*, both fiscal and pricing approaches need to be further developed in order to reduce environmental impacts. An integrated approach could also be used to deal with the impacts of economic activities on the environment. Various administrations are involved in the development of the new environmental policy. They will also have to co-operate in its implementation.

With the support of the EU, the Czech government has started the process of approximation with *EU environmental legislation*. This means that governmental

administrations and the private sector will need to make greater efforts to achieve environmental goals and implement environmental laws, and that the government will need to prioritise these efforts. *Many laws and regulations will need to be revised or introduced, and all laws will need to be implemented in full.* The accession process will require strengthening the administrative capacities of the Ministry of the Environment and of other ministries with environmental competencies.

Ensuring efficient and effective environmental expenditure

Expenditure on environmental protection during the 1990s is very high in the Czech Republic, probably as much as 3 per cent of GDP. *Pollution abatement and control* expenditure alone is approximately 2 per cent of GDP, which is sizeable compared to other OECD countries; it includes high investment in air pollution control by the private sector, particularly at electric power stations.

A number of economic instruments have been developed and used in association with regulatory instruments. They include a system of environmental fees and fines for pollution releases and even payments for natural resource use. The *polluter pays principle* has been implemented in a few pieces of legislation, for example the 1992 Clean Air Act, which stimulated industry to finance pollution control equipment on a very large scale. *Economic instruments will need to be strengthened* to finance further environmental investment, continue to repair past damage, and play a dissuasive role *vis-à-vis* polluters. *Subsidies should be reduced*, especially when they have negative effects on the environment. Domestic energy prices in particular should reflect their true cost and internalise externalities.

Part of public environmental expenditure is covered by a *State Environmental Fund* financed by environmental charges. The privatisation process has provided additional financial resources, which have been used for clean-up of contaminated industrial sites and for improving air quality. The system of *environmental liability* should be modernised. In particular, insurance for companies engaged in hazardous activities should be compulsory. Risk assessment should be carried out more widely.

While curative and end-of-pipe investments have rapidly reduced emissions of pollutants and proven effective, in the future *massive investment will still be necessary* to implement current national legislation and to comply with EU legislation. It is therefore essential to improve the *cost-effectiveness* of environmental instruments and expenditure. Use of technologies that prevent pollution, rather

than end-of-pipe technologies, should be considered. Remediation of environmental damage should be carried out after proper analysis of costs and benefits.

The current and future level of environmental investment in the Czech Republic has created, and should continue to create, opportunities for companies that provide *environmental goods and services*. A number of firms have developed these services through cleaning up contaminated sites or helping to implement environmental management systems.

In spite of the very active Czech Environmental Inspection, it appears that legislation is not yet adequately *implemented and enforced*. The penalties imposed by this agency are not dissuasive enough overall and are not always paid. The Inspection does not have sufficient access to the courts and cannot ensure that polluters are sanctioned. The role of inspectors will need to evolve to include the *provision of education and information* concerning compliance. To better implement and enforce environmental legislation, the existing inspection and monitoring networks need to be strengthened and will require more resources and staff.

Strengthening the environmental democracy

Public participation and access to information are guaranteed by the Constitution and in environmental law. There has been a lack of public awareness of environmental issues as well as a long tradition of bureaucratic confidentiality. The adoption in 1998 of the Act on the Right of Access to Information on the Environment is likely to help improve this situation. At the level of the Ministry of the Environment, progress has already been made towards better information provision to the public. There has been considerable progress in respect of *collection of environmental data*, and detailed reviews of the state of the environment are published annually and contain valuable information. However, priority should be given to setting up a unified, accessible and validated environmental information system.

The extended system of *environmental impact assessment* (of projects and policies) provides a powerful participative, preventive and especially wide-ranging instrument. Discussing energy options offers an opportunity to raise public awareness concerning cost-effectiveness and sustainability in the energy sector. This experience can be extended to the area of transportation. The environmental impact assessment procedure also helps integrate environmental considerations in local development plans.

At the regional level, co-operation is facilitated through *physical planning*. Regional and local development plans and their associated priorities include an integrated approach and are prepared on the basis of dialogue with all concerned parties. However, as the regional reform has not yet been achieved, co-ordination between the national and local levels is carried out through territorial representatives of the central government.

Significant progress has been made in elaborating other *social instruments* such as educational programmes, eco-labelling and environmental audits. Voluntary instruments have been developed with industry to promote cleaner technologies and the use of environmental management systems. These instruments could be used more extensively to reduce pollution and risks.

7

SECTORAL INTEGRATION: INDUSTRY

1. Effects of Industrial Activities on the Environment

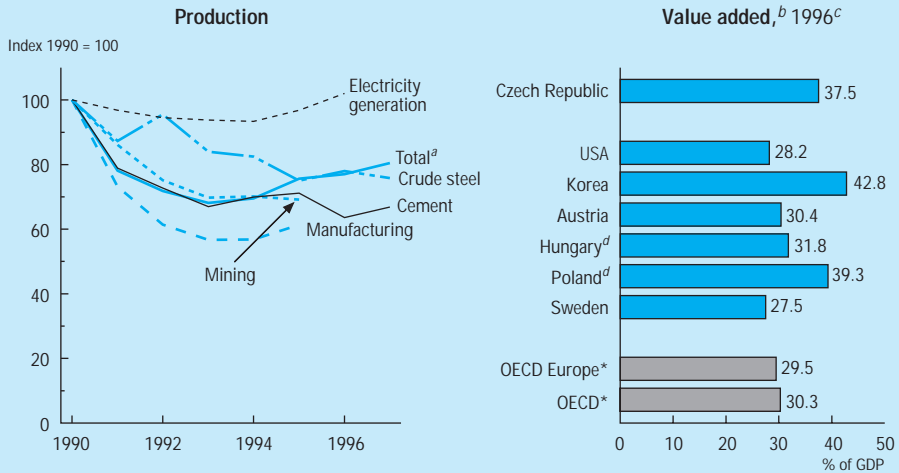
Development of the industrial sector

The Czech Republic has a *long industrial tradition*. Today industry (mining, manufacturing and utilities) still represents 37.5 per cent of GDP and employs 1.6 million people (Table 7.1). A number of *structural characteristics of Czech industry* are relevant to the country's environmental performance:

- importance of basic metallurgy (15 per cent), chemicals (13.5 per cent), food processing (19 per cent) and transport equipment (9.5 per cent) in industrial production (1995 figures);
- reliance on low quality brown and hard coal (open cast mining), which provided 55 per cent of the country's energy supply in 1996;
- high concentration of industries in Northern and Central Bohemia (30.1 per cent of total industrial output in 1996) and Northern Moravia (20.4 per cent in 1996);
- openness to international markets: 50.2 per cent of GDP in 1996 was earned with exports, of which 85.3 per cent was manufactured products.

After 1990, *industrial production* fell by more than 30 per cent. It began to grow again in 1993. The level of production in 1997 was, however, still 20 per cent below 1990 (Figure 7.1). Between 1990 and 1995, industry's share of GDP decreased by an estimated 11 per cent and industrial employment by about 3.5 per cent. The output of mining and heavy industry dropped by about one-third in this period, while electronics and machinery manufacturing also seriously declined. The overall share of the basic metallurgy, chemical, food, and pulp and paper industries in total industrial output remained about the same.

Figure 7.1 Trends in industrial activity



a) Output of enterprises in the extractive (mainly brown and black coal mining), manufacturing, electricity, gas and water industries, irrespective of the type of ownership.

b) Includes mining and quarrying, manufacturing, gas, electricity and water, and construction.

c) Or latest available year.

d) As % of total of branches at basic prices.

Source: CSO; OECD.

Table 7.1 Production and employment in industry, 1996

	Production (CZK billion)	Employment (000)
Mining industry	30	82
Manufacturing industry	386	983
Utilities: electricity, gas and water	34	80

Source: CSO.

Following a major *privatisation process*, the private sector's share in total industrial output reached almost 80 per cent in 1996. Some 53 major companies (e.g. in the chemical, coal mining and iron and steel industries) were still state-owned, with their privatisation under consideration. Rigorous budget constraints, introduced in the early phase of transition, have had a positive effect on industrial restructuring. However, further restructuring and adaptation to new market conditions are needed in a number of industries. Fragmented ownership and the role of financial institutions (e.g. banks, through investment funds) often affect corporate governance.

Foreign direct investment averaged 3.1 per cent of GDP between 1991 and 1997. This was about 11 per cent of total annual investment and was concentrated in manufacturing industry.

Environmental effects

The legacy

Czech specialisation in the chemical and metallurgy industries, and power generation based on brown coal, have led to heavy air and water pollution and caused serious negative health effects and damage to forests. The forests in the Krkonoše area, and the Krusné and Jizerske mountains in the north of the country, are among the most damaged in Europe (Chapter 5).

Two regions have generally sustained the heaviest environmental impacts: *Northern Bohemia*, in the Teplice, Most, Chomutov and Ústí districts (part of the Black Triangle), and *Northern Moravia*, especially around Ostrava (coal mining and metallurgy). Open cast mining has left a battered landscape, for instance in Northern Bohemia where 85 per cent of the country's coal mining and 60 per cent of energy generation take place. Cement production also has major impacts on the earth's surface. Sixty-five per cent of limestone quarrying takes place in or close to protected areas; in 1996, 22.8 per cent occurred in or nearby the Český Kras protected area.

Uranium mining led to the *stockpiling of mining tailings*, which are a source of water contamination. Large investments have been made to remedy this situation (Chapter 4). Uranium production has dropped by a factor of 4 since 1990.

Recent trends

Until 1993, the decline in industrial production and the closing down of the most obsolete plants were the main reasons there began to be less pollution.

After 1993, *modernisation of production and investment in pollution abatement and control* further contributed to this decrease. Environmental investment is estimated to have been responsible for a 10-25 per cent decrease in air and water pollution between 1993 and 1996 (Table 7.2).

However, *high energy and resource intensities*, another legacy of central planning, remain characteristic of Czech industry. Air and water pollution, expressed per capita or in terms of GDP, and waste generation are still high compared to other OECD European countries (Chapters 2, 3, 4). Many plants have obsolete equipment; the average age of industrial equipment is 14 years.

Table 7.2 Industrial activities and selected environmental pressures

	Units	1990	1993	1995	95/90 (%)
Air emissions from industry ^a					
SO ₂	1 000 tonnes	640	431	320	-49.9
NO _x	1 000 tonnes	240	204	111	-53.7
CO ₂ ^b	10 ⁶ tonnes	29	21	34	20.4
Particulates	1 000 tonnes	314	175	90	-71.2
Air emissions from power plants					
SO ₂	1 000 tonnes	956	731	636	-33.5
NO _x	1 000 tonnes	253	126	79	-68.8
CO ₂ ^b	10 ⁶ tonnes	94	84	67	-29.2
Particulates	1 000 tonnes	88	57	12	-86.3
Water abstraction by manufacturing industry ^c	10 ⁶ m ³	889	637	606	-31.8
Waste water generation by manufacturing industry	10 ⁶ m ³	708	..	496	-30.0
Waste generation by manufacturing industry ^d	1 000 tonnes	44 597	..	38 500	-13.7
Industrial production	(Index 1990 = 100)	100	68	76	-24.4
Manufacturing industry	(Index 1990 = 100)	100	57	61	-38.7
Electricity generation	(Index 1990 = 100)	100	94	97	-3.2

a) Large emission sources as defined in the 1991 Clean Air Act.

b) UN-FCCE data.

c) Includes cooling.

d) 1991 and 1996 data.

Source: OECD.

Air pollution and energy efficiency

Air pollution mainly comes from large emission sources in the *electricity generating sector* (Table 7.2). Altogether in 1996, large power plants and manufacturing plants accounted for 51.8 per cent of total particulate emissions, 86.8 per cent of SO₂ emissions and 40.7 per cent of NO_x emissions. Some *manufacturing industries* have emitted large amounts of toxic air pollutants such as arsenic, cadmium and lead. Overall emission levels have decreased considerably since 1990, but they are still very high: e.g. 92 kg of SO_x per inhabitant, compared to an average of 33 kg in OECD Europe (Chapter 2).

