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Committee on Environmental Policy

ENVIRONMENTAL PERFORMANCE REVIEWS

REPUBLIC OF MOLDOVA

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NOTE

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Preface

The ECE Committee on Environmental Policy included the Environmental Performance Review of Moldova in its work programme in May 1996. In October of the same year, the preparatory mission for the project was organized, and a team of both national and ECE experts was formed to carry out the review. The Governments of Germany, Italy, Latvia, Lithuania, Slovenia and the United Kingdom made national experts available for the task. The Bilthoven Division of the WHO European Centre for Environment and Health contributed its expertise and resources for the preparation of the review of environmental health issues. The travel expenses of experts from countries in transition and from the ECE secretariat were covered by extra-budgetary funds, which had been provided by Austria, Finland, Italy, Netherlands and Norway. The successful conclusion of the project would not have been possible without the generous support from all these sources.

The review team prepared a report on the environmental performance of Moldova before, during and after the review mission in Chisinau in May 1997. The Moldovan partners in discussion with the review team did not spare time or effort in responding to the queries and requests made. The report by the review team, including draft recommendations for the solution of existing problems in national environmental policy and management, was submitted for evaluation by the ECE Committee on Environmental Policy at its annual session in Geneva, on 16 March 1998. A high-level delegation from Moldova attended this session. It was headed by the Director-General of the Department for Environmental Protection and also included representatives of the Ministry of Agriculture and Food Industry, and the Ministry of Economics and Reforms. The evaluation by the Committee was based on the in-depth preparation by two reviewing countries, Italy and Latvia. At the end of its evaluation, the Committee agreed on a final set of recommendations, replacing the draft recommendations of the review team for inclusion in this publication.

The discussion by the Committee revealed the considerable efforts that have been made in Moldova in favour of environmental protection, as well as the enormous difficulties for successful environmental policy and management in the light of a particularly complex and thorny transition process. The scarcity of financial means acts as a substantial impediment to the improvement of the environmental situation of the country - also with regard to the development of long-term soil conservation as one major objective of sustainable agricultural development. It also appears that environmental problems do not occupy the place on the political agenda they would merit in the light of the sometimes very difficult environmental problems.

The ECE Committee on Environmental Policy and the ECE review team wish the Moldovan environmental managers success in implementing and following up the policy recommendations that are included in this review.

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The preparatory mission for the project took place on 28-29 October 1996. The review mission was organized from 12 to 21 May 1997, and the peer review was held in Geneva on 16 March 1998. The ECE Committee on Environmental Policy adopted the recommendations set out in this publication.

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ABBREVIATIONS AND SIGNS

Abbreviations:

AAP	Pollution above allowable limits
AER	Admissible emission range
AEWS	Alarms, emergency and warning system
AgeoM	Association Geologia of Moldova
AP	Pollution within allowable limits
BAT	Best available technology
BATNEEC	Best available technology not entailing excessive cost
BOD	Biochemical oxygen demand
CFC	Chlorofluorocarbon
CIS	Commonwealth of Independent States
CNG	Compressed natural gas
CPI	Consumer price index
$DeNo_x$	Denitrification
DEP	Department for Environmental Protection
EBRD	European Bank for Reconstruction and Development
ECE	United Nations Economic Commission for Europe
EEE	Ecological expert evaluation
EFF	Extended fund facility
EIA	Environmental impact assessment
EIE	Environmental impact evaluation
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
EnvU	Environmental Unit in Moldenergo
EPR	Environmental Performance Review
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign direct investment
FGD	Fluegas desulphurization
GDP	Gross domestic product
GEF	Global Environment Facility
GNP	Gross national product
GT2	German Association for Technical Cooperation
IAEA	International Atomic Energy Agency
ICM	Interstate Council of Hydrometeorology
IEC	Interstate Ecological Council
IMF	International Monetary Fund
ISO	International Organization for Standardization
IUCN	World Conservation Union
HFO	Heavy fuel oils
LAC	Limits of admitted concentrations
LEP	Law on Environmental Protection
LPG	Liquefied petroleum gas
MLIM	Monitoring, Laboratories, Information, Management
MPC	Maximum permissible concentration
MSC-E	Meteorological Synthesizing Centre-East
MSC-W	Meteorological Synthesizing Centre-West
MoAF	Ministry of Agriculture and Food
MoH	Ministry of Health
MoT	Ministry of Transport
NAGCC	National Agency of Geodesy, Cartography and Cadaster
NCSAHE	National Centre for Scientific and Applied Hygiene and Epidemiology

NEAP	National Environmental Action Plan
NEF	National Environmental Fund
NIE	National Institute of Ecology
NGO	Non-governmental organization
NMP	Net material product
NSAPEP	National Strategic Action Plan for Environmental Protection
NU	Nutrient unit
OECD	Organization for Economic Cooperation and Development
POP	Persistent organic pollutant
Rb	Rouble
R&D	Research and Development
SDR	Special Drawing Unit
SEE	State ecological expertise
SIE	Statement of impact on the environment
SOE	State-owned enterprise
SPFA	State Petroleum Fuels Agency
STF	Systemic transformation facility
TACIS	Technical Assistance to the Commonwealth of Independent States
TSP	Total suspended particulates
TU	Turbidity unit
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
US$	United States dollar
USAID	United States Agency for International Development
VAT	Value added tax
VOC	Volatile organic compound
WHO	World Health Organization
WMO	World Meteorological Organization
WTO	World Trade Organization

Signs and measures:

..	not available
-	nil or negligible
.	decimal point
ha	hectare
t	metric tonne
kt	kilotonne
g	gram
kg	kilogram
mg	miligram
mm	milimetre
cm^2	square centimetre
m^3	cubic metre
km	kilometre
km^2	square kilometre
toe	ton oil equivalent
l	litre
ml	millilitre
min	minute
s	second

PJ	petajoule
m	metre
ºC	degree Celsius
GJ	gigajoule
kW_{el}	kilowatt (electric)
kW_{th}	kilowatt (thermal)
MW_{el}	megawatt (electric)
MW_{th}	megawatt (thermal)
MWh	megawatt-hour
TWh	terawatt-hour
Bq	becquerel
y or yr	year
cap	capita
eq	equivalent
h	hour
kV	kilovolt
MW	megawatt
Gcal	gigacalorie
Hz	hertz
GWh	gigawatt-hour

Currency

Monetary unit : Leu (plural: Lei), 100 Bani

Exchange rates : (1)

Annual average (in Lei):

Year	1 US$
1994	4.07
1995	4.50
1996	4.60
1997	4.70
1 March 1998	4.70

Source: UNECE Economic Survey, 1997

(1) the Moldovan national currency, the Leu, was introduced in 1993.

Introduction

FEATURES OF MOLDOVA

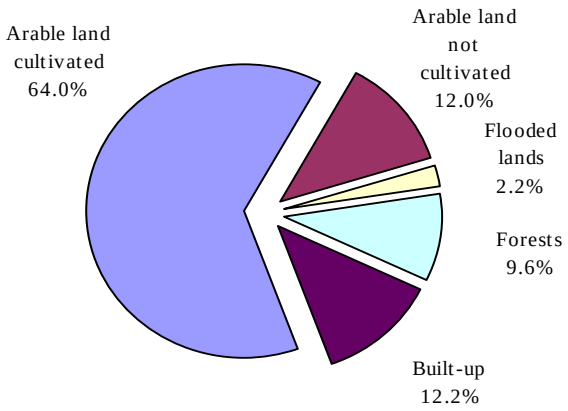
1. Physical structure

The Republic of Moldova emerged as an independent State from the break-up of the former Soviet Union and officially acceded to independence on 27 August 1991. It is a small (33 800 km^2), landlocked country with a population of 4 320 000 (01.01.1997 estimate). Chisinau (formerly Kishinev), the capital, has a population of 700 000. The next largest cities are Tiraspol with 200 000, Balti with 150 000, and Bender (formerly Teghina) with 140 000 inhabitants, respectively. Moldova shares borders with Ukraine and Romania. It is delimited by the Prut river, which it shares with Romania. On the border with Ukraine, part of its territory is on the left bank of the Dniester river (Transnistria). Moldova forms part of the Black Sea watershed. A predominantly rural country, 76% of its total area is agricultural land[1] and 9.6% are forests (see Figure I.1).[2] 20% of cultivated land (310 000 ha) is under irrigation.

Moldova has 3 150 m^3 of water resources per capita per year, or 378 000 m^3/km^2. A surface area of approximately 56% of the country is drained by the Dniester. 56% of the country's population live in its basin. Both the Dniester, with a total length of 1 350 km and a drainage area of 72 000 km^2, and the Prut, which is one of the major affluents of the Danube, are transboundary watercourses and their water use is regulated by bilateral agreements.

The country is relatively low-lying and hilly, with semi-arid steppe plains in the south and a dry climate with mean temperatures between 8+and 10+C.[3] Precipitation is erratic, and it is estimated that in the past 50 years droughts (i.e. precipitations below 90% of the normal rainfall) have occurred in 4.5 years out of 10. In recent years, lack of rainfall has produced poor harvests for several consecutive seasons, with particularly bad harvests in 1994, after hurricanes and heavy rainfalls followed a long period of drought.

Figure I.1: Land use in 1995



Source: Department for Statistics, Republic of Moldova.

2. The political context

Moldova has long-standing historical and cultural ties with Romania; its language is Moldavian (Romanian) and uses the Latin alphabet. Its history has been marked by frequent invasions, annexations and border changes, although the historical core of the country, under the former designation of Basarabia, is roughly the territory between the Dniester and the Prut rivers. The current borders were consolidated in 1947.

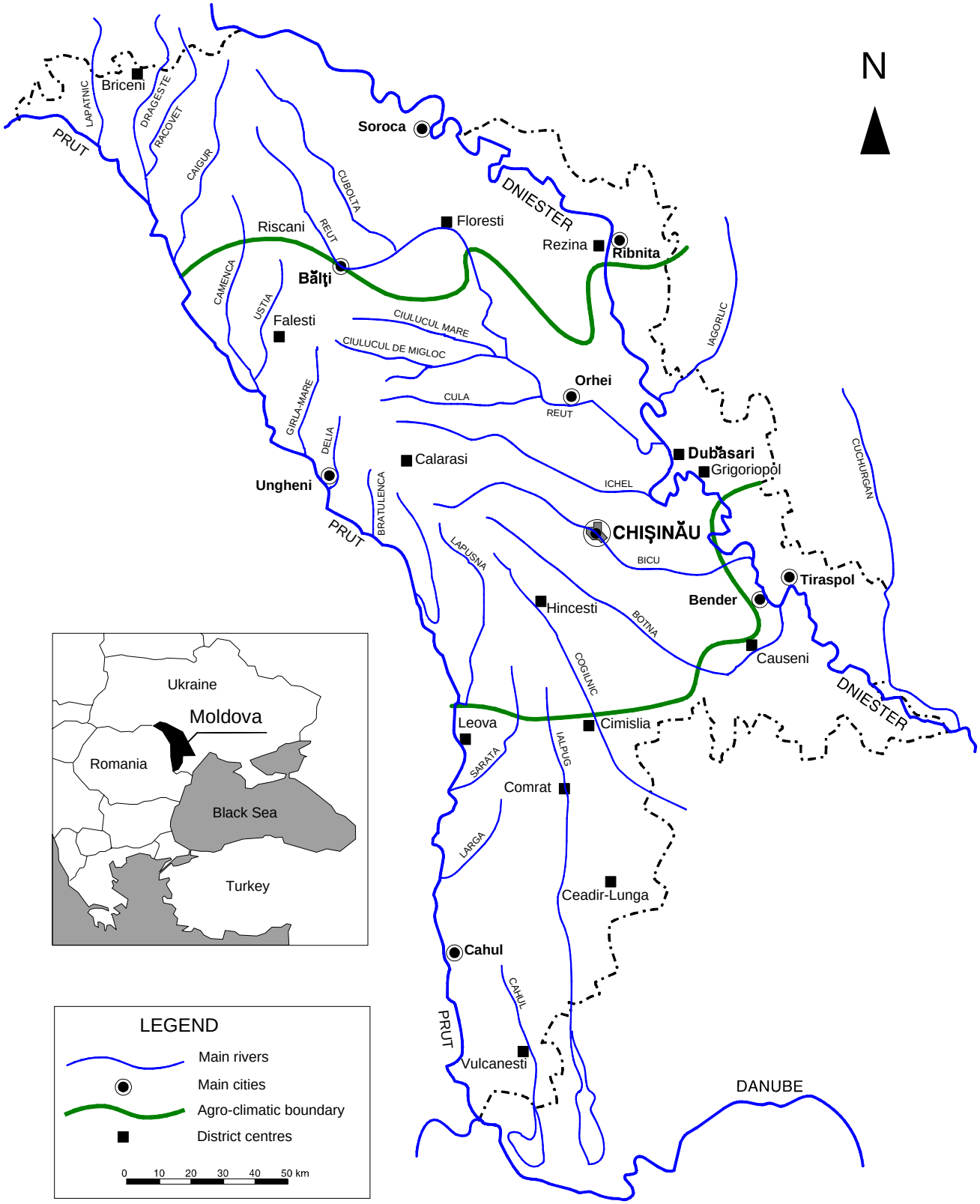
Definitely placed under Soviet control in July-August 1944, when Romania gave up all claims to Basarabian territories, the Moldovan SSR became part of the USSR and was influenced by all the processes that took place in the Soviet system (collectivization in agriculture, nationalization of property, centralization and others). In the mainstream of perestroika, a drive to independence emerged in Moldova, as well as a commitment to

[1] In 1990, agricultural land represented 86% of total land use.

[2] Data at 1 January 1993. Republic of Moldova, National Statistical Office, *The Republic of Moldova in Figures, Statistical Pocketbook*, 1992.

[3] Definition by Köppen-Geiger system used by RIVM.

Map of the Republic of Moldova



reform. A major challenge in the first years of independence was the situation in Transnistria (left bank of the Dniester), where unilateral secession by separatist movements escalated into an armed conflict which lasted from March to July 1992, when a cease-fire put an end to the hostilities but did not resolve the disagreements over the status of the territory. In April 1997, a political memorandum was signed which granted the left bank of the Dniester a certain autonomy. The Gagauz territories in the south were granted autonomy by the Parliament.

3. Population

Moldova is one of the most densely populated countries in the region, with 128 inhabitants/km^2, but population growth is marginal (0.6% in 1990, - 0.4% from 1990 to 1996, with a continued slight decrease in 1997). The distribution of rural and urban population stabilized at 54% and 46% respectively in 1996.[4] The trend of a growing urban population now seems to be reversing however, as a result of diminishing employment possibilities in urban areas. In 1995, the rural population increased by 27 000 and the urban population decreased by 41 000, the difference being attributable to external migration. Emigration, mostly within the former Soviet Union, as well as migratory movements within the country are largely due to economic and occupational rather than ethnic motivations. Moldovans constitute a majority in the country (64.5%), followed by Ukrainians (13.8%) and Russians (13%). The Gagauz in the south, who are Turkish Orthodox, constitute 3.5% of the population, and Bulgarians 2%.[5] Romanian is spoken by 62.7% of the population, Russian by 21.8% and Ukrainian by 9.8%.

4. Economic performance

After a period of steady economic growth throughout the 1970s, growth rates began to decline in the 1980s and fell sharply after 1990, with the disruption of the centrally planned system and price liberalization in trade relations within the former Soviet Union, as trade had been based almost entirely on the network of specialized production and distribution of the centrally planned system. GDP growth rates have remained consistently negative since the beginning of transition, with particularly sharp declines in 1992 (29.1%) and 1994 (31.2%). In spite of positive forecasts for GDP growth in 1996, economic recovery failed to pick up at the expected pace, due to the heavy dependence on agricultural output and falling consumption and exports, and the year ended with a negative rate of 8%.[6] Investments have been falling since the beginning of transition, with fixed capital formation hitting its sharpest decline of 76.5% in 1994, the worst in the former Soviet Union. The decrease stopped only in 1997, when GDP grew 1.3%.

Before independence, 42% of the country's net material product (NMP) was derived from agriculture, which employed one third of the labour force. Furthermore, food-processing represented 40% of Moldova's industrial output; in the last years before the break up of the Soviet Union, agricultural and processed food products represented 65% of Moldova's export earnings. Sectoral contribution to GDP has remained virtually unchanged since independence, and the share of the service sector in GDP has barely expanded, unlike the development which has taken place in most countries in transition.

Table I.1: Composition of final demand and output, 1992-1995

% of GDP, current prices

	1992	1993	1994	1995[1]
Demand				
Consumption	57.0	55.9	71.1	58.8
Fixed investment	16.2	15.5	9.3	7.4
Changes in stocks	43.6	40.3	25.1	36.6
Net trade	-16.8	-16.7	-6.0	-3.4
Output				
Industry	29.8	31.2	..	..
Agriculture	37.5	38.9	..	..
Services	27.8	28.8	..	..

Source: UNECE Economic Survey, 1996.

[1] Data refer to the period January-June.

Agricultural and food output declined by an average of 7.5% per year between 1992 and 1996, and by as much as 25% in 1994 due to poor harvests. However, in 1997 there was an 11% increase. Gross industrial output declined by almost 30% in 1992 and 1994. Its growth remained negative in 1995 and 1996, and stabilized in 1997. To a large extent, industrial production contracted because of sharp declines in heavy industry and because technologically advanced industries had been oriented to production for

4 In 1970, the ratio was of 68:32. Republic of Moldova, National Statistical Office, 1991.

5 1989 population census.

6 UNECE, *Economic Survey for Europe, 1995-1996.*

military activities. Labour productivity is among the lowest in the former Soviet Union, especially in industry, but marginally improved in 1995-1996. At present, the industrial sector produces mainly consumer goods. Downstream agricultural industry remains the main source of industrial output in Moldova, with food processing, canning, sugar production from sugar beets, tobacco and beverages being major activities. There is also some textile industry, light machinery and cement works, of which the major ones are located at Ribnita and Rezina, and a steel mill at Ribnita. Although Moldova's main natural resource is its agricultural potential, it has some mineral resources too, like the small oil deposits and gas wells insouth-western Moldova.

Moldova committed itself very early on in the transition to economic reforms and the development of a market-based economy. A National Bank and a two-tier banking system were established in the aftermath of the declaration of independence in 1991, and in 1993 a national currency, the Lei, was introduced as sole legal tender. The foreign exchange regime was liberalized for current account operations and a commercial banking system was set up. In 1994, Moldova adopted a comprehensive economic reform programme, strengthening its policies to create a market-based economic environment. Besides stressing privatization, the programme introduced tight monetary policies, reducing inflation to a monthly 2.9% in January 1995, down from 44.5% in January 1994 (average monthly rate of inflation in 1993: 32-%; in 1994: 6%; and in 1997: 0.9%). Inflation declined further in 1995 and 1996. Preferential credits were abolished and refinancing real rates were positive in 1994 and 1995. The economic objectives for 1998 include reducing inflation to an annual 6% and the external current account deficit to 2% of GDP; reforming the tax structure to generate more State revenue; and strengthening the banking system.[7]

In 1996, Moldova managed to boost its foreign currency reserves by 25% over the preceding year thanks to increased financial inflows and the higher volume of exported goods and services, in spite of a worsening of the current account deficit, which reached US$ 214 million, or 11% of GDP in 1996 (up from 6.8% in 1995).[8] Available current account data for 1997 do not indicate a significant improvement in the deficit, nor the achievement of the 4.5% target set by International Monetary Fund (IMF), largely because revenue-raising efforts have not been successful. In November 1997, IMF delayed the payment of the third Extended Fund Facility (EFF) tranche and recommended that the Parliament should reconsider its lowering of energy tariffs and rejection of a bill on value-added tax (VAT).

In spite of a Partnership and Cooperation programme signed with the European Union (EU) in November 1994, substantial trade with western Europe is limited to Germany (14%). Moldova's main trading partners, besides Romania, which accounts for 22% of trade, remain in the former Soviet Union (Russian Federation, Belarus and Ukraine). Wine, canned foods and other agricultural produce are considered potential export products, but failure to upgrade processing methods, meet quality standards and gain access to markets continues to undermine any major reorientation of trade. On 1 December 1995, the maximum tariffs on imports were reduced to 20% and export quotas on grain and grain products were abolished. Agricultural produce and food make up the bulk of exports, both within the Commonwealth of Independent States (CIS) and outside (57% of intra-CIS trade). Mineral products (including fuels) represent 65.6% of imports from the CIS, whereas machinery and equipment are the main import products from other countries (30%).[9] Import and export values grew in the 1994-1995 period, but trade performance deteriorated in 1996, which closed with a trade-balance-to-GDP ratio of -10% compared to 1995 after export values fell by 10-13% in the second half of the year, and in the first half of 1997. Moldova has applied for membership of the World Trade Organization (WTO).

The privatization of agricultural assets is regarded as a priority given the importance of agriculture in the country's future economic development, but the privatization programme has advanced at an irregular pace. In 1996 and the first half of 1997, private

[7] IMF.

[8] UNECE, *Economic Survey for Europe, 1996-1997; data for the period January-September*.

[9] Data for 1995.

ownership in the agricultural sector grew considerably.[10]

Although a private sector has emerged in the form of newly created enterprises, the fate of State-owned enterprises (SOEs), carried over from one privatization programme to another, remains unresolved. In 1994, a mass privatization programme was launched to privatize up to 45% of State assets, mainly in industry, construction and catering. The 1995 Law on Bankruptcy marked a breakthrough in the privatization process, allowing for the liquidation and earmarking of several large SOEs.

Foreign direct investment (FDI) is encouraged through a legal framework for property ownership, joint companies and guarantees, contained in the Law on Foreign Investment, including incentives such as tax holidays, repatriation of profits and tariff privileges. In 1997, the Agency for Foreign Investments was created within the Government to promote foreign investment. In July 1996, a free trade zone was established, offering a variety of tax privileges, such as VAT exemption on goods manufactured in the zone and duty exemptions on imports and exports. Three more have been set up in 1998. More than 50 companies have so far set up in the first zone (Chisinau), of which six are entirely foreign-owned. FDI flows represented 2.8% of GDP in 1996. Cumulative stocks increased 10-fold between 1994 and 1996.[11] The bulk of FDI is directed to electricity, water and gas supply, which represent half of FDI stocks in the country, followed by services (25%). 13% of foreign capital stocks are invested in manufacturing, mostly in the food industry, representing 84% of total investments in this sector of the economy. Numerically, the majority of FDI projects focus on non-tradable sectors, such as manufacturing, wholesale and retail trade, food industries and services, which are less capital-intensive. In the first half of 1997, FDI flows were significantly lower than in the previous year, but twice as much capital entered the country as in the first half of 1996 due to a sharp increase in portfolio investment and the country's first issuance of bonds. In January 1997, Moldova received for the first time an international credit rating from Moody's sub-investment grading Ba2), improving access to international capital markets.

Moldova became a member of IMF in August 1992 with a quota of 90 million special drawing rights (SDRs). In December 1993, Moldova received a Systematic Transformation Facility (STF) and stand-by credits from IMF for its new economic reform programme. In May 1996, IMF approved a further three-year credit of SDR 135 million under EFF arrangements to support the 1996-1998 economic programme, which includes macro economic objectives to consolidate the reforms achieved in the first years of transition[12]. In December 1994, the World Bank approved a US$ 60 million structural adjustment loan for energy and agriculture. However, as mentioned above, IMF recently delayed payments because its conditions were not met. In 1996, total external debt amounted to US$ 0.6 billion, bringing the ratio of gross debt to exports to 59%.[13]In 1997, the external foreign debt increased.

5. Human development

Table I.2: Selected human development indicators

	1989	1993 [1]	1996
Population density *(inhabitants/km²)*	128	129	128
Rural population *(%)*	53	53	54
Urban population *(%)*	47	47	46
Life expectancy *(years)*	69.0	67.7	66.7
Male life expectancy *(years)*	65.5	64.3	62.9
Female life expectancy *(years)*	72.3	71.1	70.4
Infant mortality *(per 1 000 live births)*	20.4	21.5	20.2
Access to safe water *(%)*	..	55	..

Source: Various national sources.
[1] Data are from the 1990 population census.

In the past few years, access to social services have become more difficult. The number of people living in precarious conditions has gone up. In 1989, life expectancy was 69 years, 65.5 for men and 72.3 for women, which was within the Soviet average.[14] However, it has declined since, to 67.7 years in 1993 and 66.7 in 1996 (see Table I.2). The country's potential lies in its highly educated labour force and

[10]Republic of Moldova, Department for Environmental Protection, Case Study: " Agricultural Subsidies and the Environment in the Republic of Moldova", Capcelea, 1997.

[11]UNECE secretariat.

[12]IMF Press Release, 20 May 1996.

[13]UNECE, *Economic Survey*...op.cit.

[14]Moldova National Statistical Office, 1991.

Table I.3: Selected economic indicators

	1991	1992	1993	1994	1995	1996	1997
GDP *(% change over previous year)*	-18.0	-29.1	-1.2	-31.2	-1.9	-8.0	1.3
Industrial output *(% change over previous year)*	-11.1	-27.1	0.3	-27.7	-3.9	-6.5	6.0
Agricultural output (% change over previous year)	-10.0	-16.0	10.0	-25.0	3.0	-10.0	11.0
Measured labour productivity *(% change over previous year)*	-17.5	-28.4	-0.2	-30.9	-2.5	-3.1	..
CPI *(% change over the same period of previous year, Dec-Dec)*	159.4	1,669.6	2,705.7	104.6	23.8	15.1	..
PPI *(% change over the same period of previous year, Dec-Dec)*	..	..	..	178.4	46.3	19.5	..
Total employment[1] *(% change over previous year)*	..	..	..	-0.4	-0.5	-1.8	..
Registered unemployment *(% of labour force)*	..	0.7	0.6	1.0	1.4	1.4	1.6
Balance of trade in goods and non-factor services *(million US$)*	..	..	-135	-100	-137	-342	..
Current account balance *(million US$)*	-476	-152	-155	-94	-115	-214	-180.0
(as % of GDP)	..	..	..	-5.8	-6.8	-11.2	-11.3
Net FDI inflows *(million US$)*	..	..	..	12	64	45	..
(as % of GDP)	..	..	..	..	3.8	2.8	..
Cumulative FDI *(million US$)*	..	..	..	12	76	121	..
Foreign exchange reserves *(million US$)*	..	2	42	159	227	306	..
(as months of imports)	..	..	1.0	2.4	2.6	2.7	..
Total net external debt *(million US$)*	..	..	200	312	393	471	..
Ratio of net debt to exports[2]	..	..	80	49	44	44	..
Ratio of gross debt to GDP	..	..	..	20	37	49	..

Source: UNECE and National Statistics.

[3] Cumulative change 1990-1995 = -5.1%.

[5] Exports of merchandise, services and income receipts.

its large pool of scientific and technical skills. Although the structure of the educational system is satisfactory, financial resources are urgently needed to maintain its effective functioning.[15]

Infant mortality fell between 1985 and 1989, it then rose again but has now fallen off (20.2/1000 in 1996). Abortion rates were the second highest in the former Soviet Union and accounted for 12.5% of maternal mortality. The first UNICEF Country Programme for Moldova[16] identifies infant and maternal mortality as one of its priority issues. Until now, immunization rates and the quality of primary health care services for children have been relatively high, but these rates cannot be maintained without external funding. Death rates have been rising, with increases not only in infant and maternal mortality, but also in accidents, suicides, and alcohol-related mortality. Occupational safety regulation enforcement has weakened and the medical system lacks the funds to operate at its full capacity.

Another socio-economic problem is the overall ageing of the population (13% of the population is over 60) and a growing dependency ratio of almost 60%. The private sector accounted for 61% of total employment in 1995.[17] Although officially unemployment stands at 1.6% (28 000), the real rate in 1996 was estimated at around 250 000, or 15% of the active population[18]. Furthermore, there is a problem of hidden unemployment (excess employment), estimated at 14% of the active population, with many workers on administrative leave or working part-time. Real wages declined sharply in 1993 and 1994, picking up only marginally

[15] UNDP *Human Development Report on Moldova*, 1997.

[16] E/ICEF/1996/P/L.34

[17] UNECE, *Economic Survey*..., op.cit.

[18] UNDP, *Human Development Report on Moldova*, 1997. The CIS Interstate Statistical Committee indicated real rates of unemployment at 11% in 1995.

in 1995, and wage arrears are estimated at 111%.[19] These economic factors are gradually leading to an impoverishment of the population, and although efforts have been made to strengthen social safety nets, the growing effects of poverty and unemployment are a serious challenge to the social security system.

[19]UNECE, Economic Survey of Europe, 1995-1996. Data is for November 1995.

PART ONE: THE CONDITIONS OF ENVIRONMENTAL POLICY AND MANAGEMENT

Chapter 1

LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

1.1 The legal framework

Introduction

Laws originate in Government and must be approved by it before being debated in Parliament. Difficulties and problems faced by ministries and departments are usually at the origin of laws. Concerned government staff and/or Deputies may suggest that a new law is needed. If there is initial agreement by the Government then the appropriate ministry or department specialists will prepare a draft and the Government will include the proposed law in its legislative programme.

Before reaching Government for approval, the draft is sent to relevant ministries, including the Ministry of Justice, for review. The ministries vary according to the topic, but the following are always involved:

- The Ministry of Justice;
- The Ministry of Finance; and
- The Ministry of Economy and Reforms.

The Ministry of Justice has a department for legislation responsible in particular for environmental and soil protection legislation. Once approved by the Government, the draft goes to Parliament. A similar procedure applies to proposed amendments to existing laws.

The comments of the consulted ministries are sent to the originating ministry/department. Subsequently, all comments are forwarded to the Ministry of Justice. This Ministry compares the draft to existing legislation (always including the Constitution) to determine compatibility. A synthesis of comments is forwarded from the Ministry of Justice to the originating ministry/department, with a conclusion/recommendation. If a positive conclusion is reached then the draft law is reviewed within Government at a meeting of Ministers. If accepted it proceeds to Parliament, where it is subject to scrutiny by relevant Commissions and, then, the Deputies vote in two readings: first, to approve the conception of the law; and second, to approve the integral law. Changes will probably be introduced. After voting has been completed, it is sent to the Parliamentary Secretariat for final editorial work. This editing focuses solely on linguistic expression not legal wording. The final version of the law will be promulgated by the President.

Environmental legislation

Moldova has a comprehensive corpus of environmental laws and regulations, which is being supplemented, regularly, by the addition of new laws. There is a general consensus that the existing body of laws is a sufficient base for effective environmental action to manage the serious environmental difficulties faced by Moldova. There are four major problems, however, in translating legal requirements into effective action. These are:

- Weak enforcement;
- Ineffective penalties;
- Structure/content of the laws; and
- Conflict between laws.

To a great extent the first two problems are a phenomenon, probably temporary, of the economic and political transition which is under way. The last two difficulties are of greater significance because they are a product of structural weakness in both the style of law-making and coordination within and between ministries and departments.

Environmental legislation is oriented toward allocating functions and tasks to different organizations. The structures of these organizations are defined and their functions (areas of responsibility, tasks, etc.) established, with varying degrees of precision, as definitions of key terms are not always a feature of laws. Generally, the procedural element is weak or, indeed, absent. In some cases, procedures are contained in regulations or normative instructions, but this does not always

occur. The lack of procedural clarity and definitions sometimes makes implementation difficult because individual organizations are not clear about the nature of their relationship with other similar entities (on issues such as precedence, timing, dispute resolution, etc.). This, in turn, leads to confusion and opens the door to "conflict" between differing legal interpretations. The overall result can be that needed activities are not implemented effectively and efficiently and government credibility, within the wider population, suffers. Moldovan specialists are aware that laws are contradictory in some cases.

Conflict between laws also arises from the nature of drafting and consultation activities in the legislative process. Internal and external consultation procedures are poorly developed. Although there is a stage in the legislative process for checking compatibility between laws, the time allocated for this activity is very short (a few weeks). It is clear that the pressures of work and time are not conducive to careful consideration of issues of compatibility.

Since February 1998, when conflicts between laws are identified, specific amendments to other laws can be proposed for scrutiny when laws are sent to Parliament. Often laws contain a statement such as, "... all other normative acts on this subject shall apply so long as they do not conflict with this law."

The Law on Ecological Expert Evaluation and the Evaluation of impact on the environment provides an example of this difficulty. Article 27 states that the Government, "... will make its own normative acts comply with this law". At the end of 1997 this had not yet been accomplished. Such statements of intent, unless supplemented by the identification of specific amendments, only succeed in increasing the potential for confusion and conflict.

The problems faced by Moldova in a time of economic transition and gradual incorporation into the international legal framework for environmental management have posed considerable difficulties for the Department for Environmental Protection (DEP) and other organizations. They are faced with rapid changes and the need to cope with these changes often requires an appropriate legal framework. Unfortunately, the speed of change, and the identification of specific problems, have resulted in a "fire-fighting" approach. There is a discernible tendency to deal with problems by drafting, quickly, a targeted law or laws. Passing laws has to some extent been a priority to the detriment of successful implementation of activities to deal with the problems. The speed at which new laws, and amendments to existing laws, are produced is astonishing. Unfortunately, "quantity" is being achieved at the expense of "quality".

The following is a list of the most important laws and codes.

LEGAL FRAMEWORK

The Constitution, 1994
Law on Protected Areas, 1998
Law on Taxes on Environmental Pollution, 1998Law on Natural Resources, 1997
Law on Hazardous Substances and Product Management, 1997
Law on Air Protection, 1997
Law on Wastes, 1997Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment, 1996
Law on Secondary Material Resources, 1996
Law on the Protection of Fauna ('Animal Kingdom'), 1995
Law on the Protection of Riparian Zones, 1995
Law on Environmental Protection, 1993 (minor changes were adopted by Government in 1997)
Law on the Protection of Consumers' Rights, 1993
Law on the Protection of Monuments, 1993
Law on Civil Protection, 1993
Law on Land Property Control, Cadastre, and State Land Monitoring, 1992
Law on Sanitary-Epidemiological Protection of the Population, 1993.

A number of codes are important. The main ones are:

Underground Resources Code, 1993
Water Code, 1993
Land Code, 1991; revised in 1995
Forestry Code, 1996
Hydrometeorological Service, 1998

In the future laws and codes are expected to be adopted concerning:

Access to environmental information
Drinking water

1.2 The policy framework

Accompanying the afore-mentioned legal structure is a variety of policy documents which have been given official status and are implemented following government and/or parliamentary decisions. Moldova now has a comprehensive legal and policy framework for environmental management.

The significant policy documents are:

- the Environmental Protection Concept (1995)
- the National Strategic Action Programme for Environmental Protection 1995-2020, 1995 (NSAPEP);
- the National Environmental Action Plan 1995-1998 (although mostly focused on identifying specific projects for implementation and requiring international financial assistance), 1996 (NEAP);
-

- Two older documents are still consulted as well:Territorial Scheme for Environmental Protection and Rational Use of Natural Resources of the Republic of Moldova 1991-2010, 1991; and
- the Comprehensive Long-Term Programme for Environmental Protection and rational use of Natural Resources in the Republic of Moldova 1987-2005, 1987.

It is understood that the documents originating from the pre-independence period are still in force. There is considerable overlap between these documents, particularly at the broad scale of national policy objectives and in terms of priorities. They have shaped current government policies which can be summarized as follows:

- integrating environmental considerations into the economic reform process and improving the procedures for licensing and control of individual development projects;
- strengthening institutional capacities for environmental management;
- introducing economic incentives to reduce pollution and the use of natural resources;
- encouraging the private sector, the public and non-governmental organizations (NGOs) to play an active role in improving environmental conditions;
- decentralizing environmental management functions; and
- participating fully in international activities and harmonizing legislation with international laws and conventions.

Although all these policy documents are in force, not all have equal influence in current government activities. At present, the National Environmental Action Plan is the most influential as its recommended priority actions carry the authority of both the Government and the World Bank and are the most likely to be supported by the international donor community.

This Plan was approved by the Government on 7 June 1996 and Government Decision 302 requires ministries and departments to use this Plan to guide their actions. DEP coordinates its implementation, reports on progress to the Government and created a Division of Environmental Strategies and Programmes to:

- organize and coordinate the Plan's implementation; and
- coordinate international technical assistance for environmental protection.

The first task is difficult to achieve because the Plan is not an integrated programme of linked and phased activities which can be taken, easily, and put into operation by ministries and departments within their respective sectors. It lacks specific targeted policies and recommendations which can be meshed with current sectoral actions. Also, financial and institutional constraints make any kind of implementation more difficult without external assistance.

A Project Management Office was established in DEP to assist Plan implementation by identifying and preparing projects for donor consideration and to help with resulting project implementation. As of March 1997 six projects had been selected for possible donor funding. Unfortunately, the funding for this Office has not been renewed. However, a recently approved TACIS project may provide valuable assistance to revive NEAP implementation. Another project on "Building capacity for the implementation of the NEAP in Moldova" was recently approved by United Nations Development Programme (UNDP). It aims at assisting DEP by improving its institutional capacity, supporting the development of local environmental action plans and mechanisms for their implementation: it also aims at identifying and promoting projects fitting with the NEAP recommendations.

The Plan divides its recommended actions between short-term and long-term. Short-term actions need finance, but can be implemented by existing institutions. Long-term actions need the creation of appropriate institutional capacity before implementation. To enable long-term actions to be implemented, institutional strengthening activities are expected to occur, while the short-term actions are being implemented.

The main Plan recommendations for the period 1996-1999 are as follows:

- preparation of a water resource strategy and master plan (with identification of "hot spots" and specific watershed management studies);

- preparation of a water supply investment programme to deal with the identified "hot spots" and to improve maintenance and delivery of potable water to urban areas;

- improved agricultural extension services to tackle erosion, increase efficiency of pesticide and fertilizer application;

- improved forest management and protection against uncontrolled exploitation;

- introduction of a strategy to control air pollution by a mix of controls and economic incentives; and

- strengthening DEP by enhancing its status in the government hierarchy (by making it a ministry) and increasing the financial, administrative and technical ability of its staff to implement its mandate and deliver its services.

These priorities form the context within which a number of projects have been identified and prepared. Examples are:

For technical assistance projects:
- strategy, action plan and national report to the Climate Convention;
-
- drawing-up of the national biodiversity strategy and action plan;
- agricultural and water quality study;
- feasibility study for irrigation systems;
- Prut river water management, a TACIS cross-border programme;
- building capacity for the implementation of the NEAP; and
- NEAP support and development of common environmental policies (TACIS project for NIS and Mongolia).

For investment projects:

- Telenesti water supply system improvements;
- separate collection and handling of waste in Chisinau;
- improvement of water supply networks in the southern districts of Moldova;Biogas production at the MWWTU;
- improvement of water and sewage network in Chisinau;
- environmental programme for transport and toxic waste for Chisinau municipality

The elements of a policy framework are in place, but two major problems remain. First, policy appears to develop somewhat incrementally and haphazardly, based on a variety of documents of varying status and provenance. Second, implementation is not effective enough because of Moldova's financial problems, the relatively weak position of DEP and the limited environmental awareness and expertise in sectoral ministries.

1.3 Elements of the institutional framework

According to the Constitution (Article 37) all citizens have both a right to a healthy environment and a duty to conduct themselves in a manner that contributes to its maintenance and does not cause it harm. Environmental management responsibilities are diffused throughout the entire population. However, specific individual members of the Executive Branch of the Government (e.g. the President) and governmental organizations have certain defined responsibilities and these are mentioned, briefly, below, accompanied by indications of their current and possible future activities. Figure 1.1 presents a flow chart of the institutional framework for environmental management. The President represents Moldova's environmental interest at the international level.

The Parliament plays an important role in adopting laws and policies for environmental management and national limits on use of resources and polluting discharges. It is assisted by the Sub-commission on Environment, which is part of the Special Commission on Health, Social and Environmental Problems.

The national Government is responsible, primarily via DEP, for implementing the environmental laws and policies adopted by Parliament. It also must act with local governments in implementing specific functions. The Prime Minister is the head of the Government and is assisted by a number of Vice-Prime Ministers, each of whom is responsible for a range of sectoral portfolios and to whom line ministries report. One of the current Vice-Prime Ministers is responsible for both agriculture and environmental protection. He is supported by a "division" of three environmental experts . The

Director of DEP reports to this Vice-Prime Minister. In terms of the government hierarchy, DEP is placed on the third tier, below the level of a line ministry, and "equal" to some institutions with specific activities, e.g. Department for Statistics, Department for Customs Control, etc.

Line ministries are involved in environmental management, to varying extents, depending on their mandates. Some ministries are more influential than others. The Ministry of Health is particularly important owing to the health implications of pollution. The continuing economic significance of agriculture gives the Ministry of Agriculture and Food considerable power and authority. Those ministries with a role in managing and utilizing renewable and non-renewable resources have a major effect on the quality and quantity of the resources and, ultimately, the wider environment. Their environmental responsibilities and powers, unlike those of DEP and local government units, are not contained in the 1993 Law on Environmental Protection. Nearly all ministries are involved in licensing and Government Decision 110 of 2February 1998 specifies the projects which are licensed by individual ministries. Proponents of new activities must obtain a series of approvals from different ministries, departments and agencies (ranging from the Ministry of Health to the Department for Emergency Situations) before submitting all of them to the licensing ministry. When all is satisfactory the "final" licence is issued.

A number of line ministries have small units (three-four people) with environmental responsibilities. DEP has written recently (December 1996) to ministries without such units urging them to create them in the near future. Most ministries have agreed. Some departments have environmental responsibilities and DEP is by far the most important. Due to its central role it is considered in detail below.

Local government units are arranged in a two-tier hierarchy. The first tier consists of the four main municipalities and district authorities. The second tier consists of towns and villages. The President appoints Executive Committees, which are responsible for ensuring good governance in the individual units/regions. They are responsible to the President and not to a specific ministry or Vice-Prime Minister, and are not elected locally. The Primars, who head municipalities or villages, are directly elected and work with councils of locally elected representatives.

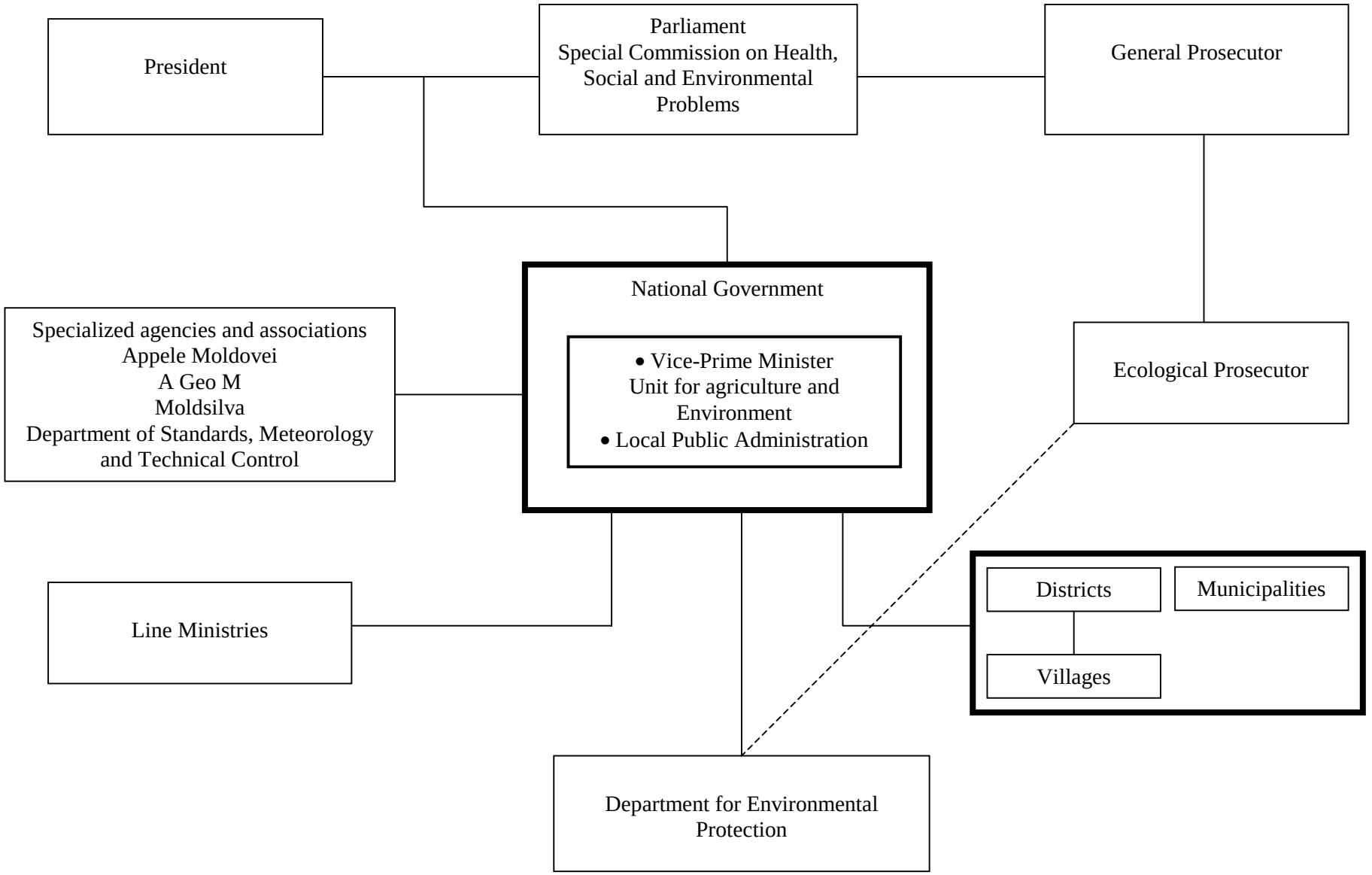
The role of local administration in environmental management is now clearly regulated (since the Law on Environmental Protection was modified in 1997) but it does not seem to be very decisive so far. However, in the future it will play an increasingly important role in this respect. The current policy of decentralization of decision-making has found expression in the Law on Environmental Protection, which includes a wide range of differing specific powers and responsibilities for the units in both tiers. Essentially, the higher level units of local government can coordinate the lower level entities and have some powers not available to the latter. For example, these units can approve, in collaboration with local offices of central government administration, the limits to natural resource use and discharges of pollutants within their jurisdiction. However, second tier units have powers not available to those at the higher level. For example, only lower level entities can take action to prevent the operation of installations which have not been authorized.

Department for Environmental Protection

This Department was created in 1990, but its current structure, functions and responsibilities date from 1993 with the enactment of the 1993 Law on Environmental Protection. Initially, it reported to Parliament, but now it reports to the Government. At the same time there were changes in its powers to initiate and draft laws and regulations and issue binding instructions/decisions. Also, the Moldsilva agency (the main forestry authority) was removed from the Department and made responsible to the Ministry of Agriculture and Food. In May 1997, the position of Moldsilva was changed again and it now reports directly to the Government.

The structure of DEP is shown in Figure 1.2. DEP was created by amalgamating existing institutions and entities with the addition of new units. Basically, there are a number of sections which constitute the central body of the Department and other entities which are more free-standing and, in some cases, are located in their own buildings, e.g. the National Institute of Ecology. The structure and main functions of the most important of the division/sections/agencies are summarized in Figure 1.1.

Figure 1.1: Institutional framework for environmental management in the Republic of Moldova



State Ecological Inspectorate

The Inspectorate was set up in 1990, with a small number of staff as part of the State Committee for Nature Protection (now abolished). The central office is located in Chisinau, with 12 local agencies in the main towns, including the office in Comrat (Gagauzia) following the political agreement. There are four technical sections in the Inspectorate: air/water; soils/groundwater/chemicals/waste; flora/fauna; and project expertise. Since 1993 it has been decentralizing, from 9 to 12 local offices, but staff numbers have remained constant. Each local office controls four or five districts. In each district there are three or four inspectors. In the central body of the Inspectorate there are 64 staff; approximately 50% are technical professionals. At the local levels there are approximately 420 staff of whom 220 are inspectors.