Solid fuels have played and continue to play an important role in energy supply and air pollution in the Czech Republic. Since 1990, the most obsolete coal-burning power plants, steelworks, etc. have been closed down and a gradual shift has taken place from brown coal to oil and gas-fired installations; large investments have also been made in air pollution control and abatement. However, solid fuels still accounted for 52 per cent of total energy supply in 1996 (compared with 61 per cent in 1990); use of gas as fuel increased from 12 per cent in 1990 to 19 per cent in 1996. In general, Czech coal has low calorific value and high sulphur (1 to 3 per cent) and ash content.

Manufacturing industry and mining are major energy consumers, responsible for about one-third of final energy use. Total energy demand per unit of GDP has been declining since 1992, but energy intensity in industry is still high. Some industries have improved their *energy efficiency*, but improvement is still needed in most of them. Since 1990, emissions of CO₂ by large industrial plants have increased by 20.4 per cent (Table 7.2). Industry directly contributes 23 per cent of energy-related CO₂ emissions.

Water use and pollution

In 1995, over 600 million m³ of water, mainly surface water, was abstracted for use by manufacturing industry (Table 7.2). This figure, representing 22 per cent of total *water abstraction*, was 31.8 per cent lower than in 1990, reflecting both the decrease in production and improvements in water use by steelworks, the chemical industry and others (Chapter 3).

Also in 1995, almost 500 million m³ of *waste water* was generated by manufacturing industry, 30 per cent less than in 1990. The metallurgy industry decreased its discharges to surface waters by 53 per cent, the chemical industry by 59 per cent, and the pulp and paper industry by 29 per cent.

Waste

Manufacturing industry is a *major generator of waste*: in 1996 it produced 38.5 million tonnes, while mining and energy production produced 22.1 million tonnes (Chapter 4). Per unit of GDP, Czech industry generates more waste than industry in other OECD countries (Figure 4.1). Of the total waste generated by manufacturing industry, about 17 per cent is defined as hazardous.

Twenty-eight per cent of all industrial waste generated in 1996 was handled directly by the plant, including all types of *treatment, storage and landfilling*. Seventy-two per cent was disposed of off the premises or handed over to other companies. In many cases, hazardous waste dumps are contaminating groundwater.

2. Responses

Policy objectives

In the 1995 State Environmental Policy (Chapter 1), the Czech Government established the following *industry-related objectives* for the short, medium and long terms.

Short-term priorities (up to 1998) included:

- improving air quality by reducing pollution from large and medium-sized stationary sources (by the end of 1998, these sources must comply with the emission limits established in the 1991 Clean Air Act);
- improving water quality by reducing pollution from large point sources;
- reducing generation of hazardous waste;
- remedying previous environmental damage that presents severe risks to human health;
- giving special attention to the highly industrialised areas of Northern Bohemia, Northern Moravia and Prague.

The State Environmental Policy document contains *general recommendations directly addressing the industrial sector*: development and introduction of low-waste, low-emission, low-power and resource-saving technologies, closed production cycles, environmentally friendly products. It also states that producer responsibility should be introduced gradually and that measures should be taken to minimise the risk of industrial accidents.

Medium-term priorities (1999-2005) related to industry include, in addition to continued application of the short-term priorities where needed, increased attention to physical planning and continued reclamation of areas devastated by mining activities. *Long-term priorities* (post 2005) include changing the energy supply structure, reducing energy demand and promoting energy savings. The government's overall objective is to reach by 2005, in industry and other economic sectors, the environmental average of OECD countries or the level western countries had attained in the early 1990s.

An *industrial strategy* has not been developed by the Czech Government. Industrial policy, now receiving more attention, is considered part of general economic policy, which aims at creating favourable conditions for a competitive economy and future EU membership.

Implementation of environmental policies

A *permitting* system, based on legislation relating to air, water and waste management, is applied to industry. The *Czech Environmental Inspection* issues permits for large and medium-sized companies and sets the total amount of charges and possibly fines. It has 182 inspectors in its service who carry out these activities. National law, which prescribes fixing emission limits for each individual source (stack), leaves no room for the Inspection to take regional conditions into account.

The use of permits is combined with the use of economic instruments: e.g. *fines* for non-compliance and a system of *charges* for emissions to air, discharges to surface waters, depositing of waste, the use of resources like groundwater, surface water and minerals, and the conversion of agricultural and forest land (Chapter 6). Some of these charges have been set at relatively low levels; thus, they have little or no incentive effect on company management and do not stimulate investments that would prevent or abate pollution. For example, it is estimated that the charge for emitting one tonne of SO_x (CZK 1 000 in 1997) would need to be about ten times higher in order to have a possible incentive effect. Some other charges, such as service charges for water supply and sewage disposal, have in recent years been raised at a faster rate than inflation and this has affected behaviour (Chapter 3). According to the Mining Act, mining companies must ensure *land reclamation* and create a *financial reserve* during exploitation. A major mining company sets nearly CZK 500 million aside annually for reclamation work; in 1997, the company was engaged in the reclamation of about 3 700 hectares of land. In general, land reclamation is slow and there are no data on which an assessment of progress could be based.

New legislation concerning the prevention and management of *industrial accidents* (which will follow EU legislation) is being prepared. Large companies (mining, chemical) have developed programmes on a voluntary basis, such as "Responsible Care", "Safe Enterprise", company safety reports and the Transport Information Emergency System (TRINS). New legislation concerning the handling and labelling of *chemical substances and preparations* has recently been adopted and needs to be rapidly implemented. Environmental *liability* exists for transport of chemicals and dangerous goods, but no legal obligation is related to particular industrial processes. *Producer environmental responsibility* has only been established with regard to hazardous chemicals; work is being undertaken in relation to the 1998 Waste Management Act.

A *product labelling scheme* was introduced in April 1994. To date, 262 products in 21 different product categories have been awarded an environmental label. The Ministry of the Environment (MoE) has been studying the possibility of introducing *pollutant release and transfer registers* since 1994. It hosted an international workshop in 1995, and a pilot was conducted. Possible implementation is being linked to new legislation on chemicals and the introduction of Integrated Pollution Prevention and Control (IPPC) in the framework of EU accession.

Voluntary agreements should, according to the 1995 State Environmental Policy, be given preference when a limited number of companies are concerned. At the national level, one agreement was concluded in 1995 between the MoE and the Association of Manufacturers of Washing Powders for the reduction of phosphate use. After one year, an evaluation showed an 11 per cent decrease in phosphate content. A voluntary agreement with industry is being prepared on energy saving. No further use of voluntary agreements is planned at present. At the local government level, voluntary agreements have been actively used in Ostrava (Northern Moravia): one with a coal mining company and two with coke plants to reduce air and water pollution. These agreements were part of "*Project Silesia*", which focuses in general on industrial pollution issues (air, water, soil; abandoned industrial sites and coke ovens) and involves cross-border cooperation with Polish counterparts; the project includes risk assessments as well as demonstration projects that lay the basis for voluntary agreements.

Remedying past environmental damage

Considerable *past environmental damage* (pollution of soil and groundwater) was generated by former state enterprises, and arrangements have been made to address this damage in the process of privatisation. The legal responsibility for past damage passes to new owners (Chapter 6). Financing of clean-up may be

provided by the National Property Fund (NPF), following an obligatory environmental audit and, since 1994, a risk assessment analysis. A contract may be drawn up between the new owner and the NPF; it must be approved by the MoE.

By the end of 1996, a total of 5 550 *environmental audits* had been carried out *in the framework of privatisation*. Ten per cent indicated the presence of a pollution burden whose estimated remediation cost would be beyond CZK 1 million. In 50 cases the cost was estimated to be more than CZK 500 million; in ten cases the estimate was more than CZK 1 billion. The authorities estimate that about half the past environmental burden has been mapped using these audits. It is estimated that the total cost of remediating contaminated sites would amount to more than CZK 60 000 million.

So far, five sites have been *cleaned up* and around 60 sites are in the process. Hundreds of contracts for clean-up of other sites are in preparation. By the end of 1997, CZK 3.3 billion had been spent on clean-up. One of the largest contracts was signed between the NPF, the MoE and the Skoda car factory in Mlada Boleslav, now part of the Volkswagen Group.

Environmental investment by industry

Major environmental investment has been made by industry in the Czech Republic. Manufacturing industry invested CZK 5.9 billion in environmental protection in 1995, of which CZK 3.6 billion was for air pollution abatement and control and CZK 0.6 billion for waste management. Environmental investment by mining companies in 1995 totalled CZK 1.6 billion, most of which was spent on abatement of uranium contamination of water. These expenditures were smaller than those of power generating companies (CZK 10.9 billion, of which CZK 9.3 billion for air protection). Total environmental investment by manufacturing industry and mining amounted to 0.57 per cent of GDP (Table 6.3).

Since 1990, environmental investment by manufacturing industry has clearly been *concentrated on air quality protection measures*. According to a 1997 MoE survey of major companies, 63 per cent of total environmental investment between 1990 and 1996 was in air pollution abatement and control.

In the *Northern Bohemia* (part of the Black Triangle), the share of environmental investments in total investments increased in the period 1990-95. These investments, together with production decline and restructuring of the industrial sector, resulted in considerable decreases in air emissions in this heavily industrialised region (Table 7.3).

In 1995, 13 per cent of the *state environmental budget* was devoted to projects in the mining sector. These were mainly for land reclamation, but also for some dust abatement equipment to be used by coke producers. The *State Environmental Fund* (SEF) gives increasing attention to projects whose purpose is to assist small and medium-sized companies to control industrial pollution and to avoid creating it by implementing cleaner technologies: in 1997, these projects amounted to about 12 per cent of total SEF expenditures.

Table 7.3 Selected information on the region of Northern Bohemia

	1990	1995	Change (%)
Share of regional industries in total Czech industry			
Coke, refineries, nuclear fuel	53.8	53.4	-0.7
Mining	44.5	39.4	-11.5
Textiles	16.0	13.3	-16.9
Chemicals	13.7	13.1	-4.4
Food	9.5	8.7	-8.4
Metallurgy	8.2	6.7	-18.3
Share of environmental investments in total regional investments	10.3	28.3	+175
Air emissions from regional large/medium-sized sources (t/km²)			
SO ₂	109.8	40.5	-63.1
NO _x	27.5	9.5	-65.5
CO	12.8	6.9	-46.0
Particulates	18.7	5.7	-69.5

Source: CSO, Ústí nad Labem division, 1997.

Integration of environmental concerns in industrial policies and management

Co-operation between the MoE and the Ministry of Industry and Trade (MIT) takes place on an ad hoc basis. The main areas of co-operation include energy, mining and chemicals. For example, the preparation of a state energy strategy

and an Energy Management Act involves co-ordination between the two ministries. A State Subsidy Programme for Energy Savings in Industry is being implemented by the Czech Energy Agency of the MIT: in 1997, 21 savings measures costing CZK 131 million were supported by CZK 32 million in subsidies.

Both ministries have recently begun paying more attention to promoting *good housekeeping practices* and *environmental management in companies*. Legislation based on the EU's Eco-management and Audit Scheme (EMAS) directive is being prepared, and a working group has been set up with the Confederation of Industry to co-operate with the MoE and MIT on the development of environmental management systems. Several large companies are preparing for ISO 14001 certification and two large chemical companies have already been certified. An increasing number of companies have begun to show an interest in environmental management certification. The power generating, mining, chemical and car manufacturing industries appear to have taken the lead here. Large companies regularly provide the public with environmental information (brochures, annual reports) and some have issued company environmental policy statements in which they state their environmental objectives.

In 1992, the *Czech Environment Management Centre* was founded by industry to promote knowledge of environmental management within companies and, in particular, to reduce industrial risks. Besides disseminating information and training, the Centre organises special teams to advise individual companies on eco-efficiency and environmental management. In 1993, the *Czech Business Council for Sustainable Development* was established; 17 major industrial companies are members, and three presidents of industrial associations sit on the board. The Association of the Czech Chemical Industries is promoting implementation of the "*Responsible Care*" programme. Almost all 63 of its member companies are implementing this voluntary worldwide chemical industry initiative. The Association recently began co-operating with the MoE on a long-term project mainly aimed at assessing the impact of gradual enforcement of EU environmental legislation in the Czech Republic on the chemical industry's economic situation.

Both the MoE and MIT are promoting the concept that large potential savings are possible through *cleaner production*, and that implementation of cleaner production creates win-win situations. Cleaner production activities have been promoted in the Czech Republic since the early 1990s, but in most companies, especially medium and small-sized ones, end-of-pipe technologies are still the prevailing approach. Management is often not committed to cleaner production technologies, and prices of inputs are not conducive to a change in this attitude. The Czech Cleaner Production Centre, established in 1994, offers training,

information, demonstration projects and policy advice. It has offices in Prague and Brno; by the end of 1997, 68 demonstration projects had been completed. A Pollution Prevention Centre, established in 1995 in the framework of a waste minimisation project by NGOs, co-operates closely with the Czech Environment Management Centre.

3. Environmental Performance

Basic metallurgy, chemical, mining and food industries have been and are prominent in the Czech industrial sector, which is an important contributor to GDP but also a major source of pollution and resource use. The low priority given to the environment before 1990, and a high concentration of industrial activities in areas near “cheap” energy sources (e.g. open cast brown coal mining), have resulted in some parts of the Czech Republic being among the most heavily polluted areas of Europe (e.g. the Black Triangle, Northern Moravia) with a *backlog of environmental damage*.

At the beginning of the *transition period*, industrial output declined considerably and *important structural changes* began to be made in industry, including privatisation (by 1996, almost 80 per cent of industrial output was from the private sector) and an opening to western markets. Many obsolete plants were closed down and others were modernised. Since 1993, private environmental investment has increased. These factors have led to a substantial *improvement in the state of the environment* (i.e. less air and water pollution).

Concerning *the future*, further major efforts will be needed, as intensities of pollution and resource use remain very high in the Czech Republic compared to many other OECD countries. The need to compete in international markets, and the prospect of EU membership, are important reasons for industry to bring environmental performance up to western European standards as part of the country's *environmental convergence* with western European environmental conditions.

The 1995 State Environmental Policy was an important political signal that industrial pollution was of major concern and that a high level of effort would be necessary to correct the problem. However, most *policy objectives* were formulated in a very general, qualitative way except in the case of air emissions, where industry had to meet the emission standards stipulated in the 1991 Clean Air Act by 1998.

Implementation of environmental policies and remedying past environmental damage

The State Environmental Policy refers to a wide range of policy instruments, but regulatory instruments (e.g. permitting) and pollution charges are still the main ones used in regard to industry. This policy approach has generally been successful in reducing pollution from major and medium sources. It clearly contributed, for instance, to the *improvement of air quality* in the Black Triangle (Table 7.3); in the winter of 1997-98, there was no smog alert in the city of Chomutov for the first time in many years. In general, the reduction of air and water pollution has occurred at a greater rate than the decrease in industrial production. However, the manufacturing industry of the Czech Republic remains pollution intensive and is among the highest generators of waste in the OECD. Much industrial waste is still landfilled; new waste management policies are being developed (Chapter 4).

Some experience has been gained with voluntary agreements, which are explicitly mentioned in the State Environmental Policy as an important instrument. In the city of Ostrava they are used in the framework of "*Project Silesia*". A product labelling scheme established in 1994 has met with good response from industry; the introduction of pollutant release and transfer registers has been postponed. New legislation concerning the prevention and management of *industrial accidents* is called for, and the recently adopted law on handling and labelling of *chemical substances* needs to be implemented rapidly.

In the context of privatisation, arrangements have been made to deal with *past environmental damage*. Legal responsibilities have been defined, environmental audits have been made obligatory, and clean-up may be financed by the National Property Fund. Although some remediation has already taken place, there is a considerable backlog of polluted industrial sites that need to be cleaned up.

To accelerate clean-up, a nation-wide programme giving priority to sites which pose high risks to public health and the environment should be considered.

Environmental investments and integration of environmental concerns in industry

Through environmental investments and the system of charges, *industry is paying* for using the environment. So far, most investments have been in *end-of-pipe technologies* to meet permitting standards; in 1994, only an estimated 8 per

cent of all industry environmental expenditure was related to technological innovation. This approach has contributed to the considerable reduction of heavy pollution in areas like the Black Triangle. However, after the “environmental clean-up” phase, the time has now come to give *higher priority to preventive and integrative approaches*. For waste management and minimisation, as well as energy and general resource saving, further cost-effective progress will require integrating environmental considerations in the choice of industrial processes and in company management. This should also be done in regard to making further and much needed progress in reducing pollution intensities.

There is no explicit *industrial strategy* in the Czech Republic to date, but rather economic policies aimed at promoting generally favourable conditions for industry to compete nationally and internationally. The Ministry of the Environment and Ministry of Industry and Trade have recently started promoting *good housekeeping practices* and *environmental management* in companies. An increasing number of major companies are responsive and have shown interest in being certified according to international standards. Industry initiatives, such as the Czech Business Council for Sustainable Development are promoting this type of activities. Much work remains to be done, however, in order to increase participation and general environmental awareness within companies; special attention needs to be given to working with SMEs. The Czech Cleaner Production Centre is actively involved in auditing SMEs to identify low-cost ways to reduce pollution, but its scale of activities is rather limited.

At present, co-operation between the MoE and MIT, and between these ministries and industrial associations, mainly takes place on an ad hoc basis. A more *structured dialogue* between the two ministries, and with industrial associations, could be important in further promoting the integration of environmental concerns in industrial management and making progress towards formulating quantitative environmental objectives. This should provide direction for medium and long-term environmental progress and stimulate cost-effective choices by industry.

Part III

**CO-OPERATION WITH
THE INTERNATIONAL COMMUNITY**

8

INTERNATIONAL CO-OPERATION

During the 1990s, the Czech Republic has adapted to the changes that took place in its relations with other countries after 1989. Because these changes occurred over a short period of time, *challenges related to international co-operation have been considerable.*

The main goals of *international co-operation on the environment* have been to take an active part in resolving *international environmental problems* and to prepare for membership in international organisations (including the OECD) and accession to the European Union. The Czech Republic has ratified and implemented a large number of international agreements. It is harmonising its legal system with those of other OECD countries and, most important, with EU legislation.

1. International Agreements and Organisations

Multilateral agreements

At the end of the 1980s, a significant number of international environmental agreements had not been signed or ratified by the Czech Republic. The situation began to change in the early 1990s, and the country has *now signed and ratified most pertinent agreements* (see Annex III). A few outstanding agreements which might also be incorporated in the national legal system include:

- UN-ECE Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991);
- UN-ECE Convention on Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992);

- UN-ECE Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 1992);
- Council of Europe Convention on Transfrontier Co-operation between Territorial Communities and Authorities (Madrid, 1980);
- International Agreement on Tropical Timber (Geneva, 1983, revised 1994);
- UN Convention on Non-navigational Uses of International Rivers (New York, 1997);
- Convention on Supplementary Compensation for Nuclear Damage (Vienna, 1997).

In the case of the first three (UN-ECE) agreements, steps have been taken to adopt the necessary laws in 1998 or 1999 in order to become a party to the Convention.

As a landlocked country, the Czech Republic is not a party to most maritime conventions. It nevertheless contributes to pollution of the sea from land-based sources located on international rivers.

Membership in the Council of Europe and the OECD

The Czech Republic *became a member of the Council of Europe* in 1993 and a party to the Bern Convention in 1998. It actively participated in the preparation of the draft Convention on the Protection of Landscapes and is assessing whether to sign the Lugano Convention on civil liability for damage resulting from activities that are dangerous to the environment and the new Convention on the Protection of the Environment through Criminal Law.

In 1994, the Czech Republic reported on the incorporation of *OECD Decisions and Recommendations* in its legal system. It *became a member of the OECD* in 1995. While the Czech Government fulfilled most of its OECD commitments in the area of waste management and chemical substances by enacting appropriate new legislation in 1997 and 1998, further steps are still required concerning industrial accidents. A new act on the prevention of and response to industrial accidents, whose adoption was anticipated in mid-1996, will not be sent to Parliament before 1999 since this matter requires co-ordination between at least three ministries. The OECD Recommendation on pollutant release and transfer registers (PRTRs) is being implemented progressively on a voluntary basis (Chapter 6).

Process of accession to the EU

In 1993, the Czech Republic signed an agreement *establishing association with the EU*. Since then, co-operation with the EU has increased considerably.

The country's highest priority in regard to environmental co-operation with other countries is therefore to harmonise its environmental legislation with that of the EU.

Studies on the legal and economic aspects of implementing EU legislation, begun in 1996, show that the work involved is very considerable and that *many modifications of Czech legislation will be needed in order to arrive at harmonisation*. Out of 36 directives identified in a questionnaire survey, one had been fully transposed and 17 were partially transposed. Frequent meetings are held between representatives of the EU and of the Czech Republic. As indicated above, when implementation of a directive requires joint work by more than one ministry, the harmonisation process can be fairly slow (e.g. for the Seveso II and IPPC directives). Implementation of several environmental directives will be staggared because of costs and other problems.

While estimates of the *total environmental costs of qualifying for accession* cannot be very precise, the figure of CZK 400 billion for improvements relating to air and water pollution and waste has been officially provided, including over CZK 110 billion for urban waste water treatment facilities serving cities with 2 000-10 000 inhabitants.

Under the EU's Phare programme, the Czech Republic received ECU 375 million in 1990-95; it received ECU 54 million in 1996, of which about one-fourth (ECU 12.5 million) was for environment and regional development. Phare environmental activities in 1996 amounted to CZK 402 million. In addition, soft loans are provided under Phare's Environmental Business Programme, e.g. for a gas plant. In 1997, the EU agreed to increase its financial support to prepare for the country's accession as well as to help repair damage caused by a catastrophic flood in July of that year. A special fund will be created in the Czech Republic in the near future to manage Phare activities.

2. Bilateral and European Co-operation

Relations with neighbouring countries

Austria

Co-operation with Austria is based on bilateral agreements (1967, 1987) and has mostly been in the area of *water management*. In 1996, 61 joint projects were being carried out (CZK 943 million) relating to various environmental issues (waste, biomass, water, etc.). The construction in the Czech Republic of the

Temelin *nuclear power station* (VVER Soviet design, 2 x 981 MW) and of an intermediate storage area for spent nuclear fuel at the Dukovany nuclear power station (4 x 440 MW, VVER design), both less than 50 km from its border, raised objections from the Austrian Government.

Germany

Co-operation on environmental issues with the former German Democratic Republic (GDR), or East Germany, which was fairly formal during the communist period, became much more open and fruitful after 1990. Current bilateral activities with Germany are based on a new bilateral agreement (1995) and on direct relations with Saxony and Bavaria (waste in frontier regions, protected areas such as umava national park).

The *sewage* treatment rate in Northern Bohemia is the lowest of all the regions of the Czech Republic (68 per cent compared to an average of 90 per cent). The water quality of the Labe (Elbe) on the Czech side of the border is low. In 1989, this river where it entered Germany was much more polluted than the Rhine where it entered the Netherlands. In 1990, an Agreement of the International Commission for the Protection of the River Elbe was signed; a further agreement on transboundary waters was signed in 1995. The First Action Programme (1992-95) aimed to decrease pollutant emissions (30 per cent reductions in COD, nitrogen compounds, AOX, mercury and cadmium by 1995 compared with 1989). This was achieved, and a new *Elbe Action Programme* for 1996-2010 is being implemented. It requires expenditure of CZK 2.65 billion for waste water treatment in the Czech Republic. Pollutant discharges to the river are now very much lower than in 1990. BOD and COD at Decin in 1996 were at least 33 per cent less than in 1991 as a result of large investment in waste water treatment plants.

Six joint investment projects for environmental protection are under way, for which Germany has provided CZK 1.5 billion (waste water treatment plants, cogeneration units, fluidised bed furnaces, etc.).

Poland

An agreement on transboundary co-operation was signed with Poland in 1994, and an Agreement on Co-operation in Protection of the Environment was signed in early 1998. Polish and Czech scientists from Katowice (Poland) and Ostrava (Northern Moravia) exchange data on pollution and best available technologies, with the support of US-EPA. Air pollution has been greatly reduced in the Ostrava area.