The Inspectorate maintains a hierarchy of laboratories. There are three main laboratories in Balti, Chisinau and Cahul and six smaller ones. The Chisinau laboratory is attested and it is expected that Balti will be attested soon. The others are not attested. The main function of the laboratories is to provide:

- monitoring data; and
- pollution control and information.

They assist the Inspectorate to determine the impact of pollutants on the environment directly and will to some extent continue to do so.

The State Ecological Inspectorate has within its structure the Inspectorate for Fish Protection. This Inspectorate is a separate, but subordinate entity. It maintains inspectors locally who have responsibilities for aspects of fishery control in the Dniester and Prut rivers. It controls the size of allowable catches, catching techniques and also selling procedures, and issues appropriate licences.

The State Ecological Inspectorate has a variety of functions. First, it plays a role in the assessment of proposed new development projects and modifications to those already in existence, particularly those designated as local projects (small-scale). Documentation on the project must be presented to the Inspectorate and it is considered by the project expertise section in the context of existing laws, regulations, normative instructions and standards. If there are no likely infringements and the documentation is accepted then the project may proceed to the next step in the licensing process.

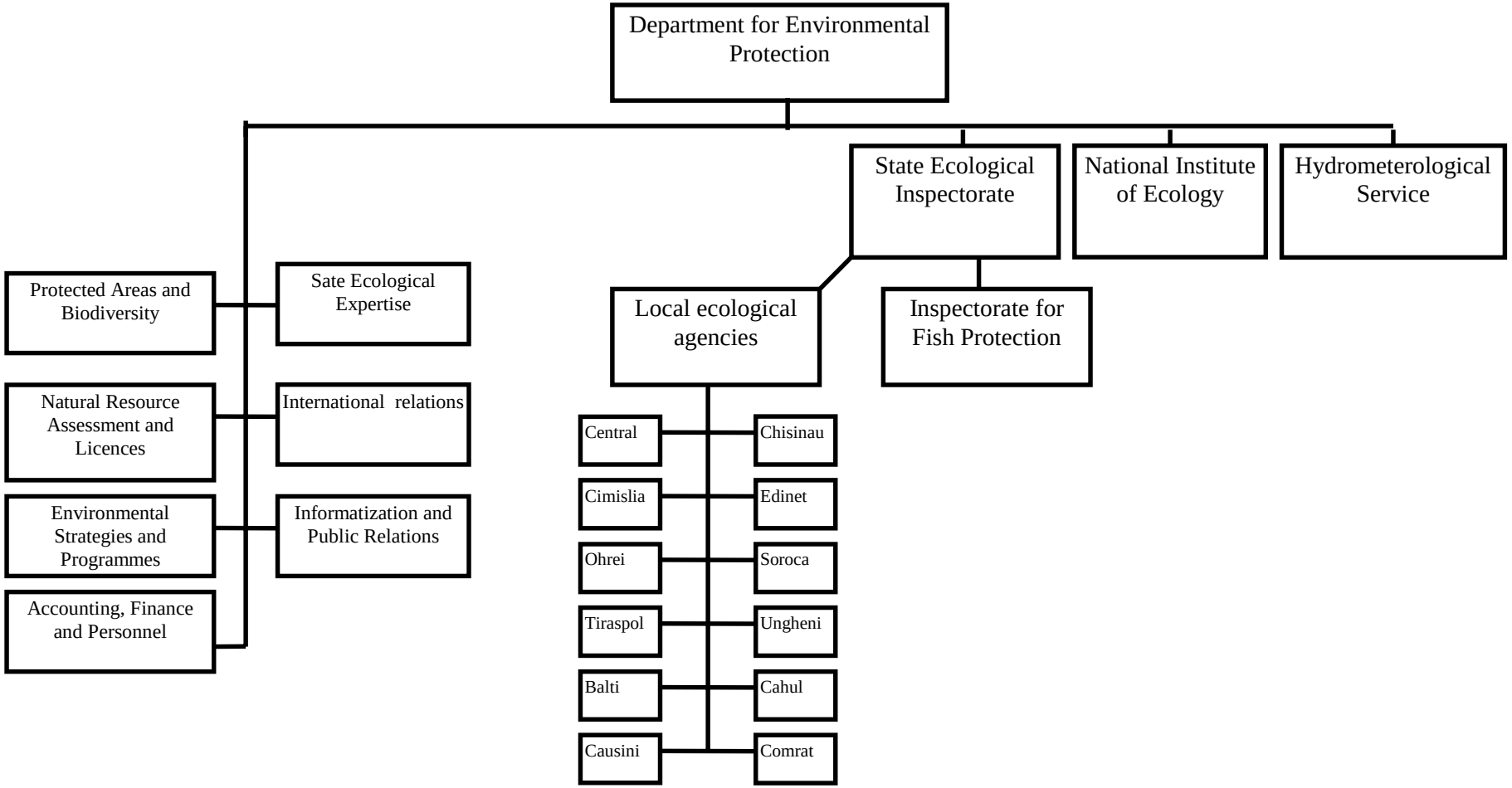
Second, the Inspectorate plays a key role in the control of existing development projects and transport. It is responsible for ensuring that all environmental control measures (within its remit) which apply to the transport of specified materials and the construction, operation and decommissioning or abandonment of a project are enforced. This duty does not cover all environmental control measures, e.g. noise and ionizing radiation are the responsibility of hygiene and epidemiology organizations. If the Inspectorate finds that there is non-compliance it can stop any activity. It also has powers to initiate legal proceedings, and may impose penalties and fees if the laws are not respected.

The Inspectorate is responsible for monitoring general environmental quality. This is shared with other organizations and to avoid duplication of effort some agreements have been signed, e.g. with Hidrometeo Service and the Centre for Hygiene and Epidemiology. It seems, however, that the main focus of the Inspectorate is analysis of pollutants in discharges and in the environment in the vicinity of polluting or potentially polluting activities.

The Inspectorate plays a fundamental role in controlling the development process and protecting the environment and human health from damage caused by pollution. Although its size increased in the early 1990s, it now faces serious difficulties in carrying out its mandate under the Law on Environmental Protection. Among the problems are:

- lack of transport for site visits (theoretically inspectors can use public transport free, but the Ministry of Transport requires payment which the Inspectorate cannot afford);
- lack of express analytical equipment;
- lack of money to buy uniforms causing the status of the inspectors to be undermined;
- laboratory equipment cannot be maintained or replaced and is declining in effectiveness;
- individuals and enterprises do not always pay the fines imposed;
- removal (in 1996) of the right of inspectors to examine cases of suspected violations and establish penalties. By a change in the Administrative Code, this right was transferred to

Figure 1.2: Structure of the Department for Environmental Protection



- specified courts. Almost 30%-40% of cases are now not resolved; and
- training needs.

The Inspectorate can raise funds directly from its border-crossing inspections of vehicle emissions. In essence, the Law on Environmental Protection extended the responsibilities of the Inspectorate, but there has been no matching budget to enable these tasks to be done effectively.

National Institute of Ecology

The Institute has its main office, with laboratories, in Chisinau. It has a devolved structure with laboratories in other localities. There are seven research areas, each with its own laboratory and experimental locations with monitoring equipment relevant to specific studies. The Institute employs 146 people. The laboratories (13 in all) vary in size, with the biggest employing between 10 and 20 people.

This Institute functions as a research organization and source of advice and information for DEP. It is funded directly from Government via DEP. Part of its work is for DEP; the remainder is for other branches of government and the public/private sector involved in development activities. It is affiliated to the Academy of Sciences and abides by its rules and protocols in terms of scientific practice.

One of the main functions of the Institute is to coordinate ecological research in Moldova.It provides consultancy advice to project proponents, and operators of existing facilities, by assisting in the ecological expertise and ecological passport procedures. Finally, it continues to be involved actively in providing technical assistance to international organizations such as the World Bank in devising national strategic programme and planning frameworks dealing with environment and development. Recently, it assisted to complete a report to the United Nations Environment Programme (UNEP) on '*Environmental Information Systems in Moldova'*.

Hydrometeorological Service (Hidrometeo)

Hidrometeo is basically a monitoring organization covering air, water and soil and weather forecasting. It has a large network of monitoring stations and laboratories, e.g. one hydrological station, 41 water quality stations and 5 main laboratories.

The main function of Hidrometeo is the analysis of air and water quality to assist in the formulation of any needed control measures. Air quality measurements are focused on the largest cities and complement the work of the State Ecological Inspectorate, which is oriented toward the discharges of waste gases, etc. to the air from enterprises.

Protected areas and biodiversity management

This section has five staff in Chisinau and some local staff with responsibilities for controlling legislation compliance in managing the protected areas and biodiversity protection. It has categorized protected areas according to the IUCN classification and issued regulations for each category. It has four main functions:

- identify and designate additional protected areas;
- prepare necessary legislation, policies and strategies;control implementation of laws;
- coordinate research work and international cooperation in this field.

Since 1993, due to the opposition of powerful vested interests anxious not to lose the opportunity to exploit the type of natural resources most likely to be protected in the near future and because of financial problems, it was difficult to define new protected areas in Moldova. The ability to manage the protected areas has declined significantly due to the adverse consequences of the transition. Additionally, there is little scope for this section to promote the interests of biodiversity outside the protected areas, making it difficult for Moldova to implement the *Convention on Biological Diversity* (see Chapter 6) effectively. However, in 1997, a draft concept regarding biodiversity conservation was prepared and in 1998, the preparation of a national biodiversity strategy and action plan will start, financed by the Global Environmental Facility (GEF).

Natural resource assessment and licensing

This section in DEP consists of five individuals. Apart from the Head and the Deputy Head, there is one specialist each for flora and fauna, water and soil.

This section has three main functions. First, it collects and analyses information on the *quality* (not quantity) of natural resources such as soils, water, forests and their inter-relationships. This information is collected from other organizations and, once analyzed, is transmitted to the Department for Statistics. Based on the analyses, the section makes proposals for the use of the resources, but mainly in terms of protection and/or restoration, not in terms of exploitation regimes. In this context it faces a major difficulty in that many agencies are involved in issuing licences for resource use and, therefore, in establishing utilization regimes. The section experiences difficulties in obtaining the data on quality which it requires - data on quantity aspects are not a problem.

Its second function is licensing. It issues a variety of licences covering:

- environmental audit procedure;
- the preparation of ecological passports and permits;use of medicinal plants;
- treatment and recycling of wastes;
- use of fauna (not hunting permits, as these are issued by Moldsilva);
- fishing and use of other aquatic animals; and
- systems developed for implementing specific activities and decision-making and the specialists who do the work.
- EIA studies

This licensing activity is important and two examples illustrate it. The section licenses the system by which discharge permits are issued and the organizations/individuals involved in the system of ecological expertise and evaluation of impact on the environment. Further, it will be involved in licensing organizations and individuals who will be active in the new ecological audit procedure.

Thirdly, the section continues to review the ecological passports (see section 1.4 below).

State ecological expertise

This section contains 13 staff; a head, a deputy Head, supported by 11 experts. Its function is to manage the system of ecological expertise and the evaluation of impact on the environment as contained in the 1996 Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment. The main features of the system are described in section 1.4 below.

Theoretically, all construction operations (new proposals or modifications) must be subject to this procedure. Local, small-scale projects are handled at the local level by a combination of inspectors from the local DEP offices. Larger projects and those with national significance are handled centrally, but with local input. No new project or modification to an existing facility can proceed until the expertise has been done and a positive decision reached.

The system is basically identical to that which existed before the 1996 law, except for the provision relating to an evaluation of impact on the environment (EIE) to be prepared before design work, and is similar to the system used in the former Soviet Union. Interestingly, draft laws, standards and proposed programmes and plans are subject to the procedures in addition to proposed 'physical' development projects.

Since the Law was passed in May 1996, only two evaluations of impact on the environment have been undertaken, while State ecological expertise has been implemented on 140 occasions in the period of May-December 1996, and 196 times over the first nine months of 1997. This latter figure compares with an approximate annual average of between 200-300 before the introduction of the Law.

Other departments/agencies

These organizations have a significant role because they have responsibilities for the control of natural resource use and for licensing. They are listed below with their main responsibilities:

- Ministry of Health (pollution control and human health);
- Apele Moldovei (surface waters);
- Association Geologia of Moldova (AGeoM) (mineral exploration /groundwater);
- Department of Standards, Metrology and Technical Control (exploitation of aggregates, minerals and other sub-surface resources);
- Department of forests (Moldsilva) (forests and hunting); and the
- National Agency of Geodesy, Cartography and Cadaster (NAGCC) (soil resources).

Some of these have strong links to sector ministries. Also, all carry out monitoring activities.

The Law on Natural Resources (adopted by Parliament on 7 February 1997) includes a number of measures to rationalize resource use and a 'general

statement' that a ministry of natural resources should be created to formulate coordinated policies for sustainable resource use and to provide an integrated control over the activities of these organizations. They would be responsible for operational implementation only.

Finally, there is the Ecological Procurator with responsibility for prosecution of suspected violations of environmental laws.

1.4 Ecological expertise/environmental impact assessment and environmental audits

In 1996, the Law on Ecological Expert Evaluation (EEE) and the Evaluation of Impact on the Environment (EIE) was passed. This Law attempts to integrate the existing system of ecological expertise with the more "western" model of environmental impact assessment (termed in the law "evaluation of impact on the environment") and produces two procedures depending on the nature of the proposed project. The Law contains two categories of projects. If a proposed project is listed in the Law, then the appropriate procedure begins. The list enumerates major projects likely to pose a significant threat to the environment (complex economic activities) and any proposed project of this type would be subject to an EIE. Other projects which are not in the list (scheduled economic activities) would be subject to an EEE. Figures 1.3 to 1.5 present a flow diagram showing the different stages in the procedures and how they link together.

There are three main types of EEE: State EEE, department EEE and public EEE. State EEE is subdivided into:

- local EEE done by the local units of the State Ecological Inspectorate. Local EEE is implemented for projects classed as being of only local importance; and
- EEE done by the State Ecological Expertise division (for big projects according to the Regulation on Ecological Expertise, 1995) Departmental EEE is done by ministries and departments, at their discretion, for their own projects only.

There is also public EEE, which can be undertaken by registered local associations. These can be NGOs or groups of local people who form an association to implement a public EEE. Public EEEs can be carried out at any time prior to the implementation of any State EEE, but the results are advisory until they have been accepted by the State Ecological Expertise division.

The documentation on a project subject to State EEE is prepared by a range of organizations all of which must be licensed. For example, in the case of roads it is prepared by one of the Design Institutes and the Institute will prepare the environmental documentation. This documentation can be part of the entire project dossier or it may be separate. Organizations preparing the documentation must follow the technical requirements, regarding methods to be used and the information to be presented, contained in both the GOST standard (1985) and the Normative Instructions issued by the State Ecological Expertise section in 1995. Once the documentation has passed the appropriate type of State EEE, a project may proceed through the licensing process. Documentation may be returned for amendment if this is considered to be necessary. No project may proceed unless the State EEE has been undertaken and the documentation approved.

If an EIE is required, the work has to be implemented by registered practitioners. During EIE work there must be consultation with local government units and a public debate before the EIE results are summarized in a statement on the impact of the environment (SIE). The SIE is the focus of additional consultations with local government and is sent to relevant ministries/agencies for comment. At this stage a public EEE can occur. A copy of the SIE is sent to DEP for State EEE. The results of the consultations on the SIE are sent to the proponent, who can revise the SIE if he considers it to be necessary. The revised SIE is then presented to DEP for State EEE.

Annually approximately 240-290 State EEEs are implemented. To date, two EIEs have been implemented (namely on the Gurgulesti oil terminal and Redeco Oil Company projects). Local EEEs vary in number depending on locality. On average, local offices of the State Ecological Inspectorate undertake between 3-10 EEEs annually with the exception of Balti, where around 40 may occur because of its importance as a centre of economic activities. No Public EEE has been undertaken at this level. A Public EEE was expected to be

Figure 1.3: System of Ecological Expert Evaluation/Environmental Input Evaluation

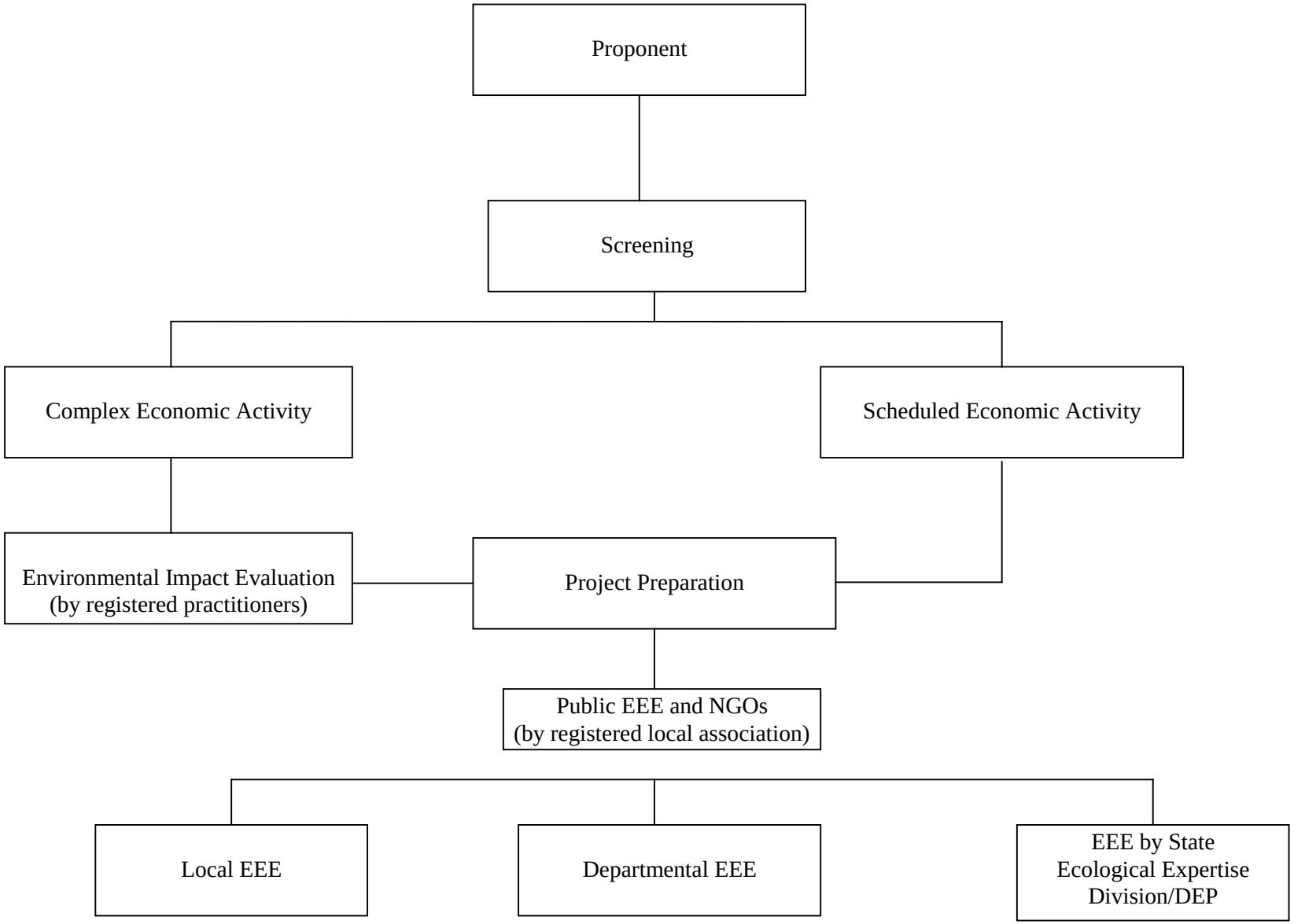


Figure 1.4: Flow diagram of EEE procedure

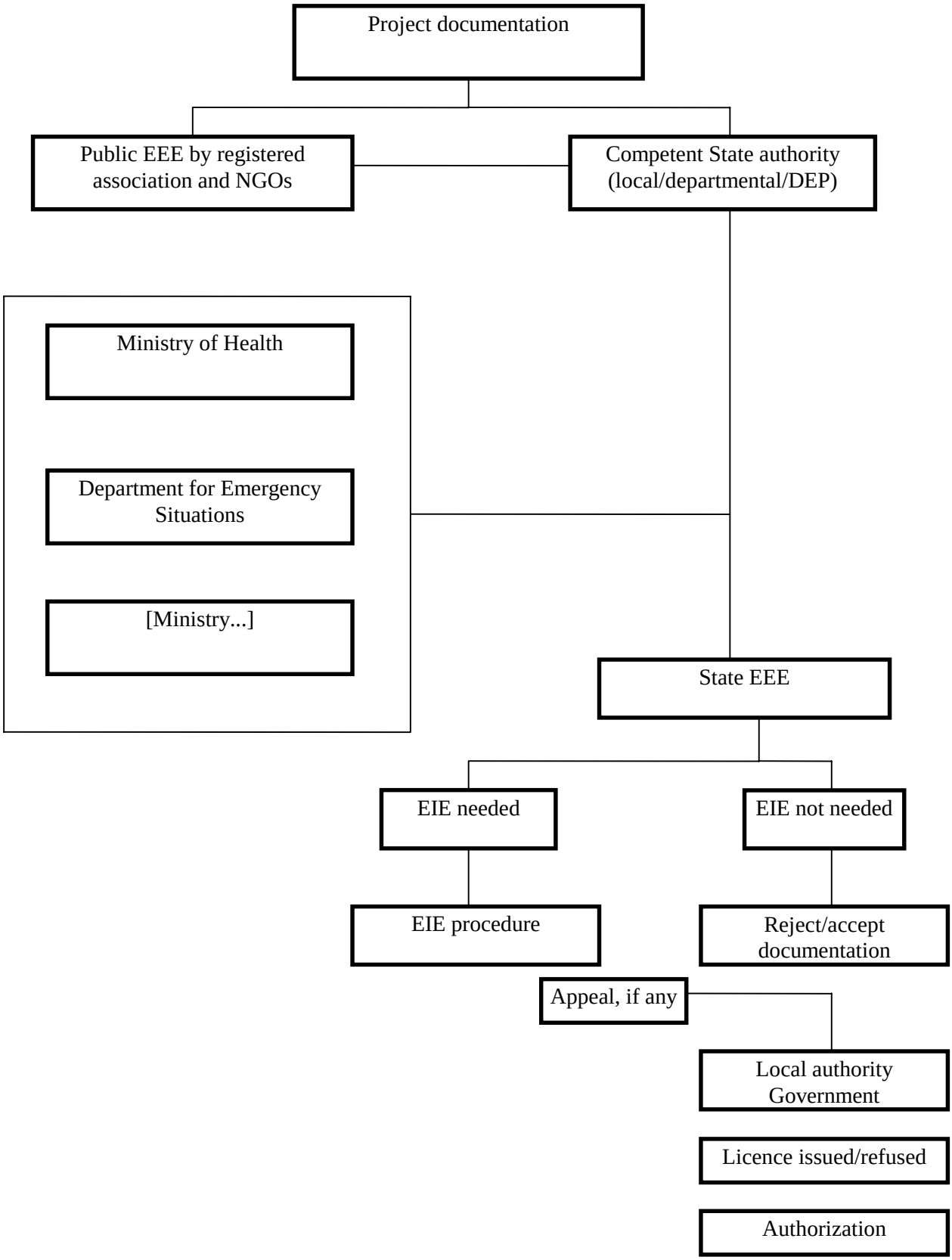
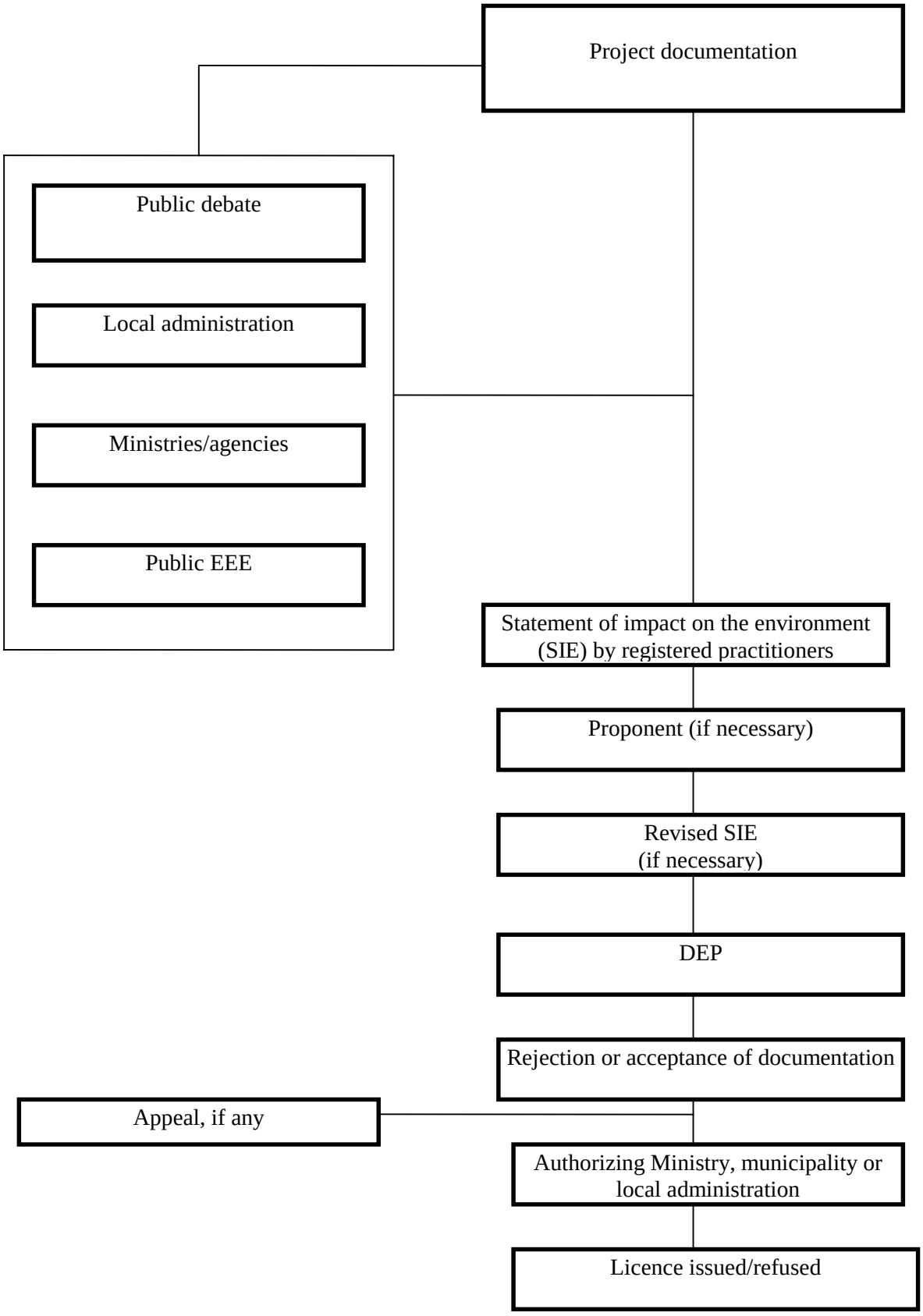


Figure 1.5: Flow diagram of EIE procedure



implemented only for the controversial proposed Giurgulesti oil terminal.

There are contrasting views on the effectiveness of the EEE/EIE procedures in terms of numbers of proposed projects subject to EEE/EIE. The State Ecological Expertise section considers that very few projects are not included in the system. However, the NGO community is of the opinion that the coverage is significantly less. For example, it was considered that approximately 10% of projects in Chisinau were not subject to EEE/EIE. A recent notorious case involved a proposed fast food restaurant in Chisinau. It transpired that local officials had been somewhat lax in ensuring that this proposal proceeded through the relevant licensing process. The public outcry resulted in the Government deciding to take action against certain officials.

Environmental control of existing economic objects is in a period of transition. At present, ecological passports are prepared annually for operators of existing facilities (see the functions of the National Resource Assessment and Licensing Division described above). These passports contain a section with proposals for improving environmental performance and, once accepted, are used as a basis for control by local governments and local ecological agencies. These passports will be replaced in the near future by ecological audits. Audits will be more comprehensive in their coverage of topics than the passports. A list of enterprises to be subject to audits will be prepared. Audits will be required also for enterprises subject to public complaint. Regulations governing this procedure have been approved recently (March 1998) by the Government.

1.5 Public involvement and access to information

The Constitution (Article 37, para. 4) gives a general right of access to government information. The 1993 Law on Environmental Protection places a general duty on local government bodies and local offices of central government authorities to provide information to the population, organizations and institutions about the state of the environment within their jurisdiction. Also, these bodies must help to educate and inform citizens concerning environmental protection and natural resource use issues. DEP is required to promote environmental knowledge and provide information to the public, e.g. through the preparation and dissemination of annual "State of the Environment" reports. These reports have become available since 1995.

At present, a proposed law on access to environmental information is before Parliament. This proposed law was drafted by a Member of Parliament and requires all government ministries, departments and agencies to allow public access to certain categories of environmental information. A number of ministries, etc. object to the draft law applying beyond DEP, to their activities, and do not support it. There are two categories of "accessible" and "special" information; the latter includes information on land use and the production and consumption of energy. Some commentators argue that including this type of information in a "special" category is unnecessarily restrictive. There is a presumption, in the draft law, that the State retains considerable discretion in deciding which information could be released, rather than the opposite presumption, which characterizes many other democracies, that all data are available unless the State can demonstrate good cause why the data cannot be released.

Many NGOs have signed the memoranda of agreements with DEP regarding the provision of environmental data and cooperation for solving environmental problems. There is no regular and systematic provision of environmental information to the public beyond that made available in the annual reports of the Statistical Department and in the annual State of the Environment reports. Access to data from other departments and ministries is very limited.

NGOs become involved in environmental decision-making, but often because of the skills of individual members and not because of their organizational status or collective knowledge and expertise. Virtually all NGOs are staffed by volunteers; often these are individuals who are working in research or academic organizations and they are asked to help prepare environmental policy and other advisory or strategic documents for the Government. To some extent NGOs are involved by "default" rather than through a recognition that they are a partner in the decision-making process.

There are a variety of environmental NGOs in Moldova, which like all NGOs have to be registered with the Ministry of Justice. Most are members of two umbrella groups; the Environmental Movement of Moldova and the Green Alliance. The

Environmental Movement of Moldova is the only nation-wide level organization with branches throughout Moldova. Many NGOs focus on single issues and have memberships ranging between 3 and 50 individuals. The economic difficulties of transition have hindered the effectiveness of NGOs as membership numbers have declined drastically. For example, in 1990 the Environmental Movement of Moldova had 70 000 members; it now has 10 000. Additionally, economic constraints hinder communications between Chisinau and the regions and, also, the formation and effective use of international links. Only two NGOs are members of the World Conservation Union (IUCN).

The Law on Ecological Expert Evaluation and the evaluation of impact on the environment enables the public and NGOs to be involved in the assessment procedures established by the Law. To undertake a public ecological expertise, members of the public have to form an association which has to meet certain criteria before it can be registered with a local government entity. NGOs can constitute such an association, however they find it difficult to interpret the specific procedural ground rules. Individual citizens seem to be restricted to sending written objections and comments, concerning a proposed project to the State ecological expertise authorities. There is a provision that one of the principles of the EEE system involves due consideration of public opinion in the decision-making process, but this is done at the discretion of the relevant competent authority(ies).

The procedures controlling the application of the EIE system requires members of the public and organizations such as NGOs to be consulted on SIEs and specify appropriate time periods. Again, however, the role of individuals appears to be restricted to the right to submit comments and objections regarding a proposed project (in this case to a person nominated by the local public administration). The public ecological expertise of an SIE can be undertaken only by associations of citizens (at least 100 individuals), whose details must be provided to a local public administration body. There is one significant difference between the EIE and the EEE systems. In the former case, the public is allowed free access to the relevant documents and public debates can occur. The results of the debates must be given, by the local public administration body, to the proponent. Therefore, there appears to be more scope for public involvement in the EIE system.

The Law on Ecological Expert Evaluation and the evaluation of impact on the environment is the main mechanism whereby the public can have an input to environmental decision-making. The procedures are, however, restrictive and are unlikely to result in an open, transparent process in which different interests can be involved and make an effective contribution. The section of the Law dealing with EIE, although modelled on United States/western European legislation, does not incorporate "typical" public involvement procedures from these countries.

The status and extent of public involvement in environmental decision-making and access to information are slowly undergoing transition. At present, however, they reflect the arrangements which characterized the situation in the former Soviet Union rather than the more "open" procedures that prevail in most European countries. Nevertheless, changes are occurring, which will be both consolidated and advanced if the draft law on access to environmental information becomes law. If the current momentum continues, eventually there is likely to be convergence between Moldova and other European countries. Significantly, Moldova is a participant in inter-governmental discussions on the draft UNECE convention on access to environmental information and public participation in environmental decision-making.

1.6 Conclusions and recommendations

Regarding environmental policies and objectives, action should be taken to produce a strategic environmental (or sustainable development) plan for Moldova. The NEAP is not able to fulfil this role because it is too focused on identifying specific priority issues. It is insufficiently strategic in its analysis, coverage of issues and in the range and type of its recommendations. The National Strategic Action Programme for Environmental Protection (1995) is rather theoretical and academic in its analysis and approach. Practical implementation of its recommendations will prove difficult. Therefore, there is a need to produce a new programme and plan which can meet the policy needs of the economic transition phase and establish a secure foundation for the post-transition period.

Recommendation 1.1:
The National Strategic Environmental Plan should be entirely overhauled in order to provide an integrated programme of linked and phased activities

which can easily be put into operation by ministries and departments in their respective sectors. Specific targeted policies should be meshed with current sectoral actions.

The legal framework for environmental management is generally in place, but does not operate effectively enough. The structure and content of the laws, the overlaps and contradictions between laws and the poor coordination during the legislative process mean that consistent implementation is difficult. The policy framework suffers from similar weaknesses particularly due to the number of policy documents, from the pre- and post-independence periods, which appear to be still current and being implemented, to varying extents, by different government organizations.

Consequently, there is a need for a "moratorium" (not interrupting, of course, ongoing legislative activities, and in particular the laws which have been prepared but are still waiting for adoption- see box on legal framework above) accompanied by a detailed consideration of those currently in force. A major review should be undertaken to identify conflicts and contradictions and then to propose amendments to remove them. At the same time, and as a part of this review, there needs to be a capacity-building programme on drafting principles, and on implementing and enforcing environmental laws. During this period it will be possible to identify any gaps in the legislation and to deal with them in the amendment work, to the extent possible.

Recommendation 1.2:
Lawmakers should focus on reviewing existing environmental laws to identify overlap, contradictions and gaps amongst them all; amendments should be proposed accordingly.

Within the context of the transition and its problems, the institutional framework for environmental management is weak. The main State body (DEP) responsible for environmental management is a recent creation and does not have the status of a ministry. Its position, and role, in the governmental hierarchy have been subject to destabilizing change. Also, changes in its composition (e.g. the removal of Moldsilva) have tended to reduce its authority and influence further. It can be stated that, in recent years, DEP has been subject to changes which have reduced, significantly, its ability to manage environmental aspects of agriculture, natural resources, forestry, rural land uses and other issues.

Another institutional difficulty is the current linking of natural resource exploitation and control in autonomous bodies such as Apele Moldovei and Moldsilva. In a time of economic hardship, it is not surprising that there is an emphasis on exploitation to the detriment of nature revitalization. In addition, there is little coordination between these organizations. The cumulative effect of the relative independence of these agencies, the nature of the links between DEP and the Ministry of Agriculture in the Government (at Vice-Prime Ministerial level) and the loss of influence on the part of DEP has been to exacerbate an already serious set of environmental problems relating to agricultural practices, land use, forestry and water usage (see Chapters 5, 6 and 8).

Therefore, it is imperative that DEP ceases to be a department and becomes a ministry. This will help enhance its status, even if additional action is needed. One of the main functions of the proposed ministry of the environment should be to coordinate activities undertaken by all central and local branches of government to implement national environmental policies. In addition, the Ministry should be responsible for activities such as: control and enforcement (discharge and ambient standards); integration of monitoring systems and evaluation of data; preparation of national "State of the Environment" Reports; identification and management of protected areas; the EEE/EIE system; initiation and management of cross-sectoral rehabilitation initiatives; and environmental training.

Recommendation 1.3:
The DEP should be raised to the level of ministry as a result of the necessary restructuring and integration of governmental decision-making and management in the areas of environment, use of natural resources and, possibly, physical planning.

When the Law on Environmental Protection was being drafted, a council for environmental quality was proposed. However, this provision was omitted at a later stage before the Law was passed by Parliament. The current government policy of incorporating environmental issues into all sectoral activities would require an extra institutional component to supplement any new ministry of the environment. Such a body should consist of ministers (including those with responsibilities for economic affairs, environment, agriculture, water and landuse) with representatives from academia, the private sector and NGOs. It should be chaired by the

Prime Minister or a senior Vice-Prime Minister and placed in a position which gives it the maximum potential to effectively influence the behaviour of sectoral ministries and agencies such as Apele Moldovei. It may report directly to the President, or perhaps, Parliament.

To be effective it is imperative that the council is not seen as being a creation of, or an adjunct to, DEP (or even a possible future ministry of the environment). On the contrary, the authority of the council will support the ministry in its task to develop strong and effective coordination, and thus contribute to a more efficient implementation of environmental policies. In this context, the ministry would act to assist and support the work of the government bodies; it would not be directing or controlling. In this way, a cooperative, rather than a potentially adversarial, relationship may emerge.

Recommendation 1.4:
A national steering committee for sustainable development should be created with broad governmental and non-governmental participation. This committee should also ensure effective coordination and implementation of environmental policies across the sectors.

There are a number of other institutional problems. The sectoral ministries, in general, have a poor understanding of environmental issues and are unable to implement environmental policies. There is a lack of consultation, coordination and information exchange between governmental organizations. This enables environmental problems which are easily preventable to occur and hinders any kind of coordinated response to rectify them. Finally, the system of local government is in a state of flux. This is a serious difficulty at a time when increasing environmental responsibilities are being devolved to them. A severe environmental capacity constraint will remain, at local level, even when the local government system is stabilized.

Recommendation 1.5:
The responsibilities of local authorities regarding environmental management should be reviewed, clarified and strengthened and the necessary resources allocated accordingly.

It is essential that the sectoral ministries, particularly those responsible for natural resource use, internalize environmental dimensions in their activities. Work to achieve this objective is under way with the letter from DEP urging each ministry to create an environmental unit, but more needs to be done. This will require both the creation of an enabling political and administrative context and specific capacity-building activities.

It is important that measures are taken to deal with the fundamental environmental issues which are embedded in the nexus of agriculture, forestry, water and environmental quality. These are closely interlinked in Moldova and considerable institutional change may be required to ensure more effective and sensitive stewardship in the future. If the council is created, this issue should be a top priority for immediate consideration.

Recommendation 1.6:
Environmental policies should be formulated, with authoritative support, at the highest government level to direct and coordinate the activities of the ministries, departments and agencies involved in agriculture, forestry, water and land use.

The need for environmental capacity building is recognized as a priority in the NEAP. Unfortunately, no funding is available to enable it to occur. It is recommended that the Government should reinforce its efforts to obtain external financial assistance for this purpose. Capacity building must focus on ministries, departments and agencies whose sectoral activities have most impact on the environment. Additionally, given the devolution of many environmental responsibilities to local governments, considerable efforts will be needed to assist them. Finally, the environmental NGO community requires assistance to enable it to play a more constructive role in environmental activities and decision-making. In this context, it is recommended that any environmental capacity building should include those public associations which are likely to be involved in public ecological expertise activities.

Recommendation 1.7:
Capacity-building activities should be implemented in the "non-environmental" agencies to sensitize senior decision makers to environmental concerns and to train operational staff in appropriate environmental issues, approaches and techniques. Financial assistance for environmental capacity building should benefit not only bodies involved in environmental issues at the national level, but also local governments and the environmental NGO community.

Action is required to improve public access to environmental information and to increase public input to environmental decision-making. Efforts should be made to redraft the law on access to environmental information so that, at a minimum, it is compatible with the provisions of the European Union legislation on this issue. The Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment should be revised to produce a single set of public involvement procedures. The reliance on registered public associations should be removed to make the process more open and transparent. The procedures used when EIEs are being implemented should be consolidated and expanded so that they strengthen both the EEE and EIE systems.

Recommendation 1.8:
Revised procedures of public involvement should include:

- *Announcing the commencement of EEE/EIE processes in the local press;*
- *Inviting individuals, organizations and communities to submit written comments and participate in public meetings relating to (i) identifying the issues to be considered in the EEE/EIE investigations; (ii) the contents of EEE/EIE reports;*
- *Requiring all EEE/EIE reports to have non-technical summaries;*
- *Placing copies of reports in local libraries; and*
- *Specifying rules governing the conduct of public meetings and the methods by which the results are conveyed to the proponent and other decision makers and how they will be used in decision-making.*

From the methodological point of view there is not much difference between environmental Impact Assessment (EIA) and EIE. However, as far as the practical management of EIE is concerned, environmental impact assessment in terms of documentation does not always follow the integrated approach. Local levels are almost excluded from examinations and public participation, as pointed out above, has been missing. Finally, the decision-making process is still too bureaucratic and does not rely sufficiently on advice from specially established commissions with public participation.

Recommendation 1.9:
The instrument of environmental impact assessment should be more systematically used at all levels of government: national, regional and local. The official attitude to public participation in EIA projects should take into account the high value of such participation, as demonstrated in all European countries.

Improved future environmental management requires the collection, synthesis and evaluation of key environmental data at both national and local levels. It is clear that an integrated environmental monitoring network needs to be established with the appropriate hardware and maintenance capability. Equally importantly, an institutional structure to manage and act upon the monitoring data should be designed. It is advisable, given the current financial and institutional situation, that a reformed institutional and managerial framework should be established, with appropriate financial support, before significant hardware investments are made.

Chapter 2

INTEGRATION OF ENVIRONMENTAL AND ECONOMIC DECISIONS

2.1 Economic instruments

The following economic instruments are in place in Moldova to integrate environmental aspects in economic decisions:

- *Taxes on the use of natural resources* (soil, water, minerals, flora, fauna)
- *Charges for environmental pollution and related services* (discharge of polluting substances above the allowable limits and dumping waste)
- *Fees to compensate for damage* to the environment
- *Excise duties* on imported cars and fuels
- *Subsidies*
- *Incentives* to promote the rational use of natural resources, apply cleaner technologies, reduce waste, close water circuits, etc.

In addition some administrative penalties such as fines for the violation of environmental legislation (standards) also have an economic character.

The Law on Environmental Protection (1993) and the Law on Natural Resources (1997) prescribe taxes on the use of soil, water, mineral resources and forests. Compensation as well as penalties are due in cases of environmental damage and violation of environmental legislation. The collected funds have to be spent exclusively on environmental needs.

The Law on Natural Resources (1997) prescribes licensing, concession and rent agreements, and a mechanism for the effective management of natural resources. This mechanism is based on the following provisions from the 1997 law, as well as other instruments: (1) the user of the resources should pay for their use; (2) the limits on resource use should be based on a rational use forecast; (3) corporate accounting should record the costs of using natural resources and the environment; (4) the pricing should apply full costs rather than only operational costs; (5) incentives should be provided to companies that invest in cleaner and raw material saving technologies and to banks and investment funds if they finance such investments; (6) a commercial ecological bank should be established; (7) the use of mineral resources that contain environmentally dangerous components should be limited.

The taxes on resource use within the allowed limits are included in production costs. Charges due when using more are not included in production costs, but reduce profits directly. The tax on natural resources should cover the cost of exploration, research, restoration, transport and sustainable use. The State Budget sets the annual tax rates for each natural resource. The adopted 1998 State budget reflects all the provisions of the law.

The law envisages public participation in decision-making concerning natural resources use, but no specific schemes for such participation exist. International agreements prevail if there is a conflict with national legislation.

Taxes on natural resources

The Law on Land Tax and Its Application (1992) regulates the *tax on the use of land*. Till 1995, the tax applied only to land used for agricultural purposes. It took both the quantity and the quality of the land into account. Each year, the State budget sets the applicable tax rates. Table 2.1 shows the downward trend of the tax rates for agricultural land.

The tax was cut for several reasons. First of all, contribution to the State Budget is small (Table 2.2). Only 58 per cent of taxes due were actually collected in 1996 (115.8 million lei compared to the 200 million originally forecast). Since 1996, the tax has gone entirely to local budgets (it makes up35-40% of local revenue). Secondly, there was a political determination to relieve the peasants' tax burden. Thirdly, agriculture being the main sector

Table 2.1: Tax rates for land use, 1995-1998

	1995	1996	1997	1998
Graded hectare *(Lei per ha)*	2.17	1.53	1.00 [1]	1.00
No soil assessment *(Lei per ha)*	154.20	110.00	75.00 [2]	75.00
In the area of settlements *(Lei per 100 m [2])*				
Urban area				
Chisinau, Belts, Bender and Tiraspol	100.00	10.00	10.00	10.00
Kachul, Dubosar, Orchei, Rybnitsa, Soroka, Ungen	-	4.00	4.00	4.00
Other urban areas	4.00	2.00	2.00	2.00
Rural areas	1.00	1.00	1.00	1.00
In the municipalities and industrial complexes *(Lei per 100 m [2])*				
Urban areas				
Chisinau, Belts, Bender and Tiraspol	30.00	30.00	30.00	30.00
Other urban areas	10.00	10.00	10.00	10.00
Rural areas	10.00	10.00	-	10.00

Source: The Law on the 1998 State Budget
Annex 11, the Law on 1997 State Budget.
Annex 7, the Law on 1996 State Budget.
Annex 5, the Law on 1995 State Budget.
[1] For grazing land: 0.65 Lei per hectare.
[2] For grazing land: 50 Lei per hectare.

of the economy, support was particularly needed in the period of structural change and ownership transfer.

The tax on industrial land was introduced in 1995. The Concept of the National Tax Reform calls for a revision of the tax on land, and proposes to merge taxes on land and real estate. Today, industry, transport, and communication enterprises pay 70 Lei for each ha outside built-up areas. However, if there are also buildings or other manufacturing constructions or quarries on the plot, the rate jumps to 350 Lei per ha.

The tax on the *use of water* depends on the purpose of the use and, in certain cases, on the type of water source. The general rate is set annually in the State budget. The 1998 State Budget Law prescribes 1.80 Lei per 10 m^3 of water supplied.

Table 2.2: Revenues from the land use tax, 1995-1997

	1995	1996	1997 [1]
Total revenue *(million Lei)*	91.7	115.8	115.0
to State budget	10.6	0.0	0.0
to local budgets	81.1	115.8	115.0
Share of total budget revenues *(%)*	4.8	5.6	4.4

Source: Ministry of Finance.
[1] Data refer to the approved 1997 budget.

The rate is only half that if the water is used for irrigation and fisheries (excluding the fishery 'Prut', which benefits from a tax holiday) and within established limits. 'Apele Moldovei' has the exclusive right to establish water use limits. If they are exceeded, the payment due is multiplied by ten according to the 1997 provisions - it was multiplied by three before. The 'fine' for exceeding the limits reduces profits directly, but does not enter into the production costs. If a farmer is connected to the 'Apele Moldovei' irrigation network, he has to sign a water supply contract with the enterprise and pays to it half the general rate (0.90 Lei per 10 m^3 of water supplied). If he is not connected to the Apele Moldovei irrigation network, he pays the same charge to the local budget.

Cooling water for electricity generation is taxed at 30% of the general rate. The full general rate is applied, if water use exceeds the set limit. The same rule applies to fishery or irrigation facilities. The 1997 and 1998 budget laws introduced a new charge for hydropower stations (0.05 Lei per 10 m^3 of surface water used). When water is used for curative purposes or mineral water, the rate is 10% of the sales price (excluding VAT). That is the only provision that has not been changed since 1995. The rates for municipal centralized water supply are based on the water treatment and distribution costs.