Pollutant discharges to the Odra (Oder) in the Czech Republic have been very much reduced. The *Oder Commission* (Germany, Poland, Czech Republic, EU), established in 1996, is preparing joint activities. The 1997 flood in the Oder basin has resulted in improved co-operation on flood control. Following an accidental oil spill, the warning system in use between the two countries was improved. The Krkonoše national park is connected to the Karkonosze Mountains national park in Poland. Co-operation on nature and landscape protection is very close.

Slovakia

General co-operation with Slovakia on environmental matters is based on a 1992 agreement and a 1996 protocol. An agreement on transboundary waters was being negotiated in 1998. Progress is not as rapid as in the case of other neighbouring countries.

Black Triangle Area (Germany, Poland and the Czech Republic)

Northern Bohemia has for years had *high air pollution* because of its industrial structure and the complete disregard for environmental impacts. Life expectancy of both males and females is the lowest among all regions of the Czech Republic. Serious transfrontier air pollution has occurred, with visible damage to trees, along the Czech-Polish border in particular. This area is part of the so-called "*Black Triangle*", where there is a very high concentration of fossil-fuelled power stations in Germany, Poland and the Czech Republic and a legacy of environmental devastation caused primarily by mining and other industrial activities. About 25 per cent of total brown coal extraction in Europe takes place in the Black Triangle. The Environment Ministers of the three countries agreed in 1991 to restore and protect this area and to take immediate action to reduce emissions of air pollutants. German power stations have either been equipped with flue gas desulphurisation equipment or been closed down; on the Czech side of the border all electric power plants will be equipped by 1998 with desulphurisation equipment or fluidised bed boilers or will be closed down. In 1996, the three Environment Ministers confirmed their commitment to rehabilitate the Black Triangle area. A trilateral Protocol on Air Quality Data Exchange was also agreed.

In spite of the considerable measures taken and the success achieved (over 50 per cent emissions reduction), there is still *significant air pollution* in this area. The density of SO₂ emissions per km² is five times, and SO₂ emissions per inhabitant four times, the national average. NO_x emissions are three times the national average. In some parts of Northern Bohemia the air has a distinct odour due to the high density of combustion sources. Near a petrochemical complex, odours are strong enough to generate complaints in Germany.

Support for activities in the Black Triangle is provided by the EU under the *Phare multi-country programme* for the environment (ECU 11.4 million for 1991-96). In 1996, work on five air and water pollution projects (CZK 35 million) was completed. A trilateral air quality monitoring network has begun operating (three national centres, 42 measuring stations).

The Czech Republic receives *air emissions* of pollutants from the Turow fuel and power complex (2 000 MW) in Poland.

Bilateral co-operation with other countries

There are bilateral agreements on environmental co-operation between the Czech Republic and each of its four neighbours, as well as with nine other countries. The purpose of these agreements is generally to share know-how and technical expertise.

Co-operation with *Denmark*, based on a 1991 agreement, focuses on four projects relating to energy, cleaner technology and environmental management systems (i.e. the EU's Eco-management and Audit Scheme or EMAS). In 1996, Denmark contributed CZK 10 million to support this co-operation. Support will continue to be provided in 1998, but is likely to decrease in the future. Co-operation with *France* is based on a 1991 agreement concerning closer relations with French institutes and universities (FF 510 000 in 1995). Co-operation with *US AID* in 1992-97 involved joint work on 12 projects relating to, for example, health impacts of pollution and the management of industrial risks. These activities were discontinued due to the good state of the Czech economy. Co-operation with the *Netherlands* in 1998-99 will mainly aim at providing assistance prior to EU accession (waste, cleaner technology, harmonisation of legislation) and promoting direct contact between private firms for purposes of giving assistance (GLD 1 million).

Bilateral co-operation is also taking place with *Belgium*, *Canada* (C\$ 80 000 in 1995), *Norway* (NK 3 million in 1995), *Switzerland* (CHF 930 000 in 1995) and the *United Kingdom*. Bilateral co-operation is particularly welcomed by Czech scientists.

European co-operation

Transfrontier water pollution

The Czech Republic lies *upstream of all three of its transboundary rivers*, the Labe (Elbe), Odra (Oder) and Morava. Partly as a result of strict water pollution control measures, the *pollution load has been dramatically reduced in recent years* (Chapter 3). Nevertheless, the water of each of these rivers is still classified as "highly polluted" (class IV) in the Czech Republic. Drawing up of national action plans for all three is being completed.

International co-operation on the protection of the Dunaj (*Danube*) is based on a 1994 Convention signed by the Czech Republic and other Danubian states. An interim commission is preparing co-operative activities.

Transfrontier air pollution

The Czech Republic has suffered from serious *transfrontier air pollution as well as that of domestic origin* for at least 25 years. Acidity contributes to significant damage, including of forests (Table 8.1). Better pollution prevention in the former GDR, Poland and the Czech Republic has considerably reduced acid deposition levels. Czech forests are recovering slowly, although new damage still occurs during air pollution episodes caused by unfavourable weather.

Table 8.1 **Damage to forests in Central Europe**

	Severe damage ^a (% of area)	Moderate or severe damage ^a (% of area)
Czech Republic	5.9	56
Hungary	5.9	22
Slovakia	5.6	36
Poland	3.0	49
Germany	1.5	26
Austria	0.7	7

a) Categories are: none, slight, moderate, severe (defoliation).

Source: UN-ECE, 1993.

SO₂ emissions in the Czech Republic peaked in 1982 and have been decreasing since. NO_x emissions peaked in 1980 and again in 1989, but have been decreasing since. VOCs emissions peaked in 1990, followed by a decrease (Chapter 2). In 1996, the Czech Republic was still a net exporter of SO_x to Germany, Poland, Slovakia and Austria (Table 8.2) and a net exporter of NO_x to Poland. It is a net importer of NO_x from Germany. As a whole, it is a *net exporter* of both SO_x and NO_x. *Deposition of SO_x and NO_x is mostly from foreign sources.* There are large combustion sources in Germany and Poland.

The Czech Republic is a party to the Geneva Convention on Long-range Transboundary Air Pollution and its protocols. *It fulfilled all its commitments* under these protocols by bringing down SO₂ emissions by 58 per cent in 1996, NO_x emissions by 47 per cent in 1996 and VOCs emissions by 29 per cent in 1996 compared with their respective reference years (Table 8.3). SO_x reduction resulted partly from the very large effort made to remove sulphur from lignite-fuelled power plants. Nevertheless, emissions of SO_x per capita (92 kg) or per unit of GDP (9.1 kg) are much higher than the European OECD averages (33 kg/cap and 2.3 kg/\$1 000). Emissions of NO_x are also higher, in particular per unit of GDP (4.2 vis-à-vis 2.0 kg/\$1 000). Further abatement efforts may be needed, especially in areas where air quality is low. The Czech Republic is promoting the adoption of further protocols on NO_x, persistent organic pollutants (POPs) and heavy metals.

Transfrontier movements of hazardous waste

The Czech Republic has ratified and implemented the Basel Convention and the OECD Decisions on hazardous waste (Chapter 4). In September 1995, it supported a proposal by the EU and Scandinavian countries to prohibit exports of hazardous waste from OECD countries. According to the new Waste Management Act, the export of hazardous wastes for the purpose of recycling to countries which are not members of the OECD is banned.

In the Czech Republic in 1994, the total amount of hazardous waste exported and imported was approximately 15 000 tonnes; in 1995, 519 tonnes was imported for recycling and 1 925 tonnes was exported. (Total production of hazardous waste in that year was 1.26 million tonnes, using international definitions.) In 1996, these amounts were 1 203 tonnes and 1 603 tonnes respectively. *Hazardous waste can no longer be legally imported for disposal in the Czech Republic.*

Table 8.2 Acid deposition, 1996
(100 tonnes)

Country of origin or recipient country	Acid deposition from Czech Republic		Acid deposition over Czech Republic	
	SO _x	NO _x	SO _x	NO _x
Czech Republic	691 (17%)	99 (11%)	691 (33%)	99 (17%)
Germany	922 (22%)	136 (15%)	631 (30%)	158 (27%)
Poland	578 (14%)	121 (13%)	328 (15%)	74 (13%)
Slovakia	70	20	46	15
Austria	135	34	18	21
Hungary	62	22	66	10
Other OECD countries	400	87	74	116
Other countries	398	164	83	28
Other (incl. sea)	857	247	183	70
Total	4 113	930	2 120	591

Source: EMEP, 1997.

Table 8.3 Regional air agreements
(1 000 tonnes)

	Reference		State or [Target]		Reduction
	Year	Emission	Year	Emission	
SO _x	1980	2 257	1993	1 419	37%
			1996	946	58%
			[2000]	[1 128]	[50%]
			[2005]	[902]	[60%]
			[2010]	[632]	[72%]
NO _x	1987	816	1996	432	47%
			[1994]	[stabilised]	
VOCs	1989	403	1996	284	29%
			[1999]	160	[60%]

Source: Czech Ministry of the Environment.

International transport

The opening up of the Czech economy in 1990 was followed by considerable changes in the transport sector. The number of passenger cars and trucks has increased; *road freight measured in tonnes/km increased by 44 per cent between 1990 and 1996*; and the number of foreign visitors arriving by road, rail or air has doubled. At the same time, *transport of freight by rail and river has decreased by 41 and 36 per cent respectively*. Further growth in road transport, especially international transport, can be expected. Trade with eastern Europe is decreasing at the same time that it is increasing with western and central Europe. Sustainable development will require careful consideration, in a pan-European context, of highway infrastructure needs and promotion of road-rail combined transport.

Pan-European co-operation and the Central European Initiative

The Czech Government has always been very active in *promoting pan-European co-operation* in the framework of the UN-ECE, the Conference on Security and Co-operation in Europe (CSCE) and the Environmental Action Programme for central and eastern Europe (EAP). It initiated and hosted the first pan-European conference of Environment Ministers at Dobříč (1991) and actively participated in the Lucerne (1993), Sofia (1995) and Aarhus (1998) conferences. It has signed the three Aarhus agreements on public information, heavy metals and POPs.

Czech representatives to the UN-ECE have also participated very actively in all the activities leading to its many international agreements. Greater attention is being paid to EU and western European activities than to further links with eastern Europe.

The Czech Republic participates in other co-operative environmental work in the framework of the Central European Initiative (CEI), to which 16 countries belong.

3. Global Co-operation

The Czech Republic takes part in the solution of global issues in a multilateral context. According to the State Environmental Policy (1995), global issues such as climate change, protection of the ozone layer and biodiversity are nevertheless "long-term priority areas (post 2005)".

Climate change

The Czech Republic is a *very large emitter of greenhouse gases* per capita and ranks second in the OECD in CO₂ emissions per unit of GDP. The principal greenhouse gases (GHG) are CO₂ (84 per cent) and CH₄ (12 per cent). Energy-related CO₂ emissions in 1995 came mainly from energy production (51 per cent), industrial processes (23 per cent), the residential sector (10 per cent) and transport (7 per cent). Methane is mainly produced by coal mining (50 per cent), landfills (17 per cent) and agriculture (11 per cent). Between 1990 and 1995, CO₂ emissions decreased by 22 per cent and total GHG emissions by 23 per cent. In this period there was an overall decrease in GDP of 6 per cent (Table 8.4) but no decrease in electrical energy generation or in transportation figures.

Predictions of the increase in GHG emissions in 1995-2010 show either near stabilisation or a return to the 1990 level (base scenario). These calculations are based on the assumption that energy efficiency will improve by 20 per cent between 1995 and 2000 and by an additional 20 per cent between 2000 and 2010.

Table 8.4 **CO₂ emissions in the Czech Republic**

	Total 1995 (%)	Trend 1990-95 (%)
Energy-related CO ₂	97	-22
<i>of which:</i> Energy	52	-29
Industry	23	+30
Transport	7	+12
Commercial	4	-49
Residential	10	-41
Agriculture/forestry	1	-70
Industrial process-related CO ₂	3	-22
Total CO ₂	100	-22
Industrial production		-24
GDP		-6

Source: Czech Republic Second Communication; UN-FCCC, 1997.