These rates are paid mainly by households and collected by local authorities. Households pay 25 Lei per 10 m^3.

Taxes on the *use of mineral resources* are applied to the construction industry and the use of quarries. When local authorities issue licences authorizing the exploration of mineral resources, the costs involved are calculated. The tax theoretically includes a fee for geological research, assessment and exploration of mineral resources. However, the Law on the State Budget has so far not taken this into account. The taxes on the use of mineral resources (Table 2.3) accrued to local budgets in 1996-1997.

Table 2.3: Revenues from the natural resources tax, 1995-1996

	1995	1996
Total revenue *(million Lei)*	6.6	14.0
to State budget	0.1	0.0
to local budgets	6.5	14.0
Share of total budget revenues *(%)*	0.3	0.7

Source: Ministry of Finance.

Government Decision 532 (10 August 1992) and the Law on the State Budget (1998) set the tax rates for *using timber*. Payments are calculated for standing wood and depend on its location, the wood species, and cutting costs. The lowest rates are for softwood, the highest for hardwood species. The funds are shared equally between the municipalities and the forest authorities. The tax accounts for less than 2.5% of the wholesale price of timber (expert estimate).

Some licences like those for *harvesting* mushrooms and berries, hunting wild animals, cutting plants and timber are granted by the forest authorities. Payments are collected when issuing hunting and fishing licences. Provisional taxes were approved by the Department of Forestry (Moldsilva).

Pollution and service charges

In early 1990, the Council of Ministers decided to introduce pollution charges in 1991, the methodological and administrative instructions of which became available towards the end of 1991. The methodology was based on that of the former Soviet Union. The charges applied to enterprises, organizations and industrial conglomerates polluting the environment, for which the polluter-pays principle was introduced. Secondly, the collected charges were earmarked to finance environmental projects. Different charges were levied for pollution within allowable limits (AP) and for pollution exceeding them (AAP). The instruction was due to expire on 1 January 1994, but charges remained in force even after that date. The charges were to be paid out of profits.

The actual charges for air emissions from stationary sources were calculated locally. The methodological instruction included tables with rates per pollutant (and city/region), which were applicable to emissions up to the AP. Emissions exceeding this 'allowable pollution' were charged at five times that rate. Local authorities were permitted to adapt the standard methodology to local needs - a possibility that was seized only by the City of Chisinau, which raised the standards considerably.

Charges for air emissions from mobile sources were based on the degree of hazard of the fuels used. For private households, it was added to the price of petrol bought. For enterprises fuelling at special stations, it depended on their location, the fuel used (petrol, diesel or natural gas), the vehicle fleet, types of vehicles, and their use. Each enterprise kept a special record of its vehicles and their use, as well as for ecological monitoring surveys showing exhaust concentrations. The special vehicle surveys were conducted by representatives of regional offices of the Department of the Environment, the Ministry of Internal Affairs, and local authorities (like Chisinau Primaria), in order to verify whether vehicles kept to AP limits (see Chapter 10).

The payments for water discharges were designed similarly to the air emission charges. Standard charges were set in each region. They were applied to water discharges up to the AP limit, while excess discharges were ten times the standard rate. Enterprises are exempted in the year of investment in water treatment facilities. Revenues from enterprises connected to the public sewerage system for discharges below the AP limit went to the communal water utility (sewerage company). If an enterprise had its own treatment facilities, such charges went to the regional environmental fund. For AAP discharges, 30 per cent of the fees were credited to the regional environmental funds and 70 per cent to the sewerage company.

The fees for the disposal of solid wastes depended on the type of waste and the location of the disposal site. As with other discharges, a limiting value for disposable quantities of wastes was determined,

taking into account the costs of incineration or detoxification, and the capacity of landfills. For example, the Chisinau city authorities allowed only biodegradable waste to be disposed on its landfills. The actual fee was calculated so as to create an incentive for industrial enterprises to adopt cleaner and more energy-efficient technologies, encouraging the reuse and processing of the waste at its place of generation. The actual charges were listed in the methodological instructions for each type of waste.

Events during the early 90s impeded the full implementation of the scheme of environmental charges. The legal basis for the charges was in question after independence was proclaimed. In addition, inflation reduced their economic impact on the polluters, as the following Table demonstrates.

Penalties and compensation for damage

Article 91 of the Law on Environmental Protection obliges polluters to compensate for, or repair, damage caused to the environment in the manner and to the extent set by the legislation in force. The system of compensation for damage caused to different ecosystems will be based on the new Regulation on the Compensation for Environmental Damage which is expected to be approved in the first half of 1998.

The Parliament indexed charges to inflation in May 1993. Fines differentiate between individual and enterprise violators. An individual is fined 1 to 10 times the minimum wage (18 Lei/month) depending on the damage to the environment. Enterprises are fined 25 times the minimum wage. Local authorities can establish their own penalties for damage caused. This scheme is still in place. In general, penalties amount to 25 to 75 times the minimum wage.

A damage fee is imposed on international transport when entering or transiting the country. The fee depends on three factors: vehicle engine capacity, distance to destination, and type of fuel used. The territorial ecological inspectorates collect the charge at the frontier. Together with customs officials they measure each vehicle's pollution levels. The fee is 20 Lei if the pollution is within AP limits and up to 45 Lei if limits are exceeded. This levy accrues to the Road Fund. Aproposal to consider this fee as an eco-tax and therefore pay it into the National Environmental Fund, was introduced in the new Law, approved by the Government in 1997 and adopted by the Parliament in 1998.

Excise duties

Excise duties on fuel were introduced in 1996. The State Budget sets the rate per tonne of imported fuel. In 1996, it stood at 270 Lei per tonne of leaded petrol and 100 Lei per tonne of diesel. A part of the revenues (34.5%) accrued to the Road Fund and the remainder to the budget. In 1997, the excise duty was raised to 600 Lei per tonne of leaded petrol and 200 Lei per tonne of diesel. Fuel imports arrive from neighbouring countries. Unleaded petrol is relatively expensive. Since 1997, the obligatory excise duty on imported cars depends on the vehicle's age (for more details see Chapter 10). Previously, it was based on engine

Table 2.4: Adaptation of environmental charges to inflation, 1991-1995
(index for base year 1991 in roubles, and 1993 in lei)

	1991	**1992**	**1993**	**1994**	**1995**
Currency applied	*Rb*	*Rb*	*Lei **	*Lei*	*Lei*
Air pollution (stationary sources)		11		1,000	5,000
(mobile sources)		..		300	1,500
Waste water discharge (surface waters)		13		300	1,500
(sewerage system)		20		10,000	50,000
Municipal waste		11		300	1,500
Annual inflation rate *(% over previous year)*	98.0	1,276.5	1,751.0	486.4	29.9
GDP *(1990=100)*	82.5	58.6	57.9	39.8	38.6

Source: Department for Statistics, DEP.
Note: The methodology has changed. Since 1993, new AP limits have been established based on the emissions from a vehicle, multiplied by the number of cars. The calculation base remained unchanged in 1994-1995.
* Conversion from roubles to lei are done on the basis of 100 roubles per lei.

power and the age of the vehicle. The rates varied from 1 to 10 per cent of the minimum wage, multiplied by the engine size in cm^3. Special rates were set for spare parts, engines and lorries. In 1998, these provisions were cancelled.

Subsidies

The former planned economy subsidized agriculture, which was and still is in difficulty as it depends heavily on imported fertilizers, forage, and energy resources. In addition, the changes in relative prices within agricultural production make re-allocation of productive factors necessary, a process that the Government attempts to facilitate in part by subsidies. The system of subsidies was partly adapted to the economic reform. Now, the Government primarily subsidizes farms by setting State procurement prices above accounting costs. In addition, special facilities were introduced for farmers to receive credits at preferential interest rates. Nevertheless, an extensive system of indirect subsidies continues to exist.

While agricultural subsidies are documented better and few have a direct impact on the environment, the energy subsidies are more environmentally relevant. The World Bank, which recently advanced a 10 million dollar loan towards energy restructuring, is particularly concerned that Moldova should, at the same time, remove energy subsidies. A Presidential Decree (January 1997) instructed the Government to liberalize energy prices step by step (see Chapter 9), while protecting socially vulnerable groups.

Other economic incentives

The legislation stipulates rebates for legal entities that carry out environmental protection activities (see section on charges above). The environmental protection investments can be deducted from corporate profit tax (environmental expenditures included). The Law on Foreign Investments authorizes a 50 per cent profit tax cut for a period of five years (Art. 37), if foreign capital investors obtain approval for their planned investment from experts of DEP and the National Centre for Scientific and Applied Hygiene and Epidemiology (NCSAHE), concerning its technological safety (Art. 10).

2.2 Regulatory instruments

DEP issues licences to generate, transport, trade, and recycle hazardous wastes. A special register has been created for dangerous wastes. The environment and health authorities share the data. The impact of toxic waste on the population's health is monitored by NCSAHE. For radioactive waste, the licences can be granted only if the radiation sources are equipped with secure protection systems for the personnel handling it. In addition, the waste should not harm the population or the environment in any way. To receive a licence, detailed information on control devices, methods, and waste generation sources has to be provided. The Law on Corporate Profit Tax was amended in 1994 to stimulate toxic waste recycling.

In addition, the Government, through DEP, sets charges for the storage and processing of industrial and domestic wastes. The authorities are preparing technical standards on waste transport, surface storage, incineration and final disposal. Till now, the former USSR standards and norms have been used.

Users of water should obtain an environmental licence for water use and are subject to taxation for this use. A licence has to be obtained for waste-water discharges. It is issued by the environmental authorities in agreement with NCSAHE and communal sewerage enterprises. Waste-water discharges into bodies of water are authorized only where they cannot result in an increase of the pollution level above the AP limits. Otherwise, the water user has to ensure treatment so that water effluents meet the established standards (for air pollution licences, see Chapter 4). Should the above-mentioned requirements not be met, the discharges might be restricted. The enterprise could be forced to discontinue production temporarily. The plant also might be completely shut down by the environmental authorities.

The water licences, according to the Internal Revenue Inspection (Rule No 09-24-04 of 12 December 1995), cost legal entities 50 times the minimum wage (900 Lei) and individuals 20 times the minimum wage (360 Lei) .

The natural resources (soil, water, minerals, flora and fauna) as well as the air and space above the territory are State property (Constitution (Art. 127), LEP (Art. 4)). The Parliament has the right to issue concessions for the use of natural resources. The Law on Natural Resources (1997) determines that the ownership of natural resources can be either public or private (Art. 9). The Law serves as a framework for transferring natural resources by concession agreements (Art. 11).

The Law on Foreign Investments (1992) has an article on 'Concessions and concession agreements' (Art. 46). When a concession agreement is signed, the Government issues a resolution to transfer the natural resources. This resolution automatically frees the foreign investor from the requirement to obtain a permit to set up an enterprise with foreign capital. Nevertheless, investors will still need a licence for their activity. A 20-year concession to Redeco Ltd for oil and gas research and exploration in the south-west of the country has been granted (the drilling started in September 1995). A 25-year concession for the planned oil terminal in Giurgulesti was delivered to Terminal S.A. (see Chapter 9).

The system of permits and licences was inherited from the former planned economy. The Ecological Expertise Division (DEP) assesses new construction projects, and the reconstruction of water facilities. Bigger projects (public and private) must be assessed for their impact on the environment. Usually, new business projects estimate the risk posed by their construction and operation on the environment and on health. (For a full description of ecological expert evaluation and environmental impact statement, see Chapter 1.)
The Natural Resources and Licences Division (DEP) issues ecological permits to manufacturers. It is in charge of the water survey (surface water, groundwater, and water management).

Standards are also important regulatory instruments. In the World Bank's opinion, a system of environmental standards should be developed for ambient water and air quality. The standards should be realistic and gradually strengthened, compliance with EU standards being the proposed goal.

To prepare air quality and other standards, DEP has at least to collaborate with the Ministry of Health and the Academy of Sciences. The standards have to have a new foundation if the country is oriented towards the European Union. Regulatory measures have to be cost-effective. However, the economic and finance units dealing with this aspect at DEP are understaffed.

Environmental management at company level remains a problem. In the past, there was some sort of environmental management and monitoring, but the monitoring institutions have been abandoned. The Environmental Inspectorate continues to be the institution that enforces the regulations. However, the enforcement of the law remains problematic. At present, the ISO 14000 series is virtually unknown to business. The ISO 9000 series is currently a priority in the manufacturing industry.

2.3 The environmental funds and public expenditure

The Interim Regulation on the Establishment and Use of Environmental Funds (1990) marked the beginning of environmental funds in Moldova. The charges and fines (described in section 2.1 above) were designed to be a source of revenue for the funds. The Regulation was drafted in such a way that it could be used to establish local funds. Article 3 specified the sources of income and Article 4 the use of the collected monies. The National Environmental Fund (NEF) took 30 per cent of the revenues of local environmental funds to solve environmental problems at the level of the Republic. Two per cent of local environmental funds' revenues had to be transferred to NEF for emergencies. Five per cent of the local funds' revenue (but not from NEF) had to be transferred directly to the USSR State Environmental Fund. Later in 1991, the methodological instructions establishing AP and AAP limits were drawn up and some local funds were created in cities like Chisinau and Tiraspol. However, the environmental funds were in fact no more than a separate sub-account in the local authorities' books with annual pro-forma statements of expenditure stemming from the local authority's five-year development plans.

The Law on Environmental Protection (1993) amended the environmental funds. It concentrated on a new institutional set-up and pretended to replace the 1990 Regulation (which had been temporary). Unfortunately, the Law was not really coordinated with other ministries and authorities. It contradicted the Law on the State Budget. Therefore, the Chisinau environmental fund, which under the previous law was managed by the Environmental Economics Section, did not follow the 1993 Law.

The new regulation on environmental funds is now before Parliament for approval.

In 1996, DEP drafted a regulation on environmental funds and a law on ecological taxes, partly to remove uncertainties created by the Law on Environmental Protection. In May 1997, the drafts with proposals to amend the Law on Environmental Protection accordingly were submitted to the Government for debate. The draft regulation on environmental funds basically repeats the statements from the Law on Environmental Protection concerning administrative councils. However, it clearly states that environmental funds should be created within the Regional Environmental Agencies, and not within municipal authorities. The sources of income remain virtually unchanged for local funds, though NEF would obtain new sources of revenue (charges from vehicles for air pollution, fines for damaging fish populations, interest from short-term balances on the current account). The draft proposes that each environmental fund should report quarterly to its administrative council, which in turn would report to NEF. The Administrative Council of NEF would report to the Government (annually) and to the Department for Statistics (quarterly). The local environmental funds would have to spend about 60 per cent of their revenues on specific projects on pollution prevention and reduction.

The new Law on Taxes on Environmental Pollution is clearly an attempt to iron out the contradictions between the Law on Environmental Protection and the Law on the State Budget. It also calls for a review of the methodological instruction for establishing standards (AP and AAP limits).

The Law on Environmental Protection determined that environmental funds could finance the following activities: (a) development and implementation of local and national programmes for environmental and biodiversity protection; (b) ecological restoration of sites and small rivers; (c) building, reconstruction, and renovation of environmental protection facilities; (d) purchasing technical devices, equipment, instruments and chemicals for the laboratories of DEP and its subordinated units; (e) R&D at the request of DEP; (f) training of environmental staff; (g) information and education, public relations; (h) support of international cooperation on the environment; (i) providing grants or bonuses to the entities or individuals that invest in or otherwise contribute to environmental improvement (limited to 5 per cent of eco-fund revenues).

In 1995, NEF received 193 200 Lei and spent 188 400 Lei as follows:

	in thousand Lei	as % of total
Ecological information and training	49.0	26.0
Laboratory equipment	55.7	29.6
International cooperation	48.6	25.8
Research and development	16.4	8.7
Other	18.7	9.9

This is only 0.3% of the total environmental expenditure. Table 2.5 shows the pollution abatement and control expenditures in Moldova, in 1995.

A rough comparison between pollution abatement and control expenditures in Moldova and in OECD countries, suggests a comparable but slightly lower level in Moldova in 1995 (1.15% of GDP versus 1.3-2.0% in OECD member countries). The dynamic of environmental expenditure in the country could be seen in conjunction with the figures of Table 2.6, where environmental investments were recalculated in real terms with the help of the overall price index of capital investment.

The data demonstrate that total environmental investments in real terms are shrinking. However, the reason behind this drop in Moldova differs from that in most OECD member countries.

Table 2.5: Environmental expenditure, 1995

	in million Lei (current prices)	as % of total
Total expenditure	**73.20**	**100.0**
Current expenditures	41.10	56.1
Expenditures to repair installations	5.00	6.8
Expenditures for forestry	15.40	21.0
Capital investments	11.65	15.9
Capital investments in 'Moldsilva'	0.05	0.1

Source: Department for Statistics.

In the OECD region, the need to adapt polluting equipment to new environmental requirements boosted investments earlier this decade. In Moldova, the expenditure decreased because of a lack of funds.

Table 2.6: Capital investment for environment and rational use of natural resources, 1990-1996[1]
(Amelioration excluded, current prices unless otherwise specified, thousand Lei)

	1990	1991	1992	1993	1994	1995	1996
Total (*Current prices*)	**30.2**	**49.0**	**337.4**	**2,916.7**	**12,450.6**	**11,651.4**	**6,184.3**
of which:							
water	14.3	24.7	220.9	1,279.8	5,803.8	6,715.4	1,826.7
soil	11.1	19.8	98.9	1,488.1	6,249.2	4,471.7	4,074.8
air	3.8	1.1	7.6	3.1	..	457.3	271.2
forest, flora and fauna	1.0	1.3	9.3	..	..	..	..
wastes	..	2.1	0.7	145.7	397.6	7.0	11.6
share (%):							
water	47.4	50.4	65.5	43.9	46.6	57.6	29.5
soil	36.8	40.4	29.3	51.0	50.2	38.4	65.9
air	12.6	2.2	2.3	0.1	..	3.9	4.4
forest, flora and fauna	3.3	2.7	2.8	..	..	..	..
wastes	..	4.3	0.2	5.0	3.2	0.1	0.2
Price inflation on capital investment[2]	..	..	2491	1131	852	141	126
Total (*Constant 1991 prices*)	**..**	**49.0**	**13.5**	**10.4**	**5.2**	**3.4**	**1.5**

Source: Department for Statistics
Note: [1] Data 1992-1996 exclude Transnistria and the city of Bender.
[2] As per cent from previous year.

Although in 1995, 73.2 million Lei (current prices) were spent on environmental protection, capital investment accounted for only 16 per cent. DEP expects capital investment in environmental protection to increase in 1998. However, judging from the Ministry of Finance's view on the budget deficit and debt administration, it seems unrealistic to expect funds to come from the budget. The breakdown of capital investment was available only for 1995 (see Table 2.7 below). It shows that the State budget was the main contributor to the funding of environmental expenditures. Enterprises were the second largest investor in the environment.

Table 2.7: Breakdown of capital investment by source of funding of environmental expenditure, 1995

	Total	State Budget	Local budget	Companies' own sources
Total investment *(million Lei)*	**11.65**	**6.49**	**0.26**	**4.90**
of which:				
water	6.72	1.91	0.25	4.55
soil	4.47	4.44	-	0.03
air	0.46	0.14	-	0.32
forest, flora and fauna	0.00	0.00	0.00	0.00
wastes	0.01	0.00	0.00	0.01
Share of total *(%)*	**100.00**	**55.70**	**2.23**	**42.06**

Source: Department for Statistics

2.4 Environmental concerns in privatization

The privatization process appears to have responded primarily to the need to develop sources of revenue for the national budget, and to the wish to attract foreign investment. However, Parliament also included a section on the environment in the privatization law. It stipulates that forest and water resources cannot be privatized (except for artificial fish ponds), and that the use of natural resources will be licensed.

The Law on Foreign Investments (1992) prescribes the ecological and sanitary examination to be conducted by certified experts. Entrepreneurs should obtain a permit to ensure the safety of their proposed technology. DEP and NCSAHE issue such permits. Environmental liability issues are discussed with foreign investors when negotiating investment projects with the Government.

The main goal of privatization was to help the economy to recover through private ownership, entrepreneurship, and competition. Foreign

investments were expected to foster the restructuring of industry. Privatization takes place according to biennial programmes. These have the status of law. The first 1993/1994 Privatization Plan targeted about 1 600 enterprises (40-50 per cent of State assets) for transfer to private ownership, mostly through voucher sales. The sale of small enterprises began in September 1993. In 1994, the Ministry for Privatization and State Property Administration was created. According to official records, 577 large, medium, and small enterprises were privatized in 1993/94. The companies that were left over from that programme together with other enterprises (in total 1 450 enterprises for cash or vouchers) were targeted by the 1995-1996 Privatization Programme (adopted by the Parliament in March 1995). The 1997-1998 privatization programme was approved in July 1997. The programme has three major tasks: (i) stipulate which enterprises are to remain in State ownership; (ii) allow enterprises to acquire land - so far the biggest impediment to privatization; (iii) complete the mass privatization process.

2.5 Conclusions and recommendations

Achievements in environmental protection depend on the financial resources that can be allocated. The Republic of Moldova suffers from a serious shortage of financial means. There are three sources currently used to finance environmental expenditure: the State Budget, funds accumulated in environmental funds, and enterprises' resources. The environmental funds might develop into a substantial source of funds, if the Government so decides. The new regulation on environmental funds provides a basis for such a decision, and could solve problems which exist with the current management of the funds. The funds are scattered and expenditure is not focused. A transparent balance of the local and national funds could be established, and the administration of the funds better streamlined and coordinated.

Recommendation 2.1:
The scope, sources of finance and purposes of the national and local environmental funds should be reconsidered between all levels of administration involved and clearly delimited. Additional funds might be forthcoming for environmental protection, if percentages of economic aggregates like GNP were earmarked for environmental protection in national budgets. The strengthening of environmental funds operations should be extended also to training for local staff to manage local funds.

Initially, a relatively large number of projects could best be funded through the National Environmental Fund, which will require adequate contributions. When the skills and capacity of local funds will have been upgraded, more decision-making on project financing should be delegated to the administrative councils of local funds. Initially, NEF would need to concentrate on project management, requiring clear rules on how projects should be documented in applications. Secondly, there should be a financial assessment to check the viability of a project. This should lead to the selection of the financial instrument to be used when accepting the application (grant, interest subsidy, subordinated loan or other).

Recommendation 2.2:
Project assessment and monitoring of project implementation should be part of a transparent administration of the National Environmental Fund. Financial analysis should be integrated with environmental audit, impact assessment, and the work of the inspectorates. Successful experiences in managing environmental funds in other countries in transition should be retained.

The balance sheet of NEF will depend very much on the pollution charges prescribed by the law. The review of methodology to set pollution charges has been requested on many occasions. Currently, DEP needs help to carry out this very ambitious task. The National Institute of Ecology should be involved, and the Ministry of Economic Reforms and the Ministry of Finance should help DEP to upgrade the Methodological Instruction (1991) on pollution charges and pollution limits. Currently, the draft law on pollution charges (ecological taxes) proposes to use multiples of the minimum wage to set charges for pollution. However, it is impossible to say how effective those will be. The answer might be found in the upcoming instruction on establishing AP and AAP limits. Limits and standards along with charges should be in line with the tax system and tax policy (particularly with taxes on natural resource use and taxes on land). The newly elaborated methodology, if biennially reviewed could be valid input for the law on pollution charges. The technique to determine charges for air pollution, water sewerage and waste placement on landfills should be adapted to modern European practice - for instance by aiming at IPPC rationale and provisions in the long term.

Recommendation 2.3:
The IPPC Directive of the EU should constitute a long-term target for pollution prevention and control. It should be included in the Partnership and Cooperation Agreement.

In the meantime, the draft law on payments for pollution ought to be coordinated with other institutions. Articles 5, 6, 7, and 8 provide an illustration of the need for such cooperation. Article 5 stipulates which vehicles should pay a fuel charge (petrol or diesel only). The charge is levied through customs procedures (as no petrol or diesel is produced domestically). Imported unleaded petrol and diesel will be charged 1.0 per cent and leaded petrol 0.2 per cent (of the import price of the fuel). The excise duty tripled in 1997. Therefore, petrol has become more expensive and this measure is going to push up the price further. It will also create inflationary pressure. The other aspect of this charge is that the excise duty is split between the Road Fund and the State budget. This new charge will be collected simultaneously with the excise duty.

Article 6 requires vehicles crossing the country's borders to pay an environmental charge. It is not clear whether this charge will replace the one that is already in place or be in addition. Secondly, the existing charge accrues to the Road Fund, but the new one is proposed to be NEF revenue.

Article 7 deals with water charges. However, the State budget currently determines how the revenue from the water charges is distributed among the Communal Water Supply and Sewerage Enterprises, and 'Apele Moldovei'.

Article 8 clearly incorporates charges that used to be revenue for local authorities managing municipal (and industrial) landfills. The Communal Waste Service Enterprises were financed partially through this revenue.

The fines for damaging the environment go to the environmental funds, but their effect is limited, as the fines are based on the minimum wage (18 Lei), which is inflation-indexed. Current inflation rates mean that they are nevertheless quickly eroded and hence ineffective.

Recommendation 2.4:
Fines for environmental pollution should be indexed to quarterly inflation figures (CPI) as published by the Department for Statistics.

The privatization process could be made more environmentally friendly. For instance, it could usefully address the following environmental concerns:

- Liability for past pollution and accumulated waste on the plant's premises;
- Use of privatization proceeds for liability financing;
- Reintroduction of environmental management into State-owned enterprises (that are domestic monopolies and use environmentally dangerous processes or are situated in highly polluted zones).

However, the DEP capacity to tackle these issues in cooperation with relevant ministries seems to be inadequate.

Recommendation 2.5:
Environmental liability issues should be included permanently in privatization laws, requiring an adaptation of the resources of the legal expertise of the DEP.

Paying a penalty does not make liability for environmental damage disappear. Insurance against environmental risks might prompt more equitable solutions to environmental risk issues. An appropriate insurance system against environmental risk might emerge, if NEF could take an initiative.

Recommendation 2.6:
An initiative by a competent authority to promote the development of insurance schemes against environmental risks could possibly contribute to improving the handling of liability issues for environmental damage in an industrial context.

The funds of enterprises constitute the second source of finance for environmental programmes. At the moment, business is weak and shrinking industry is a poor contributor to environmental plans. A particular effort is required to focus managers' attention on

low-waste production technology once resources for large new investments become available. In a forward-looking attitude, environmental management systems (ISO 14000 series) ought to find a place in the managerial practices of entrepreneurs. The recycling and reuse of packaging should be taken into account, as should labelling for future recycling.

The third financial source for environmental expenditure is the budget. It regulates the number of taxes and fees that need to be influenced by environmental authorities to have an impact and to be effective. The tax on water has been untied from the minimum wage. However, its effect is eroded because of inflation.

Recommendation 2.7
A method should be implemented that prevents real revenues from the water tax from falling due to inflation.

Chapter 3

INTERNATIONAL COOPERATION

3.1 General orientation

The Foreign Policy Concept of the Republic of Moldova, approved by Parliament in February 1995, confirms the principles of international law which are of special importance both for the Republic's foreign relations and for its environmental protection:

- The settling of international disputes by peaceful means;
- International cooperation;
- Bona fide fulfilment of international obligations.

Article 95 of the Law on Environmental Protection confirms the precedence of international conventions and agreements over the national legislation if the provisions in the international agreements are more stringent.

The Foreign Policy Concept document mentions that the Republic of Moldova will support the traditional activities of the United Nations and any new ones, in view of the trend towards a more active involvement of the United Nations in maintaining peace and security at the international level, real disarmament and environmental protection.

The key priority of Moldova's foreign policy is a gradual integration into the European Union (EU). To this end, a series of measures has been planned to meet EU requirements for associate membership by the year 2000. In November 1994, Moldova signed a Partnership and Cooperation Agreement with EU, but it does not benefit from a general agreement. Trade with western countries is limited, and its main trading partners - apart from Romania and Germany - are in the former Soviet Union (Russian Federation, Belarus and Ukraine). The Partnership and Cooperation Agreement is not yet in force, as four EU member countries have not yet ratified it.

In 1995, Moldova became a member of the Council of Europe. One of the preconditions was the abolition of capital punishment. For environmental protection, the Republic of Moldova established relations with international bodies, and governmental (e.g. UNECE, OECD, UNDP, Council of Europe) and non-governmental organizations (NGOs) from different countries.

Its environmental policy aims among other things to link up with international activities by:

- Improving international cooperation on environmental protection at the regional and European levels;
- Internationally harmonizing newly legislated instruments;
- Drawing up national programmes and setting up mechanisms for the implementation of conventions;
- Implementing bilateral agreements and participating in regional programmes (Black Sea, Danube).

The State strategy concerning international relations in environmental protection is based on the following principles:

- Adherence to different international conventions on environmental protection;
- Signing of bilateral and multilateral agreements at regional and international level;
- Participation in international programmes and projects;
- Establishment of permanent consultative ties with international organizations and representatives from different countries (governmental, NGOs);
- Establishment of relations with potential sponsors, banks and financial organizations.

Moldova has ratified nine international conventions (see Table 3.1) and expects to ratify five more in the near future (see Table 3.2). In addition, it has signed, but not yet ratified, the Convention on Cooperation for the Protection and Sustainable Use of the Danube River. A National Commission was established by presidential decree in November 1996 to oversee the implementation of the provisions of the different international agreements. Its first session took place

in June 1997, when sub-commissions were created and a work plan for the immediate future was established. The Commission's main tasks are:

- To ensure a common policy and coordination of activities connected with the implementation of international agreements to which Moldova is a Party, as well as cooperation with other Parties to these agreements;
- To draw up recommendations to improve the economic and legal bases for the implementation of agreements;
- To develop national programmes and projects to implement the agreements;
- To improve the control of their implementation;
- To draw up national reports for submission to the secretariats of the respective agreements.

Table 3.1: International agreements ratified by Moldova

International agreement	Ratified
Convention for the Protection of the Ozone Layer (Vienna, 1985)	July 1996
Montreal Protocol on Substances that Deplete the Ozone Layer (1987)	July 1996
United Nations Framework Convention on Climate Change (New York, 1992)	March 1995
Convention on Biological Diversity (Rio de Janeiro, 1992)	May 1995
Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979)	June 1993
Convention on Long-range Transboundary Air Pollution (Geneva, 1979)	July 1995
Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991)	June 1993
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992)	June 1993
Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 1992)	June 1993

Source: DEP.

The Commission consists of representatives of DEP, the Department of Industry, the Ministry of Foreign Affairs, the Ministry of Economy, the Department of Civil Defence and Emergency Situations, the National Centre for Hygiene and Epidemiology, the National Institute of Ecology, the Institute of Zoology, the Institute of Geography, the Hydrometeorological Service, as well as institutions responsible for the management of natural resources (Apele Moldovei, Moldsilva).

Table 3.2: International agreements selected for future ratification

Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 1989)
Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 1971)
Convention to Combat Desertification (Paris, 1994)

Source: DEP and Hydromet.

3.2 Multilateral, regional cooperation

Cooperation in ECE

The Republic of Moldova is exposed to imported air pollutants, although the country is practically a net exporter. Estimates of the import/export of pollutants are shown in detail in chapter 4, Table 4.2.

Moldova acceded to the Convention on Long-range Transboundary Air Pollution in July 1995. A sub-commission for the implementation of the Convention was established within the National Commission for the Implementation of International Environmental Conventions. There is only one monitoring station, located in the south-west of the country, which is equipped to record transboundary air pollution. It is included as a station of the former Soviet Union in the list of EMEP stations. At present, financial constraints prevent this station from operating.

Moldova signed and ratified the ECE Convention on the Transboundary Effects of Industrial Accidents. DEP and the Department of Civil Defence and Emergency Situations are the focal points for this Convention. Although the Convention will probably come into force in the course of 1998, several of its relevant provisions are already incorporated in the regulations drawn up by the Department of Civil Defence and Emergency Situations. An emergency information system has been created. The inventory of the storage of hazardous substances is available. The inventory of hazardous processes has not yet been drawn up, because of the current industrial crisis. However, DEP has established a system of criteria for defining hazardous activities.

Since June 1993 Moldova has been a Party to the ECE Convention on Environmental Impact

Assessment in a Transboundary Context. The focal point for the Convention is the Natural Resources and Licensing Division of DEP. The Division is not directly involved in assessing environmental impact, as this is the responsibility of the State Ecological Expertise. The relevant provisions of the Convention are incorporated in the Law on Environmental Protection and the Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment. As required by the Convention, Moldova notified its neighbours - Ukraine and Romania - of its intention to build an oil terminal in Giurgulesti on the Danube river. For large and complex projects that are likely to have a significant impact on the environment, EIA must be carried out at the feasibility study stage. The proposed oil terminal's capacity will be 2.1 million tonnes of oil products a year, half of Moldova's annual consumption. There has been no response from either Ukraine, or from Romania (neither of them being Party to the Espoo Convention).

Moldova has also ratified the ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, as has its neighbour Romania, with which it shares important water resources. The Prut river, for instance, marks the western border between the two countries. In the north-east of Moldova, the Dniester river marks the border with Ukraine. Many of its tributaries also flow into Moldova from Ukraine. So far, Ukraine has not ratified the above-mentioned Convention. There are also agreements between Moldova and Ukraine on the Dniester river and between Moldova, Ukraine and Romania on the Prut river.

In the early nineties, the Republic of Moldova joined the 'Environment for Europe' process. It took part in the Conferences of Environment Ministers in Dobris (Czechoslovakia, 1991), Lucerne (Switzerland, 1993) and Sofia (Bulgaria, 1995), and signed the respective documents. In conformity with Agenda 21 and the Lucerne Declaration, a National Environmental Action Plan (NEAP) was developed in cooperation with the World Bank. NEAP identifies the short-term priorities and objectives for the next three years (1996-1999). Technical assistance and investments are needed for this period to address the NEAP priorities. The Moldovan and Russian versions of NEAP were approved in June 1996, making NEAP a binding document. In April 1996 the Environmental Strategies and Programmes Division within DEP was created to coordinate NEAP implementation. Currently Moldova co-chairs the EAP Task Force, which is one of the institutions created after the Lucerne Conference, and which coordinates the exchange of information and experiences in the implementation of national NEAPs.

Moldova is also taking an active part in the preparations for the upcoming Conference of Environment Ministers in Aarhus (Denmark), and in particular in drafting the future convention on access to environmental information and public participation in environmental decision-making.

Cooperation in the CIS framework

The Republic of Moldova has ratified its accession to the Commonwealth of Independent States (CIS), except for all political or military agreements. Only the economic union agreements were accepted in April 1994, when Moldova became a member of the Interstate Economic Commission. The Republic of Moldova is also a member of the Interstate Ecological Council (IEC) of CIS. This organization was created in 1992. Its main functions are:

- Coordinating environmental policies;
- Harmonizing environmental legislation and standards;
- Drawing up and implementing joint environmental programmes and projects;
- Establishing a common information system, gathering and exchanging information and experiences, and capacity building in information;
- Coordinating research in different fields;
- Developing a joint Red Book;
- Drafting agreed and common recommendations for the establishment of ecological funds;
- Coordinating international activities.

In February 1992, Moldova also signed an agreement with the Interstate Meteorological Council on hydrometeorology. Moldova's hydrometeorological agency "Hidrometeo" is a member of the Interstate Council of Hydrometeorology (ICH), an institution organized in the same way as the Interstate Ecological Council. The aims and programmes pursued by this organization correspond to those of the World Meteorological Organization (WMO), of which Moldova is also a member. However, as the same methodology, standards and equipment were in use throughout the former Soviet Union, Hidrometeo is closer to ICH than to WMO.

In April 1996, a CIS agreement on the control of transboundary transport of hazardous wastes was signed. This agreement has the same requirements as

the Basel Convention, which Moldova is planning to ratify.

Danube and Black Sea protection

Moldova does not border on the Black Sea, but is located in its drainage basin. Moldova is thus interested and involved in Black Sea protection initiatives. The Foreign Policy Concept mentions that the Republic will actively participate in the ecological cooperation on Black Sea areas, in the Danube Commission and in the work of the preparatory committee for the Conference on Danube Cooperation.

In 1991, the Danube programme of UNDP, supported by the EU, initiated a regional programme for environmental management in the Danube river basin. Moldova joined this programme in 1993. It was designed as a technical assistance programme to protect the Danube river. The programme includes three subgroups:

- Monitoring, Laboratories, Information, Management (MLIM). Its tasks are to design and establish a common system and methodology of chemical analysis of water quality, international monitoring of the water, as well as developing a common data exchange format.
- Alarms, Emergency and Warning System (AEWS). This subgroup deals with prevention and warning of emergency situations.
- The Emission subgroup monitors water discharges in each country.

The main ongoing projects include research into phosphorus removal from detergents, the nutrient balance of the Danube river, and an inventory of water quality in rural areas. For all countries of the Danube programme, except for Germany and Austria, these projects are carried out with the assistance of the programme.

In the framework of the MLIM and AEWS subgroups, about 30 people from Moldova have been trained in hydrobiology and sample analysis, as well as in the interpretation of data to be submitted to decision makers. During 1996 about 30 representatives of local water authorities were trained in European water management legislation, acts and norms as well as in European practice in this field. A series of five seminars was held - three seminars were designed to train trainers and two national seminars were aimed at local authorities. Thus, the Danube programme benefits local capacity building.

An important step towards international cooperation for the environmental protection of the Danube was the signing of the Convention on Cooperation for Protection and Sustainable Use of the River Danube (Sofia, June 1994). The Convention was signed by all countries of the Danube river basin. However, as it was decided that all Parties should contribute to this Convention in equal shares, Moldova would have had to make a substantial financial effort. As other countries are also facing this problem, the Convention is still not in force, but the sharing of financial obligations is being reconsidered.

In December 1994, the Ministers of the Danubian countries adopted a declaration, specifying their objectives, priorities and strategies for inclusion in the Strategic Plan of Action for the Danube area.

3.3 Bilateral cooperation

Cooperation with Ukraine

In November 1993, a five-year cooperation agreement between the Ministry for Environmental Protection of Ukraine and DEP of the Republic of Moldova was signed. This protocol is of a general nature and calls for cooperation in the different fields of environmental protection: air and water, flora and fauna, chemical contamination of soils, processing and utilization of industrial and household waste, as well as exchange of information on energy- and resource-saving technologies, and mutual assistance in the event of an industrial accident or natural calamity. The main emphasis is put on cooperation to protect the transboundary Dniester river. Experts from Moldova participated in the impact assessment of the enlargement of the Novodnestrovsk hydropower plant (Ukraine), which is located close to the border with Moldova. The mitigation of its negative impact (see Chapter 6) has to be examined further by the common working group. A special working group was established to carry out scientific research on water quality as well as to ensure proper water management. Another special agreement has been signed between DEP and three bordering regions of Ukraine on cooperation in the event of an industrial accident.

In February 1994, an agreement on the common use and protection of transboundary waters was signed between the Governments of Moldova and Ukraine. Its main areas of concern are qualitative and

quantitative protection of surface and groundwaters, and prevention of any kind of pollution of those waters. The issues of fishing, irrigation, monitoring, measures in the event of an accident, etc. were discussed at joint working group sessions. The Republic of Moldova and Ukraine have drafted common water-quality objectives and water-quality criteria, which are currently awaiting approval.

Cooperation with Romania

In March 1997, a cooperation agreement on environmental protection and the sustainable use of natural resources was signed between Moldova's DEP and Romania's Ministry of Water, Forests and Environmental Protection. The main areas of cooperation are:

- Harmonization of legislation and technical standards;
- Implementation of joint EIAs when protected areas are expanded for the purpose of biodiversity conservation;
- Implementation of joint monitoring to provide decision makers with necessary information;
- Exchange of data on different issues including nuclear questions and accidents that have a transboundary impact;
- Promotion of cleaner technologies;
- Cooperation in the implementation of international agreements and conventions;
- Public participation and facilitation of access to environmental information;
- Environmental education and training, as well as the exchange of experiences and specialists.

The agreement foresees the establishment of a high-level commission, supplemented with working groups on particular problems. A special working group on cooperation on issues concerning the river Prut is also envisaged. To coordinate activities on both Moldovan borders - i.e. with Ukraine and with Romania - there will be one working group on transboundary waters. The agreement is now in force.

Cooperation on water resources between Romania and Moldova started even earlier. A common instruction on monitoring was signed by both Governments. Cooperation between the water companies 'Apele Moldovei' and 'Apele Romane' covers water use and management, as well as the protection of the transboundary river Prut. Finally, a new agreement on water management cooperation regarding the Danube and Prut rivers is currently being negotiated.

Cooperation with Belarus

In December 1994, an agreement was signed with the Belarusian Ministry of Natural Resources and Environmental Protection. This agreement is more general in nature than that with Ukraine, because Moldova and Belarus have no common border. The two partners committed themselves to coordinating the drafting of legislation, methodologies, energy- and resource-saving technologies, to protecting soils and their fertility, to using mineral and forest resources rationally, to protecting the genetic fund of rare animal and plant species, as well as to sharing information and experiences.

3.4 Multilateral, global cooperation

Transboundary movement of hazardous waste

Toxic waste is becoming a priority in Moldova, mainly because of obsolete pesticides and the storage of other chemicals. There is no information on transboundary movements of waste. Moldova is preparing to accede to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, as mentioned in the newly adopted Law on Hazardous Substances and Product Management. The Department for Statistics is improving its accounting system of wastes, including hazardous wastes. Article 77 of the Law on Environmental Protection prohibits the import for any purpose (including transit) of wastes or their residuals. Some steps towards controlling transboundary movements of hazardous wastes have also been taken at the regional level. In April 1996, Moldova signed an agreement with CIS on this subject.

Although Moldova does not produce any nuclear energy, nuclear safety is an issue of concern. Moldova is surrounded by eight nuclear reactors, all of them located within 150 km of its borders. The Programme on Strengthening Radioactive and Nuclear Safety of the International Atomic Energy Agency (IAEA) includes projects concerning Moldova's situation. The country was also affected by the radioactive fallout from the Chernobyl accident.

Protection of the ozone layer

In July 1996, Moldova ratified the Convention on the Protection of the Ozone Layer. Accession to the Vienna Convention was more an economic question. In fact, Moldova does not produce any chlorofluorocarbons (CFCs); it imports them mainly from the Russian Federation. As the Russian Federation had ratified the Vienna Convention, which bans the export of CFCs to non-Party countries, Moldova acceded to the Vienna Convention for the purpose of maintaining these economic relations with Russia. Imported CFCs are used for the production of refrigerators in Chisinau, as well as for repairing refrigerators. Financial assistance for consultations leading to the drawing-up of a national programme to phase out ozone-depleting substances has been received from UNEP and from the Global Environmental Facility (GEF).

Climate change

Moldova ratified the United Nations Framework Convention on Climate Change in March 1995. By September 1998, Moldova has to prepare its national communication concerning the greenhouse gas inventory and policies to deal with them. According to the Convention, Moldova receives assistance from GEF to prepare it. During the negotiations on the Berlin Protocol, Moldova formed an unofficial working group with Armenia, Azerbaijan, Turkmenistan, and Uzbekistan.

Biodiversity and nature protection

Although there are different governmental decisions, Moldova does not have a specific law on biological and/or landscape diversity, but a law on protected areas has recently been approved (February 1998). It includes lists of protected species and protected areas (existing and new ones), as well as requirements for management plans. Protected areas are classified according to the IUCN classification. The law also includes the first list of soil protection areas and a list of protected wetlands. The identification of possible Ramsar sites (internationally important wetlands) and the establishment of biosphere reserves are foreseen (see Chapter 6).

Moldova signed the Convention on Biological Diversity in 1992 and ratified it in May 1995. In June 1993, Moldova ratified the Bern Convention on the Conservation of European Wildlife and Natural Habitats. The requirements of those conventions are taken into account in the relevant policy and other documents.

In Autumn 1996, Moldova worked out a draft strategy for the conservation of biological and landscape diversity. The draft strategy is based on the National Strategic Action Plan for Environmental Protection and the Pan-European Biological and Landscape Diversity Strategy. The strategic part sets out goals, directions, principles, and *ex situ* and *in situ* conservation strategies. The Action Plan contains short-, medium-, and long-term actions, as well as the respective responsible organizations and time frames. The goals to be achieved are: minimization or elimination of negative impacts on biodiversity, sustaining the recovery capacity of biological and landscape diversity, economic integration of territories, as well as public participation in the conservation of biological diversity. The draft strategy should be approved by the Cabinet of Ministers or by Parliament.

National authorities and experts are aware of the importance of joining other biological conventions. Some preparatory steps have been taken to ratify the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat. Moldova is also preparing to accede to the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Ratification of the Washington Convention in the near future could be difficult, due to a lack of manpower and finances.

Follow-up to UNCED

Moldova took part in the United Nations Conference on Environment and Development (Rio de Janeiro (Brazil), 1992) and signed its final documents. Different aspects of Agenda 21 are reflected in the concepts and strategies for socio-economic development. The National Strategic Programme of Action of the Republic of Moldova in the field of Environmental Protection and Rational Use of Natural Resources follows the principles set in Agenda 21. Despite the fact that sustainable development and Agenda 21 are known and accepted concepts, in some governmental institutions their application is not planned systematically, but only as part of some selected policies, there being no common concept used in practical action.

In 1997, project Moldova 21 was proposed by UNDP within the framework of the Capacity 21 project. The global Capacity 21 initiative provides support to work out and promote sustainable development

strategies. Through Capacity 21, UNDP will assist the Government of Moldova in a range of activities:

- Institution and capacity building favouring the implementation of Agenda 21;
- Identification of technical assistance needs related to Agenda 21 and promotion of environmentally sound projects;
- Incorporation of public participation in the application of sustainable development principles.

The project will mainly focus on strengthening the existing High Economic Council to the President in order to promote sustainable development and Agenda 21 issues in Moldova's strategy for the next century. Particular attention will be paid to the identification and promotion of local initiatives as regards pilot projects on sustainable development issues. The project will be financed by the Capacity 21 fund, administered by UNDP.

3.5 International funding

Moldova has received financial assistance from the International Monetary Fund and the World Bank, as well as grants from the European Union, France, Germany, Italy, Japan, the Netherlands, Romania, Turkey, and the United States. The United Nations and other organizations have provided technical assistance worth US$ 34.1 million including US$ 2.9 million for investments, and humanitarian assistance worth US$ 12.3 million.

The Division of Technical Assistance within the Ministry of Economy coordinates the technical assistance. Foreign direct investment is encouraged through a legal framework for property ownership, joint companies and guarantees, contained in the Law on Foreign Investment, including incentives such as tax holidays, repatriation of profits and tariff privileges.

Foreign direct investment (FDI) flows are modest in real terms but relatively large in comparison to GDP. In 1995, they represented 3.8% of GDP, or US$ 15 per capita. Cumulative flows at the end of 1995 stood at US$ 76 million, and at US$ 121 million at the end of 1996. After a substantive increase between 1994 and 1996, FDI inflows diminished in the first half of 1997. The majority of FDI projects are directed to utilities and services (47%), manufacturing (13%), wholesale and retail trade (12%). Agriculture, construction and transport take less than 1% each.

The Ministry of Economy drew up a technical cooperation programme in 1995, which was approved by the Government. It deals with grants and non-credit financial assistance. According to the programme, the Ministry of Economy is responsible for coordinating the programme and ensuring its implementation, designing projects as well as negotiating with donors. Recipient organizations are responsible for the quality of projects and for creating favourable conditions for their implementation.

The Technical Cooperation Programme lists 17 sectors for cooperation. According to 1996 data, the total amount of technical assistance for Moldova exceeded US$ 42 million. The main areas that received technical assistance are: support for financial reform and the banking sector (27.38%), restructuring of enterprises (12.17%), development of entrepreneurship (11.87%), and development of social infrastructure (11.02%).