Such improvements would be facilitated by *proper energy pricing* (i.e. no subsidisation). It is expected that electricity prices for the residential sector will increase, as well as the wholesale price charged to utilities (plus 6 per cent). But there could still be political or social obstacles to full deregulation of the electricity market since the population has objected to previous increases in domestic electricity prices (Chapter 6).

Among the measures implemented so far are a switch from coal to gas for domestic heating, heat saving procedures in residential buildings, metering of energy consumption, tax reductions on environmentally friendly items and better insulation standards. The Czech Energy Agency has provided financial support for an *energy saving programme*, mostly for heat in housing. State support was CZK 311 million for 173 projects in 1996 (total cost CZK 1 181 million) and, in 1997, CZK 205 million for 132 projects (total cost CZK 427 million). A small part of the programme is devoted to renewable energy and cogeneration. A shift to *greater gas consumption* will bring significant reductions in CO₂ emissions. More use of nuclear energy (once the Temelin nuclear power station is operational) will bring similar reductions but also environmental problems associated with nuclear energy. Further energy saving measures, and public education and fiscal measures, are planned. These policies should be quite successful, as the Czech Republic is among the OECD countries with the *highest energy intensity and highest CO₂ emissions per unit of GDP*.

The Czech Republic acceded to the UN Framework Convention on Climate Change (FCCC) in 1993 and, in 1997, became an *Annex I party country* along with other OECD countries. It reported on its activities to the Parties to the FCCC in 1994 and 1997. It has begun to initiate research activities on joint implementation and emissions trading, and three Pilot Joint Implementation Projects have started to be implemented. The Czech Republic supported the EU position in favour of a 15 per cent reduction of CO₂ emissions in 2005 and ratified the Kyoto Protocol in 1998. It should be in a position to *limit its emissions of CO₂ in 2000 at well below the 1990 level* and could easily achieve an 8 per cent reduction for the period 2008-2012 as compared to 1990. However, few measures have been taken so far to reduce CO₂ emissions. As mentioned above, the 1995 State Environmental Policy gave climate change relatively low priority. According to a 1997 report to the Contracting Parties, the Czech Republic will decide on its further commitments to the process of stabilising and reducing GHG emissions *after 2000*.

Protection of the ozone layer

The Czech Republic has adopted strong legislation to restrict the general use of the most important ozone depleting substances (ODS). It *fulfilled its international commitments* under the Montreal Protocol by reducing CFC consumption from 5 514 tonnes in 1986 to 566 tonnes in 1995 and 93 tonnes in 1996 (mostly aerosols) and by reducing halon consumption from 11 tonnes in 1994 to less than a tonne in 1996. It has also greatly reduced tetrachloromethane and methylchloroform consumption. Producers and importers of ODS must obtain a permit and must pay a charge of CZK 200/kg to the State Environmental Fund (they paid a total of CZK 39 million in 1996). Sprays containing hydrochlorofluorocarbons (HCFCs) have been banned and HCFC production was banned as of 1 January 1997.

Hard *chlorofluorocarbons (CFCs) are being recuperated* for recycling and there is apparently no shortage of CFCs for existing installations. Projects are being implemented for gradual withdrawal of existing ODS with financial assistance from the Global Environment Facility (GEF) (US\$2.3 million) and the State Environmental Fund (CZK 47 million in 1996). Further progress is needed in order to collect and recycle or destroy all regulated substances from refrigeration and air-conditioning facilities and from fire-fighting equipment. Much existing ODS is being lost. Furthermore, the fact that the current law on ODS does not prohibit the import of CFCs for private use (e.g. in old German refrigerators) has led to abuses.

Biological diversity

In recent years, the Czech Republic has *ratified most international conventions on nature protection*. It has also adopted implementing legislation for a series of conventions that had been ratified for several years. The Bern Convention (1979) was only ratified in June 1998 and the implementing law for the Convention on International Trade in Endangered Species (CITES), ratified in 1992, is from 1997. The Czech Republic submitted its latest report to CITES in 1995 and is preparing its National Biodiversity Conservation Strategy with a GEF grant (over US\$2.75 million plus Czech support). The greater involvement of Czech scientists in international co-operative work and the implementation of a large number of new agreements is draining available resources. Significant additional work can be expected when the EU directives on birds and habitat are implemented.

Implementation of the Rio Declaration

The Czech Republic has endorsed the Rio Declaration and its 20 principles (and is including them in its environmental policies). However, it has taken *few measures so far to implement* a number of principles, such as the precautionary principle and the principle of public participation, in its legislation. The new act on the *right to information* on the environment should facilitate access to information which was not released in the past, partly because the legal framework lacked clarity in respect to issues such as commercial or business confidentiality. Little progress has been made on *public participation*, and much effort will be needed before the Czech Republic is in a position to ratify the Aarhus Convention in this regard. Concerning *liability* for new environmental damage, regulations to implement the principles adopted in the 1992 Act on the Environment have not been prepared and there is uncertainty as to whether the Czech Republic is in favour of the principles adopted by the Council of Europe (Lugano Convention). The *polluter pays principle*, a cornerstone of both OECD and EU environmental policies, is not mentioned in the State Environmental Policy, which refers to “subsidies”, tax relief and other means of reducing pollution rather than to the reduction of subsidies. The polluter pays principle is not yet part of the Czech Republic’s legal system.

Agenda 21 preparation at national and local levels

Since the Rio Conference, the Czech Government *has not prepared a national Agenda 21* or a national environmental protection and sustainable development strategy. While the State Environmental Policy includes related objectives and deals indirectly with sustainable development issues, the official Czech report to the Commission on Sustainable Development (1997) recognised that “it cannot be stated that problems in the Czech Republic which should be solved according to sustainable development principles are ... approached from the ecological, economic and social viewpoints, as would be required. *Integrating environment and development in decision-making is in the Czech Republic at its beginning*”. Little had been done to promote dialogue among all stakeholders, to engage all social partners in a discussion of future development, or to promote a new approach at ministerial level involving closer integration between ministries, which have a long tradition of working in a fairly isolated way. This is not surprising, taking into account that the universally accepted phrase “sustainable development” had not been part of the vocabulary of a previous government. In 1998, there was a desire to move towards sustainable development and opportunities for greater dialogue were being used. There is still no formal effective interministerial body for sustainable development.

In 1997, the preparation of *local and regional Agenda 21s* was encouraged by the Ministry of the Environment using courses and seminars. In 1998, it agreed to promote local Agenda 21s, to launch a nationwide campaign, and to consult NGOs and municipalities. Several cities have responded positively and have taken action to contribute to sustainable development at their level, e.g. Brno, Hradec, Králové, Ostrava, Český Krumlov, etc. The improved environmental situation in Chomutov and Louny shows that definite progress has been made towards sustainable development in Northern Bohemia.

Development assistance

Assistance to other countries by the Czech Republic

In 1995, the Czech Government approved the *provision of assistance to developing and transition countries*. The amount of official development assistance, which was CZK 400 million in 1996, should grow to 0.1 per cent of GDP in the future (this would have been CZK 1.5 billion in 1996). The Ministry of the Environment prepared 15 projects for bilateral and multilateral co-operation, costing CZK 51 million, to be carried out in 1997. In 1998, the government approved environmental projects with a total cost of CZK 20 million (for Latin America, Belarus, Moldova, Ukraine, Lithuania, Croatia). There are plans to establish a trust fund to cover the costs of Czech environmental experts working abroad. Areas of co-operation include biodiversity, CFC collection, insulation materials that have negative environmental effects and cleaner production. The Ministry of the Environment is in favour of assessing the environmental impacts of aid projects, in line with OECD Recommendations. This principle would need to be implemented as cases arise. The Czech Republic contributes to the financing of the GEF (US\$5.3 million for the most recent phase).

Assistance to the Czech Republic

The Czech Republic has received *foreign assistance* to promote its economic development and, in particular, to carry out environmental protection activities. In the period 1990-96 this amounted to CZK 12.4 billion, of which CZK 7 billion was for emission abatement in electrical power plants and CZK 2.34 billion was provided by the European Commission's Phare programme. On a yearly basis, the total assistance received for environmental protection amounts to approximately \$100 million (i.e. approximately *0.2 per cent of GDP*). Phare is the largest donor (over CZK 12 billion in 1990-95, part of which was for environment). The EU's contribution is likely to increase in the future as it transfers funds for the purpose of facilitating the Czech Republic's accession and improving the country's infrastructure (cohesion fund).

The World Bank has provided grants from Danish and Swiss trust funds for the study of the economic impacts of legislative harmonisation in regard to water management and GHG reduction. GEF grants have also been received (biodiversity US\$2 million, ozone layer US\$2.3 million, a project on the use of waste heat for heating US\$5.2 million). Bilateral aid is provided by many countries.

Among central and eastern European countries, the Czech Republic was ranked second in terms of *environmental assistance received* in 1994-97 (Table 8.5). Direct financial inflows in 1996 reached \$1.3 billion, the Czech Republic being the second largest recipient per capita.

Table 8.5 **Environmental assistance, 1994-97**

(Commitments by donors and international financial institutions)

	Total (million ECU)	ECU per capita
Poland	603	15.6
Czech Republic	397	38.5
Russia	375	2.5
Romania	250	11.0
Hungary	209	20.4
Slovakia	145	27.2
Lithuania	138	37.1
Bulgaria	136	16.0
Total CEE + NIS	3 225	8.2

Source: OECD, 1998.

4. Environmental Performance

International environmental co-operation in a transition context

At the beginning of the 1990s, the Czech Republic was confronted by a number of *environmental problems* which needed to be addressed in co-operation with other countries. It had formal but fairly ineffective links with most of its

neighbours and had taken only a very limited part in wider international co-operation. The opening up of frontiers, democracy, new freedoms and the impact of a free market, along with the end of the state's role as owner and manager of most economic activities, created *new possibilities for increased international co-operation*.

The Czech Republic is now a *party to most international environmental agreements* (Annex III). It seeks to *adopt new national legislation* so as to be able to ratify several previously signed agreements. Carrying out activities at the international level has been hampered by delays in changing domestic laws concerning, for example, water quality and industrial accidents. Effective implementation of international agreements will require substantial administrative efforts.

The Czech Republic has become *a member of the Council of Europe and of the OECD*, which has had important effects in a number of environmental policy areas such as chemicals control, waste management, industrial accidents, public participation, and protection of endangered species. Making official acts of the OECD and other international organisations available in the Czech language is a problem.

The top priority of current international policy is *accession to the European Union*, which will require harmonisation of Czech legislation (including environmental legislation) with that of the EU. The task ahead is considerable, in that it concerns a very large number of topics which are dealt with by different ministries and will necessitate numerous changes in legislation. It will require better integration of environmental and other policies, greater co-operation between ministries, and abandoning the bureaucratic approaches of another era.

The new legislation will have to be implemented. In some cases *this will take some time, owing to the cost of providing new infrastructure*, but many changes will mainly concern administrative processes and regulatory tools. There are already indications that the EU will allow some directives to be implemented at a later stage, in line with an agreed accession framework. Because of the scarce means available for implementation, it will be important to *prioritise wisely*. An emphasis on *enforcement* would increase the credibility of the actions the government has taken so far, as well as those to be taken in the future.

Even with good prioritisation, future work relating to international co-operation will require manpower and financial *means*, which ought to be increased in view of the importance given this work by the government. Since inter-ministerial

co-ordination is essential, but very time-consuming, it would be appropriate for the government to make sure that preparation for EU accession receives all necessary administrative support.

Co-operation in Europe

The Czech Republic's *bilateral relations* with its neighbours, which were based on agreements prepared in a centrally planned economy, have had to be adapted to the new political and institutional realities. New environmental agreements with these countries have been undertaken in a new spirit, and working practices are now based on the use of *solid, mutually acceptable scientific data*. The many steps taken to reduce the country's air and water pollution have had beneficial effects in regard to transfrontier issues. International water basin commissions have been created, various measurement programmes have been implemented and a number of action programmes have entered into force. There have nevertheless been some delays due to deficiencies in national legislation or difficulties in concluding agreements, for example with Slovakia. The trans-boundary rivers are much less polluted than in 1990, and further progress is likely to occur in the immediate future as a result of new investments in waste water treatment plants on the Labe (Elbe) and Odra (Oder). Co-operation with eastern Europe is supported in the framework of the European Action Programme, but it may suffer to some extent due to the priority being given EU accession.