Technical assistance for environmental protection amounted to only 2.18% of the total in 1996 (two projects, sponsored by the German Association for Technical Cooperation (GTZ) and the United States Agency for International Development (USAID). The priorities are determined by the Government, and protection of the environment is currently not a top priority. The main part of all environmental project proposals is connected with training and the exchange of know-how.

In June 1996, DEP established a Project Management Office, which was financed by the World Bank till December 1996. It was designed to identify and prepare initial descriptions of projects to be considered by donors and investors, and to manage the projects funded by the Moldovan Government. The Office identified 36 projects, of which 6 have been selected and were under consideration in March 1997. The project proposals were forwarded to GEF, GTZ, the Danube Programme Coordination Unit, and the World Bank. Most of the remaining identified projects are included in the State Investment Programme for 1995 - 1997. The DEP coordinates 7 technical assistance projects spanning the period 1997-1999.

3.6 Conclusions and recommendations

In the area of international cooperation as a whole, Moldova has taken a consistent general approach,

which is being implemented in its broad lines. This is certainly an asset in the current circumstances. At the same time, the availability of a general approach does not provide clear guidelines for all practical aspects. For example, the commitment to closer ties with the European Union does not entail an action plan that could be instrumental to this end. Also, as environmental protection has been "de-selected" from the priority list for international cooperation, this could discourage initiatives from partners which cannot offer cooperation in other fields.

The environmental administrations are currently poorly equipped for international cooperation related to national policy and management programmes. Training should not only aim at promoting the ability to assimilate foreign experiences, but should also target routines in environmental policy, management and enforcement measures. It would also be helpful for the preparation, negotiation and final implementation of projects funded in international cooperation, if DEP expertise in project management were strengthened.

Recommendation 3.1:
DEP capacities for project management, including cooperation with international funding partners, need strengthening. Among the necessary remedial measures, staff should receive language training, as well as intensive training in substantive aspects of environmental policy, management and enforcement.

In spite of the current recession, Moldova has ratified a considerable number of international environmental conventions. In addition, bilateral agreements have been signed with neighbouring countries. While the total picture of the network of international cooperation thus created is generally well adapted to the needs and possibilities of the country, it can be hoped that the National Commission for the Implementation of International Environmental Conventions should fulfil its tasks more efficiently if sufficient resources were to be allocated, and that the priority of national policies in the area of transboundary movements of hazardous waste should be reflected in an early ratification of the Basel Convention.

Recommendation 3.2:
The role and resources of the National Commission for the Implementation of International Environmental Conventions should be strengthened.

Recommendation 3.3:
The Basel Convention should be ratified, related national legislation established and specific training for the staff organized. Likewise, the ratification of the Danube Convention and other relevant intergovernmental treaties should be promoted.

While there are high hopes that the recently created (November 1996) National Commission oversees the implementation of international agreements and that it overcomes the delays in implementing fully all provisions included in the agreements and conventions, further administrative measures could be taken to improve performance. Among these measures would be the allocation of responsibility for the implementation of the Espoo Convention to the administrative unit that primarily handles the national EIAs.

Recommendation 3.4:
The responsibility for the implementation of the Espoo Convention should be assigned to the institution that assesses environmental impacts.

To control transboundary air pollution, three to four additional stations on the border with Ukraine and northern Romania would be necessary. The full analysis of samples of transboundary air pollution should be performed in the laboratories of Hidrometeo, together with the National Institute of Ecology. However, this is possible only if Hidrometeo is equipped for the purpose.

Recommendation 3.5:
To control transboundary air pollution, additional air monitoring stations should be installed on the borders with Ukraine and northern Romania. "Hidrometeo" should be fully equipped for the analysis of all samples obtained from transboundary air pollution monitoring.

PART TWO: MANAGEMENT OF POLLUTION AND NATURAL RESOURCES

Chapter 4

AIR MANAGEMENT

4.1 State and determinants of air pollution

Emission, transboundary fluxes and deposition

Since 1990, the estimated combined emissions of classic air pollutants, such as sulphur and nitrogen dioxide, carbon monoxide and particulate matter, have decreased by a factor of 2 in the Republic of Moldova, reaching approximately 550 kt in 1996 (Table 4.1). The share of emissions from mobile sources in total national estimated emissions has been rising systematically and at present accounts for 65%, even rising above 75% in urban areas. NO_x emissions from road vehicles alone equal those from all stationary sources combined.

According to the national reporting system of selected economic agents (about 800), the main stationary sources (about 18 000 total registered sources) have been identified within the energy and heat generation sector (85%), the production of construction and building materials (12%) and manufactures of foodstuffs (3%). The single most polluting source is the Dnestrovsc power plant (MTPP) located in Transnistria, which emits more pollution than all other stationary sources included in the reporting system combined (54% in term of weight). Only one third of registered stationary sources are equipped with effectively operating dust collectors and none with flue gas desulphurization (FGD) or denitrification ($DeNO_x$) systems.

Emissions of carbon dioxide are not systematically inventoried. In 1994 combustion processes emitted almost 5 400 t, half of which came from the energy sector. Emissions from agriculture and households, although they can be relatively high, are not inventoried. For example, in 1995 their shares in final energy consumption were 13% and 39%, respectively. Also, emissions of various air toxics, e.g. heavy metals and persistent organic pollutants (POPs), are neither estimated nor reported.

Table 4.1: Atmospheric emissions, 1985-1996

thousand tonnes

	1985	1990	1991	1992	1993	1994	1995 [1]	1996 [1]	1996 [2]	Remarks
Emissions from stationary sources										
Total	**477.3**	**396.5**	**311.5**	**233.7**	**72.5**	**49.5**	**40.6**	**36.7**	**195.0** *	
of which:										
SO_x	281.7	230.6	164.2	122.8	33.3	23.4	19.0	16.9	105.0 *	
NO_x	42.1	38.8	31.2	25.6	5.9	4.2	4.3	3.9	22.0 *	as NO_x
CO	48.9	38.6	32.3	25.7	18.0	9.7	8.0	7.7	18.0 *	
PM	93.9	74.3	72.8	51.1	11.2	9.5	7.2	5.9	40.0 *	
Emissions from mobile sources										
Total	**551.6**	**545.8**	**422.9**	**234.4**	**146.1**	**127.3**	**238.2**	**100.5**	**363.5** *	
of which:										
NO_x	23.6	24.5	25.8	13.6	9.1	14.0	19.8	7.0	25.5 *	*(Including off-road*
CO	434.0	432.1	317.7	178.4	109.9	88.3	160.8	72.7	205.0 *	*and diesel-fuelled*
VOCs	94.0	89.2	66.7	36.5	23.3	19.8	41.6	16.5	53.5 *	*road vehicles only)*
Total country	**1,028.9**	**942.3**	**734.4**	**468.1**	**218.6**	**176.8**	**278.8** [1]	**137.2** [1]	**558.5** [2]	

Source: Department for Statistics.
* Author calculations/estimations.
[1] Official data without Transnistria.
[2] Author estimation for the whole country.

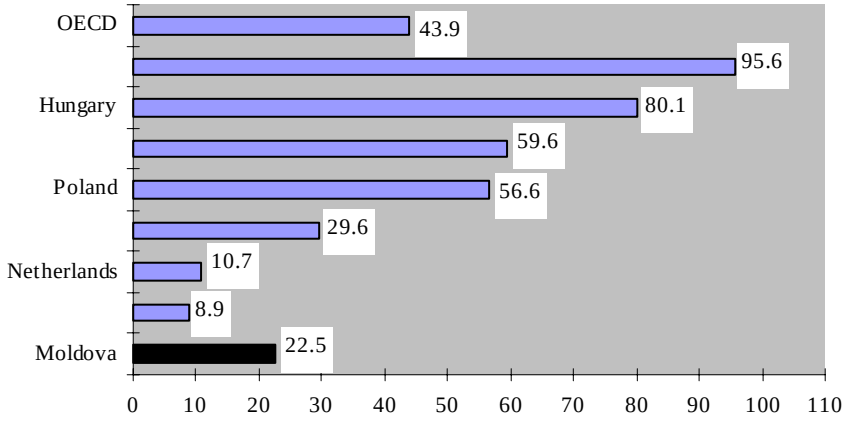
Reported emissions from mobile sources come almost exclusively from petrol-fuelled road vehicles. Diesel-fuelled transport, mainly rail and off-road vehicles construction machines and agriculture tractors are excluded from the estimations. Road-vehicle emissions are estimated on the basis of the statistics of imported fuels and the 1983 former Soviet, theoretical emission rates for different pollutants, per mass of petrol or diesel consumed, without taking into account quality variations of fuels, the technical conditions of the vehicle fleet, or driving conditions.

To arrive at a preliminary comparison of the emission factors of at least the main classic pollutants SO_x and NO_x, with those in other countries of the UNECE region, their emissions, including the missing sectors and mobile source categories, were estimated.

The estimated emission factors per capita of SO_x and NO_x in Moldova are, respectively, 4 and 2 times lower than the OECD average, and much lower than in other countries in transition (Figures 4.1 and 4.2).

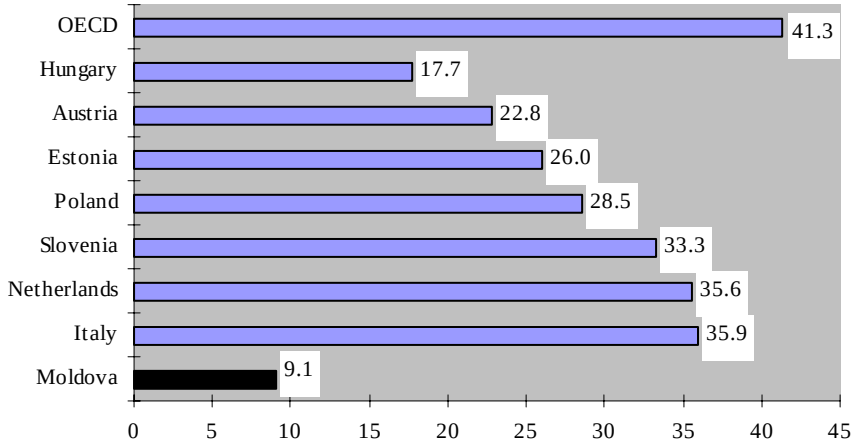
In a transboundary context, according to the EMEP Meteorological Synthesizing Centre-West (MSC-W) average import/export budget for 1986-1995, Moldova is a net exporter of sulphur compounds, nitrogen oxides and ammonia (Table 4.2). Regarding

Figure 4.1: Air emissions of SO_x, 1995 (SO_x kg/cap)



Source: 1995 annual national reporting on air pollution abatement to the Executive Body of the Convention on Long-range Transboundary Air Pollution.

Figure 4.2: Air emissions of NO_x , 1995 (NO_x kg/cap)



Source: 1995 annual national reporting on air pollution abatement to the Executive Body of the Convention on Long-range Transboundary Air Pollution.

Table 4.2: Transboundary import/export budgets, 1986-1994

	Oxidized S	Oxidized N	Reduced N
Export mass *(thousand tonnes)*	189.6	42.5	30.0
Emission *(%)*	93.0	97.0	62.0
Most export to[*/] *(%)*			
1) Ukraine	33.0	*Ukraine* 40.0	*Ukraine* 33.0
2) Romania	18.0	*Romania* 25.5	*Russian Fed. (Europe)* 17.0
3) Belarus	15.0	*Belarus* 10.5	*Romania* 16.5
Import mass *(thousand tonnes)*	74.6	34.4	15.1
Deposition *(%)*	84.0	96.0	45.0
Most import from[*/] *(%)*			
1) Ukraine	18.0	*Romania* 13.0	*Ukraine* 44.5
2) Romania	12.0	*Germany* 11.5	*Romania* 23.0
3) Poland	11.5	*Poland, Ukraine* 10.0	*Hungary, Poland* 3.0

Source: MSC-W, Convention on Long-range Transboundary Air Pollution.
* Within EMEP calculated area

these substances, the total mass of exported fluxes is almost 150 t higher annually than the total mass of fluxes imported into Moldova's territory. The share of external sources in sulphur and nitrogen deposition is very high and amounts to 84% for sulphur, 96% for oxidized nitrogen and 45% for reduced nitrogen. Romania (32%) and Ukraine (18%) contribute most to the sulphur deposition, and Ukraine (15%) and Poland (12%) to the oxidized nitrogen deposition. According to the preliminary calculations by the EMEP Meteorological Synthesizing Centre-East (MSC-E) for 1994, the values of sulphur deposition gradually decrease from the north (1000 eq/ha/yr) of the country to its centre (200-500 eq/ha/yr) and to the south (100 eq/ha/yr) and do not exceed the critical loads recommended by the World Health Organization (WHO) (250-1 500 eq/ha/yr depending on the ecosystem). The acidity of wet deposition (rain and snow) has slightly increased at the one meteorological station where it has been recorded systematically.

Reported air pollution primarily originates from the use of commercial energy and, particularly, transport activities (see Chapters 9 and 10). Substantial pollution pressure would probably appear, if all emission sources were taken into account and their emissions systematically inventoried. In the first instances, this concerns the structure of household use of energy and related combustion techniques, off-road and diesel-fuelled vehicles used in agriculture and the transport of agricultural produce. For example, the consumption of wood as fuel has grown sevenfold and most of it can be attributed to residential heating.

Ambient air quality

There is no nation wide air quality monitoring. Total suspended particulates (TSPs), SO_2, NO, NO_2, O_3, CO, are measured in four cities only: in Chisinau at six stations and in Balti, Ribnita and Tiraspol at two stations. Heavy metals and volatile organic compounds (VOC) are not monitored. All city monitoring stations were located and equipped at the time and according to the criteria of the former USSR. Air sampling is done three times a day (except one night sampling at one station in the capital) followed by chemical analysis at the laboratory. No station is equipped with automatic measuring devices.

City monitoring is complemented by measurement of wet deposition acidity, but only one meteorological station in Hancesti has recorded results systematically. They showed fluctuations in pH from 3.80 to 10.35 in 1995 and slightly rising acidity over the past few years. Another meteorological station "Leovo", located close to the Romanian border and integrated in the EMEP network, has discontinued providing results since the collapse of the USSR, because of its inadequate capacity for analysis (see Chapter 3 and Recommendation 3.4).

The main stationary sources are concentrated around five big cities in Moldova: Chisinau, Balti, Rezina, Ribnita and Tiraspol and in the town of Dnestrovsc. In cities road traffic is relatively dense, causing the immediate and short-term exposure of the urban

population to its emissions. Therefore, air pollution problems occur primarily in these areas.

Available monitoring data for four major cities, except Rezina (Table 4.3), provided by the Hydrometeorological Service (Hidrometeo), indicate that since 1993 concentrations of nitrogen dioxide and nitrogen oxide have gradually risen at most measurement points. In Chisinau in particular they exceeded the WHO annual guideline for NO_2 in 1996. The annual levels of sulphur dioxide in the years 1992-1996 were also above the WHO guide value in Balti, but in other cities they were well below.

Table 4.3: Trends in ambient air quality in main cities, 1990-1996

			Annual average in mg/m³		
City	**Pollutants**	**1990**	**1992**	**1994**	**1996**
Chisinau	Dust	0.2	0.18	0.24	0.15
	SO_2	0.002	0.002	0.002	0.003
	NO_2	0.02	0.021	0.025	0.05
	NO	0.01	0.01	0.06	0.11
Balti	Dust	0.3	0.38	0.39	0.37
	SO_2	0.08	0.074	0.049	0.059
	CO	2	2	2	1
	Aldehydes	0.01	0.011	0.01	0.009
Tiraspol	Dust	..	0.51	0.43	0.32
	SO_2	..	0.005	0.002	0.004
	NO_2	..	0.018	0.027	0.012
	CO	..	2	2	1
	Aldehydes	..	0.008	0.021	0.005
Ribnita	Dust	..	0.31	0.23	0.15
	SO_2	..	0.011	0.012	0.011
	NO_2	..	0.042	0.064	0.038
	CO	..	1	1	1

Source: Department for Statistics.

In general, relatively high annual concentrations of particulate matter or TSPs prevail in all monitored cities, exceeding three to four times present WHO guidelines. Although their values may be higher than emission estimates suggest (poor maintenance of roads and soil erosion can contribute as diffuse sources), it is known that suspended particulates contain much lead, benzo(a)pyrene and possibly other carcinogenic components emitted mainly by city traffic. Except for point measurements of aldehydes, phenol and sulphates, they are unfortunately not monitored or analysed at all. This is mainly due to the extremely poor equipment of the laboratories visited, which are condemned to using simple sampling and analytical methods that do not correspond to those recommended by the EMEP centres. In general, their situation has deteriorated since the independence of the Republic and they are unable to cooperate at international level.

At current levels of nitrogen oxides and other traffic-related pollutants, particularly during shorter exposures, when standard levels are exceeded much more, the urban population runs the risk of health problems (for details, see Chapter 11).

4.2 Policy objectives and management practices

Legislation and policy objectives

In December 1997, the Parliament adopted the Law on Air Protection prepared by DEP. Before, air management in general was theoretically based on the 1993 Law on Environmental Protection, but in practice on the Air Law of 1981. Therefore ambient air quality standards (PDKs) had been established through air monitoring and control of both stationary and mobile polluting sources, assessed against established emission limits. The ambient quality standards had been fixed on the basis of ecological examination and included subsequently in ecological passports. Emissions limits are derived from 1983 exhaust gas emission standards for CO and smoke.

Other laws relevant to air pollution management include: the Law on Natural Resources and the Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment, but they are of minor importance for air management.

According to the 1993 Law on Environmental Protection and other policy documents, mainly the National Environmental Action Plan for 1995-1998, the National Strategic Action Plan for Environmental Protection 1995-2020, and the Programme for National Economic Development, present strategies and policies for air pollution abatement should be guided by a number of principles and objectives such as sustainability, including rational use of natural resources and energy carriers resulting in cleaner production stimulated by economic instruments, improved quality of life and better health of the population and the protection of ecosystems against chemical, physical and biological air pollution.

Those strategies and policies should also be based on the Republic's international commitments, including, for air pollution, primarily the UNECE Convention on Long-range Transboundary Air Pollution, the Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol and the UNECE Convention on Environmental Impact Assessment in a Transboundary Context.

More specific objectives, although only of a qualitative nature, contained in those documents concern *inter alia* the setting-up of a comprehensive legal framework for air pollution abatement, including primarily ambient air quality standards and emission limit values from stationary and mobile sources and a more efficient control system, the drawing-up of energy saving and energy conservation programmes, including petrol consumption, the introduction of incentives to promote cleaner production and abatement technology, especially for particulate emissions, the creation and operation of air quality monitoring throughout the Republic, and, finally, the establishment of a procedure for environmental audits at plant level.

Institutional framework for air management

The main responsibility for developing policies for air protection and related objectives and for coordinating the implementation of NEAP lies with the Department for Environmental Protection (DEP).

In performing its tasks**,** DEP seeks support from other line ministries, particularly from the Ministry of Health, responsible for the population's living conditions and thus for setting ambient air quality standards, the Ministry of Energy together with the Ministry of Industry and Trade, which are responsible for integrating environmental objectives into the operation and maintenance of stationary sources, and the Ministry of Transport and Road Administration, which has similar tasks including standard setting for exhaust gas emissions.

Two divisions in particular, namely the State Ecological Expertise responsible for assessing new development projects, including modifications in terms of setting emission limit values and the Natural Resources Assessment and Licences Division responsible for preparing the ecological passports, play a role in implementing air policy objectives.

When fulfilling its mandate, DEP as a whole can generally rely on regional authorities and local governments to implement air policy objectives and in particular on the State Ecological Inspectorate and its 12 local or regional agencies to establish and enforce emission limit values for stationary sources and, together with the Road Police, for mobile sources. In addition, DEP cooperates closely with the Hydrometeorological Service for monitoring air quality in selected cities and some pollutants; and the National Institute of Ecology for compiling annual environmental reports and developing integrated monitoring networks.

Instruments used in air management

Economic instruments are used to support the concept. For air pollution these are limited to emission charges and fines, which contribute to the Ecological Fund, operating for the time being in the Chisinau area only (see also Chapter 2). Emission charges for mobile sources are included in the taxes on motor fuels paid by transport enterprises; for unleaded petrol they are half what they are for other fuels. On the other hand, the price of unleaded fuel at filling stations is 10% higher than that of leaded petrol. During road spot checks inspectors can impose fines (up to 25 Lei) directly on the driver if he does not comply with emission limits (CO and smoke). According to the new Law on Payments for Environmental Pollution, payments for air pollution from the transport sector are included in the total tax amount imposed on imported fuel (see chapter 2). These environmental taxes will be levied at the customs and the amounts transferred to the National Ecological Fund.

The base rate of payments for air pollution by stationary sources is first determined by the expected total pollution abatement costs. The rate charged also depends on the type of pollutant and the location of the emitting source. The environmental risk associated with the pollutant influences the charge levied, which is proportional to the maximum permissible concentration. The highest rates are charged in large towns, the lowest in rural areas (in a proportion of 100:1). Emissions within the set limits are charged at the base rate; emissions above the limits are charged at five times the base rate (see also Chapter 2).

In 1995 air emission charges and fines contributed, in monetary terms, 22% and 10%, respectively, to the Ecological Fund, but only 10% of their combined value was paid up. In general, emission charges represent a small fraction of the output value and for

power generation do not exceed 0.3% (Chisinau 2 power plant) or in general 0.04% of the unit cost of production. The Chisinau Municipality, which administers an ecological fund, has not so far financed projects to measure and/or reduce air pollution.

The development of taxes on air pollution (1992-1996) is shown in Table 4.4. The taxes were introduced in 1991, but rates were so low that they did not influence firms until they were indexed in 1993 (leading to a 13-fold increase), in 1994 (a 39-fold increase) and in 1995 (a 195-fold increase). Payments for environmental pollution collected from thermal power plants and boilers in Chisinau are the subject of Table 9.10, Chapter 9.

Inspectorates (230 inspectors, three central laboratories and six regional ones) are underfunded compared to similar facilities in industry (by a factor of 3 or 4) and, therefore, poorly staffed (in number 50% fewer than in 1990). Recently, staff have been allowed to work for extra-pay and use up to 5% of Ecological Fund receipts for their salaries. However, they have no adequate equipment to ensure regular and complete monitoring of polluting sources for compliance with norms or to react immediately in the event of excessive and/or accidental pollution.

Table 4.4: Taxes on air pollution, Lei/tonne

	Lei/tonne, in current prices	
Pollutants	**1992**	**1996**
SO_2	0.400	220
NO_x	0.800	275
CO	0.002	11
Dust	0.800	454

Source: DEP, Provisional Instructions on the Application of the Standards Governing Payments for Pollution. Chisinau, 1991.

The capital investment for air protection in the State budget is small. In 1995 it represented only 4% of the total real capital investment for the protection of the environment. Industry primarily invests in air protection by keeping the existing installations running and spends about 6% of its total operating cost on air emission control.

Regulatory measures complement the economic instruments. The Republic operates a system of permits to pollute. It sets maximum permissible levels for emissions from the polluting sources. Emission limits are established on the basis of an ecological examination and are included in ecological passports. In 1994, 1995 and 1996, power plants did not exceed the admissible emission ranges (AER). National standards are controlled through the Fundamental Standards of the Standardization System, adopted by the Department of Standards, Metrology and Technical Control (Moldavstandard). By decision of 1992, Moldavstandard applies the State Standards GOST in the national economy as national standards of the Republic of Moldova. Accordingly, air quality is evaluated in terms of the former Soviet Union's standards, involving about 1080 pollutants. The limits of admitted concentrations (LAC) are developed for 543 of these pollutants. In Table 4.5 some Moldovan ambient air quality standards are compared with WHO values.

State ecological expertise (SEE), although applied well before, has been institutionalized and given methodological guidance since the adoption of the 1996 Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment. Although still highly centralized, the new procedures involve some form of public participation. (For a complete description, see Chapter 1).

The licensing of polluting activities aims primarily at meeting ambient air quality standards through the dispersion of pollutants rather than through technology requirements. This is one of the reasons why cleaner technologies and/or abatement techniques are not introduced. Moreover, the "right to pollute" outside monitoring areas is based on a very simple assessment of the background pollution related to the number of inhabitants. Such background pollution is considered in general to be an underestimate. If its measurement is low, higher emissions are permitted.

When a licence is issued exclusively by DEP for a stationary source, regional agencies monitor the construction accordingly and, once it has been completed, its operator has to prepare norms identifying emission sources and their annual limits on the basis of what is permitted. He is also obliged to verify those norms regularly. Larger emission sources, e.g. power plants, measure some of their own air emissions, although not continuously. In most cases, verification is done on the basis of energy and mass balance.

Table 4.5: Comparison of selected Moldovan ambient air quality standards with recommended WHO guiding values

Substance	Moldova PDK mg/m^3, 20 min	Moldova PDK mg/m^3, 24 h	WHO guideline value/ averaging time
Classic air pollutants			
Carbon monoxide	5.0	3.0	100 mg/m^3, 15 min 60 mg/m^3, 30 min 30 mg/m^3, 1h 10 mg/m^3, 8h
Ozone	0.16	0.03	0.120 mg/m^3, 8h
Sulphur dioxide	0.50	0.05	0.5 mg/m^3, 10 min 0.125 mg/m^3, 24h 0.050 mg/m^3, annual
Organic pollutants			
Formaldehyde	0.035	0.003	0.0001 mg/m^3, 30 min
Styrene	0.20	-	0.26 mg/m^3, 30 min
Tetrachloroethylene	0.50	0.06	0.25 mg/m^3, 24h
Toluene	0.60	0.60	0.26 mg/m^3, 1 week
Trichloroethylene	4	1	4.3x10^{-6} (mg/m^3), life-time
Inorganic pollutants			
Arsenic	-	0.003	1.5x10^{-6} (mg/m^3), life-time
Cadmium	-	0.0003 (compounds)	0.005 mg/m^3, annual (deposition)
Lead	0.0010	0.0003	0.0005 mg/m^3, annual
Manganese (compounds)	0.40	0.05	0.00015 mg/m^3, annual
Mercury	-	0.0003	0.001 mg/m^3, annual

Source: WHO.

In addition, norms for stationary sources are controlled by the State Ecological Inspectorate through instrumental measurements, in general annually and adjusted on that basis to the production level, where appropriate. Their results serve for inspectors to levy emission charges according to rates determined for each toxicity class of pollutants and in case of non-compliance to impose fines, which are five times higher than the charges.

Mobile sources, exclusively road vehicles, except gas-fuelled vehicles, are controlled during spot checks in spring and autumn organized jointly by the State Ecological Inspectorate and the Road Police, and once a year, mainly for CO (petrol) and particulate matter (diesel), at 20 inspection stations, which deliver certifying stickers. Inspectors can also control vehicles inside transport enterprises that fail to observe "collective norms" and occasionally at the borders.

The efficiency of dust emission control equipment at the stationary sources in the Republic has gradually fallen from 85% in 1990 to 50% at present, and the mass of pollutants retained decreased 22 times during this period. The project to install the first FGD system has been interrupted.

Concerning mobile sources, in 1996 about 25% of vehicles (65 000 in total) were controlled and every fifth vehicle exceeded the 1981 exhaust gas emission standards (in 1995 every third vehicle controlled failed). Vehicles that are more than 10 years old can no longer be imported.

Although the 1993 Law on Environmental Protection contains provisions to restrict or even temporarily shut down activities contributing or causing excesses of ambient air quality standards, such cases have not been officially reported. Also, no legal proceedings related to suspected violations of norms and resulting environmental damage, have been brought before the

Ecological Procurator by the State Ecological Inspectorate.

However, it should be noted that the Republic of Moldova does not have an industry for control technology and equipment and measuring devices for ambient air concentrations and emission rates. In the Soviet era this industry was located outside Moldova and since its independence no national manufacturing capacity has been built.

4.3 Conclusions and recommendations

The current recession in Moldova obviates the need for urgent and decisive action. However, economic recovery will necessarily change this situation, unless preventive action is taken in a number of respects. First of all, DEP does not seem to be in a position to take decisive action, when needed. The Republic of Moldova's institutional and legal framework for environmental protection in general and for air management in particular cannot ensure the implementation of many policy objectives, because of the weak position of DEP in the Government and the subsequent poor coordination at governmental level, the incomplete laws in force and the lack of harmonization between them, the small number of genuinely stimulating policy instruments, and their ineffective enforcement. The coordinating role of DEP within the governmental structure should be reinforced, to allow for effective interministerial coordination and implementation of present and future policy objectives as recommended in Chapter 1 (See Recommendations 1.3 and 1.4).

The recently adopted Law on Air Protection does not integrate new principles and explicit policy objectives, as stipulated for example in the 1993 Law on Environmental Protection. In particular, it does not refer to technology-based standards and fuel quality standards and also does not include a realistic set of ambient air quality standards, as stipulated in the 1993 Law on Environmental Protection. The draft clean air act should therefore be revised before it is submitted to Parliament for adoption, so that it stands a reasonable chance of becoming the much needed basis for future air management.

The permit system for air polluting stationary sources is based on air quality standards that necessitate the use of complex models to set emission limits for each source. This makes it difficult to directly establish links between excesses of air quality standards and emission levels, especially for air toxics.

Moreover, emission limit values are not set in accordance with best available technology (BAT) or best available technology not entailing excessive cost (BATNEEC), as recommended widely under the Convention on Long-range Transboundary Air Pollution and its protocols. As a result, measures that do not reduce emissions but merely dilute them, e.g. higher stacks, can be required during EEE procedures.

Recommendation 4.1:
The recent adoption of the Law on Air Protection requires the preparation of implementing regulations that should benefit from contemporary European practices and experience, in particular as regards standards for ambient air quality and deposition levels.

On the basis of the new Law, a number of other administrative problems will have to be solved through appropriate legal instruments. The process of setting new standards has no clear direction (different experts refer to different sources for their inspiration) and is institutionally diffused (DEP, line Ministries of Health, Energy and Transport and Department of Standards, Metrology and Technical Control), which has led to long delays and the use of obsolete standards or no standards at all, e.g. for gas-fuelled vehicles.

Recommendation 4.2:
The administrative authority for setting environmental standards relevant for air management should be streamlined in such a way that it clarifies responsibilities and enforces appropriate coordination mechanisms between the sectoral interests involved. The new set of standards should become the basis for strict enforcement in the very near future.

A further problem concerns energy saving and energy conservation programmes. Their sections dealing with motor fuel and cleaner production programmes have not yet been formulated and NEAP, serving only as guidance, has not been translated into national or regional air protection programmes formulating concrete tasks, assigning responsibilities and providing financing, as for example action plans at different administrative levels. The sharp decrease in air emissions since 1990 has been 80% due to economic constraints, 15% to fuel switching from oil to gas and 5% to other measures related to low-cost control techniques. A shift to a more conscious

policy promoting cleaner technologies as well as to the use of cleaner fuels will be unavoidable in the future, if air management is to cope successfully with future economic recovery.

Recommendation 4.3:
The future development of the energy economy should be steered in such a way that the use of cleaner fuels and of cleaner technologies is promoted through the introduction and application of market-oriented instruments.

To improve the economics of air protection, new economic mechanisms have been proposed and wereadopted by the Parliament in the new Law on Environmental Taxes (see Chapter 2). As regards air pollution, it is expected that the new Law will strengthen emission charges and fines and index them to keep pace with inflation. Concerning road vehicles, pollution taxes will be levied on cars entering the country and the use of unleaded petrol will be promoted by eventually reversing the current petrol price structure.

The level of charges and fines are too low to serve as significant incentives to improve control techniques. In addition, the geographical scope of their collection, limited to the Chisinau area, does not comply with the 1993 Law on Environmental Protection establishing the Ecological Fund on the whole territory of the Republic.

Recommendation 4.4:
In accordance with the recently adopted Law on Payments for Environmental Pollution, the charges and fines used to combat air pollution should be enforced without delay in the country as a whole.

With the present monitoring system (location of stations, geographical coverage, equipment and related sampling and analysis methods) and weakening measurement capacity of inspectorates, it is not possible to determine background air pollution more exactly. Yet this is necessary to establish adequate emission limit values within licensing and to identify in real time activities suspected of violating norms and subsequently ambient air quality standards**.**

Recommendation 4.5:
The existing inventory, monitoring and reporting systems for air pollution should be expanded with regard to the most important air pollutants.

Recommendation 4.6:
The gradual implementation of a comprehensive nationwide monitoring programme should begin with the drawing-up of a programme of required investments and lead to the installation of continous measuring and sampling devices, especially in urban areas. See also Recommendations 2.3 and 2.4.

The State ecological expertise (SEE) is a good tool to integrate air abatement concerns into economic decisions, as far as new projects and modifications to existing pollution sources are concerned. However, so far, the decision-making process is too bureaucratic and does not reflect sufficiently the opinion of local levels, specialized commissions and the public (see Recommendations 1.8 and 1.9 in Chapter 1).

As a first step to controlling emissions from road vehicles, the Republic of Moldova should adhere to the 1958 Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts and other related UNECE regulations. As a result, vehicle exhaust emission limits, including off road, should be introduced or updated and the control of in-use vehicles reinforced. Also, unleaded petrol should be available in major cities and along main national roads.

On the basis of NEAP and following environmental audits at enterprise level, a concrete plan of action (regional and/or municipal) aiming at reducing nitrogen and particulate emission should be prepared. In the present economic situation, it should be based on low-cost environmental management and cleaner production techniques, including well enforced inspection and maintenance programmes for mobile sources.

The Republic of Moldova should accede to the 1994 Protocol on Further Reduction of Sulphur Emissions to the Convention on Long-range Transboundary Air Pollution and introduce on its territory fuel quality standards as contained in annex V to this Protocol.

Recommendation 4.7:

In the immediate future, air management authorities should focus on the control of: (a) emissions from road vehicles, preferably in accordance with relevant UNECE regulations; and (b) emissions of nitrogen and particulates in human settlements. Moldova should consider acceding to the 1994 Sulphur Protocol to the Convention on Long-range Transboundary Air Pollution.

Chapter 5

WATER MANAGEMENT

5.1 Current water resources

Aspects of the water balance

The Republic of Moldova is located in a region of insufficient precipitation and has limited water resources. The average annual air temperature across the territory is +8° to +10° C. Average annual precipitation is 370 mm in the south and 560 mm in the north. Medium and moderate droughts (respectively 70% and 90% of normal rainfall) have been reported 40% of the time over the past 50 years; severe droughts (less than 45% normal rainfalls) 4% of the time only.

The available overall aquatic resources are 6.3 billion m^3 in a typical year, 4.9 billion m^3 in a dry year and 3.4 billion m^3 in an extremely droughty year. About 3.2 billion m^3 of water are needed annually for all national economic sectors and for the supply of drinking water - of which about 2 billion m^3 are used at the Moldovan Thermal Power Plant (Dnestrovsc power plant, see Chapter 9). The rest (1.2 billion m^3) is used as follows: 63% for agriculture, 15% for household water supply, 14% for industry and 8% for building, transport and other uses (see Figure 5.1). The Republic draws 56% of its water from the Dniester River, 16% from the Prut River, 8% from small rivers and 20% from underground resources (these data do not include phreatic water sources from rural regions; see Figure 5.2).

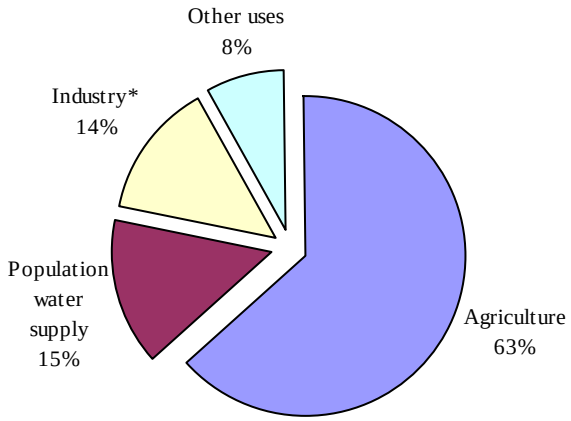
Precipitation

The rainfalls, especially the abundant ones (80%), are highly variable in time and space. The probability of short, intense torrential rains of 1-2 mm/min is 67%, and of 2-3 mm/min is 26%. The damage caused by torrential rains can be considerable, as in 1994, when GDP decreased by 31.2% as a result of drought followed by heavy rainfalls and floods.

Surface waters

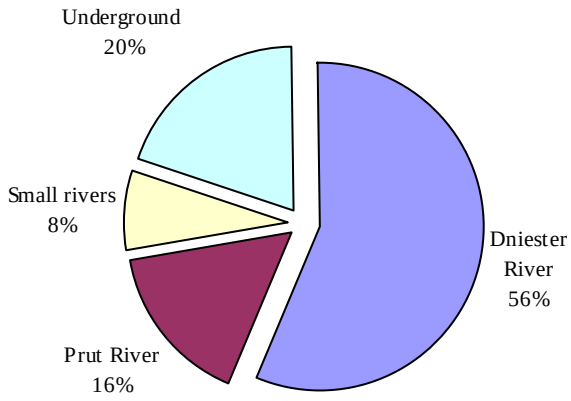
All Moldovan rivers are part of the Black Sea basin and flow from the north-west to the south-east (see map in Chapter Introduction). The country's water

Figure 5.1: Water use by different consumers, 1993



Source: The Department for Environmental Protection and the National Institute of Ecology
* Water use from the energy sector (cooling water) is excluded; it represents 50-60% of the country's overall water use.

Figure 5.2: Water sources



Source: The Department for Environmental Protection and the National Institute of Ecology.

network consists of the Dniester and Prut river systems, the rivers flowing into the Danube lakes, and the lakes in the vicinity of the Black Sea. There are 3 200 big and small rivers, permanent and temporary streams, of which only 9 are longer than 100 km. The flow of small rivers decreases in summer, sometimes drying up completely. The most intense floods take place in summer during the torrential rain season.

There are 57 lakes with a total surface of 62.2 km^2. Small lakes of under 0.2 km^2 prevail. Besides natural lakes, there are about 3 500 ponds and reservoirs, with a total volume of 1.8 km^3 and a surface of 333 km^2. Only 10% of all basins have a volume above 1 million m^3. Out of the 82 artificial water reservoirs, 75 have a capacity of 1 to 5 million m^3.

Groundwater

Groundwater resources are not uniformly distributed over the territory. The main water reserves are located in the Dniester river underlying aquifer. Moving further away from the river, the water supply of the water table decreases. Groundwater is extracted from the Cretaceous and Silurian formations (protozoic age), Baden Sarmatian, middle Sarmatian, upper Sarmatian (Neocene formations), and Meotian and Pontian geological layers.

Of the more than 200 water deposits discovered in Moldova, only half are being exploited. The degree of confirmed groundwater use is low compared with other countries and does not exceed 40%. The supplies of underground fresh and saline waters are estimated to be approximately 3-3.2 million m^3/24 hours, of which drinking water makes up 1.7 million m^3/24 hours. The extract table reserves of artesian waters are 2.1 million m^3/24 hours and the total estimated reserves are 3.4 million m^3/24 hours.

Water supply and use

The daily quantity of public drinking-water supply is 849 000 m^3. The data on water use in the economy of the Republic shown in Table 5.1 indicate a general downward trend in different sectors of the national economy. A matter of great concern is the centralized supply of drinking water because of the uneven distribution of water reservoirs on the territory and because its quality does not meet existing national standards (so far still GOST standards), especially in the south, where it has a high content of fluorine, nitrates, sulphur hydrogen and other elements.

In 1994, about 1 585 million m^3 of water abstracted from underground sources or received through central water-supply pipes were used in industry (this includes cooling water for the energy sector). Water for topping up industrial recycling systems amounts to about 800 million m^3 annually.

The main sources of drinking-water supply are the rivers Dniester and Prut, 600 springs, 6 600 artesian wells and 123 000 wells. In the future, the Danube River will also be used for water supply in the southern districts of the country. At present, water from the Dniester, Prut and Danube rivers does not meet drinking-water quality standards. River water can be used for drinking-water supply only after intensive purification, using methods based on decantation, filtration, coagulation, adsorption, oxidation and disinfection.

5.2 Water quality and waste-water treatment

There is no unified water quality monitoring system or practice in Moldova. The division of utilization, control and management functions by various entities (ministries, departments, commissions with various

Table 5.1: Water management indices

million cubic metres/year

	1985	1990	1991	1992	1993	1994	1995	1996
Water abstraction								
Total	3,647	3,827	2,981	3,026	2,622	2,559	1,889	1,766
Underground	274	312	302	283	276	..	..	..
Water utilization								
Industry	2,676	2,523	2,198	1,918	1,773	1,585	1,139	1,173
Irrigation	643	898	388	657	481	621	402	274
Agriculture	114	135	125	118	110	100	87	80
Recycling systems	766	977	947	906	788	630	558	502

Source: Statistical Yearbook, 1994 and The Republic of Moldova on the way of sustainable development, Arcadie M. Capcelea, 1996

interests) is a tradition from the former Soviet institutions. The actual situation in natural resource management and control is confusing and the system needs to be completely overhauled.

Surface water quality is classified into 4 classes, from class I (good quality) and II (moderately polluted), to class III (polluted) and IV (very polluted) for low-quality waters. The water quality of the Dniester and Prut rivers, as well as of the lakes and reservoirs, is generally satisfactory and in line with the quality standards in force. The mineralization of water increases from 290-450 mg/l total dissolved solids in the upper reaches of the Dniester (Otaci section) to 365-578 mg/l in the Olanesti section. In comparison with the 1950s, the mineralization of Dniester water has increased by 50%. A characteristic of the Dniester and Moldova's other rivers is their high turbidity. For example, in 1993, the average annual turbidity in the Olanesti section was 462 mg/l TU.

During the past two decades, concentrations of nitrogen and phosphorus have increased to 10 mg/l and 0.2 mg/l, respectively. These two levels do not exceed the standard limits for drinking-water supply, but they are rather high and are causing eutrophication, particularly in the Dubasari water basin. Downstream from Soroca, Camenca, Bender and Tiraspol, ammonia (up to 0.7 mg/l) and nitrogen (up to 0.2 mg/l) can be found as a result of residual water overflow that is insufficiently treated. Also, increasing quantities of petroleum substances (0.08 mg/l), phenols (0.02 mg/l) and detergents (0.06 mg/l) have been recorded.

The concentration of heavy metals accumulated on the bed of the Dubasari reservoir exceeds 400 times their concentration in the upstream river water, which is otherwise acceptable. The bacteriological analyses of Dniester water have detected 1.10^2 to 2.10^3 faecal coliform germs per 100 ml, reaching 2.10^3 - 2.10^4 per 100 ml in some places. On the whole, the water of the Dniester River is moderately polluted (i.e. class II), but is polluted at the confluence with the rivers Raut and Bac (i.e. quality class III).

Prut water is especially polluted by organic substances. Its level of microbial infection is quite high: the total number of faecal coliform bacteria is 3.10^5 per 100 ml at Ungheni, 2.5. 10^5 per 100 ml at Leova and Giurgiulesti. Retroviruses are periodically found (in 1994 at Leuseni and Cahul). The water of the river Prut generally falls into the class of moderately polluted water, but downstream from Ungheni, the water is polluted, even reaching the category 'strongly polluted' (i.e. class IV) near Valea Mare. The water of most small rivers falls between the classes 'polluted' and 'strongly polluted'.

From the total quantity of groundwater, only 25% can be used for economic purposes without pretreatment, because of the generally high mineralization (2.5-3 g/l), naturally high content of fluorine (5-15 mg/l), and high concentrations of ammonia nitrogen (15-20 mg/l), hydrogen sulphide and methane (up to 10 mg/l). The artesian groundwaters have so far not been seriously polluted by anthropogenic sources thanks to their surface insulation with protecting layers.

By contrast, phreatic waters undergo intensive anthropogenic pollution mainly from nitrates (in some places up to 1 000-2 000 mg/l), the main sources being livestock complexes and farms, rural settlements not equipped with sewer systems, uncontrolled waste disposal, and excess use of mineral fertilizers.

A major problem in the effort to manage water resources is to ensure adequate drinking water and waste-water collection and treatment. The Ministry of Health (MoH) has recorded an overall marked deterioration in the quality of drinking water (see Chapter 11, Table 11.3). Groundwaters under 60% of the country's territory do not satisfy drinking-water requirements. Half the drinking-water supplies from groundwater in the Prut basin have nitrate concentrations in excess of 45 mg/l (which is the Moldovan standard value, the WHO guideline being 50 mg/l). The drinking water in a good half of the village wells is estimated to be polluted with agricultural chemicals or their decay products. The tendency of well water to become polluted is evident. While, in 1985, the proportion of wells with nitrate levels above the established standards was 21%, in 1996 it was nearly 60%, showing a sharp rise. The same is true of artesian boreholes, although on a much smaller scale. In 1985 only 1.7% of the boreholes produced water with an excess nitrate content, in 1990 3.9%.

In some regions, the percentage of water samples exceeding health-related and chemical standards is very high (96% in Ciadir Lunga, 78% in Calarasi, 75% in Falesti and 71% in Slobozia). Monitoring data from natural springs and fountains indicated that 69% of samples contained nitrates and ammonium

nitrogen in 1993, compared to 62% in 1991 and 60% in 1992. See also Chapter 11 for the overall situation in more recent years.

The capacity of water-supply treatment plants to produce drinking water is 391 million m^3 per year, of which 310 million m^3/year are supplied in a centralized way. The water is distributed through a network of aqueducts 4 081 km long.

Domestic sewage and waste water from industrial and other economic activities are a major source of surface and groundwater pollution. About 70% of the population is connected to municipal waste-water treatment plants, but most of the villages discharge their waste water without treatment. The total installed capacity for waste-water treatment is about 650 million m^3/y, which includes 35 municipal waste-water treatment installations with a total capacity of 336.5 million m^3 per year. The plants are designed to reach a 60-70% reduction in biological oxygen demand (BOD). In 1993, only 60% of the installations were functioning and there is no indication that the situation has improved since. They do not work for a variety of reasons:

- many industries have stopped production because of the recession;
- maintenance and repair are too costly;
- many municipal waste-water treatment facilities have been overloaded by heavy metals because some industrial facilities do not work properly;
- in some rural areas, facilities have stopped operation because their technical lifetime has been exceeded.

The annual quantity of residual domestic waste water was 280 million m^3 in 1993, i.e. 90.3% of the total drinking water supplied to consumers. Annually, about 50 million m^3 of this water is purified, some 88-90% up to the required standards. The pollution standards for residual waste water are in some cases ignored because of the limited capacity of some treatment plants compared to the high amount of discharges (Cantemir, Sangerei, Dubasari) and the high pollution load (Orhei, Nisporeni, Cantemir).

In the Republic of Moldova, like in other countries, the water system serves as a recipient for the drainage and discharge of waste water from different sectors of the national economy. In 1994, 350 million m^3 of used and residual water flowed into the water network, including 182 million m^3 of water purified up to the required standards at treatment plants, 160 million m^3 of insufficiently purified water, and 8 million m^3 of untreated and highly polluted waste water. It can be assumed that this picture has not greatly improved in recent years, although the continuing recession account for some reduction in industrial waste-water generation. At the same time, it is likely that treatment efficiency and other investment-dependent indicators have deteriorated further.

Agricultural activities greatly influence the environmental quality of the Republic (see Chapter 8). In 1994, 621 million m^3 of water were used to irrigate 310 000 ha of land. These water quantities were comparable to those used in 1985 (see Table 5.1), which were said unnecessarily high at that time. Moreover, the efficiency of irrigation fell by 77.35% between 1978 and 1985, which means a 40% rise in water use. The consequences of these practices are aggravated by the scarcity of resources in the irrigated areas. However, it seems that in 1995 the surface of irrigated land was reduced to 170 000 ha, sprinkler irrigation being used on 48% of the total. The current recession and the transition have also led to a considerable decrease in the use of pesticides and organic and nutritive substances (see Table 5.2).

Table 5.2: Mineral and organic fertilizer used in agricultural enterprises

1 000 tonne

		1991	1992	1993	1994	1995
Mineral fertilizers		**191.4**	**127.6**	**36.2**	**12.1**	**11.2**
of which:	Nitrate	82.7	61.8	20.2	8.5	9.6
	Phosphate	75.2	43.4	10.6	2.4	1.1
	Potash	33.5	22.4	5.4	1.2	0.5
Organic fertilizer		**8,600**	**5,300**	**3,100**	**1,400**	**1,500**

Source: Statistical Yearbook, 1994

Cattle breeding has a particularly important impact on the environment. In 1994, it used about 40 million m^3 a year of groundwater (50% less than during 1985-1990). Till the 1990s about 10 million

m^3 of liquid waste (e.g. manure) with a high content of salts, organic substances, pathogenic micro-organisms, etc., were applied as organic fertilizer. This quantity drastically reduced since then (see Table 5.2) The long-term storage of these livestock wastes in reservoirs without adequate protection for leakage (not reinforced with concrete) has caused infiltration into groundwaters, entailing chemical and biological pollution.

The industries that, in spite of the decline in industrial activity, still have a major impact on the environment are sugar factories, poultry farms and dairies, electroplating shops and a few tanneries, chemical and textile plants. About 50 million m^3 of industrial water are discharged to surface waters with or without treatment, of which about 40 million m^3 are reported to be polluted above the standards. Many industrial establishments are connected to municipal treatment plants. Connected industries are required to have pretreatment facilities. At least 50 industrial waste-water plants have been constructed, but many of the industries do not use them or do not maintain them in good condition. The absence of detoxifying pretreatment for waste water discharged from galvanic shops leads to an excess of heavy metals in municipal waste-water treatment plants, undermining biological treatment.

5.3 Environmental management of water issues

Policy objectives and legislation

The targets defined in NEAP, and taken from the 1987 "Comprehensive Long-term Programme for Environmental Protection and the Rational Use of Natural Resources", that are relevant for water management are:

- Consolidation of the monitoring and laboratory systems, and upgrading of their technical capacity;
- Adoption of realistic interim environmental standards, in particular for water quality, as a basis for regulatory and investment strategies;
- Implementation of a professional development programme for staff of control authorities;
- Evaluation of water resources and use, and assessment of water quality and sources of pollution nationwide;
- Design of an integrated master plan for all aspects of water resources management;
- Implementation of studies to identify and rank water quality hot spots in terms of levels and types of pollution and of human exposure;
- Replacing, for purposes of water supply, water that fails to meet applicable standards with piped water from alternative clean sources.

Apele Moldovei commissioned a study on a "National Water Resources Management Strategy". The study was entrusted to foreign consultants and was finished in 1997. It shows detailed options for the future.

The legislative framework for water management contains the following laws:

- Law on Environment Protection (1993)
- Water Code (1993)
- Underground Resources Code (1993)
- Law on Protection of Riparian Zones (1995)
- Law on Ecological Expert Evaluation and the Evaluation of Impact on the Environment (1996)
- Law on Natural Resources (1997)
- Governmental Decision on confirmation of the Complex Scheme of Water Supply and Waste Water Discharge up to 2005 (1994).
- Draft law on potable water

Institutional arrangements

In the water sector, four different State bodies deal with various aspects of environmental management: the Department for Environment Protection (DEP), the Ministry of Health, the Ministry of Agriculture and Food and the Association Geologia of Moldova (AgeoM).

Water management in DEP is performed by:

- The State Ecological Inspectorate and its zoned agencies which monitor the State of water bodies in accordance with control plans, and in cases of evidence of wilful or accidental pollution;
- The Hydrometeorological Service with its network of laboratories on the territory;
- The National Institute of Ecology.

The Ministry of Health analyses water quality through the Republic's Centre for Hygiene and Epidemiology. Till two years ago, the Ministry of Agriculture and Food relied on monitoring institutions subordinated to the State Management Committee ACVA, such as the Moldovan Institute

for Research on Water and Land Improvement, the Association of Danube-Dniester Water Management, and the Hydrogeological Centre for Soil Amelioration. In 1995, ACVA became an independent body named "Apelei Moldovei" in charge of water management.

AgeoM and its Central Analytical Laboratory monitor and assess surface and groundwaters.

Utilization, control and management functions are divided amongst the various above-mentioned partners. For example, water resources are exploited by economic agents of the Ministry of Agriculture and Food, of industry, of communal services, while State control is performed by the DEP and Apele Moldovei. Underground resources are managed and monitored by AgeoM,, DEP and local authorities.

Regulatory instruments

Moldova applies a combination of command-and-control and economic instruments to achieve compliance with environmental regulations. Permitting and compliance reviews are conducted by the State Ecological Inspectorate. The right to impose administrative penalties for the violation of ecological legislation has been introduced.

Environmental impact assessments and expert surveys of project documentation play an important role in minimizing the damage caused by the construction of different facilities, and in predicting the environmental changes that they will cause. These studies must be submitted, with the whole package of project documentation, to the State Ecological Expertise Unit. (For a full description of the procedure, see Chapter 1.)

The Government Decision "On the Regulation of Some Types of Activities in the Republic of Moldova" of 1995 stipulates, *inter alia*, that the exploitation of underground resources requires Government approval.

Economic instruments

Economic instruments affect both public revenues and public expenditures. The Law on Environmental Protection and the Law on Natural Resources introduces a number of instruments on the revenue side which apply specifically to water (see Chapter 2).

Payments for the use of water resources are made in accordance with Government Decision No. 262 of May 1994. The levels of charges depend on whether the water concerned is drawn from rivers or from underground resources. They also differ according to the purpose of the use. For instance, the rate is lower for water used as cooling water for electricity generation, for irrigation or fisheries. The rates are valid for water use within the limits of established water consumption quotas, established by Apele Moldovei and the Danube-Dniester Basin Inspectorate. In excess of these quotas, the rates increase drastically. More details are given on this issue in Chapter 2.

Payments for the pollution of water resources depend on the type and level of toxic pollutants that are present in the waste water that is discharged into sewers or into nature. Payments rise progressively when discharges exceed the set limits. Although payments for pollution are obligatory for all economic actors, only enterprises and organizations located in Chisinau have actually paid up. Even here, the sums paid often represent only a small part of the payments due.

Public environmental protection expenditures have been rather stable since 1985, with a total volume of investments in the range of 1.5%-2.0% of GDP. Environmental protection investments totalled 11.65 million Lei in 1995. Of this amount, 6.72 million Lei were used for the protection of water resources, i.e. 58% of the total capital invested. The funds came essentially from enterprises (67.7%) and the State budget (28%). As shown in Chapter 2, Table 2.6, capital investments have mainly benefited water and soil protection, in almost equal shares and representing about half the amount of total capital investments for environmental protection. The National Strategic Action Plan for Environmental Protection shows the planned allocation of financial resources for the next 10 years (see Table 5.3).

Table 5.3: Financial possibilities for environmental protection in the implementation of NSAPEP

million Lei (1992 prices)

	1995		2000		2005	
Versions	**Pessim.**	**Optimis.**	**Pessim.**	**Optimis.**	**Pessim.**	**Optimis.**
GDP	1,970	2,150	2,484	3,320	3,300	5,600
Share of environmental protection *(%)*	3	3	4	4	5	5
Availability of funds for environmental protection						
Overall environment	5.91	6.45	9.94	13.30	16.50	28.00
of which to:						
Land	1.70	1.85	3.61	4.84	6.01	10.19
Water	3.54	3.87	5.32	7.12	8.82	14.99
Atmospheric air	0.46	0.50	0.34	0.45	0.56	0.95
Mineral raw materials	0.20	0.22	0.64	0.85	1.06	1.79
Forest	0.01	0.01	0.03	0.04	0.05	0.08

Source: NSAPEP, 1995

Proposals for funding a new project are forwarded by local and/or central public authorities. Project allocation is not based on cost-benefit criteria, though optimal selection would be very important in times of budget deficits. Economic analysis is restricted to an expense assessment. There is no in-depth analysis because the proposed project does not provide the necessary information.

During the drawing-up of the investment plan, specialists essentially strive to coordinate the list of accepted objectives with the applicants, the Ministries of the Economy and Finance and the Government. Then the selected projects with their budgets are included in the investment plans, prepared by the respective unit of the Ministry of Economy and approved by the Government. Only at that stage can the project be carried out. In practice, even when the necessary funds are available, the lack of materials, technical building capacity, equipment, and specialists make it impossible to go ahead with the projects. In such situations, funds are re-allocated, deadlines delayed. When a project does go ahead, the result is faulty design and building, slapdash work, unfinished units put into operation and, ultimately, insufficient exploitation and further costly investments to correct deficiencies.

As explained in Chapter 3, Moldova participates in a number of international agreements in relation with water management and management of transboundary watercourses. In 1994, the Government of Moldova, together with foreign partners including the World Bank, prepared a three-year draft public investment programme. It is designed to seek both internal and external sources of finance. Five projects included in the programme relate to the improvement of water-supply systems for a number of major towns and neighbouring villages. This improvement is a high priority for the Government. Total resources required for the completion of the five projects were estimated at US$ 41.9 million in 1994. The proposed core projects for 1995-1997 are:

Chok-Maidan water intake in Comrat: The justification for the project are the large deficit in supply, and the poor quality of water for the city of Comrat. Cost of investment: US$ 2 138 000, with 3% completed by 1 March 1995.

Water-supply system for the town of Kainar: The existing source of water supply does not meet the standards required for drinking water. At present, the water can be used only for industrial purposes. It is considered one of the town's most urgent problems. Cost of investment: US$ 3 million (completed).

Water-supply systems for the cities of Ungheni, Kalarash and Bucovest: At present, Ungheni is supplied with only 60% of its needs, while Bucovets and neighbouring villages do not receive more than 12% of their requirements. Cost of investment: US$ 22 million (in progress).

Water supply for the Leovo Region: The objective is to improve the water supply to 37 settlements, which is currently not fit for human consumption. Cost of investment: US$ 21 375.

Water supply for the town of Telenesht and neighbouring villages: The proposed water-supply system will provide clean drinking water from the Dniester-Soroca-Belts supply network, replacing the

current groundwater supply. Cost of investment: US$ 8 550 000.

In addition to the five core projects, the upgrading of the *water-supply system of Kahul* is also included in the programme. Its present system was designed in 1974 as a temporary scheme. It can meet household needs for no more than 5 hours a day. Cost: US$ 1 261 000. The World Bank is preparing other projects under the umbrella of international assistance.

As regards other foreign assistance for environmental management, the TACIS programme disbursed a grant for training courses for Moldovan experts, in view of the harmonization of ecological legislation between Moldova and EU, and the planning of environmental projects. In 1997, the European Bank for Reconstruction and Development (EBRD) provided a loan of US$ 29 million to the Chisinau Water Services Company for its modernization project.

5.4 Conclusions and recommendations

Moldova's water management authorities are sustaining a considerable effort to plan and design an infrastructure that corresponds to the needs of a market economy. They are doing this in difficult conditions, as the economy is going through a transition and recession, and the country tries to strengthen its independence. The task being truly enormous, it has to proceed in stages. The current objective of overriding importance to water resource management is covering the maintenance and operating costs of the water-supply facilities.

In general, to improve the situation with regard to water resources, the following issues need to be addressed: (a) the overall poor quality of water resources, (b) the supply of drinking water to the rural population in accordance with established standards, (c) the installation of sewers and waste-water treatment plants also in industry, (d) cost recovery, tariffs, and sustainability of water resource developments, (e) strengthening of institutional capacity in planning methodologies and in efficient management techniques, (f) watershed protection, (g) developing curricula at university level for water resources management, and increasing the qualification of water management staff especially within local authorities.

Recommendation 5.1:
The existing water supply programmes should be updated, alternative sources of supply should be included, and the involvement of local authorities should be increased.

To solve the problems involved, a number of other recommendations could be implemented in the near future. The EPR team concentrated on improvements which do not undermine the country's prime objective, but could be implemented at relatively little cost, while fitting into the overall objectives and priority tasks.

A first major problem, of which the Moldovan authorities are very aware, centres on the assessment of water's true production costs. It is an absolute priority in the light of national water resource management objectives. Water abstraction, treatment and supply, waste-water collection and sewer systems, waste-water treatment plants and their final discharge all give rise to costs, which need to be properly assessed. The lower the operating efficiency of the equipment in the different phases, the more important this assessment. A very big effort should be made to recover the cost of operating and maintaining water facilities. As energy costs increase, the capacity of water users to pay for water will be further eroded. This situation requires the formulation of an adequate tariff policy at the national level. Moldova's water management authorities are truly willing to solve these problems, also through international cooperation.

Recommendation 5.2:
The assessment of the costs of water abstraction and supply, waste-water collection, treatment and discharge should be seen as a priority for Moldova's water resource management. It is essential for revising the national water tariff policy. The assessment should include all economic costs related to the operation of all relevant technical installations, their maintenance and their replacement.

The allocation of funds to different parts of the water management system does not appear to be optimal. The blurred delineation between authorities and agencies involved in the control and management of water resources reduces the efficiency of the system as a whole. Solving this administrative deficiency appears to require the elevation of the status of the environmental administration, before operational cooperation routines can be developed. Such routines should make full use of the existing

provisions for environmental impact evaluation (EIE) with the full involvement of NGOs (see recommendation 1.8, Chapter 1).

To improve the management of water resources, each river basin should be managed by its own authority under the "umbrella" of an appropriate national body. Basin-specific authorities should control water abstraction, the quality of return flows, pollution prevention, and operation and maintenance of the water management infrastructure.

Recommendation 5.3:
As a precondition for the implementation of effective cooperation between all administrations involved, water management should be represented at ministerial level as part of overall environmental management. Separating policy authority from actual exploitation activities is advisable. River basin administrative units should be created for each basin. Cooperation should be extended to NGOs in the context of EIEs. See also Recommendation 1.3.

The monitoring system is facing a complex situation and is not able to carry out all its tasks. The tasks and mandates of the authorities involved are in any case not clearly defined. One result of this state of affairs is the low rate of actually collected charges, taxes and penalties for water use and pollution. However, if the quality and coverage of the monitoring data improved, they could become the basis for planning and implementing strategies and projects more efficiently. In any case, an efficient monitoring and evaluation network is needed to prevent and control pollution. Upgrading the system of laboratories and strengthening the capability of staff to produce reliable data will initially require additional funds.

Recommendation 5.4:
The necessary streamlining of the monitoring system between the different partners should, among other results, lead to more reliable and more complete monitoring data.

International water treaties with neighbouring countries are currently being reviewed and updated (Chapter 3). Particular respect should be paid to the quality of return flows to rivers and their tributaries and the sharing of joint water resources during periods of drought. Treaties should also specify target concentrations and parameter limits. Treaties should plan a water quality monitoring network along rivers, methods of analysis and their verification, and legal and enforcement instruments and penalties.

Recommendation 5.5:
The enforcement of bilateral water treaties with neighbouring countries should lead to common monitoring systems, specifications for the use of common water resources during droughts, as well as for detailed limit values for the water parameters to be aimed at by the partners in the treaties.

The supply of safe drinking water to the rural population is another big concern (see also Chapter 11). Underground sources are very polluted. Preventing future pollutant discharges in the environment will require a major effort. Also, the waste-water treatment plants need to be upgraded, as does the sewer network in many rural areas. Small bodies of water flowing through or near villages are often used as open air sewers, creating substantial pollution risks.

The water supply to the rural population should be organized through viable least-cost systems, above all in terms of initial and recurrent investment costs. This will require optimization studies of a range of alternatives, which should in turn be analysed through pre-feasibility studies. Many different alternatives should be assessed in each different local situation in order to determine the optimal scheme. The scheme should preferably be simple, easy to implement, maintainable by users (local authorities) and based, as much as possible, on local resources.

To this end, local authorities need a legal framework enabling them to enforce the overall policy and strategy for municipal water supply and sewerage, for drainage and for the industrial use of water. An appropriate local authority should manage, operate and maintain the rural and centralized water-supply system under the guidance of a central technical authority. For municipal water supply and sewerage, the role and respective responsibilities of the partners at the local level need to be clearly defined (legal, regulatory, institutional and financial), in particular for small municipalities, villages and rural settlements.

Recommendation 5.6:
The supply of safe drinking water to the rural population should be ensured with the help of a legal and administrative (including budgetary) framework that enables local authorities to control and enforce effectively all relevant water quality standards and

the implementation of related water policies. See also recommendation 1.5 and recommendations 11.3, 11.4 and 11.5.

To adopt an adequate tariff policy, authorities should establish an efficient metering system to know how much water has been treated, extracted, pumped and piped and then supplied to users. This is the only way to ensure efficiency and to recover the real cost of water supply. It could be worthwhile exploring whether the introduction of metering equipment could be harmonized with other countries in transition, so that its production could become more attractive to investors.

Recommendation 5.7:
The water management authorities should avoid all unnecessary delays in the introduction of appropriate metering systems as a prerequisite for the recovery of water costs. See also recommendation 9.5.

Chapter 6

NATURE CONSERVATION, FOREST AND BIODIVERSITY MANAGEMENT

6.1 Current state of nature

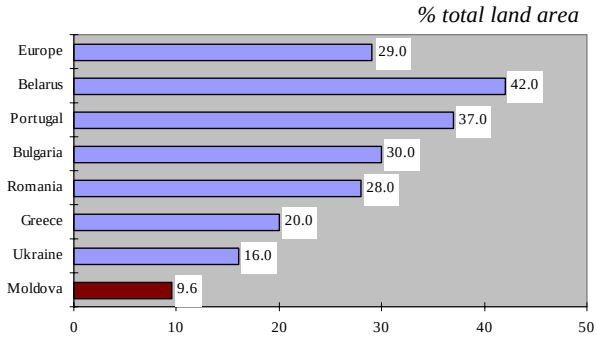
Terrestrial habitats

Moldova borders the Mediterranean biogeographic zone in the south, the rest of the country occupying an intermediate zone between the continental Eurasian steppe to the east (cold climate) and the European silvosteppe to the west (moderate climate). The spontaneous vegetation in the Republic of Moldova has been conserved on about 10% of the territory. Originally, there were two basic ecosystem types: *steppes* and *forests* (see Figure 6.1 next page).

The steppes have undergone big changes, their vegetation being practically destroyed. Their area decreased drastically during the 19th century, when vast areas were ploughed to cultivate cereal as their soils were fertile. Only some fragments have survived, e.g. the halophyte vegetation on some salty soil (0.35% of the territory).

Forests cover 9.6% of the territory, 86% of these are planted. Natural formations represent only 4% of the total cover. The largest forests are located in the centre and western centre (Codri). Forest cover is low elsewhere (see Figure 6.2). In the south and south-east (Cahul and Bender regions), cover can be less than 25% of the average. Overall, Moldova is far less forested than other European countries (Figure 6.3).

Figure 6.3: Forest area in selected European countries, 1996



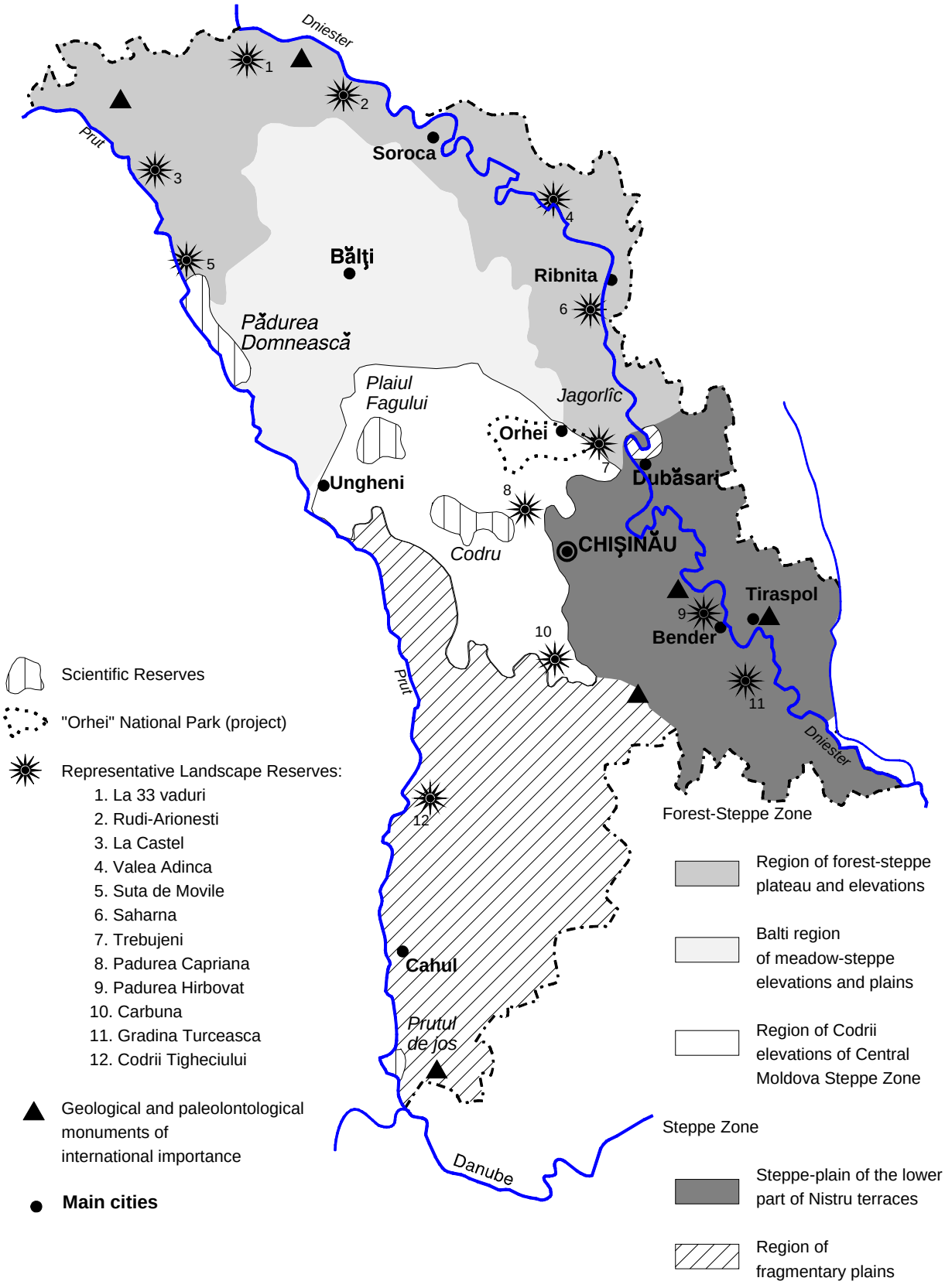
Source: FAO, State of the World's Forest, 1997.

In 1848 (when records began), forests occupied 366 200 ha; in 1918, 230 000 ha. In this period the logging of trees took place without protecting or preserving seed varieties. Species with greater shooting capacity and quicker growth have replaced indigenous species. This management has also prevailed during the last 40-50 years. As a result, the forest fund now consists of biologically old trees, of little resistance to destructive factors, with reduced growth and low fruiting capacity. During the past 20 years, the surface of forests has increased from 271 200 ha in 1973 to 342 000 ha in 1995 (Table 6.1) and consists of 800 forest plots of 5 to 1500 hectares. About 54% (193 000 ha) of them are considered suitable for exploitation.

Moldovan forests have the highest proportion of broadleaved species of any temperate zone country (over 99% of the growing stock of 35.3 million m^3). Oak (*Quercus robur*, *Q. petraea* and *Q. rubescens*) is the predominant species (47.6% of area). The second most common species (31.8%), namely robinia (*Robinia pseudoacacia*), has been introduced to stabilize poor soils. The rest covers a wide range of other indigenous species, such as ash, beech, lime, maple, hornbeam, birch, and poplar.

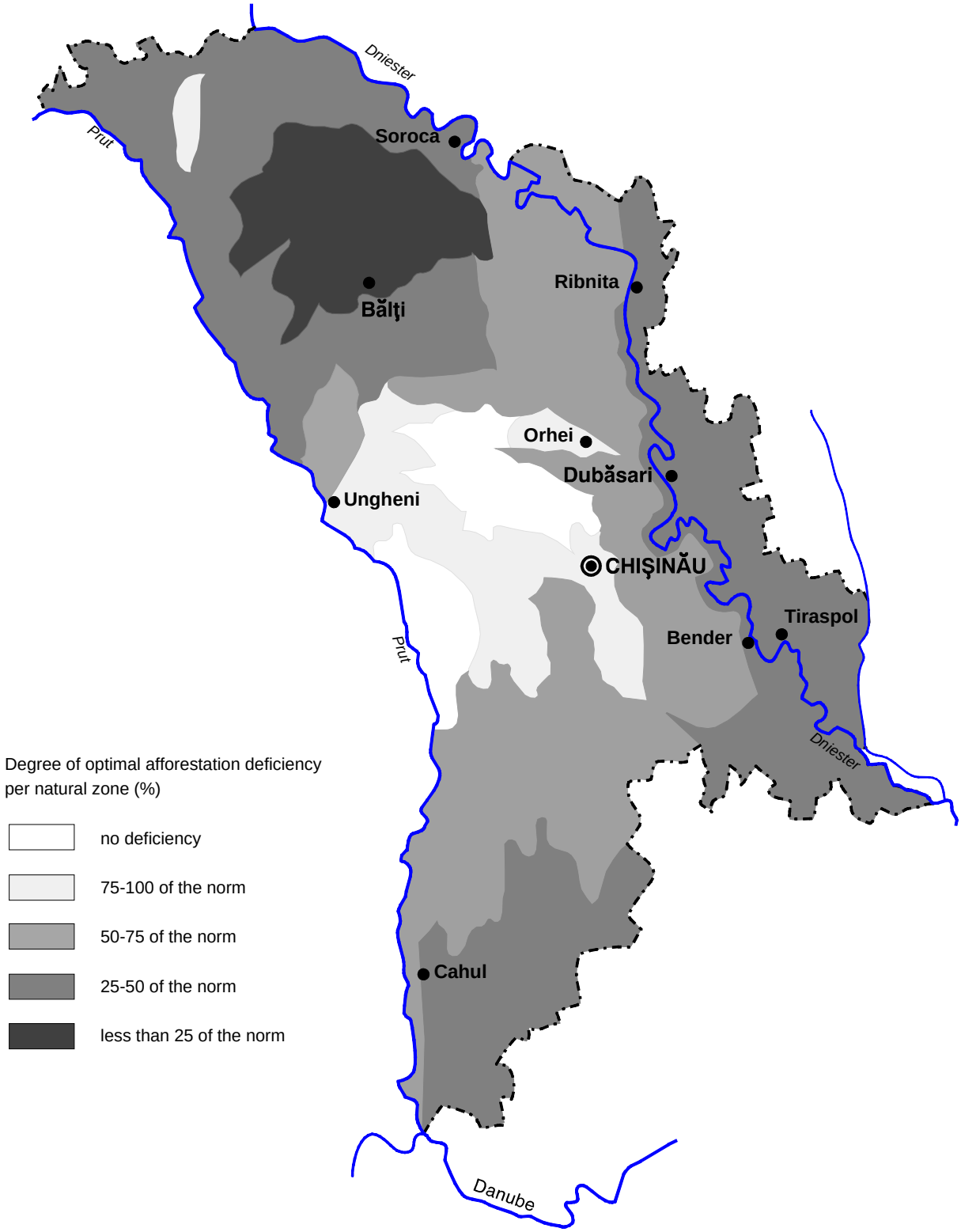
At the end of 1994, 69 700 ha of forests were affected by pests and diseases. The 1995 survey undertaken under the Convention of Long-range Transboundary Air Pollution showed that 25.6% of trees were healthy, 40.4% were damaged (classes 2-4), and 1.0% were dead. 43.0 % of oaks and 27.6% of sessile oaks were affected. In comparison with 1994, the percentage of trees showing over 25% defoliation increased. This situation can be explained by excessive drought during the past 15 years and the effects of air pollution. Moldovan forests are also vulnerable to insects and fungi. Oak forest stands are particularly affected by insects. Forest fires destroyed 120.1 ha in 91 events in 1990, while 3 fires in 1995 destroyed 1.4 ha.

Figure 6.1: Biodiversity in Moldova, 1997



Source: The Department for Environmental Protection and the Institute of Geography of the Academy of Science.

Figure 6.2: Forest deficiency on Moldovan territory, 1997



Source: The Department for Environmental Protection and the Institute of Geography of the Academy of Science.

Table 6.1: State of forests, 1990-1996

	1990	1991	1992	1993	1994	1995	1996
Forest areas surface *(1 000 ha)*	317	325	325	317	324	342	326
Protected areas *(1 000 ha)*	-	2.1	2.1	12.1	12.4	12.4	12.4
Maintenance wood cutting *(1 000 m^3)*	123	62	61	61	94	128	-
State reforestation *(1 000 ha)*	3.0	2.4	2.1	1.7	1.4	1.4	1.1

Source: Department for Statistics, Republic of Moldova.

After 1940, to combat soil erosion by wind, wood protection belts were planted along ploughland (2.3% of it is protected from wind erosion) and river banks, and around cities and industrial plants. In 1970 these green belts covered 20 000 ha. However, they are subject to illegal logging as they are not efficiently supervised and administered. In 1994 their surface had shrunk to 5 200 ha. The continuous degradation of the forest cover and destruction of forest belts have significantly contributed to making the climate more arid, increasing erosion, intensifying the landslide process, with an important annual loss in humus

Aquatic habitats

More than 3 200 permanent and intermittent rivers flow on the territory, 90% are less than 10 km long. Some of the small rivers dry up during summer. Of the 3 500 lakes, ponds and reservoirs, 90% have a volume of more than 1 million m^3 each. Regarding water quality, the salt content is rising (mineralization), e.g. in the Dniester river the mineral content has increased by 50% since 1950s, and the turbidity of waters is increasing as well. Eutrophication phenomena are taking place in some bodies of water (for example, the Dubasari reservoir), and are accompanied by a modification in ecosystem structure and functioning.

Most *wetlands* have been drained with the exception of small isolated areas in the lower Dniester river and areas bordering the Prut river. In 1994, marshes represented only 0.2% of the territory (i.e. 5 500 ha). Limestone quarrying and river bed dredging for sand have significantly contributed to altering river ecosystems and their fish populations.

Protected areas

Protected areas in Moldova are classified into eight categories. Strict Nature Reserves cover about 0.58% of the territory (only 0.17% in 1990). Currently four out of the five strictly protected areas (scientific reserves) are effectively subordinated to Moldsilva because they are mostly forest zones; the fifth (Iagorlic) is located on the Dniester left bank. Other types of protected areas (natural protected landscapes, fenced-in districts, landscape, natural monuments, garden art monuments, botanic gardens, dendrological parks, zoological parks) are under the local authorities.

Since the 1998 law on Protected areas has been adopted, protected areas occupy 1.96 % of the territory of the Republic, placing it far behind most other European countries (as shown in Figure 6.4). There is only one national park in Moldova, and no wetlands of international importance/Ramsar sites. In 1996, the existing State Protected Areas were inventoried and classified in accordance with the IUCN criteria (Table 6.2).

Table 6.2: Protected areas, 1998

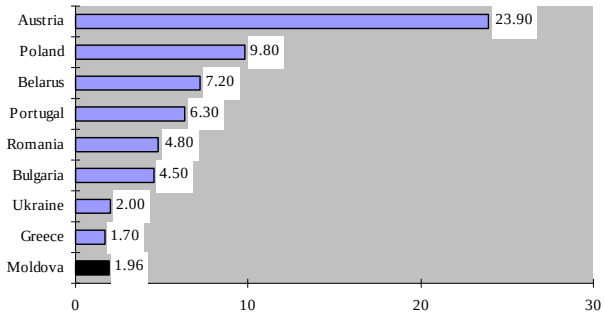
	IUCN classification	Number	Area (ha)
Scientific reserve	I	5	19,410
National park	II	1	24,000
Natural monument	III	971	3,145
Natural reserve	IV	61	7,714
Protected landscape	V	41	35,140
Resources reserves	VI	13	523
Multifunctional areas	VII	26	980

Source: DEP, the draft law on protected areas (1998) and the draft biodiversity conception (1997).

Flora and fauna

About 2 000 plant species are known in Moldova. Most of them are concentrated in the northern and eastern part of the country. The greatest fauna diversity is found in the northern forest zones, in the Prut and Dniester meadows, the Beleu lake, etc. The current situation of many protected plant and animal species is difficult, as reflected in the decreasing number of species and population density, and their restriction to specific habitats (Table 6.3). This is the

Figure 6.4: Protected areas in Moldova and other European countries, 1996



Source: IUCN and national statistical offices

result of intensive land use and the destruction of wetlands. For example, the Kashmir deer was an endemic species. It almost disappeared in the 1950s. Since then, species such as the Ascanian deer from Ukraine and the sika deer were introduced in the same reserves, leading to natural hybridization. In 1961, an attempt was made to introduce the European elk into the Codrii reserve.

The situation of the fish population is of great concern. Amongst the 75 species mentioned in Table 6.3, the most common are perch *Perca fluviatilis*, pike *Esox lucius*, bream *Abramis brama*, crusian carp *Carassius auratus*, common carp *Cyprinus carpio*, silver carp *Hypophtalmichthys molitrix*, grass carp *Ctenopharyngodon idella*, roach *Rutilus rutilus*, rudd *Scardinius erythrophthalmus*, and zander *Stizostedion lucioperca*. Some species such as *Umbra krameri* and *Zingel zingel* are endangered; trout and lamprey have been totally wiped out.

6.2 Impact of human activities on nature

Agriculture

Intensive land use (currently 76% of the country's surface is agricultural, compared with 86% in the 1980s), the choice of crops irrespective of the topography (in the 60s-70s, of the 55 000 ha of slopes recorded, more than 20 000 were used for annual crop production), excessive crop specialization and the use of chemicals have put considerable stress on biodiversity, expelling flora and fauna from their usual habitats, drastically reducing their natural population in most cases (insects, graminanoids, small mammals, etc.). As soils are especially fertile, they were cultivated to the maximum possible extent. Bushes and fences and riparian vegetation were largely eliminated. The present landscape (especially in the north and south) is dominated by isolated forest blocks sheltering most of the remaining biodiversity and not connected between each other. They are surrounded with huge cultivated mono-crop areas crossed with bare riverbanks. In these streams, solar radiation is increasing the water temperature, reducing the concentration of dissolved oxygen, and increasing in-stream primary production. It also increases the river flow to the detriment of riverine plants and animal communities. Microclimates have thus been disrupted with various impacts on aquatic life. Spawning areas have been destroyed.

Moreover, natural pastures and meadows were turned into arable land, reducing the extent of the typical steppe areas. Large-scale animal husbandry has also exerted strong pressure on the natural environment. The establishment, in the early 1980s, of large livestock complexes (see Chapter 8) with no prior evaluation of their environmental impact, has done much damage to the countryside. The large quantities of manure used as fertilizer has led to surface and groundwater pollution.

Table 6.3: Flora and fauna species by group

	Species	Endangered, vulnerable or rare species	Endangered
	(number)		*(%)*
Mammals	67	29	43.0
Birds	243	59	24.0
Reptiles	14	8	57.0
Amphibians	14	1	7.0
Freshwater fish	75	15	20.0
Invertebrates	15,000	39	0.2
Vascular plants	1,752	186	11.0
Mosses	154	10	6.0
Fungi	307	17	5.5
Lichens	70	16	23.0
Algae	2,500	-	-

Source: DEP, National Strategic Action Programme (1995) and the Red Book for Moldova.

Illegal logging and forest exploitation

The recession and the high cost of imported fuel have led to the illegal cutting of trees for fuelwood. Illegal felling represented about 800 000 m^3 from 1992 to 1995. It reached alarming numbers in 1996 and has even increased over the past two years as the energy crisis continues. It is estimated that 65% of fuelwood needs are met in this way. According to Moldsilva, the economic and environmental damage amounts to 1.8 million Lei for 1997. The large increase in the prices of energy for households (60% since the beginning of 1996, and expected to reach to levels charged to industry within 6 months) is likely to increase illegal cutting.

Another threat to forest areas is grazing, because animal feed prices have risen. Newly planted areas are particularly vulnerable to grazing animals, which destroy young plants and tear out seedlings.

Hunting

Zones and territories reserved for hunting are controlled by law, as are the authorized bags (see Table 6.4). Game population trends over the past years (Figure 6.5) show a decline in the population of roes and boars, which is explained by illegal hunting. In 1996 and 1997, it was decided that hunting in State forests would be prohibited. However, it seems that the economic interests prevail over inspectors who are badly equipped for enforcing the decisions. Bird populations seem better preserved (Table 6.5).

Table 6.4: Major hunted species, 1995 and 1996

Number

	Population of selected hunted species		Authorized hunting quotas
	1995	1996	
Roe	5 644	3 290	0
European deer	420	..	14
Wild boar	3 339	1 690	84
Hare	134 158	59 880	20 563
Pheasant	26 108	4 960	1 910
Partridge	2 395	..	..
Fox	10 833	12 050	873
Moose	5	..	..

Source: Association of Hunters and Fishers of the Republic of Moldova, transmitted to IEDS.

Table 6.5: Population of selected hunted birds, 1994-1996

Number

	1994	1995	1996
Doves	116 500	198 905	..
Wild ducks	85 138	156 430	..
Moorhens	36 048	30 020	..
Geese	20 670	15 600	..
Pheasants [1/]	36 240	26 108	26 300
Partridges	1 352	2 395	..

Source: Moldsilva and the Association of Hunters and Fishers of the Republic of Moldova.

[1] Hunting quota for pheasants was 1 910 animals in 1995.

Fishing and other pressures on fish populations

Fishery activities are declining because of the dwindling fish stocks. In 1995, declared fish catches in the Prut river were 10% of the 1990 catch. However, it is estimated that poaching is three times more important than declared catches. Before independence, State-owned fish farms ensured artificial reproduction of river fish with farm-grown indigenous species. Now the system is disrupted as economic entities liable for damages are no longer able to pay for them**.** For example, about 160 million fry were reintroduced in the central part of the Dniester river in 1980, and only 6.5 million in 1996.

The origin of other important factors affecting fish populations is transboundary. For instance, a large hydroelectric station on the Dniester near Novodnedrovsk (Ukraine) started operating in 1987. It altered the natural flow and temperature of the water, and had an impact on the hydrobiologicalsystem. Consequently, fish populations downstream are decreasing, especially as the reintroduction of artificially grown indigenous fish has been interrupted. The polluted waters which are discharged into the Prut river from industries located on the Romanian border are also having an adverse impact on fish stocks. Recently (July 1997), the Parliament decided to call on the Government to start negotiations with Ukraine on a bilateral agreement to protect the biodiversity and ecosystems of the Dniester river. Cooperation with Romania regarding the river Prut is also envisaged (see Chapter 3).

Others

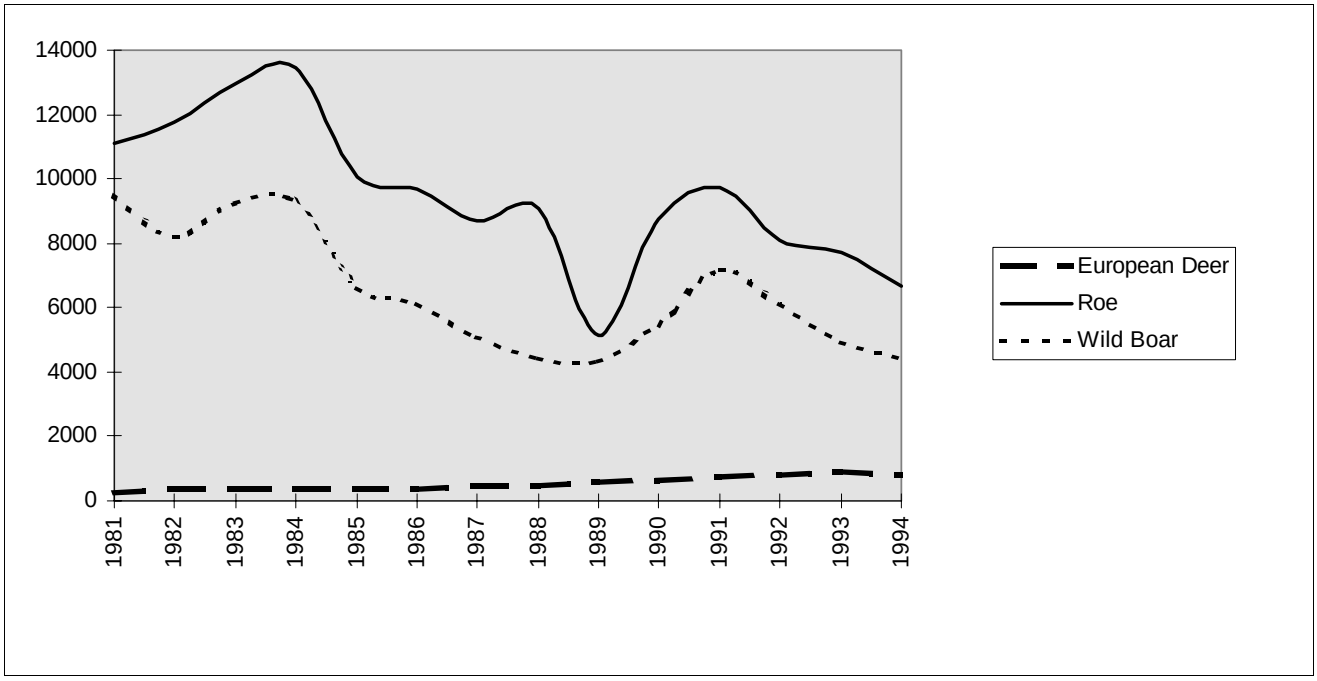
Due to the high population density and the growing urban settlements, i.e. cities and the capital, the pressure on nature from humans is particularly intense with an uncontrolled sprawl of construction activities.

6.3 Nature protection policies and management

Legislation and policy objectives

The Law on Environmental Protection (1993) states the right to existence of all natural species as an essential element of the planetary cycle of matter,

Figure 6.5: Some game population trends, 1981-1994



Source: Moldsilva, 1997.

climate and renewal potential of natural resources. The Law calls for the drawing-up within a year from its adoption of a programme for biodiversity conservation aiming at protecting all species and habitats in the spirit of the Convention on Biological Diversity. In particular, the hunting, fishing or collecting of species listed in the Red Book should be forbidden, the introduction of new species strictly limited, the burning or destruction of protection belts forbidden, and a system of natural protected zones and natural monuments created.

Numerous other provisions focus on the protection of forest zones and the increase in wooded areas. This is to compensate for the illegal felling and, chiefly, the poor tree coverage, which is leading to major problems of slipping slopes and erosion. Tree planted areas have to be widened, and plots taken out of agricultural use, or degraded, or formerly forested have to be afforested. Owners of agricultural plots are requested to plant green protection belts around them.

At the national level, the Government and DEP can decide on the temporary or permanent set-aside of agricultural plots, on territories to be afforested and on the creation of sanitary zones and forest belts. DEP, together with the Government, is given the task of drawing up an inventory of the natural resources and imposing limits on their use, taking into account economic constraints; of protecting landscapes, natural ecosystems and monuments; of inventorying State forest resources in the reserves, national parks, and other areas which according to the law are designated for nature protection. The Director-General of DEP approves the regulations of the Red Book and consults the central bodies of the neighbouring States to harmonize their policies on the same matter. The Government and DEP organize and support ecological training, and are creating a system of ecological training at all levels of education.

Local authorities draw up and implement ecological programmes at municipal and regional (district) levels in order to reconstruct and restore the natural equilibrium in zones affected by human activities; declare some natural ecological and landscape monuments as being protected zones; and inform the citizens regarding the problems of environmental protection and rational use of natural resources. The municipal authorities distribute plots for foresting, and organize the widening and maintenance of forest belts, protection belts of trees and bushes, green surfaces as well as green fences.

The *citizens* have a duty to contribute to improving the environment, to creating tree belts and green spaces and safeguarding them. The *economic actors* have a duty to cultivate and maintain protection belts or green spaces around industrial units, industrial complexes, and cattle breeding complexes, to

permanently supervise the state of the environment around industrial units and to take measures to protect the zones.

The Law on Environmental Protection (LEP) and the Law on Natural Resources also foresees the payment for natural resources use including flora and fauna; it also provides for fines for ecological infringements and damage. These payments have to be collected into an ecological fund.

However, many general provisions of LEP have not yet been specified in implementing regulations. For instance, there is no specific legislation for plant protection, nor for protected areas (draft dragging on since 1995).

As illegal logging and hunting were getting out of hand, a draft Law on the Declaration of a State of Emergency on the Whole Territory of the Republic of Moldova in Connection With the Forests and Hunting Fund Destruction was proposed in 1994, but not adopted. It would have provided for a stricter guarding of forests with the help of the Ministry of Internal Affairs and local authorities and gives additional responsibilities to Moldsilva to control the ecological situation and impose penalties in case of forest law violation. It also calls for a forest regeneration programme for 1995-2000. The programme has not been issued so far.

According to the Forestry Code (approved in 1996), all State forests are of ecological importance. Logging is authorized only for sanitary purposes. But auxiliary activities are allowed. The revised Code includes a chapter on sustainable management of forests, rational use of forest products and biodiversity protection, with general principles. It also specifies the sharing of responsibilities for the management of forests between DEP and Moldsilva.

The Forestry Code prohibits the reduction of the present surface of forest land. Afforestation will be carried out with ecological funds on the plots which were forested before and on set-aside or degraded plots. Forests having special functions, for instance stabilizing the soil, will be protected. Bushes, pastures and forests will be maintained, and economic and social activities that have a negative effect on forests and their ecosystems will be banned. The granting of licences for the exploitation of forest resources (wood, game, flora, etc.) will be regulated and violations penalized.

The Republic's main objectives in terms of biodiversity conservation are broad. Nature should, to the extent possible, be restored to the state in which it was before the development of agricultural collectivism and preserved. Biodiversity will be conserved *in situ* by extending protected areas and better managing them, and by developing an ecological network connected to regional structures. Monitoring as well as research will be improved.

Simultaneously, the country also has to meet the objectives of the international conventions to which it adheres. Moldova adhered to the World Charter on Nature (New York, 1982), ratified the Convention on Biological Diversity (1995) and the United Nations Convention on Climate Change (1995). At regional framework level it is also a Party to the Bern Convention (1993). Moldova is now considering ratifying the Bonn Convention, the Ramsar Convention and the Convention to Combat Desertification.

In 1997, none of the government agencies was a member of IUCN for financial reasons, and only two NGOs were members (of which the Ecological Movement of Moldova). As a member of the Council of Europe, Moldova is abreast of the developments in the implementation of the Pan-European Biodiversity and Landscape Conservation Strategy.

The Comprehensive Long-term Programme for Environmental Protection and Rational Use of Natural Resources up to the Year 2005, adopted in 1987, aimed at giving an ecological orientation to all economic decisions affecting the country's development. Concretely, the Programme called for 330 000 ha of eroded land to be taken out of cultivation, the woodland cover on ploughland to be increased to 4%, setting up water-protection zones and green protection belts along small rivers, the release of untreated waste water into rivers and lakes to be stopped, atmospheric pollution to be cut by 30%, etc. However, as financing drastically dropped after 1990, and monitoring by the State bodies concerned slackened, targets have only partly been met. The recession and changing management conditions brought the Programme to a halt in 1994.

Legal instruments for nature protection

Main laws:
- The Law on Environmental Protection (1993), and in particular Chapter 6, section 5, devoted to biodiversity and nature monument protection;
- The Law on Cultural and Natural Monument Protection (1993);
- The Code on Mineral Resources (1994);
- The Law on Declaration of a State of Emergency on the whole territory of the Republic of Moldova in connection with the Forests and Hunting Fund Destruction (1994);
- The Law on the Protection of the Animal Kingdom (1995);
- The Land Code (1991), revised in 1995;
- The Forestry Code (1979), revised in 1996;
- The Law on Protection of Riparian Zones (1995);

Other laws:
- The Code on Administrative Sanctions (1985 and 1993);
- The Law on Ecological Expert Evaluation of Impact on the Environment (1996);

Decisions:
- Governmental decision 595 of 29/10/96 on improvement of forests and forest vegetation management;
- Decision on the Red Book of the Republic of Moldova (1985);
- Decision regarding the State protection of natural objects and complexes (1975);

Decrees :
- Payment for Released Wood;
- Regulation of Pastures and Hay Collection in Forests;
- Fees in case of Forestry Law Violation;
- Regulation on rare and vulnerable animals and plants (1975);
- Regulation on State Natural Reserves (including rare animals and plant species) (1975).