Concerning *transfrontier air pollution*, the Czech Republic has met all its international commitments (SO_x, NO_x, VOCs). SO_x reduction was achieved through a tremendous financial effort undertaken to retrofit all electric power stations (and close a few) within five years. While this was a remarkable achievement, too much sulphur is still being emitted, whether measured per capita, per km² or in relation to GDP. Thus, there is a need to further reduce the level of emissions and so bring down the deposition rate, which remains very high along the German and Polish borders. The air in these regions can still be seriously polluted in winter, with continuing negative health effects and damage to forests.

The Czech Government supports the integration of environmental and other policies, especially in a *pan-European context*. One area which will receive increasing attention is sustainable road transport, in particular since there is likely to be a great increase in car and truck traffic between the Czech Republic and other European (including central and eastern European) countries.

Climate change

Climate change has not been a priority policy area for the Czech Government. However, CO₂ emissions have been reduced and will be well below their 1990 level in 2000. They may be 8 per cent below the 1990 level in 2010. The Czech Republic, which requested to be considered an Annex I country in the FCCC, has reported to the meetings of the Contracting Parties. Postponing the removal of all direct subsidies and cross-subsidies of electricity prices has delayed essential improvements in energy intensity.

In 1996, the Czech Republic was one of the OECD countries with the highest CO₂ emissions intensities per capita and ranked second in OECD Europe per unit of GDP (Figure 8.1). There are considerable opportunities for improvement which would benefit the economy as a whole, including in the context of climate change. The closer co-operation between the ministries responsible for energy and the environment is a very positive sign for further progress.

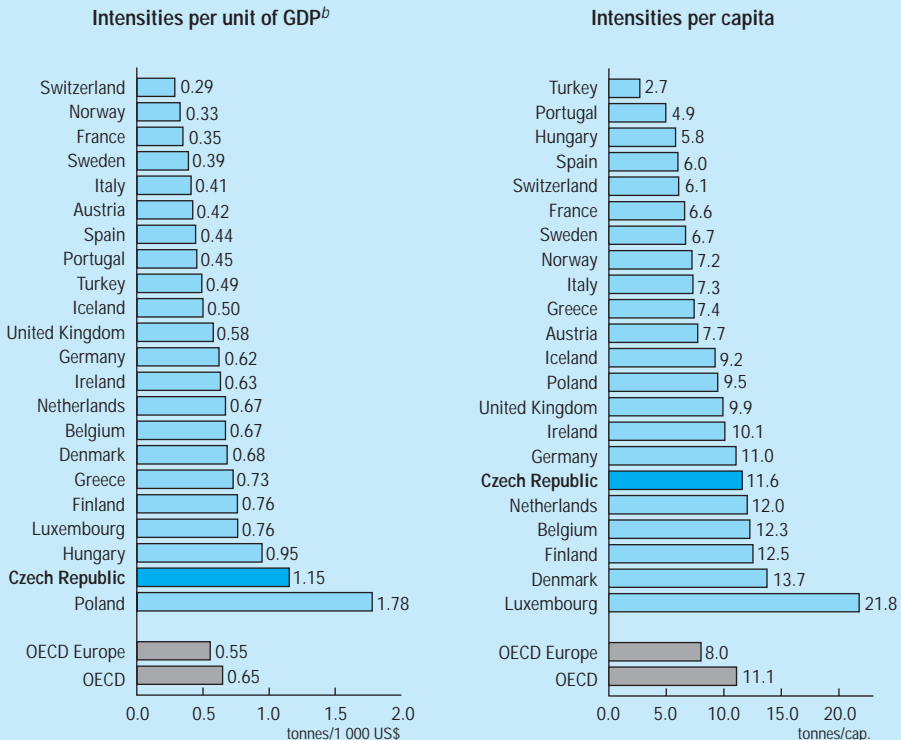
The development and adoption of an *energy strategy* based on win-win actions would be highly desirable. Consumers should be made aware that energy prices are not likely to be subsidised in the future and that wasting energy is going to become expensive. In order to change production and consumption patterns, new laws and regulations concerning energy will be needed in the framework of an energy strategy which takes full account of the environment.

Other global issues

The Czech Republic has fulfilled all its international commitments relating to *ODS* and has adopted a very strict national law restricting ODS use. Existing CFCs are being recycled and there is a small charge on all ODS. The national law does not apply to individuals, who are still allowed to import hard CFCs for private use.

Participation in international agreements on *biological diversity* is another area in which the Czech Republic has made rapid progress since the transition period began. The backlog of international agreements to be ratified was rapidly eliminated and implementing legislation was adopted. Consequently, the government may have found itself more involved in this area than was anticipated.

A country in transition must generally address a number of urgent priority environmental issues within its borders before undertaking co-operative work based on general environmental principles such as those in the Rio Declaration.

Figure 8.1 CO₂ emissions intensities,^a 1996

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

b) GDP at 1991 prices and purchasing power parities.

Source: IEA-OECD.

Laying down the principles by which sustainable development may be reached is nevertheless of value in regard to integrating the country's economy with the economies of developed countries which have already agreed to implement the Rio principles. The first step consists in giving effect to the official endorsement of the principle of sustainable development. In view of the statement by the new government, there is a possibility for progress in this respect in the new national strategies under preparation.

Adoption and implementation of other environmental principles of the Rio Declaration would be in line with the commitments of the Czech Government at the UNCED Conference in 1992. These would include the *precautionary principle* and the *polluter pays principle*, already part of the Maastricht Treaty, and the principles of *public information and participation* which are advocated in OECD Acts to which the Czech Government has subscribed. In the area of liability, progress could be made so as to clarify the obligations of polluters and remove uncertainties for investors. While such moves would be in line with the official environmental policy of the Czech Government, they would be strengthened if they were included in legislation and made available to potential claimants. Such development would be in line with the Aarhus Convention, which the Czech Republic has signed and which will require adaptation of a legal and juridical system developed for the most part within another political framework.

Public participation and dialogue with stakeholders are basic to the preparation of an Agenda 21. An attempt to draw up a national Agenda 21 failed. While the State Environmental Policy is a very useful document which sets out specific goals and targets, it fails to promote sustainable development as such. As to local Agenda 21s, actions to encourage the preparation of such plans were only taken by the Czech Government in 1997.

Aid

For many years the Czech Republic received substantial *assistance from a number of OECD countries and the EU*. Environmental aid covered approximately 5 per cent of the country's total environmental expenditures, but was most useful because it was spent in areas where the need was greatest. Significant assistance may be provided in the future to facilitate EU accession. Grants and loans have also been provided by the World Bank and the GEF.

The Czech Republic recently decided to provide *assistance to developing countries*. The amount is expected to be 0.1 per cent of GDP. A part of the total will be specifically for environmental assistance.

ANNEXES

- I. Selected environmental data
- II. Selected economic data and trends
- III.A Selected multilateral agreements (worldwide)
- III.B Selected multilateral agreements (regional)
- IV. Chronology of selected environmental events (prior to 1989, 1989-98)

Annex I: Selected environmental data¹

	CZE	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	DNK	FIN
LAND												
Total area (1 000 km ²)	79	9 971	1 958	9 364	378	99 7 713	270	84	31	43	338	
Major protected areas (% of total area) ² . . .	15.5	9.5	8.2	18.9	6.8	6.9	7.7	23.4	28.2	2.6	31.8	8.3
Nitrogenous fertiliser use (t/sq. km of arable land)	7.8	4.0	3.8	6.0	11.6	22.2	1.5	34.4	7.4	18.3	12.7	7.5
FOREST												
Forest area (% of land area)	34.0	45.3	29.8	32.6	66.8	65.4	19.4	28.2	46.9	20.1	10.5	76.1
Use of forest resources (harvest/growth) . . .	0.7	0.8	0.2	0.6	0.3	..	..	0.6	0.6	1.0	0.6	0.8
Tropical wood imports (US\$/cap.) ³	0.5	1.1	0.2	1.5	21.5	14.5	6.0	3.1	4.8	12.1	3.6	3.2
THREATENED SPECIES												
Mammals (% of species known)	33.3	24.4	33.5	10.5	7.7	12.1	14.9	..	37.5	31.6	24.0	11.9
Birds (% of species known)	55.9	8.8	16.9	7.2	8.3	7.4	5.9	29.5	28.1	27.5	12.9	6.8
Fish (% of species known)	29.2	21.7	5.7	2.4	11.1	7.5	0.4	37.0	42.5	54.3	18.2	11.7
WATER												
Water withdrawal (% of gross annual availability)	15.6	1.6	14.5	18.9	20.8	28.5	4.3	0.6	2.7	42.5	16.0	2.2
Fish catches (% of world catches)	–	0.9	1.4	5.7	6.5	2.5	0.2	0.6	–	–	2.2	0.2
Public waste water treatment (% of population served)	59	78	22	71	50	45	..	..	75	27	87	77
AIR												
Emissions of sulphur oxides (kg/cap.)	91.7	91.2	23.2	63.1	7.3	34.0	119.1	11.5	8.0	23.6	33.6	18.8
“ (kg/1 000 US\$ GDP) ⁴	9.1	4.7	3.9	2.5	0.4	3.0	6.6	0.8	0.4	1.3	1.7	1.2
Emissions of nitrogen oxides (kg/cap.)	41.9	68.2	16.4	75.1	11.7	25.5	120.4	57.5	21.7	32.9	54.7	50.5
“ (kg/1 000 US\$ GDP) ⁴	4.2	3.5	2.8	3.0	0.6	2.2	6.6	3.9	1.2	1.8	2.7	3.2
Emissions of carbon dioxide (t./cap.) ⁵	11.6	15.7	3.5	20.1	9.4	9.0	16.6	8.9	7.8	12.3	13.7	12.5
“ (t./1 000 US\$ GDP) ⁴	1.15	0.80	0.63	0.79	0.46	0.74	0.89	0.60	0.42	0.67	0.68	0.76
WASTE GENERATED												
Industrial waste (kg/1 000 US\$ GDP) ^{4,6} . . .	371	..	60	..	61	52	124	..	75	74	25	140
Municipal waste (kg/cap.)	310	630	330	720	400	390	690	..	480	470	540	410
Nuclear waste (t./Mtoe of TPES) ⁷	1.1	7.2	0.3	1.1	1.7	1.5	–	–	–	2.2	–	2.2
NOISE												
Population exposed to leq > 65dB(A) (million inh.) ⁸	1.5	..	..	17.2	38.0	..	..	..	1.2	1.2	0.5	0.2

.. Not available.

– Nil or negligible.

* Figures in italics include: for Germany: western Germany only;

for United Kingdom: threatened species and public waste water treatment: Great Britain only.

Water withdrawal: England and Wales only.

a) Data for Luxembourg are included under Belgium.

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: national data.