Amongst the priorities and objectives of NSAPEP, a national biodiversity strategy was requested for 1996, protecting the rare and disappearing species threatened by trade, reintroducing rare species, creating a natural genetic fund, and creating protected areas. A number of laws on protected areas, on the protection of hunted and fished animal populations, on the protection of the indigenous natural genetic fund, and related research programmes were requested for 1996. Forest protection and sustainable forestry were also on the agenda, a forestry code was to be issued by 1995 and a complex programme drawn up for the ecological recovery of the silvicultural fund. The latter should in the period 1995-2005 provide for the planting of 1400 ha of forests a year, 200 ha of forest belts a year on slopes, and tree planting along rivers, on landsliding surfaces and slopes. These objectives are modest compared to those of the previous programme.

NSAPEP also aims to double in the short term the present overall surface of protected areas (to 2.8% of the territory). Recently, proposals have been made to create a national park in Orhei to protect a forest zone (24 000 ha). There was another project for a biosphere reserve of 24 000 ha in the Prut river basin. This would preserve some remaining wetlands, as most of them have practically disappeared due to extensive land improvement and consolidation; only few still exist along the lower stretches of the Prut and Dniester. However, both projects face strong opposition in particular from the local populations, on economic grounds. The Republic of Moldova has also been invited to adhere to the biosphere reserve of the Danube Delta.

Institutions

Two divisions of DEP deal with nature protection (see Figure 1.2). The natural resource assessment and licensing division (five staff) collects and analyses information on the quality of natural resources including forests, and issues licences in particular for the use of medicinal plants, of fauna (excluding hunting licences delivered by Moldsilva), fishing and the use of aquatic animals. The protected areas and biodiversity division, also with a staff of five, is responsible for managing the scientific investigations in protected areas, planning new protected zones, preparing legislation and controlling the implementation of the law.

In each of the 12 Environmental Inspectorate Agencies at local (district and municipal) level, one inspector is assigned to enforce DEP policies for flora and fauna protection. The inspectors' role is to exercise State control, on plants and animals (including hunting outside forest areas) throughout the territory, including protected areas and State forests. According to LEP, the Inspectorate has the right to forbid any work on the territories of natural reserves and natural monuments, on special plots and in buffer zones when the works contradict the provisions of the given territory's regime. Moreover, there is one Inspectorate office in charge of fish protection throughout the territory (see Figure 1.2). It is estimated that 60% of overall environmental violations recorded by the Inspectorate concern nature, flora and flora, mostly illegal logging.

A Local Self Government Act was adopted in July 1991, giving municipal authorities responsibility for protecting the environment and using natural resources within their administrative unit (in particular the forest formerly under sovkhoz and kolkhoz responsibility). Because of the ongoing land privatization, the current modalities and financing of the application of the implementing measures are unclear.

State control of forestry resources and protection is the responsibility of DEP. However, simultaneously, forestry management is the task of the State association "Moldsilva". Moldsilva, which is the main administrative authority for the forestry sector,

depended on DEP before 1994, then from 1994 to 1997 it was put under the Ministry of Agriculture and Food (MoAF); recently (May 1997) it has been placed under the direct responsibility of the Government, in a position and level similar to that of DEP. Moldsilva exploits the State forest resources, protects forest health as well as their environment and biodiversity. State forests include protected forests (130 100 ha), forests with sanitary and genetic functions (91 900 ha), forest reserves (20 500 ha), forests and belts protecting water and soils (8 200 ha) and forests for timber production (12 600 ha).

Until the end of 1996, Moldsilva was in charge of managing State forests only (86% of forest stock), which are all classified in category I (so-called ecological forests). Since then, in an attempt to better control illegal cutting, a special forest guard was created to improve forest protection with the help of the police and local authorities. As illegal cutting was particularly intensive in non-State forests (in 1995, 150 000 m^3 cut against 4 702 m^3 in State forests), these remaining 14% of forests, i.e. former sovkhoz-and kolkhoz-owned forests given to local authorities when privatization started, were placed under Moldsilva's management. There are no private forests.

Until now, Moldsilva's budget has depended on MoAF. This budget has been cut back considerably over the past years. In 1990, 90% of the budget came from the State, the rest from Moldsilva's commercial activities. In 1997, the share from the State budget represented only 8%, hardly covering the salaries. The remainder was obtained from the selling of timber and the exploitation of other forest products such as berries, medicinal plants, herbs, mushrooms, etc. Those activities are carried out by Moldsilva staff. Budgetary constraints have prevented Moldsilva from properly monitoring and enforcing forest resource policies and carrying out afforestation to the extent planned (Figure 6.6). In 1993, expenditures for tree planting reached hardly 10% of what was planned, expenditures for bush planting 0%.

Moldsilva manages hunting in the forest territory. The DEP inspectorate unit fixes the hunting and fishing quotas and is responsible for their application. However, the inspectorate employs only 30 inspectors in the Dniester basin and about 20 in the Prut basin. They are poorly equipped. Therefore, illegal fishing with prohibited methods (including use of explosives) is frequent. The State silvicultural farm and the Association of Hunters and Fishers participate in the management of fishing and hunting, distributing the licences and geographically balancing the quotas.

Monitoring and research

Research capacities are considered to be insufficient, particularly as regards forest protection. Most of the research linked to nature protection is done by the Academy of Sciences (Institutes of Physiology, Zoology, Plant Physiology, Biological Protection of Plants, Botany, Microbiology, Geography), which has had its budget drastically reduced over the past years. Of the 22 NGOs dealing with the environment, most are working on biodiversity and habitat protection, often at local level. Initiatives to introduce nature protection at all education levels have been modest so far.

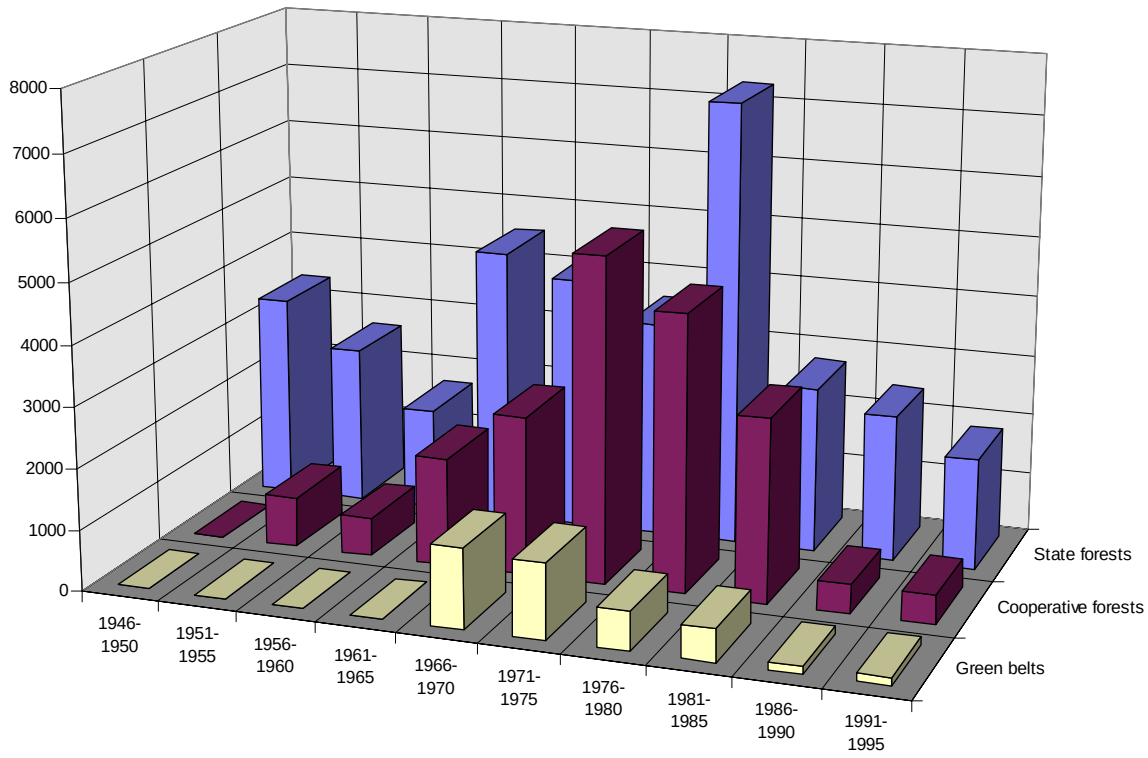
Moldova's flora and fauna have been extensively inventoried by the Academy of Science and the ecological monitoring centre of the National Institute of Ecology, inventories being published successively over the years. The state of flora and fauna species is regularly updated (every three years). An inventory of State protected areas has also recently been drawn up. Moldsilva has monitored forests since 1992 in a way that is compatible with the European network; local forest monitoring started in 1993. A first "Red Book" for the Republic of Moldova was issued in 1976, and a revised version is forthcoming.

Hunting and fishing populations are monitored jointly by Moldsilva and the Association of Hunters and Fishers. Each year DEP with specialists of the National Institute for Ecology, the Zoology Institute, representatives of administration, and farmers, set the norms, quotas, hunting season and ways of hunting depending on the legislation in force, data on the current state of the animal populations, and scientific recommendations. Licences for hunting are issued by Moldsilva.

Instruments used in nature management

In the Republic of Moldova, the legislation foresees that people pay for using natural resources, *inter alia*, for released wood, collecting of medicinal plants,

Figure 6.6: Afforestation in Moldova (ha planted)



Source: Forest Country Profile, UNECE and FAO, 1997; report submitted by Moldsilva.

pastures and haymaking in forests, for the fishing and use of aquatic animals, and for hunting through licences. Industrial logging is not permitted, but maintenance and regenerative felling are. Payment for standing timber (stumpage) varies with species, quality and size. It makes up less than 2.5% of the wholesale price of timber. The lowest rates are for softwood, the highest (almost double) for hardwood species. Prices nevertheless take into account social constraints. Thus, charges for kindling and fuelwood (household energy needs) are 60% lower than for top-grade commercial timber. The procedure governing the enforcement of levies, and the use of the funds collected are laid down in governmental decrees.

The illegal exploitation of natural resources is penalized. Fines for the sale of flora and fauna, including illegal logging, hunting and fishing, go to extra-budgetary ecological funds. For instance, the Law on the Protection of the Animal Kingdom lays down provisional fines for shooting wild animals and for fishing, with differential amounts according to species and their level of protection. The fines are especially high on species listed in the Red Book; they are indexed to the minimum wage. The illegal export of flora and fauna species and illegal logging are also penalized as well as damage caused to ecosystems (see Chapter 2). The collected funds may be used *inter alia* for local or national biodiversity protection and silviculture programmes. However, only an insignificant part of the imposed fines are effectively collected.

Since 1995, a National Day of the Green Tree has taken place on the first Saturday of April, when the whole nation is called upon to plant trees and shrubs in public areas. Moldsilva and DEP take an important part in this event. In 1997, more than 1 million trees were planted.

6.4 Integration of nature protection and sectoral management

Territorial planning

With a view to accelerating the process and making it more objective, land privatization, which was till 1995 the remit of MoAF, has been put under the responsibility of an independent governmental body, the National Agency of Geodesy, Cartography and Cadaster (NAGCC). Its first goal will be to introduce a land cadaster law. So far, any privatization with land distribution has been carried out without a preliminary land-use planning scheme. Municipalities (Primaria) take decisions on their own

territories. By law, Moldgiprozem, the NAGCC office in charge of land privatization outside villages, is required to coordinate its action with the territorial services of DEP.

Formally, LEP and the Law on Ownership recognize that the environmental protection regime should also apply to some objects under private ownership. Existing protected areas (such as reserves, protected belts along rivers and bodies of water) will not be privatized, but managed by the State, municipalities or other managing organisms. However, there is no concrete procedure for specifying restrictions on the privatization and use of lands, and there are no provisions for compensating the owner for such restrictions.

Agriculture

An environmental protection unit within the Ministry of Agriculture and Food with a staff of four deals with soil improvement, irrigation, silviculture and nature protection. This unit aims at ensuring coordination between MoAF and DEP. However, when Moldgiprozem organized land privatization under MoAF (before 1995), a land-use mapping scheme was established without consultation between MoAF and DEP. No use restrictions were put on those plots which were privatized but affected by erosion. Farmers were not informed of the best agricultural practices that they should follow to preserve or improve the quality of the soil that they were receiving. No information was given on the setting-up of ecological corridors or the creation of ecological networks, which are amongst the objectives of DEP. The NAGCC elaborated the Regulation on the Plans of the New Farms in which are included specific articles on planning in order to prevent soil erosion.

The integrated pest management included in the first agriculture project (see Chapter 8) foresees an increased use in biological pest control means. This project's implementation and follow-up are to be subjected to an EIA (currently carried out) and imply cooperation between the Department for Environmental Protection and the Ministry of Agriculture and Food.

Energy, transport and industry

For the time being, the unfavourable economic conditions are not encouraging new development projects in these sectors. There is no project to develop the transport infrastructure. Regarding energy, its restructuring and a rising of energy prices do not incorporate social measures to prevent people from meeting their energy needs by using illegally cut wood.

6.5 Conclusions and recommendations

The current poor state of nature in Moldova is mainly the result of fifty years of over-intensive agriculture compounded by the present severe economic recession and difficult process of land privatization. The outlook is not so encouraging: excessively large open-plain landscape, shrinking natural areas such as marshland, wetlands and steppes, disappeareance of bushes and fences, vulnerable/bare river banks, landslides and erosion problems, polluted waters, poor forest coverage, illegal felling of trees, poaching and illegal hunting, in addition to general difficulties connected with the transition. During the past five years, efforts have been made to update the legal framework for the protection and management of forests, natural resources and nature. However, many legal instruments, some of them newly issued, are often contradictory, overlap and are badly enforced (see Chapter 1). Moreover, the unclear division of responsibilities between different authorities complicates the management of nature and biodiversity.

The national objectives for nature protection policy and biodiversity management are broad, but seem too ambitious in the present economic circumstances. They should be translated and streamlined into a realistic and stepwise plan of action. A national biodiversity strategy and national programme defining the country's main objectives and priorities was requested by NSEPAP for 1996, but is still in the drafting stage. The strategy should promote biodiversity inside and outside the protected areas, making it possible to implement the Convention on Biological Diversity, which Moldova has ratified. Moldova's typical ecosystems should be protected. The strategy should also address sectoral issues, in

particular with regard to agriculture, its impact and the measures to alleviate its pressure. The increasing pressure from human settlements should also be tackled.

The protection of soil quality, the increase in woodland, the protection of steppe species and of the few remaining wetlands, and the restoration of protective vegetation on river banks should be explicitly addressed in the comprehensive strategy. These questions will require coordination with programmes for agricultural development and with related local requirements. Coordination may best be put into the context of sustainable development (see also Chapter 8).

Recommendation 6.1:
The envisaged comprehensive national biodiversity strategy should be finalized as a matter of priority. It should be supplemented with an action plan including specific projects, coordinated with all other relevant sectoral strategies, notably those governing the development of sustainable agriculture.

In Moldova's circumstances, it appears that the necessary coordination and integration of the protection objectives and other affected sectoral objectives could best be achieved through a territorial planning system. A land-use planning scheme (it seems that such a scheme was developed by MoAF with an exclusive focus on agriculture), incorporating the priorities, land reservations, and land restrictions necessary to meet the objectives of the biodiversity strategy is urgently needed. The scheme should be coordinated with local land-use planning. This exercise is urgent. It may lead to exempting from privatization all or some areas that are foreseen for protection regimes or to protection requirements being added to the privatization process.

Recommendation 6.2:
Competing claims on land should be coordinated in the context of territorial planning at all levels of government (national, regional and local). The coordination should involve public participation. It may result in the identification of areas to be excluded from the privatization process in accordance with the national biodiversity strategy.

The existing protected territories are insufficient to ensure a long-term ecological balance. The recently adopted Law on Protected Areas gives a legal foundation to protected regimes, protecting measures and management structures. By this law, protected areas have been extended to 2.0% of the territory. But objections were raised regarding the management of strictly protected areas (scientific reserves) and the acceptance of new protected areas at the local level. The Law should be reconsidered in a more pragmatic manner, leaving the way open for the further development of protected areas, and paying particular attention to setting realistic and workable modalities for the short-term implementation of the law. Consultation with the bodies which will actually apply the law is indispensable. The responsibility of scientific reserves should be attributed to a special body (or bodies) possessing the required scientific competencies and the will to fulfil the goals defined.

In addition to a law, a long-term programme for the development of protected areas is lacking. Such a programme ought to specify the ecosystems and habitats (steppes in particular should be mentioned here) that need to be protected and how. The possibility of establishing ecological corridors together with neighbouring countries according to the Pan-European Biological and Landscape Diversity Strategy should be preserved.

Recommendation 6.3:
A long-term programme should be developed to define (explain and justify) what natural habitats and ecosystem will need future protection, under what regimes and in what specific geographic zones. The planning at an early stage of a future ecological network would facilitate the setting of priorities. Environmental bilateral agreements with neighbouring countries (Romania and Ukraine) should include the protection of transboundary aquatic habitats, and their ecosystems and species; the continuity of transboundary ecological corridors/networks; and agreement on objectives and harmonized programmes for the management of protected transboundary zones.

Another key priority is the effective protection of water bodies and their ecosystems. The law on protection zones and belts of rivers and water basins, the so-called Law on the Protection of Riparian Zones, enacted in 1995, is clearly a step forward. However, no concrete measures have been taken to implement it. In particular the local level (municipalities) has not been given a clear mandate or financial resources to put the law into practice. The weak role of local public administrations

(municipalities, rayons) as well as insufficient budgetary resources and autonomy need to be addressed to allow them to fulfil their responsibilities. The required measures would include assistance from agricultural extension services, in zones where there are restrictions on agricultural activities, and compensation for restrictions.

Taking into account the present economic difficulties, it would be advisable to implement the Law on the Protection of Riparian Zones stepwise. Geographical priority zones could be identified in those areas where the vegetal cover is virtually non-existent and aquatic ecosystems and bodies of water endangered. Financial resources, both budgetary and extra-budgetary, should concentrate on them. Replanting of vegetation cover on strictly protected river banks, informing the municipalities of their tasks and obligations, informing the public of the restrictions on activities in the protected belts (agriculture and industry), and reinforcing the control over the newly restored areas are examples of adequate management measures. The Law on Local Authorities should be instrumental in solving the funding problems involved.

Recommendation 6.4:
The Law on the Protection of Riparian Zones (1995) should be enforced, starting in priority regions, i.e. where vegetation cover is poor and water ecosystems and resources are threatened. Actions should involve the national as well as the local level and could include:

- *Informing of local and regional levels of their tasks,*
- *Requesting municipalities to identify problems on their territory, priorities and resources needed,*
- *Requesting municipalities to issue and enforce the necessary municipal decrees, and*
- *Ensuring that the necessary resources (from national and local sources) are made available at the local level to fulfil these tasks.*

The specific problem of the management authority over former sovkhoz and kolkhoz forests now under the responsibility of local authorities should also be solved. The restitution to the State of these forests was required by government decision at the end of 1996. However, the plan to put them under Moldsilva management is controversial, as 60% of the local authorities have refused to give up their municipal property, arguing that current legislation is not explicit with regard to the legal force of government decisions. In Moldova, no forests are in private hands. They are either State property (86%) or local authorities property (14%). Because of the structural reform and the very lengthy decentralization of responsibilities from State control to local and municipal control, local authorities do not yet have sufficient resources to manage and protect their forest. This situation adds uncertainty to both short-term and long-term forest management.

Recommendation 6.5:
A separation of policy authority and actual exploitation of forest is advisable.

A first step towards solving the problem could be to draw up a national forest programme and action plan prepared with the participation of all those involved on the basis of an existing forest inventory. The Ministry of Environmental Protection of Finland has provided technical assistance for improving forest management and to prepare a strategic forest action plan. To help achieve this task, the assistance of the Food and Agriculture Organization of the United Nations (FAO), if requested by the country, would be valuable. Solutions should be found in particular to eliminate the conflicts of interest often created by the concentration in the same hands of tasks such as exploitation and protection of resources.

Recommendation 6.6:
A national strategic forest action plan should be developed as a basis for the management of the forest resources as a whole. It should takes relevant aspects ot the Pan-European Ecological Network and the Pan-European Startegy on Biodiversity and Landscape Protection into account. The action plan should address the question of forest management regimes and should be fully coordinated between the national government (i.e. Moldsilva) and local authorities. A programme for the extension of forest area should be included in the strategic forest action plan.

In Moldova, too, the forest has important functions to protect nature, soils and biodiversity. Among other things, it stabilizes landslides resulting from inappropriate farming practices (overgrazing, extension of arable land, increase in sheep and cattle herds) and unstable soil structure in many areas. Tree planting, in the form of blocks and shelter belts, has also helped to reduce the effects of wind erosion and flooding. But, the lack of funds has considerably slowed down the planting and afforestation effort in

the past few years. Another problem is the resistance of farmers, peasants and local communities to planting trees and thus losing grazing lands, depriving them of a source of revenue.

The problem of illegal logging has not been solved, whether inside or outside human settlements. Moreover, due to the increase in energy prices and the persistently difficult economic situation, it could get even worse. Illegal fishing, hunting and collecting of plants will also go on. Wild animal populations have declined considerably in recent years due to excessive hunting, some species are now in the Red Book. Therefore, it is important that existing laws should be enforced. This can succeed only if a special effort is made to equip inspectors adequately. Specific measures could also be developed. For instance, the law and penalties should be strictly enforced when commercial interests have prompted the offence.

Recommendation 6.7:
All laws prohibiting the cutting of trees, catching of fish or hunting should be properly enforced.

Chapter 7

WASTE MANAGEMENT AND CLEANER PRODUCTION

7.1 Waste flows in the transition period

General overview

At the beginning of the transition period, some of the Moldovan economy's features were of particular relevance to both waste management and the introduction of cleaner technologies. The most noteworthy were the imbalance in the structure of the economy in favour of agriculture and the food industry, the relatively high use of natural resources per unit of output, and the maintenance of machinery and equipment that did not lend itself to the avoidance of waste residuals and excessive environmental degradation. As this situation partly reflected the relatively low priority attached to environmental protection and sustainability, Moldova entered the transition with considerable tasks ahead if it wanted to reduce natural resource use and waste volumes, create waste treatment facilities, and adapt technologies to the modern standards required for both economic and environmental reasons.

However, these imperatives were partly eclipsed by the economic decline that became characteristic of the transition period. For example, industrial production decreased to only 50-60% of its 1990 level. At the same time, the amount of water used in industry dropped from 6.9 million m^3/day in 1990 to 4.3 million m^3/day in 1994 (including 2.5 to 3 million m^3/day cooling water for electricity production) (see Chapter 5). The emissions into air of noxious substances from industrial enterprises also decreased by about 20% between 1991 and 1993 for the same reason and not because of air depollution treatment (only the concrete plants in Rabnita and Rezina are equipped with electro-filters for the collection of solid particles). Further indications of the drop in economic activity and resulting changes in environmental nuisances can be found in other chapters of this report (see, in particular, Chapters 4, 5, 9 and 10).

Waste generation

Data on the generation of household waste are collected only in the large cities and refer to its quantity and not to its composition. Through the Inspectorate's introduction of reporting forms for toxic and other waste, a systematic registration of industrial wastes has started recently, but is still incomplete. There is no effective registration or data collection of agricultural and other types of waste.

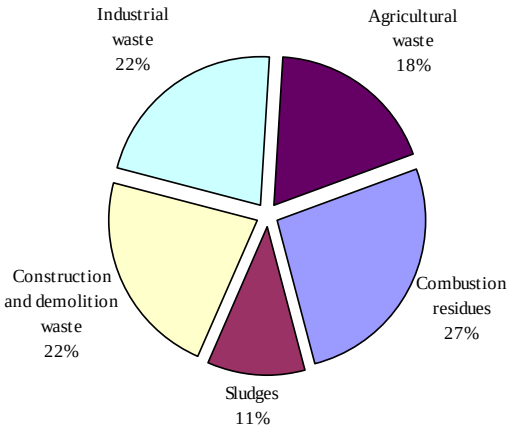
At present, only rough estimates are available about the generation of waste, generally indicating a total volume of between 4 and 5 million tonnes annually, of which 3.5 million tonnes would be 'solid'. Owing to the absence of adequate treatment technologies, the volume of accumulated wastes is growing steadily. The quantity of solid domestic residues produced in 1994 is estimated at 800 000 tonnes, in Chisinau 300 000 tonnes, i.e. about 180 kg/resident/year for the country as a whole and about 400 kg for each inhabitant of Chisinau. Most domestic waste is deposited in legal or illegal landfills.

The following approximate amounts of waste had been accumulated by 1994 (Figure 7.1): 13 million tonnes of combustion residues (ashes, slag) at power plants and boiler stations; 5.2 million tonnes of sludges at urban, rural and industrial waste-water treatment plants; 11 million tonnes of construction and demolition waste; 11 million tonnes of industrial waste, including considerable amounts of toxic waste; and 9 million tonnes of agricultural waste, including 7.9 million tonnes of animal waste (mainly manure).

Annually more than 2.5 million m^3 of solid municipal waste and 1.5 million m^3 of liquid waste are generated. The collection of waste is generally centralized and regular in the larger cities, on average once a week. Service costs are about 1 Lei per flat per month. Periodic, irregular collection is the norm in most rural areas.

Figure 7.1 Waste accumulated by 1994 in need of final disposal (% of total amount)

Total = 49.2 million tonnes



Source: NSAPEP.

Municipal solid waste

The significance of the decrease in waste disposal in 1993/95 is not clear. The problems connected with waste collection imply that the decrease in disposal does not necessarily indicate a decrease in generation. There is no indication that this assessment has changed since, so that it is difficult to develop even a "feeling" for the situation in 1997.

Table 7.1: Municipal solid waste (disposal in towns)

	1991	1992	1993	1995
Quantity of waste *(1 000 m^3)*	3,444.7	3,593.8	1,568.9	1,373.5
Surface of landfills *(ha)*	131.6	135.9	106.9	112.8

Source: DEP, 1997.

Agricultural waste

The amount of water used in agriculture has decreased since 1990, as shown in Table 5.1, Chapter 5, and explained in Chapter 8. There are no official data on the methods of storage, handling or dilution of wastes from agricultural enterprises. The waste quantities from the agro-industrial sector amounted to:

(1 000 tonnes)

	1995	1996
Wastes from fruit/vegetable production	19.1	32.2
Wastes from animal husbandry	1,526	2,091

Source: Department for Statistics.

Industrial and hazardous waste

The annual generation has decreased. At the same time, the volume of accumulated wastes is growing steadily. The accumulation of selected toxic wastes is shown in Table 7.2.

The decommissioning of banned and unusable pesticides, stockpiled in farms and warehouses, must still be solved. The non-observance of storage and accounting rules, and the wearing-out of packaging materials lead to soil pollution. In one case, pesticides together with other wastes totalling 4 000 tonnes, were reportedly buried in the district of Vulcanesti and covered with earth in the 1980s.

The wine industry does not have the technology to process and dispose of wine production wastes. To solve the problem of used luminescent tubes, a demercurization plant with a capacity of 3 000 lamps/day was brought on stream in Bender in 1995. The original cost charged was 50 bani per lamp. Now the price has risen to 3 Lei per lamp, which most enterprises cannot afford. No alternative concept for the collection of the tubes and for financing the project has so far been developed.

Other types of accumulated toxic/industrial wastes include:

- Waste oils: statistical data, provided by the Department for Statistics, are incomplete and inconsistent, and vary between 900 and 4 500 tonnes in 1995 and 1996, including both generation in enterprises and entries into enterprises from other sources. These numbers do

Table 7.2: Selected toxic wastes accumulated on company premises

Type of waste	1993	1994	1995	1996	1997
Wastes with heavy metals (galvanic wastes) *(tonnes*	1,243	1,221	1,008	1,100	1,240
Old, banned pesticides *(tonnes)*	240	1,255	3,752	4,661	5,411
Ferrocyanide (wine production) *(tonnes)*	1,089	1,069	991	1,167	1,899
Used luminescent tubes *(units)*	166	178	168	1,158	728

Source: DEP, 1997.

not include used car engine oil: the 1995 report on the state of the protection of the environment estimates the quantity of used engine oil at 239 000 tonnes in 1993. It is likely that these quantities will increase in line with the car fleet, which is expected to grow annually by 8 to 10% (see Chapter 10). The waste oils constitute a serious environmental problem, which will be compounded by the increasing number of cars. Formerly, waste oil used to be collected by special organizations, as well as by companies selling oil products. This system does not exist anymore. The 1995 report proposes a new department for oil recycling.

- Solid wastes from coal burning in the Tiraspol electric power plant "Dnestrovesc" (MTPP, see Chapter 9) are thought to amount to millions of tonnes, but exact quantities are unknown.
- Hospital wastes: their amount, disposal practices and potential risks are not well established.
- Residues from cleaning boilers, containing heavy metals (Vd, Ni): about 1000 tonnes.
- Other industrial wastes: 1 000 tonnes of hydroxides, 915 tonnes of rubber waste (tyres), 200 tonnes of paints and enamels, 100 tonnes of used emulsions, 60 tonnes of used solvents, 45 tonnes of leather, 40 tonnes of lead residues.

Radioactive waste

There is an 11 ha radioactive waste disposal site at the special Centre for Radioactive Waste in the eastern part of Chisinau. Only low and medium-level wastes need to be decommissioned, causing no special problems. Table 7.3 shows the figures concerning radioactive waste stored. A significant increase in waste generation appears between 1980 and 1985 for Co-60 (factor of 7) and C-14 (factor of 5). Between 1985 and 1990, a significant increase was registered: by a factor of 3 for Sr-90, by a factor of 6 for Cs-137 and by a factor of 8 for Pu-239. There is a gradual significant decrease over the whole period only for Ra-228 and Tl-204.

Recycling and reuse

Waste recycling (or waste treatment) is problematic. Some data exist on the use of secondary raw materials for the period 1985-1989. The data in Table 7.4 demonstrate the importance of the use of secondary materials during that time.

Table 7.3: Radioactive waste (GBq) stored at the Centre for Radioactive Waste

GBq

	1980	1985	1990
Sr-90	12.3	11.3	44.2
Co-60	387	2,520	2,140
Cs-137	200	227	1,400
Pu-239	1.82	2.04	16.50
C-14	5.3	26.0	26.0
H-3	1.49	1.69	1.83
Ra-226	0.149	0.149	0.152
Ra-228	1.02	0.56	0.31
Th-230	0.22	0.22	0.22
Tl-204	0.170	0.060	0.026

Source: UNDP Moldova 1993 - Studies carried out by Moldovan consultants.

Important changes in the use of secondary raw materials during the reporting period were:

- Steel production slag: up from 39 900 tonnes in 1987 to 114 400 tonnes in 1989.
- Glass: down from 107 200 tonnes in 1985 to 20 100 tonnes in 1986, then rising again slowly.
- Tyres: dramatic drop from 1 088 tonnes in 1988 to 6 tonnes in 1989.
- Resin wastes: up from 211 tonnes in 1985 to 8 647 tonnes in 1986.
- Paper: steady rise from 3 553 tonnes in 1985 to 10 714 tonnes in 1989.

It is not clear how significant these changes in the use of secondary materials are and how they relate to the generation of materials. For comparison, there are data on the generation of secondary materials (tonnes) in 1994 provided by the DEP in 1997:

Paper	2 286
Polymers	103
Textiles	187
Tyres	91
Glass	2 798
Resin wastes	915
Scrap metals	11 193

No reliable data exist on the actual reuse or market potential for reuse of wastes such as those from the textile and construction industries and, in particular,

Table 7.4: Use of secondary materials

	1985	1986	1987	1988	1989
Ashes and ash slags *(1 000 tonnes)*	433.5	495.2	670.4	549.6	579.2
Black metal scrap and waste *(1 000 tonnes)*	-	-	763.4	782.8	746.8
Steel furnace slags *(1 000 tonnes)*	-	-	39.9	85.0	114.4
Glass scrap *(1 000 tonnes)*	107.2	20.1	23.7	26.1	37.8
Timber waste *(1 000 m^3)*	251.1	178.2	284.2	259.0	232.7
Sec. polymer raw materials *(1 000 tonnes)*	5.5	6.6	7.6	7.4	5.6
Used tyres *(tonnes)*	-	1,261	1,170	1,088	6
Resin wastes *(tonnes)*	211	8,647	8,154	7,398	7,783
Secondary tannery materials *(tonnes)*	-	3,566	3,643	3,834	4,831
Secondary textile materials *(tonnes)*	9,673	6,942	8,609	9,466	8,590
Secondary winery materials *(tonnes)*	-	-	1,850	1,399	1,401
Paper waste *(tonnes)*	3,553	3,655	6,450	13,176	10,714
Liquid glutine *(1 000 tonnes)*	-	29.4	30.7	33.1	30.4
Lignin *(tonnes dry material)*	2,000	5,800	7,000	7,800	7,500
Corn-cob rods *(1 000 tonnes)*	53.6	33.1	28.9	15.4	46.0
Oil-cake and solvent cake *(1 000 tonnes)*	-	-	4.5	200.8	203.1
Pyrite cinders *(1 000 tonnes)*	32.4	74.2	78.5	91.7	66.5
Sunflower husks *(1 000 tonnes)*	28.9	25.1	26.4	16.0	17.0
Wine grape marc *(1 000 tonnes)*	38.6	111.0	88.0	92.2	60.4
Apple marc *(1 000 tonnes)*	33.6	67.5	39.8	20.8	15.6
Sugar-beet marc *(1 000 tonnes)*	389.8	1,709.3	1,419.4	1,510.0	1,710.0

Source: Department for Statistics, statistical report 1991.

used oils. The "Moldovaresurs" company in principle collects all reusable secondary resources. However, there seems to be no company to recover waste oil, which does have considerable market potential in some CIS countries. Some categories of waste are collected by specialized enterprises and delivered to glass and cardboard factories, and plastic processing plants ("Chisinau-plast", "Uniplast"). The most important secondary materials, from the market point of view, seem to be: iron, non-ferrous metals, oil products waste, paper. The roughly 1 000 tonnes of used tyres accumulated at enterprises and transport units have not found any application, although this is technically and economically feasible.

Transport, imports, exports

There appears to be little or no coordination of the transport of toxic and hazardous waste into and within Moldova. While permits may technically be required for the transport and transshipment of certain categories of materials, responsibility for their issuance is scattered among several different departments, depending on the mode of transport and the material involved. No central control, transport labelling, technical specifications of transport equipment, training of staff involved in the trade, or emergency response plans or equipment seem to be presently in place. Moldova is neither a Party to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), nor to the Basel Convention (see Chapter 3).

Waste disposal

Approximately 70 landfills are located in towns (with a total surface estimated to be between 100 and 140 ha) and more than 1 300 landfills in villages. Most of the sites are not properly authorized and do not meet the modern environmental and sanitary requirements (standards dating from the Soviet era), especially in rural areas. More than half the urban landfills, and a high percentage of rural landfills, are assumed to fall in that category. As can be expected, the unauthorized landfills (gullies, pits, disused quarries, along roads, etc.) are more polluting than authorized landfills. In Chisinau, there appear to be seven unauthorized waste plots in different parts of the city, of a surface of between 0.5 and 2 ha each.

The exact numbers of landfills and their characteristics are not very well known. The numbers given in Table 7.5 are official, but do not reflect the uncertainty of various expert opinions.

Table 7.5: Landfill sites

	1991	1995	1996
Surface *(ha)*	1,380	1,389	1,392
Total landfills *(number)*	1,669	1,681	1,676
of which:			
- in the towns (authorized)	69	64	65
- in the villages (authorized)	1,600	1,617	1,611

Source: Department for Statistics, 1997.

For at least 30% of the landfills, the volume of waste currently exceeds capacity (Balti, Soroca Ungeni, Hincesti, Edinet, etc.), which occasionally leads to untenable situations. Construction of new landfills has been stopped owing to a combination of factors such as high population density, strict sanitary and environmental standards, and high costs.

There is no organized disposal site for hazardous industrial and chemical waste. Most toxic industrial wastes are stored at industrial sites while awaiting a solution. Currently, only 5% of the industrial waste generated annually is sent to proper disposal sites; three quarters is dumped informally on communal tips, mixed with municipal waste, and surface water and groundwater have been polluted to an unknown level. However, there also seem to be cases of toxic waste dumps (e.g. of outdated pesticides) under insufficiently controlled conditions. The situation is getting worse, as the majority of industrial enterprises are in crisis and efficient standards for treatment and disposal are lacking. Another obstacle to the processing of hazardous wastes is the lack of basic equipment to determine the chemical composition of some of them. The closed landfill site at Singera is not capped with an impermeable soil layer and leachate continues to leak into the river in the valley bottom. The risk of contamination of the groundwater is considered minimal, as the site is situated on a layer of clays, but groundwater monitoring wells have not been installed to verify the situation. A permanent closure plan has not been implemented owing to the high capital costs.

There are many concerns over illegal and uncontrolled dumping of both municipal solid waste and industrial wastes at numerous locations. The situation is escalating owing to rising petrol prices, and the consequent temptation to shorten hauling distances by illegally dumping wastes before they reach authorized landfills.

The municipality of Chisinau has launched an Environmental Programme, which was approved by Parliament. As part of it, a waste collection and handling project is being carried out to select and collect glass, paper and domestic waste separately. The Programme also seeks to solve toxic waste management problems.

7.2 Policy objectives and management instruments

Legal provisions

Waste management is rapidly growing into a major preoccupation in Moldova. Existing legislation, while providing a number of starting points for the implementation of sustainability, waste reduction and cleaner technology objectives, is considered to be insufficient at this time. As a result, the Law on Waste was drawn up in DEP and recently approved by the Parliament.

Among the existing legislation, the 1993 Law on Environmental Protection contains core provisions. Its Article 71(a) lays down that enterprises, regardless of ownership, must introduce in their technological process new effective technologies saving energy, water and materials, and minimizing the generation of waste. Article 72 stipulates that the Government has the obligation to recommend and implement cleaner technologies. According to Article 75, economic actors must switch to cleaner technologies and create conditions for preventing accidental environmental pollution. Encouraging enterprises, through the modification of legislation, to use new technologies which reduce, to the extent possible, energy and raw materials consumption and to produce environmentally friendly products is described as a top priority.

Chapter 7 of the Law on Environmental Protection is entitled “The control of waste, toxic substances, chemical nutrients and plant protection products”. Article 71 states the principles of State policy. Articles 72, 73, 74 and 75 enumerate the rights and obligations of the Government, the local administration, producers and users of packaging, and the economic agents. Article 76 contains provisions on the handling of toxic and nuclear substances, including dangerous waste. Article 77 forbids the import of waste. However, iron scrap has been exempted from this provision. The import of used tyres has been explicitly forbidden. The import of pesticides is possible only with the authorization of the Republic’s Centre for the Attestation of Chemicals for Agriculture. Articles 78 and 79 contain provisions on chemical nutrients and plant protection substances, and Article 80 determines that

a network of specialized laboratories must be organized.

The Law on Secondary Material Resources was adopted in 1996, with two main regulations concerning the collection and the use of secondary resources, and in particular the collection and secondary use of metal scrap. The Law on Hazardous Substances and products was also approved in 1997.

At the same time, to encourage toxic waste recycling, the Department for Environmental Protection passed a motion to amend the Law on Company Profit Tax. The amendments, granting tax relief to enterprises disposing of toxic waste, were approved by the Parliament in 1994. Investments into environmental protection can be offset against charges for polluting the environment. In 1993, for example, the Etalon experimental factory, which repaired its drainage network, the Signal combine, which installed methylene dichloride recovery equipment, and the Alpha combine, which built a device to remove the copper from its electroplating wastes, were granted full tax relief on the amounts they had spent.

The Law on Foreign Investments defines the legal, organizational and economic foundations and forms of activities of foreign investors and enterprises with foreign investments. Fiscal arrangements to offset capital outlays on nature conservation and on retrofitting and modernizing production against their taxable profits are described in Chapter 2.

In June 1996, DEP submitted to the Government the Law on Wastes, which was approved by the Parliament in December 1997. This law is intended to supplement Chapter 6 of the Law on Environmental Protection. It contains substantive chapters on (a) competence in the area of waste management, (b) registration and planning in handling waste, (c) control, monitoring, registering of wastes and programming of their use, (d) requirements concerning environmental safety in waste management, (e) financing and economic incentives in waste management, (f) violations in, and responsibilities for, the generation, use, treatment and removal of wastes, and (g) international conventions on waste management. Standards for payments for storage and disposal of various categories of waste are annexed to the Law.

The new Law contains basic principles and a number of regulations, such as the tariffs for payments concerning storage and disposal of various categories of waste. The polluter-pays principle is included in a form which obliges the polluter to pay these tariffs, but it is not clear whether they correspond to the true cost of handling waste. The prevention principle is included by requiring that the producers of waste should use waste-minimizing technologies. In this respect, the Law would need to be supplemented with technical regulations and requirements required for licensing procedures, technical monitoring and enforcement.

The necessary preparatory work has been done for the accession of the Republic of Moldova to the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. In 1996 Moldova signed, a CIS agreement on the control of the transboundary transport of hazardous wastes (see also Chapter 3).

Policy objectives

Policy objectives are included in a number of fundamental policy statements on environmental protection. The most important are the National Environmental Action Plan (NEAP), the National Strategic Action Plan for Environmental Protection, and the National Programme of Strategic Activities in Ecology, Rational Utilization of Natural Resources and Environment Protection (1995). The stated objectives have not yet been spelt out in terms of operational targets, programmes and tools necessary for their implementation.

NEAP primarily states policy objectives for the management of municipal solid wastes and industrial and hazardous wastes. The envisaged policies for municipal solid waste start from the recognition that the solid waste management system throughout Moldova will need to be completely renewed during the coming 10 to 15 years, as investment in disposal facilities, solid and liquid waste collection trucks, containers, street sweepers, and other sanitation equipment has been more or less at a standstill since the beginning of the transition. In the short term, the emphasis will be on:

- Stabilizing the quality of waste collection services and management of landfill sites by raising tariffs and developing direct invoice collection (thus applying more directly the polluter pays principle);
- Identifying the extent and sites for illegal dumping prior to the elimination of illegal

dumping, and identifying instances where municipal, hospital and industrial waste are mixed;
- Carrying out a study to develop a national waste management strategy, including economic and environmental cost assessment of various disposal options (landfills, compost plants and incineration).

There are no estimates of the negative environmental and economic consequences of industrial and hazardous wastes. Their effects may be high in terms of unexpected accidents. A precautionary approach is recommended in general. Short-term recommendations include:

- Safe storage of toxic pesticide wastes, followed by incineration at the plant in Chisinau if it is constructed;
- Development of sites for the long-term storage of industrial wastes, and enactment and enforcement of regulations for the separate disposal of hazardous/industrial wastes;
- Improvement of management and disposal practices for hospital wastes.

The *National Strategic Action Plan for Environmental Protection* (1995) contains a number of, mainly general, statements on the priorities and goals of the environmental protection policy under the new economic circumstances:

- Environmental protection policy as it was formerly understood (focusing on "end-of-pipe" technologies for pollution abatement) is becoming environmentally unacceptable and economically inefficient;
- The new economic order calls for the development of market-oriented instruments leading to the adoption of low-waste technologies, reductions in the intrinsic material and energy content of output, incentives for environmentally-oriented operations, preferential loans for ecological projects, financial support for the manufacture of environmentally friendly products, etc.;
- Market reform and economic mechanisms governing natural resource exploitation may help reduce pollution as the economy picks up and businesses acquire the resources to invest in new, competitive technology;
- Investments will be required in water and energy conservation, the development of resource-saving and low-waste technology and "good housekeeping" generally, so as to reduce losses and eliminate inefficient use of materials;
- Investments in sustainable development are long-term. One priority is to set resources for programmes not requiring substantial financial resources but long lead times to produce substantial effects in the future (the introduction of unleaded petrol, or the establishment of environmentally "responsible care" in enterprises, or the use of technology to close natural material cycles);
- State investment support should be given to the following:
  - The conversion of boilers to gas;
  - The provision of facilities for the pre-treatment of industrial effluents;
  - Strict supervision of the generation and reprocessing of wastes;
- The State plans to lend every support to the introduction of low-waste technology;
- Urgent action is required to deal with the problem of accumulating waste from intensive animal husbandry.

The *Comprehensive Long-Term Programme for Environmental Protection and Rational Use of Natural Resources (1987)* foresees programme developments related to cleaner production. The following aims are given as a shopping list, without any details on the contents or deadlines:

- Rational utilization of natural resources;
- Technologies for re-utilization of water resources and creation of water reserves;
- Organization of ecological self-monitoring at industrial enterprises;
- Development of normative documents in line with international standards;
- Replacement of industrial processes that destroy the ozone layer;
- Decreasing air pollution from the generation of energy;
- Carbon dioxide recycling;
- Change of technology at plants producing coolants;
- Infrastructure for "ecological production and services";
- Compensation for damage to the environment by industrial production, internalizing externalities;
- Reproduction of renewable resources and recycling of non-renewable resources;
- Fines for economic actors causing environmental degradation or exceeding pollution limits;

- Taxes and fines for physical persons causing environmental degradation and pollution;
- Charges for the use of natural resources in accordance with sustainable development.

With a few exceptions, such acts, regulations and programme documents have not been formulated or issued so far, nor is there an indication of the costs of their development and enforcement, or of how these resources can be provided.

According to the 1995 *National Human Development Report*, the Government is committed to cleaning up waste sites, including those causing toxic pollution and predating the transition period, and to establishing regulations to create/enforce waste management schemes, particularly in industry and agriculture. In addition to the clean-up and regulation, Moldova is promoting waste management, including the establishment of recycling programmes, the promotion of regional/national programmes on waste minimization, and the establishment of a national database to monitor waste sites and the production, transport and elimination/treatment of toxic substances. Overall, Moldova seeks to coordinate and implement State programmes in accordance with EU standards.

Economic context

Currently, the financing of projects is done in two different ways: the old way applies mainly to State-owned enterprises, while a more recent one is practised by private enterprises in emerging market conditions. According to the old system, the requests for financing environmental protection facilities come from the public authorities. Ministries and government departments can submit their own requests. The list includes projects to be financed out of the budget, and projects that the submitting entities intend to finance themselves. The procedure for project selection consists of an evaluation of the resources available and the determination of the problem's importance. Formal cost-benefit analyses or other optimizing procedures are not applied. Once selected, a project and the estimated sum required are added to an investment plan drawn up within the Ministry of the Economy.

Water supply and sewerage charges for households are in general too low to recover capital investments. In many instances charges to industry reach the true cost of the supply of water and sewerage. Low water prices, and consequently low revenues, are undermining the operation of water and waste-water treatment plants and preventing investments.

Incentives for implementation and results

The budgets of the public enterprise sector have been severely tightened. New credits have become extremely difficult to obtain, and subsidies to enterprises are being withdrawn. However, financial constraints have been relieved through loan roll-over and capitalization of interest owed. The closing-down of inefficient enterprises has slowed. To minimize disincentives to cleaner growth, tax and import duty relief, as well as financing mechanisms, have been applied.

Energy prices have increased substantially in recent years. Natural gas and district heat cross-subsidies continue to exist, and electricity tariffs are generally well below marginal costs. Cross-subsidies to natural gas, with higher prices paid by the industrial and power sector, provide limited incentives to substitute natural gas for more polluting fuel oil and coal. More than 100 boilers (50% of the total number) have switched to gas.

Institutional set-up and enforcement

Several public administrations are involved in the implementation and enforcement of both regulatory and economic instruments for environmental management. It is not always clear how the tasks and rights of the various services are delimited. Regarding *permits and licences*, the sanitary authorization for a landfill is given by the organs of the Ministry of Health, after authorizations have been obtained from the municipality concerned (testifying conformity with local land-use plans) and from the District Environmental Inspectorate (stipulating an ecological expertise to be done by DEP). The Ministry of Territorial Development, Public Housing and Utilities is involved in spatial planning especially in urban areas.

DEP controls the flows of toxic waste. The Department, in accordance with the Law on Environmental Protection, may license the manufacturing, transport and use of toxic wastes, and designs and controls the necessary regulations. DEP is, in particular, responsible for verifying surface and water quality. Monitoring or scientific data on leachates from either operating or closed landfills are currently unavailable.

To inspect waste generation and handling, the Environmental Inspectorate has recently introduced two types of reporting forms: one for toxic waste, the other for other types of waste. The forms are filled in only by registered enterprises, so that many smaller-scale activities are not controlled. The inspectors have or will have the right to inspect and impose penalties on the basis of several laws, including the Public Health Protection Act, the Law on Environmental Protection, the Law on Secondary Resources Materials, the Law on Wastes and the Forestry Code.

The Government of the Republic approved the creation of a system for noxious substances and the destruction of banned pesticides. Concurrently, the Scientific Production Association for Research, Collection and Processing of Hazardous Substances and Forbidden Pesticides was created. However, the decision cannot be implemented until resources are allocated.

Any border controls (on, for instance, imports of prohibited waste materials) are obviously a task for the customs services. However, for technical expertise and control equipment, they have to rely on the Environmental Inspectorate.

At present, the former Soviet standards are still applied to municipal waste (Ministry of Health of USSR: Sanitary Rules on the Installation and Contents of Disposal Facilities for Solid Domestic Waste, Moscow 1983). Recently, some additional Moldovan standards and regulations on toxic waste have been drawn up (Health Ministry of the Republic of Moldova: Sanitary Regulation on the Storage, Neutralization, Utilization and Disposal of Toxic Substances and Residues, 1995). For radiological protection, the former Soviet standards continue to be valid.

Waste management in Chisinau

The capital Chisinau has 650 000 inhabitants, and represents about three quarters of Moldova's industrial potential. Environmental standards (for air, water, car emissions and waste) generated income of about 1 million Lei (fines, taxes from enterprises) in 1996. Enterprises pay a charge of between 5 and 1 250 Lei per tonne of accumulated industrial waste, depending on the type of waste. The highest tariffs are charged for toxic waste and used oil.

In addition, a special fee of 5 Lei/tonne must be paid by enterprises as well as by individual citizens or families, for the collection of domestic-type waste by municipal waste services.

Revenues go into an extrabudgetary municipal eco-fund, which in 1996 used its income as follows:

	%
Reserve for emergency situations	10
Credits and investments for public services (parks, waste collection, etc.)	80
Current expenditures	8
Performance-related bonuses for staff	2

In 1989 the City of Chisinau opened a new landfill site, which is located about 40 km from the city. It has acceptable design and operating standards that include daily cover, collection and sampling of leachate. However, the site requires additional investment to make use of the remaining capacity over another 10-15 years.

A new concept for municipal waste management in Chisinau is being developed on the basis of a feasibility study performed by an external consultant. Various approaches are under discussion, including incineration with thermal recovery, and separate collection followed by bioconversion into useful products like fertilizers, biogas, fuel briquettes, construction material, glass, etc. To estimate the feasibility of separate collection, being an indispensable prerequisite for bioconversion, an experiment involving containers of different colours in a representative neighbourhood of Chisinau with 15 000 inhabitants has been started. The experiment is to give answers on the composition of waste, and how feasible it will be to change the behaviour of the population.

The feasibility study also addresses a number of institutional and financing issues which need to be resolved, such as:

- basic costs of the various technical options/installations
- existing and needed infrastructure (e.g. glass factories, paper plants, etc.) for recycling.
- costs of the land and infrastructure (water, electricity, etc.) for the various options
- legal ownership structure of waste management (public authority, shareholders' company)
- how to make foreign investment attractive
- social components (coping with increased financial burden on citizens, additional employment, school and pre-school education on waste)

7.3 Conclusions and recommendations

Any set of conclusions and recommendations to be drawn from the circumstances in which environmental policies and management practices unfold in Moldova has to start from the recognition

that considerable economic difficulties currently limit the freedom of action. At the same time, their consequences could be mitigated through some institutional arrangements. As this subject is dealt with elsewhere in this report, they will not be repeated here, even though they also apply to waste and technology policies.

The three central objectives for municipal waste management included in NEAP reflect realistic national priorities. But only the first is in the very initial stage of being recognized as being applicable, and so far only in the municipality of Chisinau. However, each of the three objectives needs to be elaborated and enforced in separate and detailed programmes. None of the NEAP recommendations for industrial and hazardous waste management is being implemented, despite their very pertinent nature. Safe storage of toxic pesticide waste should indeed be a priority, but incineration as an option is uncertain, since the plans for building an incinerator are uncertain. Possibly a solution involving a number of (neighbouring) countries could be found with the support of the international community. The two other recommendations accurately reflect the existing priority needs in industrial waste management, but there is too little emphasis on waste minimization and cleaner production. The objectives listed in the Human Development Report are more ambitious but even less specific than the ones made in NEAP. Although coherent and desirable in the long term, these objectives would need to be elaborated, focused and reformulated in the short and medium term.

The variety of legal instruments relevant for waste management and stemming from different periods does not form a coherent set of references. Moreover, many legal principles are not elaborated in a form suitable for practical prevention, monitoring, control and enforcement. There is an urgent need to develop a consistent, realistic legislative system of practice-oriented regulations concerning cleaner, waste-minimizing production and waste management. A basis for developing modern instruments of policy and management, a national waste strategy should be established and approved as soon as possible.

Recommendation 7.1:
The necessary translation of broadly formulated general policy objectives into concrete action plans should start from NEAP. The totality of action plans should be comprehensive to the extent that it constitutes a waste management strategy. It should result in enforceable actions and improved legal instruments, which should explicitly replace all existing action plans in the respective areas of concern.

In parallel to developing modern waste legislation, it is necessary to develop capacities for the implementation and enforcement of legislation by all levels of administration and by the business sector. The capacity development programme would include the creation of a reliable waste information system, technologies for policy implementation in all phases of the waste flows, and the development of the required skills among all staff concerned.

The quantitative and qualitative data on the generation, use, disposal and environmental effects of industrial/toxic wastes are not reliable, and trends in time are therefore difficult to assess. A reliable system of monitoring the generation (quantity and quality), movements, disposal and effects of industrial/toxic wastes needs to be established. The data concerning the numbers, the technical and legal status of urban and especially rural landfills are not reliable and give only a very rough picture of the real situation. Even less is known about the current and potential impact of the landfills on the environment.

Recommendation 7.2:
A plan is required for the provision of resources for the acquisition of waste treatment technologies, training of staff at all levels of waste management, and the development of an adequate information system. All three aspects are expensive. The plan should therefore take into account the fact that successful waste management will increasingly become an instrument for the achievement of export growth.

Moldova has experimented with various ways of stimulating foreign cooperation for environmental protection. None of the experiments seems to have been fully convincing. While this aspect remains an open question, the situation could perhaps move forward through the ratification of international instruments and their introduction into national practices.

Recommendation 7.3:
Moldova should ratify the European Agreement concerning the International Carriage of Dangerous Goods by Roads (ADR). An implementation programme, including an analysis of costs and

training for the staff involved in its implementation, should be established. See also Recommendation 3.2.

Experience with the introduction of cleaner production (comprising technology and management aspects) is still lacking. To gain experience and make progress, a cooperative effort will be needed by public administrations and their partners, private enterprises, as well as foreign investors/sponsors. A forum for networking and cooperation between business and the authorities, e.g. a centre on cleaner production, promoting the ISO 14000 standard, could be worthwhile. It would be helpful to launch a pilot project programme, with the emphasis on low-cost measures. One pilot project could be selected for each of the main industrial sectors.

Recommendation 7.4:
Technological change for the purposes of cleaner production should be promoted through the creation of a centre for cleaner production, including the preparation of the national programme for the phase-out of ODS. The centre should be jointly supported by the Government and the representative industrial organizations. It should be responsible for the promotion of the ISO 14000 series among Moldovan enterprises.

Effective legal instruments for promoting appropriate technological change do not exist. As future industrial growth is likely to be driven by private investments, disincentives to cleaner growth should be minimized. This includes removal of tariffs and taxes on clean production equipment and allowing accelerated depreciation for income tax purposes, both reducing the effective tax rate on clean technology.

Recommendation 7.5:
The relevant fiscal instruments, particularly profit taxes and import duties, should be used to encourage cleaner production by removing any disincentive to the installation of cleaner technologies, and by introducing appropriate depreciation schemes.

The separate collection of various categories of municipal waste, as a precondition for their subsequent reuse, is not practised to any significant extent in Moldova. Out of the total volume of solid domestic residue, 35% are food scraps, 25% paper and cardboard, 7% glass, 5% textiles, 5% plastic materials, 3% wood, metals, leather and rubber, and 14% stones, soil, soot. The figures suggest that there might be a recycling potential for part of the municipal wastes. The separate collection of municipal and agricultural wastes should always be accompanied by the construction of composting and biogas facilities, as well as other facilities for reuse or recycling, like incineration with energy recovery. The option of separate collection with subsequent reprocessing of waste categories requires the creation of new waste collection, selection and utilization networks, as well as markets for recycled products. It also requires a change in attitude among the public and the enterprises, which can be achieved only over longer periods of time.

A decision on the right mix of the existing options (separate collection and reuse, incineration, landfill) can only be taken by investigating the environmental, health, economic and social consequences of the options. A comprehensive national programme, involving the authorities, municipalities, enterprises and the public, should be started to determine the optimal choice. In this respect, the experience gained with the development of a new waste management concept for Chisinau should be used.

Recommendation 7.6:
The development of an action plan to reduce the volume of municipal waste for final disposal, destruction (with energy recovery where applicable) or reuse should be started without delay. The first step should be the drawing-up of a study on the installation of treatment facilities, including their costs, the possibility and costs of separate collection and pretreatment of different types of municipal waste, the need and possible success of public education programmes for waste separation in cooperation with NGOs, and the possible scope of markets for recycled materials.

Dangerous wastes that are either being accumulated or dumped in an uncontrolled manner, including stockpiled banned pesticides, galvanic and other wastes containing toxic metals, ferrocyanide and waste oils, are a special problem of great potential impact. For such categories of waste, a programme of inventories and clean-up/decommissioning should be established.

Recommendation 7.7:

An inventory should be established of industrial wastes of high potential hazard, which are either stored on industrial premises or were (or continue to be) dumped on landfill sites, including information on the site where they might have been discharged, whether legally or illegally. The inventory should be the basis for urgent clean-up or decommissioning, as the case may be.

PART THREE: ECONOMIC AND SECTORAL INTEGRATION

Chapter 8

ENVIRONMENTAL CONCERNS IN AGRICULTURE

8.1 The agricultural sector in transition

Economic importance of agriculture and historical development

The labour-intensive economy of the Republic of Moldova is based on agriculture, which accounted for 42% of net material product (NMP) and employed over 35% of the labour force before independence, in 1990. Within the former Soviet Union, Moldova had specialized in agricultural production and food processing. Processing of agricultural products represented 40% of industrial output, and 20% of industrial employment. Agricultural and food products accounted for over 50% of Moldova's exports in the final years of the Soviet Union.

Until about 1945-50, the territory of Moldova was intensively cultivated. Farmers' plots were small - between 5 and 7 ha on average - but the country was self-sufficient in agricultural produce. Farmers favoured mixed production in orchards, gardens and pastures. The comparatively high share of grassland effectively precluded substantial erosion. The organization of the agricultural sector involved agricultural chambers, which supplied farmers with seeds and other material. An agricultural bank granted loans at reasonable interest rates to tide farmers over.

With the process of collectivization in the former Soviet Union (in Moldova later than in other Soviet republics), all those institutions were disbanded, and bigger, more economically viable units (kolkhozes and sovkhozes) were created. Monoculture and intensive technologies displaced traditional agricultural practices. For example, in the south of the country, where animal husbandry had prevailed, almost all grassland was turned into arable land. Also, steppes were cultivated, as were alkaline soils on river banks, despite their high salt contents. Moldova's big collective farms specialized in certain types of produce and were relatively well-equipped, compared to others in the Soviet Union. They were considered as an agricultural testing and development area. All new technologies were first implemented here, and selection stations supplied the rest of the Soviet Union with seeds of indigenous species (particularly maize). Until the late eighties, Moldovan agriculture was a powerful economic sector.

Since independence in August 1991, Moldova's agriculture and food industry have faced a series of shocks, including a large deterioration in the terms of trade and severe droughts. A drastic reduction in input of capital into agriculture has gone hand in hand with a significant decline in production as shown in Table I.3 (Chapter Introduction). The drop was particularly severe in 1994, due to a severe drought, inadequate financing of agricultural operations, and a decline in both domestic demand and export. Crops have been left unharvested because the agro-processors could not afford to purchase them. Favourable weather in 1995 helped to stabilize agricultural production, but at a relatively low level.

Obvious features and effects of past agricultural practices include high levels of pesticide (up to 14 kg/ha before 1990) and fertilizer use, as well as risks of landslides, salinization, erosion and compaction of soils, flooding, and soil and groundwater pollution (60% of rural wells are polluted by nitrates and other nitrogen compounds, as there are usually no landfills, no sewage treatment plants and no manure disposal sites).

Privatization and ownership reform

The process of privatization is of key importance to the transition. Although only 4.5% of agricultural land is still State-owned (January 1997), for the remaining 95.5% privatized under different forms of land tenure (see Table 8.1) the effective process of transfer of ownership is not yet finished. According to a study by the World Bank (1996), roughly 66% of the privatization has been only nominal, i.e. the kolkhozes continue to use the land. To speed up the privatization, the World Bank together with some countries (EU, Japan, Netherlands and United States)

offered help in 1996-1997. The procedure for land registration will be subject to revision. At this time, the mayor of the local authority decides to whom a given piece of land is to be allotted (his commission also collects applications). After this decision, the Institute for Territorial Planning (formerly Moldgiprozem) prepares a project for parcel division, which has to be approved by the Department for Environmental Protection and by the mayor. The mayor's office then issues title deeds with the help of the cadastral offices.

The distribution of land to households (average plot size less than 0.3 ha) was the first step of privatization. This stage has been completed, although title deeds have not yet been given to all new owners. The second step concerns small-scale farm holdings. The initial legal privatization procedure granted agricultural workers the right to leave their agricultural units and purchase their own individual farm. In practice, every employee of a former kolkhoz received 1.78 ha on average. The share depended of the size of the kolkhoz in 1989 and the number of workers that had by 1992 resided in the village for at least one year. The social group of "intellectuals" (i.e. teachers, doctors, etc.) received 50% of that quota, located around their buildings. In addition, every peasant received 0.1 ha. One of the undesirable consequences of this provision was a risk of high fragmentation of parcels.

The privatization advanced at an irregular pace until February 1995, when Parliament revised the 1991 Land Code. To overcome previous difficulties, the 1995 land code stipulates that new agricultural enterprises can be created, only if they are at least the size of a crop rotation field. As no individual farm can meet this requirement, individual farmers are being forced to form associations before being able to become owners. The law also extended the number of people eligible to free land, requires the managers of the new farms to be qualified (certified) farmers, provides for shared access to machinery by all successor enterprises to old agricultural units - a provision that, in practice, did not appear easy to follow. Recently, the Constitutional Court excluded this article . It is now possible to divide the individual land, and since the adoption on the Law on selling-buying of agricultural lands, it is possible to buy land for agricultural use. For example, the first three auctioms on land sellings took place in Chisinau. Seventeen plots were sold at the price of 1068 Lei/m^2.

The number of joint-stock agricultural companies rose continuously from 29 in 1993 to 80 in 1995 and doubled in 1996. During the same period, the number of agricultural limited liability companies fell from 310 to only 6 in 1995. The structural reforms also led to an increase in the number of productive agricultural cooperatives from 75 in 1995 to 194 in 1996 and associations of peasant farms rose sharply from 6 to 67 in 1995 and 146 in 1996.

Annual land surveys in January 1995, 1996 and 1997 (Table 8.1) revealed a significant growth in the development of the private sector.

Table 8.1 Agricultural land by ownership category

		% of agricultural land surface		
		1/1/95	**1/1/96**	**1/1/97**
Lands under State ownership		**22.3**	**3.8**	**4.5**
Lands under private ownership		**77.7**	**96.2**	**95.5**
of which:	Collective farms	61.0	53.4	31.8
	Joint-stock companies	9.3	12.4	15.2
	Cooperatives	3.8	9.2	25.2
	Individual farms	2.7	3.1	6.2
	Farmers associations	1.0	1.4	3.7
	Others	0.1	16.6	13.4

Source: Department for Statistics.

Cooperative farms (privatized kolkhozes and agricultural State farms). A kolkhoz is a collective farm (a sovkhoz is a State farm). Kolkhozes continue to exist. These large farms have been turned into other legal forms of ownership, but they are still in an early stage of transformation. The decision to maintain them may be prompted by fears of being denied access to technical equipment, general risk aversion connected with change, fears of economic independence for reasons of age, etc.

The major part of output for the market continues to come from these State farms and collectives. Non-cash transactions are common among them, too. Such farms provide many goods that are exchanged against Russian energy imports. Similarly, inter-enterprise indebtedness in the food-processing industry often leads to payment for agricultural produce in kind rather than in cash.

Joint-stock companies. A few kolkhozes became joint-stock companies. In the majority of cases the decision to transform the kolkhoze into a joint-stock company was not taken at a general council assembly, and the new management was not elected. Normally (i.e. in 61% of cases) the share value was

determined, and the shares distributed to the shareholders. Joint-stock companies are encountering some common difficulties:

- Lack of spare parts and fuel for agricultural machinery and equipment (for data see Table 8.2).
- Lack of markets for agricultural produce and unattractive prices, sometimes even below unit costs of production, and difficult terms of payment (agro-industrial units often pay late, if at all).
- Heavy taxation on farms (social security tax, land tax, farming tax, income tax, etc.). Taxes have increased significantly, sometimes as much as fifteen times, over recent years.
- High interest rates for credits offered by banks (sometimes reaching 40-50%).
- High labour intensity, in an environment of rural unemployment. Most joint-stock companies employ large numbers of workers, and a great number of pensioners are usually attached to them.
- Theft of agricultural goods and company property.
- Mismanagement in the unfamiliar market environment.

Table 8.2: Agricultural machinery

Type of machinery	Number	% operational
Tractor	37,253	60
Plough	15,311	60
Sower	11,755	63
Cultivator	16,956	58
Water tank	7,666	51
Sprinkler	3,598	51
Combine E-280, CSC-100	1,177	55
Combine	1,679	62
Cereal combine	3,947	47
Reaper	3,846	56

Source: DEP.

Profits and, hence, shareholders' income from the joint-stock companies are low or non-existent; in fact most companies operate at a loss. It seems that many of the shareholders would now like to become independent farmers, but the legislation and complex administrative procedures make this almost impossible.

Agro-firms (collective farms). Agro-firms, like joint-stock companies, are also very similar to kolkhozes. However, unlike in joint-stock companies, their shareholders do not even have nominal control over management. Agro-firms closely resemble kolkhozes in decision-making on working schedule, use of profits, and general management style. Those wishing to leave the firm are deterred from doing so because they would lose the right to any machinery or other assets that are collective property.

Individual and associated farmers. In 1992, the process of privatization began with only 5 farmers. Their number increased to 13 958 in 1995, and by 1996 there were 16 064 registered farmers. Up to the end of 1997, 176 000 people received land. These farmers owned 34 555 ha of land in 1995 and 58 280 ha in 1997. Their private plots measure up to 2.5 ha, 1.78 ha being the average. The structural changes were accompanied by production changes.

Privately owned farms were allotted on the basis of bids made by potential farmers. Except in the south (46%), farmers generally got the land they requested (77%- 93%). It was much more difficult to process the claims to machinery and equipment. Of the average 1.78 ha plot, 1.40 ha is arable land, 0.19 ha vineyards, and 0.16 ha orchards. No longer able to work, kolkhoze pensioners have given their land to family members.

The number of private farmers and farmers working through small associations, although growing, is still quite small. Their share in total agricultural output was about 2%, in 1997 almost 8%, but remains modest. Farmers' associations are rather loose and mostly organized around the sharing of the equipment of former kolkhozes.

The household plots, which reached one million in 1996, producing largely for subsistence, are thought to account for 36% of agricultural output; in 1997, they accounted for 44%.

The main difficulties facing farmers are:

- Poor quality of their equipment and machinery.
- Scarcity of spare parts and fuel for machinery.
- Unavailability or high cost of fertilizers.
- Poor soil quality of the privatized land (resulting from past over-exploitation and under-fertilization

Table 8.3: Agricultural land use by type of ownership, January 1996

	All types		Public		Private	
	1 000 ha	*%*	*1 000 ha*	*%*	*1 000 ha*	*%*
Total	**2,556.3**	**100.0**	**434.3**	**100.0**	**2,122.0**	**100.0**
Arable land	1,774.0	69.4	110.2	26.8	1,663.8	78.1
Perennial plantations	412.6	16.1	26.5	6.1	386.1	18.2
of which: Orchards	*199.6*	*7.9*	*12.7*	*2.9*	*186.9*	*8.8*
Vineyards	*195.9*	*7.7*	*9.7*	*2.2*	*186.2*	*8.8*
Pastures	367.4	14.4	290.2	66.8	77.2	3.6
Hayfields	2.3	0.1	1.4	0.3	0.9	0.1

Source: Department for Statistics.

since independence) on the allotted plots and their geographical distribution. Difficult access to credit and markets.
- High taxation (land tax, income tax. The latter is only due for registered farmers, so they avoid registering).

The situation of land privatization in early 1996 is summarized in Table 8.3.

The following practices are frequently encountered in the privatization process:

- New farmers are being given their land but not legal title to it or, alternatively, are given legal title to their plot, but do not manage it themselves.
- Some landowners, particularly pensioners, who have leased their land back to the former kolkhoz, have found that their land has never officially changed status and is still listed as an asset of the kolkhoz. This practice contradicts article 21 of the Land Code, article 3 of the Law Regarding the Individual Farm, as well as article 12 of the Law for the Extension and Completion of the Land Code. Nevertheless, the leasing of farmland by agricultural enterprises is standard practice.

A real estate market was created only for urban land, residential land and orchards in 1995, and since 1997 also for agricultural land..

Agricultural production

Moldovan agriculture is blessed with a moderate climate and excellent soils. Seventy-five per cent of soils are chernozems, which rank among the most fertile in the world. Production is constrained by erratic rainfalls, droughts (45% of the time precipitations are down to 90% of normal precipitation rate) and low levels of groundwater resources in the south. Its most important output is: wine, horticultural, cereal, tobacco, and livestock (hogs and poultry) products. With 0.45% of the former Soviet Union's agricultural surface, it hosted 20% of its vineyards and 10% of its orchards. In part, the dominance of livestock (dependent on imported feedstuff) is a remnant of Soviet central planning, which emphasized Moldova's role as a supplier of both horticultural and livestock products. The evolution in agricultural land use in this decade is the subject of Table 8.4.

Large livestock raising complexes were built in the early eighties. The livestock sector was severely disrupted after 1991 and continues to decline, but the growing number of small private farms may cause some underestimate. Today there are over 160 large cattle farms, 49 fattening units for pigs, 16 of which have capacities for over 54 000 animals, and 40 poultry farms. They do not work at full capacity, for economic -- not ecological -- reasons. Meat production fell 55%, dairy production 35%, and egg production 47% between 1991 and 1995. In 1994 a drought caused low horticultural production and a shortage of feedstuffs, and 1995 was characterized by a static domestic market and low world market prices. The milk processing industry collapsed as well. However, nationally processed dairy products (butter, white cheese) can be found on the main Chisinau market.

The data of the Department for Statistics show that the output of most major crops was considerably higher in 1995 than in 1994. Figures record large increases in cereals, sunflower, sugar beet and grapes. On the other hand, tobacco, vegetable, potato and fruit production fell slightly. The area of cultivated land did not change in 1994 and 1995, but there was a significant change in crop patterns as compared to 1993. Orchards shrank 10% in 1995,

Table 8.4: Structure of land use, 1990-1996

1 000 ha

	1990	1991	1992	1993	1994	1995	1996
Total area	**3,376.0**	**3,376.0**	**3,384.0**	**3,384.0**	**3,385.1**	**3,385.3**	**3,384.5**
Total agricultural	**2,566.0**	**2,565.9**	**2,559.6**	**2,557.3**	**2,556.7**	**2,556.3**	**2,555.5**
of which:							
- Arable	1,739.4	1,736.3	1,735.6	1,744.5	1,758.7	1,774.0	1,784.4
- Perennial crops	470.6	474.8	466.0	448.2	430.7	412.6	399.1
of which: Orchards	*234.0*	*224.5*	*222.9*	*216.6*	*208.3*	*199.6*	*192.4*
Vineyards	*201.0*	*215.8*	*211.8*	*205.5*	*202.6*	*195.9*	*191.2*
- Pastures	351.3	350.5	355.1	362.0	365.2	367.4	369.6
- Hayfields	4.7	4.3	2.9	2.6	2.1	2.3	2.4
Forest land	**418.4**	**421.7**	**421.3**	**420.7**	**425.3**	**425.0**	**424.5**
Inland water	**89.4**	**88.7**	**89.5**	**90.4**	**92.6**	**92.4**	**92.8**
Other	**302.2**	**299.7**	**313.6**	**315.6**	**310.5**	**311.6**	**311.7**

Source: Department for Statistics, 1996.

Table 8.5: Agricultural production, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
				(1 000 Lei, at current prices)				
Total	6,095	11,336	97,260	1,067,202	3,212,027	4,520,000	4,021,000	-
				(% over previous year, at constant prices)				
Total	87.1	89.9	83.5	109.9	75.7	102.7	87.1	98.0
Plant production	82.4	94.0	86.0	127.6	68.6	106.1	82.8	102.8
Animal production	94.5	84.3	79.9	81.1	93.9	96.4	96.9	88.9

Source: Department for Statistics.

following a 19% decline the year before. During that time, vineyards expanded 4.5%, presumably reflecting better market opportunities compared to other products.

8.2 Environmental issues in agriculture

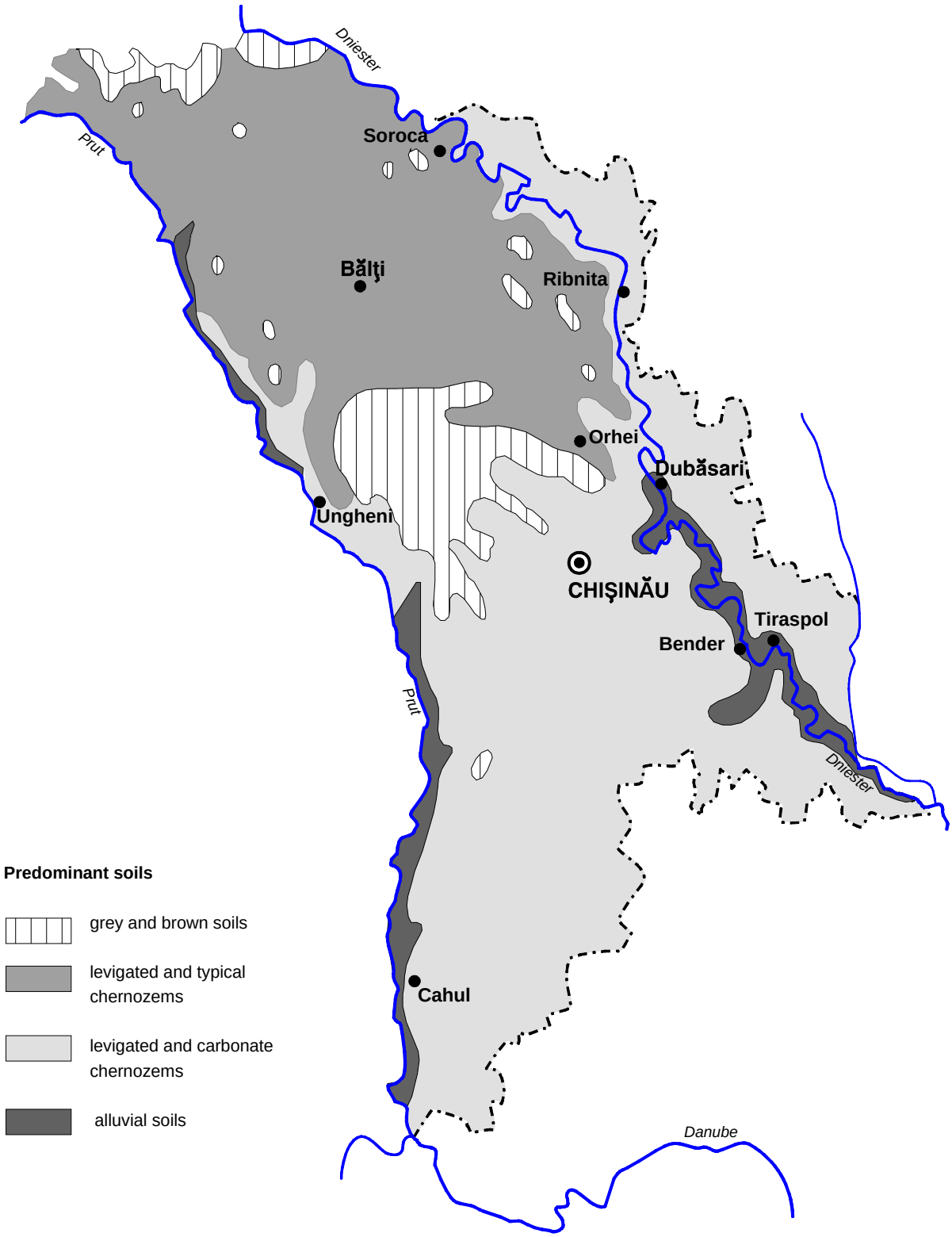
Soil resources

There are 745 classified soil varieties in the Republic of Moldova. The diversity found in the country in terms of geomorphology (i.e. relief), climate, vegetation, fauna, and geological formation has determined the diversity of soils. The very rich soils are a precious natural resource (see Figure 8.1).

Most of the soils are being used as arable land - even those that are naturally not very suitable for agriculture, like alkaline soils originating from saline Neocene clays. Also, about two thirds of alluvial meadow soils, mainly along the Dniester and Prut rivers, and in the basins of their tributaries, were improved for agricultural purposes by drainage systems. In the past 15 years the salt level in these soils has increased. As a result, 70% of them have become unsuitable for normal agricultural use. Grey soils are the most vulnerable as a natural resource, because of their low humus content, and among the chernozem types, calcareous and common chernozems have often been damaged. For instance, as even slopes have been put under cultivation, their topsoil is vulnerable to heavy rainfalls, which wash them off, diminishing their humus content.

Another example is in the south of the country, where a recent eco-pedological report shows that compacting of eroded podsolic chernozem has significantly increased in upper soil layers (porosity of the soil is decreasing). This is the effect of heavy machinery still used for field work. Its pressure exceeds 3-5 kg/cm^2 (the normal acceptable pressure for most soils is 0.4-0.5 kg/cm^2). As a result,

Figure 8.1: Main soil types of Moldova



Source: Institute of Geography and DEP.

over-compaction is noticeable on 60-65% of arable fields before harvest, and on 98% after harvest. Compaction is recorded down to a depth of 40-50 cm.

In addition to erosion and degradation, urban encroachment is responsible for an annual loss of 1 500-2 000 ha. During the last three decades, 205 000 ha of fertile land have been built up for infrastructure, industry and uncontrolled urbanization. The amount of fertile land per capita decreased from 0.53 to 0.39 ha. During the same period, intensive agriculture on 133 000 ha of land resulted in a continuous reduction of soil fertility, often adding to soil degradation problems.

Soil erosion

Soil erosion is attributed to a combination of factors, namely:

Natural factors: soil washed away during rainfalls depending on topographic factors (hills) and agricultural practices. Moldova is naturally exposed to intensive rainfall. Torrential rain affects about 80% of agricultural land, i.e. that located on slopes and covering roughly 2 million ha. According to data from 1993, 886 000 ha, or about 25.8% of the total land area including agricultural land, have been affected by different forms of primarily water erosion. More than 310 000 ha were considered eroded to a medium to high degree. The rapid soil erosion has serious implications for the long-term sustainability of agricultural production in Moldova, as the natural regenerative capacity of soils on slopes is low.

In addition to soil erosion, landslides along slopes also produce noticeable damage. A total of 55 427 ha of sliding area has been recorded in 1993, 2 362 ha of which were active annually. These sliding areas are mainly located in the central part of the country, and often covered by forests which stabilize the slopes. Updating of data on erosion in 1995 showed that the situation has further degraded, with 1430 800 ha affected (Table 8.6).

Institutional factors: such as emphasis on short-term production targets with a lack of soil conservation technology and of incentives for conserving land resources. Zonal soil protection actions are now developed, including soil conservation technologies, but as a result of lack of funds these actions are implemented partially.

Land-use management factors: Unsuitable matching of crops, relief and soil type (crops on slopes, instead of small grains, perennial plants or woody crops). Excessive transformation of hilly pastures and meadows to annual cropland, with no attention to relief, physical or biological monitoring. In the case of cultivation of slopes, the humus layer is easily washed off and only sandy and clay layers are left on the top of the slope. This can be seen in the light greyish colour of the slope covers, while lower parts of the soil are still dark and rich in humus and of a dark colour. The humus is washed downhill, often reaching surface waters. This causes euthrophication in most rivers and lakes every summer. The existing frameworks of hydrographic basins territory planning are suitable for plane territories, but they include some preventive actions to reduce soil erosion damage (forest belts, damps, channels, grassed waterways). The terraces are widely implemented in Moldova (about 60,000 hectares), but their effectiveness are less than in other countries, even increasing landslide activivity in some places. Intensive tillage systems have a very negative effect on soil. Inappropriate crop rotation, the unadapted use of chemicals, and the use of old machinery and equipment have had negative effects, too.

Table 8.6: Annual soil erosion and related loss in soil nutrients, 1995

Region	Eroded area	Loss in				
		Soil particles	Humus	Nitrogen	Phosphorus	Potassium
	1 000 ha	*1 000 tonnes*				
North	652.4	3,880.6	115.0	8.2	4.9	104.2
Central	289.9	9,828.0	255.5	17.6	12.6	2,298.6
South-East	103.6	740.8	21.2	1.6	0.9	17.2
South	384.9	7,694.9	214.8	15.9	9.4	178.5
Total	**1,430.8**	**22,144.3**	**606.5**	**43.3**	**27.8**	**2,598.5**

Source: Bulletin of ecopedologic monitoring, 3rd Edition, Chisinau, 1996.

Overall, the eroded area grows by 0.86% a year. The annual loss of fertile soil particles amounts to about 22 million tonnes (see Table 8.6), i.e. more than 30 tonnes per ha of eroded land. Orchards, vineyards and arable land are the most eroded. Loss of topsoil reduces productivity over time. Field experiments in Moldova on maize, wheat and sunflower show that the decrease in production is significant (see Table 8.7). Extrapolation of these soil erosion losses corresponds to an estimated annual loss of US$ 45-55 million. The total benefits of soil conservation are estimated at US$ 450-550 million.

Table 8.7: Estimated crop losses due to erosion, 1996

Agricultural product		Loss in production due to soil erosion
Raw crops (sunflowers, maize, etc)		
	(tonnes of NU)*	302,100
Fall cereals	*(tonnes of NU*)*	110,100
Spring cereals	*(tonnes of NU*)*	50,400
Perennial grass	*(tonnes of NU*)*	62,200
Grapes	*(tonnes of grapes)*	32,158
Fruit	*(tonnes of fruits)*	24,943

Source: Soil Institute, annual publication.
* Nutrient Unit

Fertility, pesticide and fertilizer use

Previously, kolkhozes were obliged to have fertility plans (on the basis of expected yield, the proposed amount of fertilizers was calculated from 20 parameters), field passports (with information on, for instance, crop rotation, irrigation, soil type and agrochemical data). They were responsible for forests and hedges on their territory, and had to supervise protected grassland. Up to 1990, approximately 500 000 soil samples were analysed per year nation wide, compared to 150 000 in 1996.

Fertilizer use (expressed as active substance) was high before the transition: about 350 000 tonnes in 1986-1987. In 1991 it amounted to 191 400 tonnes of mineral fertilizer and 8.6 million tonnes of organic fertilizer. Then, it fell drastically as the figures of 1995 show: 11 200 tonnes (with 20% nitrogen, 10% phosphate, 5% potassium) and 1.5 million tonnes respectively. According to scientists, the quantities of nitrogen fertilizer used between 1980 and 1988 exceeded requirements by 20 000-30 000 tonnes a year. There was no problem with the use of mineral fertilizers as long as they supplemented organic fertilizers. But the uneven use of organic fertilizers (uneven animal distribution, highly concentrated in big farms) created gaps in the humus balance of cultivated soils, while other lands were over-fertilized (also with a negative impact). In 1981-85, the deficiency was 0.37 tonne per ha, and humus became even scarcer after 1990. Data on current soil fertility show a low humus content of 3.6% in average (and only 2% on 13% of soils), clearly down from the 9% at the end of the last century. Also, the macronutrient content on examined soils is low. The phosphorus content is 21%, and mobile potassium 9.2%. Otherwise, agricultural practices have remained the same and are still very demanding in nutrient elements from soil.

The strategy to cope with this problem is to reduce crop surface by 40% of the total sown area, and to increase the area covered by perennial crops by up to 20%, accompanied by the use of organic fertilizers. Depending on the soil characteristics and the level of soil erosion, it is estimated that 8-12 tonnes of organic fertilizers per hectare are required to maintain the humus balance in the soil. However, applications declined from an average of 5.1 tonnes to 1.2 tonnes per hectare between 1991 and 1995.

Total pesticide use has dropped from 38 300 tonnes of active ingredients in 1984 to 5 800 tonnes in 1993; application rates decreased from 15-20 kg/ha to 0.5-0.1 kg/ha. In 1986, the average use of pesticides in Moldova was 15.4 kg/ha of agricultural land; in 1990, 5.7 kg/ha (37% of the 1986 level). In 1988-1989, 30.2% of soil and 8.8% of vegetation samples showed traces of pesticides and 7% of food did not meet health standards on chemical contents, 1% exceeded maximum permissible concentrations (MPCs) of pesticides. In 1993 - the latest year for which data are available - about one fifth (21.6%) of all agricultural produce contained pesticide residues, but less than 1% exceeded allowable levels. Detection in fruit and vegetables was more frequent, but the proportion of polluted samples has declined in recent years. In livestock products, pesticide residues appear to be increasing slightly, both in the overall detection frequency and in the proportion of MPC excess.

Soil and groundwater contamination with pesticides are facilitated by poor storage facilities for pesticides and lack of enforcement of rules for their transport. Also significant is the 90% decline in the number of trees grown for soil and water conservation and protection (green belt); they have been illegally cut for firewood (see Chapter 6).

Soil quality

Moldova's soil has some unusual chemical features, with a high level of fluoride in the north-west, an iodine deficit in the north, and a manganese deficit in other regions. Reportedly, these characteristics, combined with the heavy application of mineral fertilizers comprising traces of heavy metals, have led to special reactions and conditions. As a result, the humus content of the soils in question has dropped sharply, leading to a negative balance of nitrogen and phosphorus as crops consume many more nutrients than are available in soil water.

Data indicate significant levels of heavy metals, nitrates and pesticides in the soil profile. During 1990-1993, some soil samples contained nitrate levels of 256 mg/kg (national standard is 130 mg/kg), and lead levels of 36.3 mg/kg (national standard is 30 mg/kg). The highest amount of heavy metals was detected at a distance of 50-60 m from roads. In 1992, 3.3% and 11.4% of soil samples exceeded microbiological and chemical standards, respectively. A recent study of the Centre for Hygiene and Epidemiology shows that 1.0% out of 660 soil samples did not meet the standards because of high nitrate (5 samples) or metal content.

Soil biota and species selection

Destruction processes in soil have led to a decrease in the general abundance and variety of microfauna and microflora. It has also resulted in the reorganization of species and the accumulation of predatory varieties and toxic products. The focus on a few promising crops and monocultural agricultural practices in general have had a negative impact in this respect.

Several gene banks aim at preserving the genetic potential of domestic animal and plant species:

- In 1991 a special laboratory for genetic resources was established at the Institute for Genetics of the Academy of Sciences (they keep over 150 species).
- The Scientific Research Institute for Maize of the Scientific and Practical Association "Porumbeni" owns a collection of 1 091 species, 1 830 lines (self-pollinated) and 1 033 genetic sources of maize.
- The Scientific Research Institute for Field Cultures of the Scientific and Practical Association "Selectia" keeps more than 65 000 species of wheat, peas, soya, 123 hybrids of sunflower and 1 300 hybrids of sugar beet, etc.
- The Scientific Research Institute for Selection and Technologies of the Scientific and Practical Association "Codru" keeps genetic material of hybrids of nuts, apricots, and quinces.
- The National Institute of Viticulture and Wine has a bank of 2 800 species of grapevines from all over the world.

Water use and discharges

The most noticeable environmental water issues related to agricultural practices concern irrigation and waste-water discharges. In 1994, 310 000 ha of agricultural fields were irrigated. In the north, where impermeable rock is found at a depth of up to 12 m, the rising water table contributes to salinization. In the south, water from small rivers is used for irrigation. As it contains high levels of minerals and salts, it also causes salinization. Another frequent and detrimental consequence of irrigation is declaying and compaction of soil when there is no proper drainage.

In some places, groundwater is contaminated down to a depth of 12-14 m as a result of agricultural misuse of mineral fertilizers, pesticides and inefficient treatment of agro-industrial wastes. About 60% of rural wells are polluted with nitrogen compounds, hydrogen sulphide and fluorides (especially in deep wells). However in recent years, the maximum concentration of nitrates measured in the drinking water of decentralized systems has rarely exceeded 150 mg/l-250 mg/l. These levels were much higher in the 1980s. Nitrates, ammonium, pesticides, as well as heavy metals, are also detectable in surface waters.

Waste-water discharges from food-processing activities also badly affect the quality of surface water. Polyphenols are discharged from 100 wine producers, sugar factories and other processing factories. Untreated waste water from agricultural units and the food-processing industry may be discharged into rivers or ponds. Some treatment facilities do not operate for reasons of cost. Six of the nine sugar factories discharge waste water into lagoons, which may leak or spill over. Poultry farms and dairies have treatment facilities but they do not operate them owing to a lack of resources for repair and maintenance. Instead, many use diluted waste water for irrigation.

Regarding livestock complexes, the leaking of their slurry disposal systems has not only led to yearly losses of some 3 million m^3 of freshwater, but has also heavily polluted groundwater, which, in many

places, is the only source of drinking water. Adjoining land was covered every year with some 4 million tonnes of untreated manure. The system of organic fertilization was well-developed, applying up to 200 kg N/ha in a radius of 10-12 km around the big animal farms. Till 1991, about 10 million tonnes of manure were applied per year. Consequently, nitrogen from both surplus mineral fertilizers and nitrogen-containing manure mineralized into soluble nitrate and percolated into groundwater. A scientific survey in this period showed that nitrate concentrations in half the wells were 2 to 7 times higher than their permitted level. In 1996, the amount of manure applied fell to 80 000 tonnes. However the level of nitrates in underground water is still rising (see Chapter 5).

The agro-industrial sector also produces an important quantity of solid wastes (see Chapter 7).

8.3 Agricultural management with environmental implications

Policy objectives and legislation

The Parliament of the Republic has adopted a number of important legal instruments such as the Land Code, legislation on private farming, privatization, the land tax and various taxation procedures. These instruments also influence the country's environmental conditions. However, there is no direct integration of environmental issues in the agricultural development strategy - although agricultural activities are of course widely mentioned in Moldova's NEAP. Furthermore, most economic incentives for agriculture aim to boost production.

The Agricultural Sector Review, a MoAF policy document, recommended for the medium term that Moldova’s strategy should emphasize:

- Higher yield and efficiency, through public investment in agricultural research, education and extension.
- Promotion of agricultural exports to drive economic growth in general, through liberalized pricing and trade, better product quality, development of new markets, marketing channels and marketing institutions.
- Sectoral reforms in production through rapid de-monopolization and privatization of agro-processors and traders, with parallel farm restructuring, privatization and land reform, the development of land markets and adequate rural financial services, and the development of new public institutions and private initiatives.

Moldova's NEAP suggests many changes in agriculture to reduce the impact of fertilizers and pesticides on soil and groundwater, as well as to prevent degradation. In addition, its environmental policy lists objectives that concern agriculture:

- Areas requiring or enjoying environmental protection must not be privatized.
- The shift from 'traditional' to 'biological' agricultural production, with a minimal use of chemicals, should be encouraged.
- Agricultural management schemes including crop rotation systems that correspond to the soil's agro-ecological potential should be introduced.
- New managers of agricultural units should be given training in agro-ecological management practices.
- Agrarian reform should be backed up with agro-pedology, selection of agrochemicals, diagnosis and prediction of plant diseases and pests through the creation of informal consulting services.

Institutional arrangements

MoAF is responsible for the management of environmental issues in agriculture. It has an environmental protection unit with a staff of four whose task is to ensure coordination with DEP. MoAF supervises institutions and bodies such as:

- The scientific production association "Fertilitate" with its subdivisions.
- The Institute for Agrochemical Services with its chemical stations (Chisinau, Balti, Cahul) and six district production quality stations. They are responsible for monitoring nutrient and pesticide use, radiological contamination of soil and agricultural produce.
- The Service against Agricultural Pests and Diseases with its National Station and district stations.
- The Institute for Research and Technology Design in Pedology, Amelioration and Agrochemicals "N. Dimo".
- The State Association Apele Moldovei (formerly ACVA) (1995) which is an independent body (see Chapter 5).
- The Moldovan Institute for Water and Land Improvement Research.

- The National Veterinary Diagnosis Control, which deals with animal disease and epizootic disease prophilaxy, as well as monitoring forage and animal products for radionuclides.

Some institutions work in agriculture but are under the responsibility of another ministry or, more often, directly under the Government. The service Hidrometeo of the DEP monitors soil pollution with pesticides in the framework of a special programme. The State Ecological Inspectorate of the DEP monitors soil pollution within a programme for soil pollution and degradation prevention. It also controls the distribution of land, owners' ecological expert assessments, and the annual cutting of wood. The Inspectorate collaborates with local entities.

Since April 1994, soil control has been performed within a unified programme, developed in coordination with ecological monitoring. The service Hidrometeo monitors point sources (with the help of five stations with laboratories), and collects continuous data, while the Centre for Hygiene and Epidemiology carries out spot checks. The Centre monitors the state of the soil according to soil pollution indices, covering pesticides, heavy metals, pathogens, etc.

Regulating and monitoring land use, maintaining the land registry and land protection on behalf of the State are the responsibility of the National Agency for Geodesy, Cartography and Cadaster (NAGCC). The pedological station, previously run by the Land Property Regulation and Land Reform Directorate, is now with the NAGCC. Land development and reform sections have also been set up in district executive committees under the agro-industrial complex departments. The so-called Land Office (Moldgiprozem) has been moved to the National Agency of Geodesy, Cartography and Cadaster, which falls under the direct supervision of the Government.

Three universities, a number of technical schools, 18 research institutes under the Ministry of Agriculture, the Academy of Sciences, and agricultural extension staff constitute the network of agricultural research and education. The system is inherited from the former Soviet Union and does not appear to be fully equipped to cope with the needs of farmers in the present and future economic and technological conditions.