Annex I: Selected environmental data¹

FRA	DEU*	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD*	OECD*
552	357	132	93	104	70	301	3	42	324	313	92	506	450	41	779	245	34 730
11.6	26.4	2.5	6.8	9.4	0.8	7.1	13.9	11.5	24.2	9.3	6.5	8.3	4.7	17.3	1.6	19.8	11.8
13.0	14.8	10.0	6.4	8.5	42.7	8.0	a	37.7	12.0	6.5	5.2	5.7	6.7	13.9	4.3	22.5	6.4
27.4	29.9	20.3	19.1	1.5	8.3	23.1	34.4	9.2	39.2	29.4	35.3	32.3	67.8	31.7	26.9	10.4	33.5
0.6	..	0.5	0.5	..	..	0.3	0.5	0.4	0.5	0.6	1.1	0.5	0.7	0.5	0.4	0.5	<u>0.6</u>
8.6	2.5	4.2	-	3.6	10.0	9.5	a	17.7	6.8	0.2	23.7	6.9	3.8	1.2	0.6	4.0	<u>6.1</u>
20.2	39.8	37.1	69.9	-	16.1	32.2	54.1	15.6	8.0	11.9	17.2	19.5	18.2	33.8	8.6	22.2	..
14.7	39.6	11.8	27.1	13.3	24.7	24.7	20.0	27.1	10.4	15.9	34.9	13.0	8.6	44.2	13.9	22.6	..
6.3	68.2	36.9	19.5	-	..	..	38.2	82.1	-	25.0	18.6	26.5	4.7	44.7	2.3	11.1	..
21.3	25.3	..	5.2	0.1	2.3	32.2	3.4	8.6	..	19.2	11.9	28.7	1.5	4.9	15.2	13.7	11.3
0.6	0.3	0.2	-	1.7	0.4	0.4	-	0.5	2.7	0.5	0.3	1.3	0.4	-	0.7	1.0	31.1
77	89	11	32	4	..	61	88	96	67	42	21	48	95	94	12	86	<u>59</u>
17.4	26.1	50.6	69.8	30.3	46.1	25.0	19.5	9.6	8.0	60.6	26.1	52.8	10.6	4.7	29.2	40.3	39.5
0.9	1.5	5.2	11.4	1.7	3.1	1.5	0.7	0.5	0.4	12.1	2.5	4.2	0.6	0.2	6.4	2.4	2.4
25.8	23.7	33.5	18.0	106.4	32.2	37.2	48.8	34.9	50.9	29.0	25.9	31.3	41.0	18.6	13.3	39.1	40.0
1.4	1.3	3.5	3.0	6.0	2.2	2.2	1.7	2.0	2.4	5.8	2.5	2.5	2.4	0.9	2.3	2.3	2.4
6.6	11.0	7.4	5.9	9.3	10.1	7.3	21.9	12.0	7.2	9.5	4.9	6.0	6.7	6.0	2.7	9.9	11.1
0.35	0.62	0.73	0.95	0.50	0.63	0.41	0.76	0.67	0.33	1.78	0.45	0.44	0.39	0.29	0.49	0.58	0.65
101	48	5	104	1	71	22	162	30	39	117	..	28	100	9	94	58	89
560	400	310	420	560	430	470	530	580	620	290	350	370	440	610	590	490	500
5.0	1.3	-	2.2	-	-	-	-	0.2	-	..	-	1.6	4.5	2.5	-	3.3	1.7
9.4	9.5	2.0	..	..	..	..	..	0.6	0.5	..	3.0	8.9	0.3	0.8	..	5.7	<u>124.0</u>

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

4. GDP at 1991 prices and purchasing power parities.

5. CO₂ from energy use only; international marine bunkers are excluded.

6. Waste from manufacturing industries (ISIC 3).

7. 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.

8. Road traffic noise.

Annex II: Selected economic data and trends¹

	CZE	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	DNK	FIN
TOTAL AREA (1 000 km ²)	79	9 971	1 958	9 364	378	99	7 713	270	84	31	43	338
POPULATION												
Total population, 1997 (100 000 inh.)	103	302	982	2 677	1 262	460	185	37	81	102	53	51
% change (1980-1997)	-0.2	22.9	41.0	17.6	8.0	20.5	25.8	17.0	7.5	3.4	2.9	7.5
Population density, 1997 (inh./km ²)	130.6	3.0	50.2	28.6	333.9	462.9	2.4	13.6	96.8	333.6	122.4	15.2
GROSS DOMESTIC PRODUCT²												
GDP, 1997 (billion US\$)	105	611	583	6 996	2 576	587	349	56	152	191	110	90
% change (1980-1997) . . . . .	..	49.4	39.5	55.8	66.7	285.7	67.9	50.9	43.8	33.2	44.5	45.5
per capita, 1997 (1 000 US\$/cap.)	10.2	20.2	5.9	26.1	20.4	12.8	18.9	15.2	18.7	18.8	20.8	17.4
INDUSTRY³												
Value added in industry (% of GDP)	38	26	26	28	38	43	26	26	30	27	24	30
Industrial production – % change (1980-1996)	-8	39	38	45	50	397	41	..	44	21	53	60
AGRICULTURE												
Value added in agriculture (% of GDP) ⁴	4	2	6	2	2	6	3	7	1	1	4	4
ENERGY SUPPLY												
Total supply, 1996 (Mtoe)	40	236	141	2 135	510	163	101	16	27	56	23	31
% change (1980-1996)	-13.9	22.4	43.0	17.8	47.3	272.2	43.0	76.1	15.9	22.3	15.9	23.9
Energy intensity, 1996 (Toe/1 000 US\$)	0.39	0.40	0.26	0.32	0.20	0.29	0.30	0.30	0.18	0.30	0.22	0.37
% change (1980-1996) . . . . .	..	-14.9	9.6	-21.5	-10.8	1.8	-12.5	20.0	-17.6	-5.6	-17.1	-9.8
Structure of energy supply, 1996 (%) ⁵												
Solid fuels	52.2	14.5	10.1	26.5	18.0	19.4	45.3	12.0	21.1	16.5	42.8	40.5
Oil	20.3	33.2	62.3	39.0	53.6	62.0	36.9	37.2	43.0	42.2	41.6	30.4
Gas	18.7	29.4	20.8	23.6	11.0	6.7	16.5	26.8	25.0	21.1	15.2	9.5
Nuclear	8.3	10.1	1.5	8.7	15.4	11.8	–	–	–	20.2	–	16.3
Hydro, etc.	0.5	12.8	5.4	2.1	2.0	0.1	1.4	24.0	10.9	–	0.5	3.3
ROAD TRANSPORT⁶												
Road traffic volumes, 1996												
billion veh.-km	30	267	54	3 570	690	57	172	27	56	95	42	43
% change (1980-1996)	42.3	29.9	27.0	47.6	77.3	554.5	49.9	65.8	58.5	106.7	57.8	60.0
per capita (1 000 veh.-km/cap.)	2.9	8.9	0.6	13.4	5.5	1.3	9.4	7.5	7.0	9.3	7.9	8.4
Road vehicle stock, 1996												
10 000 vehicles	361	1 768	1 291	20 637	6 720	955	1 075	206	401	478	204	221
% change (1980-1996)	86.6	33.8	108.9	32.5	81.3	1 710.2	48.0	31.5	63.9	37.5	23.7	59.7
per capita (veh./100 inh.)	35	59	13	78	53	21	59	57	50	47	39	43

.. Not available.

– Nil or negligible.

* Figures in italics include western Germany only.

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

2. GDP at 1991 prices and purchasing power parities.

Annex II: Selected economic data and trends¹

FRA	DEU*	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	ESP	SWE	CHE	TUR	UKD	OECD*
552	357	132	93	104	70	301	3	42	324	313	92	506	450	41	779	245	34 730
586	822	105	102	3	37	575	4	156	47	387	99	397	88	72	637	588	10 998
8.7	4.9	9.0	-5.0	18.4	7.6	1.8	15.3	10.3	14.3	8.6	1.2	6.2	6.5	12.1	43.3	4.5	14.3
106.2	230.2	79.6	109.4	2.6	52.1	190.8	162.8	375.9	14.4	123.5	108.0	78.4	19.7	173.4	81.7	240.3	31.7
1 134	1 491	111	65	5	64	1043	12	288	100	220	112	550	155	151	365	1 041	19 313
38.6	41.1	32.7	..	50.0	119.1	34.7	115.2	46.9	65.0	..	52.4	51.9	28.7	22.9	121.7	46.5	<u>54.8</u>
19.4	18.1	10.5	6.4	19.4	17.4	18.1	29.4	18.4	21.5	5.7	11.3	13.9	17.6	21.1	5.7	17.7	17.6
26	36	20	32	22	39	31	24	27	32	39	32	32	28	34	31	28	30
12	20	9	..	..	215	20	44	28	111	..	56	23	41	26	179	31	<u>38</u>
2	1	12	7	9	5	3	1	3	2	8	4	4	2	3	17	2	3
254	350	24	25	2	12	161	3	76	23	108	19	101	53	26	66	235	5 020
33.7	-3.0	52.8	-11.9	54.5	41.0	16.2	-5.4	16.6	23.0	-13.1	86.1	47.9	28.3	22.8	109.2	16.6	23.5
0.23	0.24	0.23	0.41	0.45	0.21	0.16	0.29	0.27	0.24	0.53	0.18	0.19	0.34	0.17	0.19	0.23	0.27
-1.2	..	19.3	..	8.1	-28.9	-12.4	-54.4	-18.0	-22.9	..	26.3	0.6	1.4	0.6	0.3	-17.8	..
10.4	26.8	35.1	17.8	2.9	27.1	8.0	17.2	13.3	9.9	74.5	23.8	19.5	20.7	6.2	36.5	20.0	23.8
35.0	39.7	62.7	27.1	35.3	50.2	59.0	62.4	35.2	36.9	16.6	69.2	54.0	32.4	49.4	47.3	36.7	41.9
12.6	21.0	0.2	40.4	-	22.1	29.2	20.2	50.0	13.4	8.8	-	8.5	1.4	9.2	10.4	32.5	20.6
39.8	11.9	-	14.6	-	-	-	-	1.4	-	-	-	14.5	36.9	25.6	-	10.6	10.9
2.2	0.6	2.0	0.1	61.8	0.5	3.8	0.2	0.1	39.8	0.2	7.0	3.4	8.6	9.6	5.7	0.1	2.9
468	563	52	29	2	28	453	5	108	28	119	49	147	69	51	41	436	7 750
58.0	52.1	156.2	52.7	97.9	53.5	100.0	104.8	53.8	46.5	165.8	129.2	108.4	54.8	40.4	177.7	80.6	59.2
8.0	6.9	5.0	2.9	6.6	7.8	7.9	10.9	7.0	6.4	3.1	5.0	3.7	7.8	7.1	0.7	7.4	7.1
3 076	4 356	328	279	14	122	3 352	25	635	205	960	368	1 786	398	355	433	2 849	53 856
41.7	58.4	159.3	137.1	48.0	51.9	75.3	78.1	39.9	46.9	213.1	205.5	99.8	29.4	46.1	269.8	64.1	55.0
53	53	31	28	53	34	58	61	41	47	25	37	45	45	50	7	48	49

3. Value added: includes mining and quarrying (ISIC 2), manufacturing (ISIC 3), gas, electricity and water (ISIC 4), and construction (ISIC 5); HUN, POL: as % of total of branches at basic prices; production: ISIC 2 to 4.

4. Agriculture, forestry, hunting, fishery, etc; HUN, POL: as % of total of branches at basic prices.

5. Breakdown excludes electricity trade.

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

Annex III.A: Selected multilateral agreements (worldwide)

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

			CAN	MEX	USA	JPN	KOR	AUS
1949	Geneva	Conv. – Road traffic	Y	R		R	R	R
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	R	R
1970	Bern	Conv. – Transport of goods by rail (CIM)	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	R	R
1971	Ramsar	Conv. – Wetlands of international importance especially as waterfowl habitat	Y	R	R	R		R
1982	Paris	Protocol	Y	R	R	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	R	R
1996	London	Protocol to the Conv. – Prevention of marine pollution by dumping of wastes and other matter						
1972	London, Moscow, Washington	Conv. – International liability for damage caused by space objects	Y	R	R	R	R	R
1972	Paris	Conv. – Protection of the world cultural and natural heritage	Y	R	R	R	R	R
1973	Washington	Conv. – International trade in endangered species of wild fauna and flora (CITES)	Y	R	R	R	R	R
1974	Geneva	Conv. – Prev. and control of occup. hazards caused by carcinog. subst. and agents (ILO 139)	Y				R	
1977	Geneva	Conv. – Protec. of workers against occup. hazards in the working env. due to air poll., noise and vibrat. (ILO 148)	Y					
1979	Bonn	Conv. – Conservation of migratory species of wild animals.	Y					R
1991	London	Agreem. – Conservation of bats in Europe	Y					
1982	Montego Bay	Conv. – Law of the sea	Y	S	R		R	R
1994	New York	Agreem. – relating to the implementation of part XI of the convention	Y	R		R	R	R
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 stocks		S		R		S
1983	Geneva	Agreem. – Tropical timber	Y	R		R	R	R
1994	New York	Revised agreem. – Tropical timber	Y	R		R	R	R
1985	Vienna	Conv. – Protection of the ozone layer	Y	R	R	R	R	R
1987	Montreal	Protocol (substances that deplete the ozone layer)	Y	R	R	R	R	R
1990	London	Amendment to protocol	Y	R	R	R	R	R
1992	Copenhagen	Amendment to protocol	Y	R	R	R	R	R
1997		Amendment to protocol						

Annex III.A: Selected multilateral agreements (worldwide)

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

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

Annex III.A: Selected multilateral agreements (worldwide) (cont.)

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

			CAN	MEX	USA	JPN	KOR	AUS
1986	Vienna	Conv. – Early notification of a nuclear accident	Y	R	R	R	R	R
1986	Vienna	Conv. – Assistance in the case of a nuclear accident or radiological emergency	Y	S	R	R	R	R
1989	Basel	Conv. – Control of transboundary movements of hazardous wastes and their disposal	Y	R	R	S	R	R
1995		Amendment						
1992	Rio de Janeiro	Conv. – Biological diversity	Y	R	R	S	R	R
1992	New York	Conv. – Framework convention on climate change	Y	R	R	R	R	R
1997	Kyoto	Protocol						
1993	Paris	Conv. – Prohibition of the development, production, stockpiling and use of chemical weapons and their destruction	Y	R	R	S	R	S
1993	Geneva	Conv. – Prevention of major industrial accidents (ILO 174)						
1994	Vienna	Conv. – Nuclear safety		S	S	S	S	S
1994	Paris	Conv. – Combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa	Y	R	R	R	R	R
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		S
1997	Vienna	Conv. – Joint convention on the safety of spent fuel management and on the safety of radioactive waste management				S		S

Source: IUCN; OECD.

Annex III.A: Selected multilateral agreements (worldwide) (cont.)

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

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

Annex III.B: Selected multilateral agreements (regional)

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

			CAN	MEX	USA	JPN	KOR	AUS
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		
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 unif. cond. of approv. and recipr. recogn. of approv. for motor veh. equip. and parts	Y					
1959	Washington	Treaty – Antarctic	Y	R		R	R	R
1991	Madrid	Protocol to the Antarctic treaty (environmental protection)	S		S	S	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					
1964	Brussels	Agreem. – Measures for the conservation of Antarctic Fauna and Flora	Y			R	R	R
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					
1972	London	Conv. – Conservation of Antarctic seals	Y	R		R	R	R
1992	Paris	Conv. – Protection of North-East Atlantic marine env. (ex-Oslo-1972 and Paris-1974)	Y					
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 (sulphur emission ceilings and percentage emission reduction)	Y	S				
1998	Aarhus	Protocol (heavy metals)	S	S				

Annex III.B: Selected multilateral agreements (regional) (cont.)

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

			CAN	MEX	USA	JPN	KOR	AUS
1998	Aarhus	Protocol (persistent organic pollutants)	S		S			
1980	Madrid	Conv. – Transfrontier co-operation between territorial communities or authorities	Y					
1980	Canberra	Conv. – Conservation of Antarctic marine living resources	Y	R		R	R	R
1989		Agreem. – Co-operation in environmental protection						
1989	Geneva	Conv. – Civil liab. for damage caused during carriage of dang. goods by road, rail, and inland navig. (CRTD)						
1990	Magdeburg	Agreem.-International commission for the protection of the Elbe river						
1991	Espoo	Conv. – Environmental impact assessment in a transboundary context	Y	R		S		
1992	Helsinki	Conv. – Transboundary effects of industrial accidents		S		S		
1992	Bucharest	Conv. – Protection of the Black Sea against pollution	Y					
1992	Helsinki	Conv. – Protection and use of transboundary water courses and international lakes	Y					
1992	Vienna	Agreem. – Forecast, prevention and mitigation of natural and technological disasters						S
1993	Lugano	Conv. – Civil liability for damage resulting from activities dangerous to the environment						
1994	Lisbon	Treaty – Energy Charter						S
1994	Lisbon	Protocol (energy efficiency and related environmental aspects)						S
1994	Sofia	Conv. – Co-operation for the protection and sust. use of the Danube river						
1996		Agreem. – Exchange of immissions data in the Black Triangle						
1996	Wroclaw	Agreem.-International commission for the protection of the Oder river against pollution						
1998	Aarhus	Conv. – Access to environmental information and public participation in environmental decision-making						

Source: IUCN; OECD.

Annex III.B: Selected multilateral agreements (regional) (cont.)

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

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

CHRONOLOGY OF SELECTED ENVIRONMENTAL EVENTS (PRIOR TO 1989, 1989-98)

1971-89

- 1971 – Creation of the Council for the Environment of the Government of the Czech Socialist Republic.
- 1974 – Institute of Geography of the Czechoslovak Academy of Sciences publishes the first scientific report on the state of the environment in what is now the Czech Republic; the report did not prompt a political response.
- 1974 – First International Festival of Environmental Films and Video Programmes. This festival, the first of its kind, is still in existence.
- 1977 – Statistical Yearbook of the ČSSR includes, for the first time, a chapter on the environment.
- 1977 – Creation of the country's first two UNESCO biosphere reserves (Křivoklátsko and Třeboňsko), to which will be added Pálava (1986), Šumava (1990), Krkonoše (1992) and Bílé Karpaty (1996) for a total area of 4 372 km² (about 5.5 per cent of the territory of what is now the Czech Republic).
- Late 1970s – Ecological Section of the Biological Society (under the Czechoslovak Academy of Sciences) and several other organisations (e.g. Brontosaurus, TIS, Czech Union of Nature Conservation) begin “underground” environmental activities (“whistle blowing” reports on the state of the environment, first drafts of environmental laws, direct nature protection activities, translation of foreign literature, etc.).
- January 1982 – One of the most serious episodes of atmospheric inversion ever recorded in what is now the Czech Republic, lasting 19 days with an average SO₂ concentration of more than 400 µg/m³. Peak average daily SO₂ concentration was 3 193 µg/m³ in Prague and 2 440 µg/m³ in Osek (northwestern Bohemia).
- 1983 – Convention on Long-Range Transboundary Air Pollution enters into force in Czechoslovakia.
- 1987 – Protocol to the Convention on Long-Range Transboundary Air Pollution on the Reduction of Sulphur Emissions or Their Transboundary Fluxes by at least 30 per cent enters into force in Czechoslovakia.

1989

- 11 November – Demonstrations for a better and healthier environment in Teplice (northwestern Bohemia) start the “Velvet Revolution”.

- December – Federal Assembly of the Czechoslovak Socialist Republic makes “endangering the environment” a criminal act (par. 181 of the Criminal Code).
- December – Creation, as of January 1990, of the Ministry of the Environment of the Czech Republic by an act of the Czech National Assembly.

1990

- January – Establishment of the Federal Assembly Committee for the Environment.
- Start of a programme to create new environmental legislation.
- 1 June – Fall of the “Iron Curtain” and opening up of the zone along the German and Austrian borders. About 3 000 km² of relatively undisturbed landscape (4 per cent of the territory of the Czech Republic) becomes accessible.
- June – Publication of a “Blue Book” on environmental development, state of the environment and trends in what is now the Czech Republic prior to 1989.
- Publication of the first in a continuing series of Environmental Yearbooks of the Czech Republic and of Prague Environment Yearbooks.
- December – Government approves the “Rainbow Programme” for environmental recovery.
- (Ramsar) Convention on Wetlands of International Importance Especially as Waterfowl Habitat enters into force

1991

- January – Federal Assembly approves the Charter of Fundamental Rights and Freedoms, which recognises the citizen’s right to live in a safe environment.
- January – Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution Concerning the Control of Emissions of Nitrogen Oxides or Their Transboundary Fluxes enters into force (signed in Sofia, October 1988, by former Czechoslovakia).
- 21-23 June – First Pan-European Conference of Environment Ministers at Dobříš Castle near Prague, on the initiative of the Czechoslovak Environment Minister.
- June – Czech National Assembly approves the Act on the Czech Environmental Inspection and its competencies in forest protection.
- June – Federal Assembly approves the Clean Air Act and an act creating the State Environmental Fund.
- Creation of the Šumava and Podyjí National Parks and renewal of the statute of the Krkonoše National Park, established in 1963. In all, national parks constitute about 1.2 per cent of the territory of the Czech Republic.
- The first Waste Management Act, and the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, enter into force in the Czech Republic.

1992

- 1 January – Act on the Environment enters into force.
- Czech National Assembly approves the Act on Nature and Landscape Protection, and the Act on Environmental Impact Assessment.
- Publication of an Atlas on the Environment and Health of the Population in the former Czech and Slovak Federal Republic (ČSFR).
- August – Abolition of the Federal Assembly Committee for the Environment and transfer of all its competencies in the Czech Republic to the Czech Ministry of the Environment.
- Foundation of the Society for Sustainable Living, a prominent Czech NGO addressing sustainable development issues.
- Convention on the International Commission on the Protection of the Labe (Elbe) enters into force.
- Work begins on the clean-up of 73 contaminated sites formerly occupied by the Soviet Army; at least 60 sites (about 1.2 million m³ of soil) are badly contaminated.

1993

- January – Vienna Convention for the Protection of the Ozone Layer (including the Montreal Protocol), Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, and Convention on International Trade in Endangered Species of Wild Flora and Fauna enter into force.
- Beginning of serious four-year bark beetle epidemic in Czech forests, particularly in Northern Moravia and Southern Bohemia.
- March – Convention on Biological Diversity enters into force.
- April – National eco-labelling programme begins.
- First report on the state of the environment in the Czech Republic drafted for the government but not published. Since 1994, however, such reports have been published regularly in Czech and English.
- June – Czech Republic signs the UN Framework Convention on Climate Change.

1994

- June – Czech Republic signs (in Oslo) the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Further Reduction of Sulphur Emissions.
- (Bonn) Convention on the Conservation of Migratory Species of Wild Animals enters into force. Czech Republic becomes a party to the Agreement on the Conservation of Bats in Europe, under the same Convention.

1995

- 10 March – Czech Republic signs (in Bucharest) the Convention on Co-operation for the Protection and Sustainable Use of the Danube.
- 23 August – Government approves the State Environmental Policy.
- November – Parliament approves the new Forest Act.
- OECD Environment Policy Committee recommends that the Czech Republic become a member of the OECD.
- December – Czech Republic joins the OECD.

1996

- 1 January – New Act on the Protection of the Ozone Layer of the Earth, which satisfies the requirements of both the London and Copenhagen amendments, enters into force.
- January – Ministry of the Environment completes the environmental part of the EU questionnaire (phase A of the accession process).
- 11 April – Czech Republic signs (in Wroclaw, Poland) the Convention on the International Commission on the Protection of the Odra (Oder) Against Pollution.

1997

- July – Act on Peaceful Utilisation of Nuclear Energy and Ionising Radiation (“Nuclear Act”) enters into force.
- July – Heavy flooding in Southern and Northern Moravia with many casualties and very serious damage.
- (Bern) Convention on the Conservation of European Wildlife and Natural Habitats takes effect in the Czech Republic.
- October – At the Conference of Parties to the UN FCCC (COP 3) at Kyoto, the Czech Republic commits itself to an 8 per cent reduction of GHG emissions (up to 2008-2012) with 1990 as the reference year.
- President Vaclav Havel organises FORUM 2000, an international conference including a workshop on sustainable development, in which many internationally known personalities are invited to participate.

1998

- 1 January – New Waste Management Act enters into force.
- 1 July – Act on the Right of Access to Information on the Environment enters into force.
- Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution Concerning the Control of Emissions of Volatile Organic Compounds or Their Transboundary Fluxes enters into force.
- June – Act on Chemical Substances and Preparations approved by Parliament (to enter into force as of 1 January 1999).
- June – Government approves the State Policy for Nature and Landscape Protection and the State Transportation Policy, which emphasises the importance of public transport development.

OECD PUBLICATIONS, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(97 1999 02 1 P) ISBN 92-64-17009-X – No. 50475 1999