The Ministry of Agriculture and Food gets data only from time to time. During recent years, much soil monitoring and/or water and soil fertility monitoring has had to be stopped because of a lack of money. Sometimes research findings remain unpublished due to financial restrictions. For example, the radionuclide Laboratory of Moldova has collected and stored unique data on contamination before, during and after the Chernobyl accident, but the results cannot be published.

Several NGOs deal with agricultural problems such as: soil erosion, sewage disposal, groundwater quality, soil fertility, education of rural populations, or alternative technologies. Most of them have sprung from scientific and research institutions which used to be under State responsibility and are now seeking a new way of raising money. Some NGOs have international contacts. Independent farmers are not usually members of NGOs. They have created two associations.

Instruments used in management

The most important instruments are soil monitoring, land taxation and technical assistance. Public expenditures for certain purposes would normally play an important role, but during the transition period budgets are tight. Soil monitoring is carried out in several stations: Ursoaia (Kahul district), Chirsova (south Comrat district); Ivancea (Ohrei district), Budai (Telenesti district), Durlesti (Ialoveni district), Lapusna (central Hincesti district); Briceni (north). Sampling is mainly done on arable land, sometimes also in vineyards and orchards. Usually soil loss, quantity and quality of water, nutrients in soil, organic matter and pesticide residues are analysed. The heavy metal content used to be analysed, but this has now been discontinued owing to a lack of money. The nutrient cycle is monitored in some places, and groundwater is collected occasionally (lysimeters).

A land tax is paid for the use of soil by farm owners. It depends on the land's quality and quantity, forest being excluded. The related tax revenues accrue to local budgets, for which they represent a significant item (3%). However, only 25% of the taxes due are actually paid up. Irrigation water is taxed at half the rate of drinking water (see Chapter 2). Tax money collected from irrigation goes to Apele Moldovei for the maintenance of irrigation systems.

Credits are needed to upgrade the mechanization of small farms and irrigation systems, to introduce integrated pest management, and to invest in improving seed and plant species. The reduction in financial support for measures against erosion has been clearly evident since 1993 (see Table 8.8). Technical assistance and investment programmes were proposed for the restructuring of the agricultural extension service, the systematic detection of pesticide residues, the introduction of soil conservation methods and for environmentally friendly agricultural practices. Recently, agricultural project loans were obtained from the World Bank and EBRD. They were mostly focused on increasing agricultural productivity and efficiency, boosting export earnings, strengthening the institutions and the rural financial sector. However, one of the components of the World Bank project focuses on integrated pest management, and education and extension of sustainable agriculture methods.

8.4 Conclusions and recommendations

Agriculture is clearly the key to Moldova's economic development at least in the near future. Not only is the country endowed with an excellent resource base, it also has a long tradition of agricultural production. The current hesitation to embark fully and energetically on the revitalization of agriculture is therefore both surprising and disappointing. Surprising, because the almost exclusive focus of agricultural policy and farm management on more or less short-term production targets during the pre-transition period led to unnecessarily high soil degradation and a relatively low quality of a number of important agricultural products - a conclusion to which the vast majority of Moldovan agriculture experts appear to subscribe. Disappointing, because the transition period, if positively approached and properly managed, would at least provide an opportunity to correct some of the mistakes of the recent past.

Since the recent Decision of the Constitutional Court, it is possible to sell and buy agricultural land. Till then, while the regulations embodied in the 1995 revision of the Land Code did not stop the land privatization process outright, they clearly complicated its continuation. In the initial stages, most farmers prefered to work the land without being forced into associations. Other current problems for independent farmers are the general lack of agricultural machinery, or access to it, the lack of fuel, seeds, and fertilizers, the lack of access to credits, and to marketing information and training. Unlike the agro-processing monopoly, independent and associated private farmers are not supported by the State, and are, for instance, forced to accept below-market prices for their produce. Despite these difficulties, the small independent farms are proving to be more efficient than the old structures, as they are able to provide food for the family and farm animals on plots of no more than 1.5 to 2.5 ha.

Farmers lack information on laws, technologies and agricultural practices. There is no up-to-date information on markets, machinery or agricultural supply (seeds, fuel, fertilizers, pesticides, etc.). Support should be given both financially (by providing advantageous loans, a proper fiscal policy, access to modern agricultural equipment, purchasing farm produce at market prices, etc.) and technically (through specialized assistance and extension services).

The National Strategic Action Plan for Environmental Protection gives first priority to the elimination of sources of environmental degradation as well as to the solution of some urgent ecological, economic and social problems. This is a convenient basis for the development of more concrete measures. These measures could probably best be set out in the framework of a sectoral policy for sustainable agriculture. Such an explicit policy needs to be complemented with (annual) implementation plans. The main objective of the policy should be soil conservation, while the most urgent measures are in the areas of:

research and extension programmes for sustainable agricultural practices (information on new technology including conservation tillage and conservation measures to reduce surface run-off; pest and disease diagnosis and prediction; nutrient management; efficient irrigation);

- environmental training for all farm managers, whether State officers or private farmers;
- creation of extension and technical advisory services available to all farmers.

Table 8.8: Budgets allocated to anti-erosion measures, 1991-1996

	1991	1992	1993	1994	1995	1996
Budget (from the national budget)						
(1 000 Lei, at current prices)	**22,000**	**43,047**	**1,149**	**3,383**	**2,555**	**3,974**
Consumer Price Index						
(% change over the same period of previous year, Dec-Dec)	159.4	1,669.6	2,705.7	104.6	23.8	15.1

Source: DEP.
Note*:* CPI: Consumer Price Index.

The degradation of soil may not be totally reversible, depending on the changes in soil structure and function that have occurred. However, nutrient loss can be remedied. The benefits of specific conservation measures will have to be studied. There is evidence that some of the structural measures, such as terracing, will not be as cost-effective as measures involving changes in cropping patterns (conversion of steep slopes into pasture), vegetation buffers, and tillage practices.

Recommendation 8.1:
A policy programme aiming at sustainable agriculture should be developed as a matter of top priority. The programme should deal with soil conservation as one main focus. It should be implemented simultaneously with agrarian reform, with measures that focus initially on research, training and the creation of extension and technical advisory services. It is also important to remove obstacles to the full and rapid implementation of land privatization.

The influence of the introduction of foreign animal and plant species has till now been insignificant, but there could be a rise in foreign seeds and breeds if the country does not provide enough qualitative domestic seeds, backed up with advanced technology. In the years to come, the main demand will be for low input and resistant species and hybrids.

Recommendation 8.2:
Programmes to control the introduction of foreign species should be developed.

A programme for sustainable agriculture does require complementary measures that confine the adverse effects on environment of past agricultural management and policy. These measures could best be realized in the context of territorial planning developed by the Institute for Pedology, the Academy of Sciences, the Institute for Territorial Planning and University of Agriculture. The programme should include in particular:

- the design and enforcement of use restrictions for land that suffers from serious chemical contamination and endangers groundwater quality;
- the limitation of the agricultural use of river banks;
- the determination of procedures for the adaptation to optimal land-use patterns at the local and regional levels, including the introduction of land-use planning and the provision of the necessary infrastructure in rural areas.

Recommendation 8.3:
A comprehensive system for territorial planning should be introduced at all levels of government (local, regional, national). It should be based on: (a) the need to respect environmental objectives in land-use decisions, and (b) the requirement to provide the necessary infrastructure and communal services for all types of land use.
See also recommendation 6.2.

There is no generalized advisory service for all farmers to teach them how to apply sound agricultural practices. There are some extension centres - partly maintained by foreign companies seeking to promote their products (seeds, equipment). These extension centres are purely technically oriented, they do not have the capacity to give managerial advice to private farmers. It is paradoxical that foreign companies offer a better service and technology, while Moldova's Institute of Selection, once renowned for its selection (plant/animal) and reproduction, has no money to carry out research or upgrade its services.

The most evident problems generally arising from current agricultural practices are:

- Only 35% of the so-called 'scientific crop rotation' was implemented, a percentage that is not very

different from practices under centrally planned agriculture.

- Forests and agricultural land are strictly divided. Forests are usually encircled by a country road. Natural afforestation does not take place, because virtually each square metre of uncultivated land is used as pasture. This practice also prevents the survival of natural plant species.
- There is no regulation on the maximum permissible number of animals per ha. Cattle, goats and sheep often graze in forests. This is actually illegal, but the law is rarely enforced.
- The average use of fertilizers of about 300 kg/ha in 1996, if maintained, could upset the nutrient balance of the soil (output exceeds input, humus reserves or sorptive parts of the soil are exhausted).
- Cleaned water is often used for irrigation, or it is mixed with freshwater for irrigation. The main problem is dry saline residue, which is sometimes contaminated. It is mainly discharged on landfills, or sometimes composted and then used in agriculture.
- Farmers do not operate adequate water treatment equipment, nor do they have storage facilities for manure.

Soil conservation being vital for the long-term preservation of the country's natural resource base, the legislative basis for governmental action needs to be made explicit. Land management should be done according to the recommendations and actions developed in the General Scheme for Anti-erosion Measures for 1991-2005 and the Territory Scheme for Nature Protection for years 1990-2010.

Recommendation 8.4:
Soil conservation as an aim in itself should be the subject of special legislation. It should concentrate on vulnerable soils and protect the endemic xerophyte forest chernozem. Soil conserving measures should be envisaged for all agricultural practices (crop patterns, land use, vegetation cover, machinery used, production techniques, etc.). Economic instruments should be developed and used to make soil conservation economically viable for all types of farm management.

Some attempts are being made by private farms to produce so-called biological products. This is not done in accordance with controlled technologies, but on the basis of "the lowest possible" input. However, there is no market yet for such products, which are therefore selling at low prices. As a result, only few basic crops (not vegetables) are currently produced and marketed in this category of agricultural production.

Recommendation 8.5:
Farm management practices should systematically be aligned with soil conservation targets, primarily by changing crop patterns and production techniques, and by promoting organic farming methods.

The funding of the policy programme and its implementation should be considered a top priority in the State budget, in view of the agricultural sector's importance. The current programme of reforms, centred on the privatization of agricultural land, needs to be complemented not only with a large investment programme, but also with the introduction of incentives to encourage private initiatives. The overall objectives in Moldova's policy documents are to improve agricultural productivity, to make natural resource use sustainable, and to reduce the external impact of agricultural activities. The introduction of high-value crops, the adaptation of new species (i.e. selected domestic breeds) to environmental conditions, food quality control, improvement of mechanization in line with changed crop patterns, more efficient irrigation techniques, improved pest and fertilizer application, the improvement of farm management and the development of sustainable practices in all areas of agriculture will help to achieve the general objectives.

Most international donors concentrate mainly on privatization, bank restructuring, and on economic relations between enterprises, but rarely on solving the country's environmental problems. The Moldovan Government's decision to rely primarily on its own resources to this end is therefore sensible. However, it should not lead to a systematic neglect of concrete sustainability objectives, particularly given that the sector concerned manages the country's major natural resource. The Government has adopted two scenarios for financing priority actions, one with foreign financial input, the other without. External assistance to Moldova's agriculture was US$ 400 000 in 1992, US$ 1 215 000 in 1993, and expected to reach US$ 3 998 000 in 1994.

The use of heavily contaminated water for irrigation results in high levels of nitrogen compounds in groundwater. A scientific report on the use of irrigation water was submitted to the Ministry of Agriculture in 1991, but has not been followed up. The practice of irrigating with highly mineralized

water still goes on, carrying the risk of ongoing salinization of soil.

Recommendation 8.6:
A programme for the reduction of water pollution from agricultural sources should be developed and implemented. It should introduce water protection objectives into the designation of agricultural lands (e.g. river banks), the suitability of water for use in irrigation, and the handling and application of agro-chemicals. The programme should also provide effective mechanisms for the dissemination of information on the use of pesticides to all farmers.

Before the transition, the use of land for agriculture was considered an absolute priority. As a result, agriculture encroached upon areas that are vital for nature's other biological functions. A new balance therefore needs to be struck to protect such functions (see Chapter 6 and its recommendations).

Most countries in transition suffer from a lack of reliable information, and Moldova is no exception. The main source of statistical information in the past was the reporting and accounting system, built up over a number of decades. A decisive move away from unnecessary statistical reporting is one of the most important tasks in the reconstruction of the agricultural information system. A census of perennial plantations was already carried out in 1994, and a reporting system for the statistical study of small private farms started in 1993. The improvement and adaptation of agricultural information systems also require renewed and/or increased funding for selected laboratories. Support for the radionuclide laboratory at the Fertilizate Chemizal Station appears to be a particularly strong case in point, as this station seems to hold unique information in the context of the Chernobyl accident.

Recommendation 8.7:
The agricultural and environmental information systems should be rapidly adapted to the transition conditions, so that a comprehensive agricultural information system becomes available for decision-making. The funds required in this context could perhaps be mobilized partly through international cooperation projects.

Finally, attention is also urgently required for the health effects of the use of agrochemicals. In this connection, it is important to develop safety regulations for their use, handling and transport. In addition, agrochemical residues in food need to be monitored. Enforcing relevant standards requires the tracking of violators, based on legal provisions for liability. If necessary, the introduction of special charges, taxes or other economic instruments linked to the use of agrochemicals should be considered.

Chapter 9

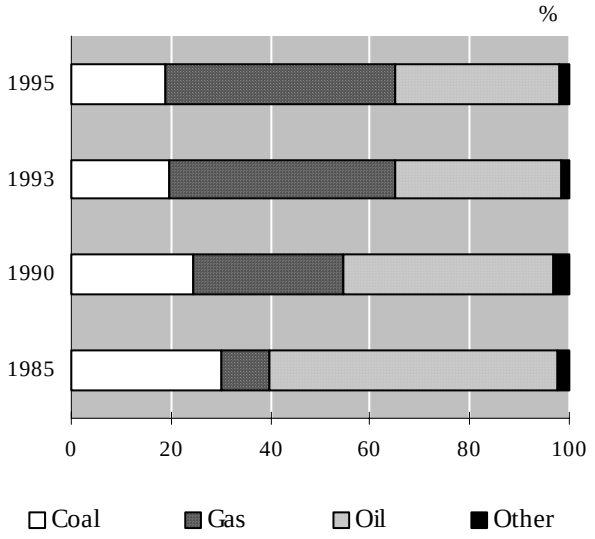
ENVIRONMENTAL CONCERNS IN ENERGY

9.1 The energy economy in transition

Energy supply and use

Moldova is a net energy importer with only 3% of demand for primary energy covered by domestic sources. In 1995 primary energy supply was dominated by natural gas (48%). The main energy suppliers are the Russian Federation (100% of gas imports, i.e. 3 035 million m^3 in 1995), Ukraine (with the Russian Federation it accounts for 100% of the country's coal imports, 1 315 000 tonnes in 1995) and several European countries (oil products totalling 1 466 500 tonnes in 1995). The Republic annually spends more than US$ 500 million on energy, an amount equivalent to 29% of GNP in 1995.

Figure 9.1: Development of primary energy supply structure



Source: Prepared from:

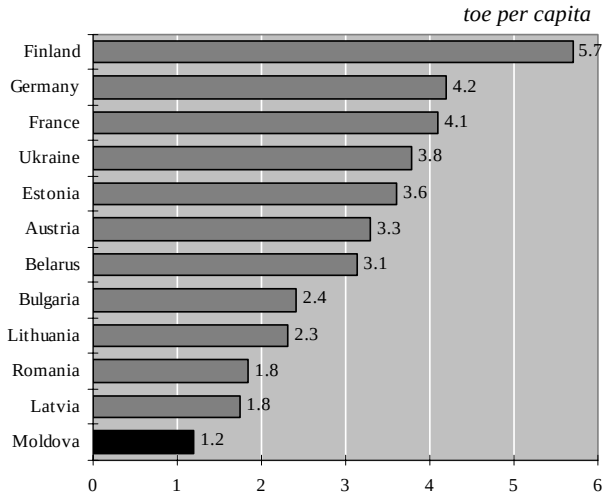
1. Ministry of Economy, Moldovan Economic trends. Quarterly Issue. "Section 9. Energy Issues". Government of Moldova/European Expertise Service. August 1966, 12 pages.

2. International Monetary Fund (IMF), Staff Country Report No. 95/73: "Republic of Moldova - Recent Economic Developments", August 1995, 7 pages.

Some 60% of final energy consumption is in the form of electricity and heat, of which industry is the main consumer (41% and 47%, respectively). Until 1998, electricity was supplied by only one public enterprise, the "Moldenergo" State Company. The biggest plant is the Moldovan Thermal Power Plant (MTPP) located on the Nistru left bank (84% of total installed capacity). MTPP produces 85% of the electricity used in the country. At the end of 1997, this Company was broken into 14 smaller enterprises, which were included in the privatisation programme.

TPP-1, TPP-2 and TPP Balti co-generate electricity and heat. Their unit production costs are lower than at MTPP, where the condensation principle is used. HPS Costesti and HPS Dubasari are basically only used for the regulation of the load curve. Drops in voltage are common, and frequency (which may drop to 49.3 Hz) is unstable. Operating capacity amounts to only 54 per cent of installed capacity, and the quality of the electricity supplied is poor. The security of electricity supply in all parts of the country is affected by the location of MTPP.

Figure 9.2: Energy supply



Source: Prepared from:

1. UNECE, Committee on Environmental Policy and Senior Economic Advisers to ECE Governments, Energy prices and taxes in countries in transition: an overview of recent developments, document CEP/WG.2/R.17-EC.AD/WG.1/R.40), 14 November 1995, 24 pages.

2. OECD, Statistical yearbook 1995.

The energy supply level per capita in Moldova is below the average of OECD Europe and lower than

Table 9.1: Operating capacities of power plants, 1996

MW

Plant	Installed capacity	Operating capacity
Total	**2,996.4**	**1,629.4**
Moldovan thermal power plant *(MTPP) (Dnestrovsk)*	2,520.0	1,100.0
Thermal power plant No 1 *(TPP-1, Chisinau)*	54.0	40.0
Thermal power plant No 2 *(TPP-2, Chisinau)*	240.0	215.0
Thermal power plant *(TPP Balti)*	20.4	20.4
District heating power plant *(Chisinau)*	98.0	92.0
Hydro power station *(HPS Dubasari)*	48.0	48.0
Hydro power station *(HPS Costesti)*	16.0	14.0

Source: Capcelea, A., The Republic of Moldova on the way to sustainable development. Chisinau, 1996.

Table 9.2: Energy balances, 1990-1995

1 000 toe

	1990	1991	1992	1993	1994	1995
1. Total import	11,010	8,869	6,730	5,301	4,972	4,521
of which: Coal	2,559	2,117	1,341	1,002	1,154	554
HFO	2,574	1,862	1,535	982	707	648
Petrol	818	613	304	251	220	268
Diesel oil	1,198	1,030	604	540	380	389
Natural gas	3,209	3,053	2,818	2,468	2,451	2,394
Liquefied gas	158	135	105	43	22	43
Other types of fuel	107	60	24	14	26	54
Electricity	385	0	0	0	53	171
2. Total own production	69	51	37	66	205	279
of which: Electricity in HPP	22	30	22	32	24	28
Wood and agricultural residues	47	22	15	34	181	251
3. Total (production and import)	11,079	8,920	6,768	5,367	5,177	4,799
4. Stock at the beginning of the year	956	1,056	774	402	306	362
5. Stock at the end of the year	1,050	774	403	306	362	364
6. Export of fuel and energy	645	98	73	73	25	14
7. Total inland consumption	10,339	9,098	5,391	5,391	3,099	4,783
8. Total final consumption	**7,362**	**6,234**	**3,278**	**3,278**	**3,106**	**3,034**

Source: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.

in all neighbouring countries. The consumption of primary energy dropped by more than 50% from 10.3 million toe (435 PJ) in 1990 to 4.8 million toe (203 PJ) in 1995. Electricity consumption decreased from 12.7 TWh to 5.4 TWh. There was a significant decrease in heat consumption, from 4 283 000 toe in 1991 to 1 630 000 toe in 1995.

Energy consumption in the residential sector fell between 1991 and 1995, from 2.02 million toe to about 1.18 million toe. Heat represents 29.3% of residential energy consumption. About 300 000 flats are connected to district heating systems. The total thermal capacity of district heating plants is 7 373 000 Gcal, of which 78% come from combined heat and power plants, the rest from heating plants. The share of final energy consumption by the population in total energy consumption increased from 27.8% in 1990 to 39.5% in 1995. Energy consumption in the transport sector decreased considerably, from 1.25 million toe in 1990 (or 17% of total final energy consumption) to 0.35 million toe in 1995 (or 11%). The share of construction in final energy consumption decreased by 0.7%.

Table 9.3: Main energy flows by type of fuel, 1994

1 000 toe

	Overall	Coal	Petrol	Diesel	HFO	Gas	Biomass	Electricity	Heat
Primary energy consumption	5,018.6	1,166.5	242.7	399.6	56.0	2,420.0	164.7	69.3	69.3
Internal sources of energy	147.9	..	..	..	..	..	148.9	38.8	38.8
Import	4,833.7	1,153.7	243.7	381.2	576.1	2,420.0	5.9	53.2	53.2
Power plants	2,043.9	887.7	..	1.0	239.3	915.8	..	648.3	1,012.5
Combined heat plants	952.8	22.7	..	7.2	274.5	642.3	6.1	..	902.4
Final energy	3,195.0	255.0	240.6	389.4	41.2	729.6	149.9	546.9	1,389.4
Heavy industry	377.5	1.8	..	1.9	5.4	325.1	..	34.2	43.4
Food industry	342.8	4.6	..	9.7	7.2	4.3	..	109.8	317.0
Other	203.5	0.4	..	0.6	2.7	8.8	2.3	63.9	188.6
Construction	16.0	..	1.0	6.1	1.9	0.8	..	4.1	6.1
Service	253.6	61.3	2.7	2.0	11.0	11.0	6.3	47.0	159.4
Agriculture	434.4	4.0	2.1	216.7	2.9	66.2	2.3	94.5	140.3
Residential sector	1,231.1	180.8	63.4	6.2	7.2	305.1	138.9	188.2	529.5
Transport	336.5	2.1	171.3	147.2	2.9	8.3	..	4.7	4.7

Source: TACIS, Diversification of Energy Supply Sources. 1997.

Industrial manufacturing is the main energy consumer among the economic sectors. Energy consumption in industry decreased from 2.09 million toe in 1990 to 0.7 million toe in 1995, and that of agriculture from 0.98 million toe to 0.35 million toe. The share of industry in total final fuel consumption decreased from 28.5% in 1990 to 23% in 1995, while that of agriculture remained almost constant during the same period.

Considerable changes also occurred in the structure of the forms of energy used. The consumption of coal decreased by over 90% that of liquefied petroleum gas (LPG) by 80%, and that of thermal energy by about one third. At the same time, consumption of electricity grew considerably (up 10% or, if unpaid consumption is added, up 65%), as did that of methane (up 64%) and wood (up more than 700%). The decreasing consumption of coal and liquid gas resulted in the first place from price increases, which were twice as big as the price increases on the world market. For example, in 1995, the cost of LPG in Moldova was US$ 462/tonne, in foreign countries US$ 293/tonne. The import price on the world market was US$ 140 per tonne.

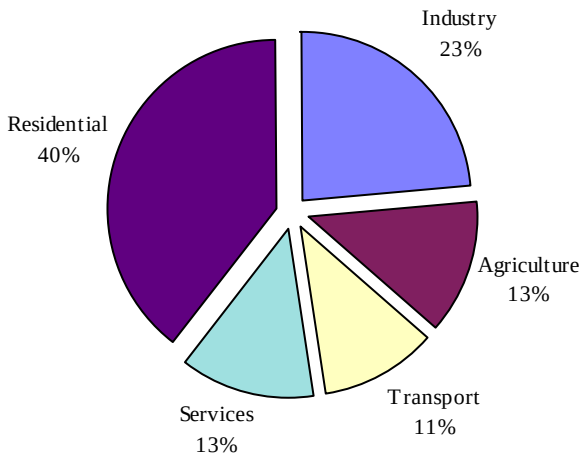
Losses of energy

Electricity losses in total energy losses increased from 10.7% in 1990 to 19.4% in 1995. The energy efficiency can also be shown by the ratio between finally consumed and primary energy. This index decreased during the period under consideration by 11%. It compares to selected market economies as follows: Japan - 0.717, France - 0.651, Republic of Moldova - 0.708 (1990), 0.63 (1995).

In 1995, the most important losses, indicating a potential for energy savings, occurred with the final consumers (44.7% of all energy), although final consumption is the only part of the energy economy showing a decreasing share in total losses between 1990 and 1995 (from 55.2% to 43.5%). The relative losses of energy in transport and distribution were much higher in 1995 than in 1990. They are the highest in the distribution of electricity, where they grew from 10.7 % in 1990 to 19.1 % in 1995. The main reason is unpaid consumption. The total share of losses in transport of all types of energy was 15.7% in 1995, compared to 5.9% in 1990. In other words, there is a considerable potential for energy savings in the transport of energy. If the level of losses in 1995 had been that of 1990, the savings would have been about 300 000 toe, or approximately US$ 30 million.

The medium efficiency coefficient in electricity generation in Moldova decreased from 35.5% in 1990 to 30% in 1995, which is equivalent to annual losses of 81 300 toe (approximately US$ 9 million). Heat use decreased by about 50% between 1990 and 1995. However, total losses in heat transport increased from 120 600 toe to 150 400 toe, that is by 25%.

Figure 9.3: Final energy consumption, 1995



Source: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.

Energy pricing

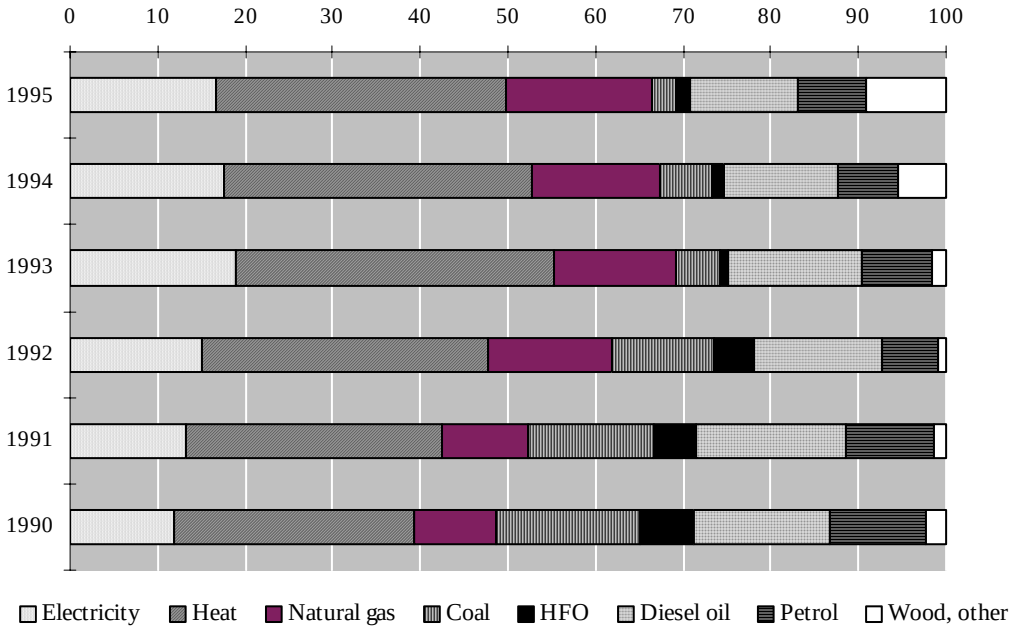
Energy prices have increased substantially over recent years. However, natural gas and district heat subsidies continue to exist, and electricity tariffs are generally significantly below long-term marginal costs. In particular, cross-subsidies to natural gas, with the industrial and power sectors paying more than households, provide little incentives to substitute natural gas for highly polluting HFO and coal in these sectors.

The prices of petroleum products and coal are now unregulated for private importers, who are currently handling some 30% of the related imports. For the State sector, a mark-up system, which does not fully cover depreciation, has been adopted. Increases of electricity and heat tariffs constitute a major problem, as they relate to a high proportion of household expenditures.

Table 9.5 shows the great discrepancy between world and domestic energy prices that still existed in 1991. Cross-subsidies were the most important for electricity and heat. According to World Bank calculations in 1995, industry paid more than three times the minimum cost recovery level of electricity, whilst household tariffs were only a quarter of this minimum. In 1997, consumer tariffs for electricity were just over half the minimum cost recovery, while for gas, consumers were charged about 90% of the cost recovery. Industrial tariffs were in both cases around 135% of the minimum cost recovery level.

The indebtedness of energy users to suppliers is a major problem. At 1 January 1996, total debt in the national economy stood at 2.6 billion Lei. The debts of the economic agents vis-à-vis "Moldenergo" at 1 January 1996 exceeded 336.7 million Lei, after increasing in 1995 by 53.6 million Lei. The comparable figure for "Moldovagaz" at 1 January 1996 is 731.3 million Lei, and for "Tirex-Petrol" 86.6

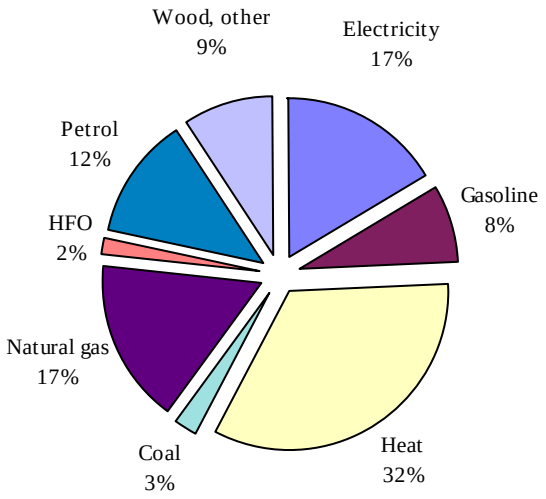
Figure 9.4: Final energy consumption by form of energy



Source: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.

million Lei. The external debt of Moldova at the end of 1996 amounted to about US$ 471 million and US$ 615 million in the first six months of 1997 (see Table I.3).

Figure 9.5: Total final energy consumption by energy source, 1995



Source: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.

Energy intensity

Before the break-up of the Soviet Union, Moldova's energy intensity was high by international standards. Despite a substantial increase in real energy prices, it is still high, but decreased at an impressive average annual rate of 8.25% between 1990 and 1995. The decrease was primarily caused by the growing share of agriculture in GDP, giving higher weight to the relatively low specific energy consumption in agriculture as compared with industry. As a result, energy intensity reached a value of 1 279 toe/US$ 1000 of GDP in 1995. This figure is about twice as high as that for upper-middle income OECD countries: OECD reported an average energy intensity for such countries of 0.6 toe/US$ 1000 in 1993. It is likely that the unfavourable economic development during 1996 and 1997 has led to a further reduction in overall energy intensity in Moldova, although at a somewhat reduced rate.

The main reasons for the still unsatisfactorily high level of energy intensity are the lack of investments in improved efficiency in the power plants and district heating utilities, the so far limited scope of industrial restructuring, the lack of incentives for energy conservation in the household sector, primarily due to the lack of metering, and the social unacceptability of cutting off non-paying energy customers from supply. Nevertheless, a clear downward trend in energy intensity prevails.

Table 9.4: Energy losses in the energy economy

	1990			1995		
	Absolute losses	Losses compared to input	Share of total losses	Absolute losses	Losses compared to input	Share of total losses
	(1 000 toe)	*(%)*		*(1 000 toe)*	*(%)*	
Total losses	**6,637**	**64.2**		**3,094**	**65.0**	
Fuel losses during its transportation	45	0.8	1.3	212	4.4	6.8
Heat generation losses	376	14.5	5.7	230	16.7	7.4
Losses in the electricity generation process	2,205	64.5	33.2	1,034	70.0	33.4
Losses in the thermal energy networks	200	9.1	3.0	150	13.1	4.9
Power losses in the grid	105	10.7	1.6	123	19.1	4.0
Losses in final consumption	3,666	49.5	55.2	1,345	44.7	43.5

Source: Prepared from: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.

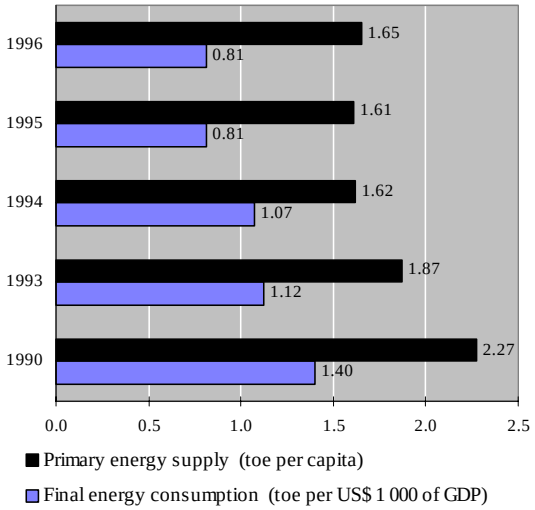
Table 9.5: Energy prices in 1991, in roubles (Rb300 R = US$1)

Energy	Industry/ Commercial	Households	World prices	
	in roubles		*in roubles*	*in US$ **
Petrol *(per tonne)*	24 - 27 000	..	60 - 69 000	200 - 230
Diesel *(per tonne)*	17,000	..	54 - 64 500	180 - 215
Fuel oil *(per tonne)*	11,000	..	24,000	80
Natural gas *(per 1 000 m^3)*	2 - 3 000	1 200 - 1 300	45 - 60 000	150 - 200
Coal *(per tonne)*	3 - 8 000	3 - 8 000	10.5 - 15 000	35 - 50
District heating *(Gcal)*	3,000	21	10.5 - 18 600	35 - 62
Electricity *(MWh)*	3,000	600	15 - 19 500	50 - 65

Source: Prepared from:

1. The World Bank, "Moldova - Moving to a Market Economy". A World Bank Study. Washington, D.C. 1994, 106 pages.
2. UNECE, Committee on Environmental Policy and Senior Economic Advisers to ECE Governments, Energy Prices and Taxes in Countries in Transition: an Overview of Recent Developments. Document CEP/WG.2/R.17/Add.1-EC.AD/WG.1/R.40/Add.1. 16 November 1995, 32 pages.

Figure 9.6: Development of primary supply and final consumption per capita



Source: Calculated from:

1. The Department for Environmental Protection/The National Institute of Ecology/World Bank, The National Strategic Action Plan for Environmental Protection. Chisinau, October 1995.
2. UNECE, Committee on Environmental Policy and Senior Economic Advisers to ECE Governments, Energy prices and taxes in countries in transition: an overview of recent developments. Document CEP/WG.2/R.17-EC.AD/WG.1/R.40. 14 November 1995, 24 pages.

9.2 Environmental effects of energy use

Air pollution

With declining industrial activity and energy use during recent years, air emissions have decreased too. Almost a half of all air emissions originate from stationary sources. Emissions of SO_2 and NO_x per capita are remarkably lower in Moldova than in other countries in transition and lower than the OECD average (see also Chapter 4). Emissions of carbon dioxide are not systematically inventoried. In 1994, fuel combustion gave rise to 5 391 kt of CO_2 emissions, of which 2 750 kt were attributable to the energy sector.

The most important pollution source in terms of both volume (59.2%) and level of intoxication (82.4%) are the establishments of Moldenergo (93% of total NO_x emissions from the energy sector). MTTP is the largest single source of sulphur and particulate emissions (approximately 90% of SO_2, 80% of NO_x and 100% of particulate emissions from the energy sector) with a total emission volume of 251 700 tonnes/year (92% of Moldenergo emissions). This station produces 54% of all emissions from stationary pollution sources. Only MTPP uses coal: 800 MW of installed capacity require coal as input, 800 MW coal and gas, and 920 MW gas and HFO. In 1995, 30% of all energy (6 836 GWh) produced at MTPP was generated using coal. Other power plants use only gas and HFO in the proportion of 70:30. None of the power plants is equipped with desulphurization or denitrification systems. Only MTPP has dust capturing filters, mounted in the chimneys of the plant on the basis of the Venturi tube, with an efficiency of about 95.4%.

About 60% of the energy boilers have exceeded their technological lifetime by 21 years; 40% by 26 years. Moreover, the boilers were built to save space, thus the installation of combustion gas desulphurization equipment is impossible in most cases. The costs of the structural changes that would be required to permit the installation of such equipment sometimes

Table 9.6: Air emissions by energy sector, 1990-1996

						1 000 tonnes	
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
SO_2	162.4	108.0	80.6	83.8	68.8	31.5	32.2
NO_x	30.8	30.5	20.5	21.4	18.5	12.3	11.6
Particulate	33.6	36.7	24.4	20.7	24.7	14.0	10.3
CO	-	-	0.9	1.0	0.5	0.5	0.4

Source: 1. Department for Environmental Protection/The National Institute of Ecology, The State and Protection of the Environment in the Republic of Moldova. Report submitted to the European Conference of the Environment, Sofia, 1995.

2. DEP of Moldova, Environmental Objectives and Data. Chisinau, 21 March 1997, 16 pages.

equal the cost of the boilers. The same problem applies to the potential reduction of NO_x emissions. The first step would be action to avoid the formation of thermal NO - the cheapest method of reducing NO_x emissions (low-NO_x burners).

Water consumption and solid waste from power plants

MTPP abstracts almost 2 billion m^3 of water a year from the Cuciurgan reservoir. Every day, the plant needs 6.87 million m^3 of water to cool its generators - over 60% of the country's total water use. The plant produces almost all the waste water (99.6%) of the energy sector. MTPP occupies an area of 150 ha for the storage of waste resulting from coal burning. Here again, 99.6% originate from MTPP.

Problems related to the planned oil terminal at Giurgulesti

The suggestion to build an oil terminal on the river Danube first emerged in 1990. Moldova imports oil products from the Russian Federation and Ukraine by rail. The oil terminal was expected to accelerate the economic development of the south of Moldova, where infrastructure is poor compared with the north. The Government decided in 1994 to create a joint stock company for the design, construction and exploitation of an oil terminal in Giurgulesti. The shareholders of this company were Tirexpetrol (51%) on the Moldova side, and the Greek company Technovax (49%). The company "Terminal S.A." was registered on 12 January 1995. It operates on the basis of a concession agreement with the Government of Moldova, which was adopted by Parliament. The land was given to Terminal S. A. for 25 years of exploitation. The agreement obliges the Moldovan Government to:

- Create the external infrastructure necessary for the oil terminal's operation;
- Guarantee a minimum utilization of the terminal: a load of 365 000 tonnes of oil products in the first year, and of 1 million tonnes in the following years; and
- Ensure the distribution in the Republic of oil products that transit through the terminal.

The project for a terminal with a capacity of 2.1 million tonnes of oil products per year was prepared, including the ecological, sanitary, epidemiological, fire protection and technological expertise required under the applicable legislation. In addition, an

Table 9.7: Air pollution from power plants

Source of pollution	**1990 emissions**			**1996 emissions**		
	SO_2	**NO_x**	**Dust**	**SO_2**	**NO_x**	**Dust**
	1 000 tonnes/year		*tonnes/year*	*1 000 tonnes/year*		*tonnes/year*
MTPP	156.00	26.90	33,600.0	28.00	9.20	10,300.0
TPP-1	0.60	0.40	6.0	0.30	0.18	4.0
TPP-2	4.19	2.90	30.0	2.90	1.70	30.0
TPP Balti	7.43	0.45	10.0	0.04	0.30	0.6

Source: Department for Environmental Protection/National Institute of Ecology/World Bank, The National Strategic Action Plan for Environmental Protection. Chisinau, October 1995.

Table 9.8: Ashes and waste water generated in the energy sector

	1991	1992	1993	1994	1995	1996
Solid waste *(1 000 tonnes)*	828	537	473	525	306	238
Waste water *(million m^3)*	1,997	1,801	1,607	1,450	1,028	1,066

Source: Prepared from reports 1991-1996 of MTTP on toxic waste disposal and water use.

international expertise was required by EBRD and also carried out.

At the end of 1996, a land area of 32.15 ha (including about 400 m of Danube river banks) was allocated to the Terminal. Shortly thereafter, a credit agreement was signed with EBRD. EBRD granted a US$ 25.5 million loan for a period of 10 years, on favourable terms during the first two years. In exchange, EBRD became the third stockholder of Terminal S.A., holding a stake of 20%. Tirexpetrol and Technovax each reduced theirs by 10%.

The total expected cost of the terminal is US$ 38 million. In addition to the loan, Tirexpetrol undertook to finance US$ 5.1 million, Technovax US$ 4.9 million and EBRD US$ 2.5 million. Owing to Moldova's financial difficulties, the beginning of construction was postponed until July 1997.

NGOs oppose the construction of the Giurgulesti oil terminal. They argue that the import of oil products via a powerful oil terminal in Romania would be preferable ecologically, as the envisaged terminal would become one of the most important environmental problems in Moldova.

9.3 Environmental policy and management in the energy sector

Energy policy and environmental objectives

The main objectives of Moldova's energy policy concern (a) the overall development of the energy sector of the economy, (b) the demonopolization and privatization of electricity generation, and (c) energy conservation. Each of these is the subject of a separate major policy document.

The *Energy Sector Development Programme* was adopted in 1994. The broad energy policy objectives of Moldova pervade also its energy development programme, i.e.:

- Stabilizing the supply of energy;
- Increasing the use of electricity and heat;
- Increasing the use of non-conventional energy;
- Decreasing energy consumption per unit of production.

The Development Programme includes references to the need for saving and making efficient use of energy, through structural and technological changes throughout the economy. In addition, the continued increase in the use of gas is envisaged, by making provisions for the necessary adaptations. There are plans to modernize and decentralize heating systems, to use non-conventional forms of energy, and to install water, heat and gas meters.

Special attention is being paid to financial questions. For the implementation of the programme aiming to ensure the financial stability of the supply sector, a special body will be created to regulate prices and tariffs in the energy sector. The tasks of the national agency for energy regulation are described in the draft electricity act and the draft gas act:

- License the production, transmission or distribution and the supply of electricity and gas;
- Control the meeting of requirements and the quality of services;
- Prepare and approve the methodology of calculation of electricity tariffs;
- Supervise licensees' calculations of energy tariffs;
- Approve the business regulations of the agents acting in the electricity and gas markets;
- Promote competition in the electricity and gas markets.

In 1998-2000, all debts to fuel suppliers should be paid back, and subsidies will be abolished. As of 1998, the prices and tariffs for energy use will start to converge to production costs, irrespective of the consumer category.

The *plan for the demonopolization of the electricity sector* prepared (1997) by the Agency for Assistance to Restructuring Enterprises, is now being implemented. Restructuring is envisaged in the following sequence:

Table 9.9: Electricity and heat tariffs

	1994	1995	1996	03/1/1997	01/05/97*	01/08/97*	01/03/98*
Tariff for electricity				***(Bani/kWh)***			
Urban population	10.0	10.0	15.0	20.0	25.0	24.0	..
Rural population	8.0	8.0	12.0	16.0	25.0	24.0	..
Electric urban transport	9.0	9.0	10.0	15.0	20.0	24.0	..
Industry	23.1	18.5	21.0	23.5	25.0	24.0	..
Tariff for thermal energy supplied by Termocomenergo and Termocom				***(Lei/Gcal)***			
Budgetary organizations on the privileged list**	73.4	73.4	73.4	..	..	..	..
Budgetary organizations not on the privileged list		344.9	344.9	344.9	344.9	215.0	110.0
Households, pre-school and sports facilities, hostels	22.8	19.0	28.5	37.1	44.5	73.5	110.0
Industry, hot water and steam (selected steam line and throttled steam)	301.0	271.8	271.6	271.6	271.6	165.0	110.0
Tariff for thermal energy supplied by Moldenergo				***(Lei/Gcal)***			
Budgetary organizations on the privileged list**	73.4	73.4	73.4	..	..	..	..
Budgetary organizations not on the privileged list		231.8	231.8	344.9	344.9	215.0	110.0
Households, pre-school and sports facilities, hostels	22.8	19.0	28.5	37.1	44.5	73.5	110.0
Industry, hot water and steam (selected steam line and throttled steam)	301.0	231.2	231.8	271.6	271.5	165.0	110.0

Source: Energy consumption in the Republic of Moldova. Trends. Informative bulletin, January 1997.
* Planned prices not approved by the Goverment
** After 01.03.97, this group of consumers is abolished. They pay as budgetary organizations.

- Organize electricity generating units as independent joint stock companies, and privatize them in the second half of 1998;
- Organize high-voltage transmission lines (35 kV and higher), as well as the Dispatching Centre, as independent State enterprises;
- Organize of regional distribution lines (0.4 to 10 kV) into independent joint stock companies and privatize them (the 6 through 10 kV transformation stations included);
- Privatize retail distributors which have no low-voltage transmission lines and no territorial sale limitations;
- Organize wholesale electric power sales through private enterprises;
- Separate of auxiliary activities and organize them into enterprises; and
- Transfer social activities to administrative public institutions, or separate them from their parent activities and privatize them.

The *National Environmental Action Plan* (1995) foresees priority actions in order to increase energy conservation and reduce pollution. The action plan aims at (a) lowering energy consumption through a national energy conservation programme, (b) developing gas as an alternative to coal and (c) centralizing energy supply and closing down low-capacity boilers.

The *draft energy saving programme* of 1997 is being prepared in the Energy Institute of the Academy of Sciences. Taking into account the total dependence on imported energy, the Government has taken action to conserve energy, and it is seeking alternative sources of import. Simultaneously, specific measures will be taken to make savings through increases in energy efficiency, i.e. technological and structural changes, and the use of economic instruments to make the existing equipment more efficient, as well as to increase the use of renewable energy.

The use of renewable sources of energy amounts to 2.5 - 3% of total energy consumption. Studies of Moldova's solar energy capacity indicate that the 550 - 600 kilocalories/cm^2 of energy received on sunny days is sufficient for the use of solar technology. Wind presents another potential energy resource, with an annual average wind speed of 2.25 - 4.5 m/s. While biogas energy is relatively unexplored at present, the Republic's significant agricultural sector suggests at least a potential for biogas production and utilization. However, not all solar installations presently used in private houses of about 100 m^2 of living floor space are operational. Likewise, wind generators broke down after one year of exploitation.

There were four biogas installations in poultry farms - none of them currently operational.

The Comprehensive Long-term Programme for Environmental Protection and Rational Use of Natural Resources and the *Programme of Actions for the Diminution of the Negative Impact of Power Production on the Environment* primarily foresee a reduction in the current degree of pollution from the energy sector, and the internalization of social costs as part of the efforts to meet the national energy requirements in a market economy framework.

Legislation related to environmental concerns in the energy sector

The Government of Moldova has adopted several environmental legal instruments during the transition period, but a large number of enforceable laws date back to the Soviet era. In 1993 the Government adopted the decision "On Strict Energy Saving". It foresaw, *inter alia*, the production of power, heat and water meters during 1993-1995 for all 'small' consumers and households. According to the governmental decision "On the Socio-economic Situation of the Republic of Moldova" (1994), the Department for Energy and Energy Resources was responsible for preparing the Programme for Energy Conservation for the 1995-1997 period.

The provisional instructions on the application of the standards governing payment for emissions into the atmosphere entered into force in 1991. They are implemented by local authorities in their jurisdictions (see Chapter 2).

The law on air protection, the law on payments for environmental pollution, the energy conservation law (1998), the electricity act and the gas act are relevant for environmental management in the energy sector. The Law an Air Protection of December 1997 resembles the old Air Protection Law passed in 1981. For example, the air quality standards of the former Soviet Union (i.e. PDKs) continue to be valid. This means that the law does not introduce realistic standards based on technology and fuel quality (as required by the Convention on Long-range Transboundary Air Pollution, see also Chapter 4).

The law on payments for environmental pollution (see Chapter 2) introduce economic incentives to decrease pollution. Emission charges are indexed to minimum wages, but the basis for setting the level of charges is not yet clear (damage caused by pollution, pollution abatement costs or something else).

The energy conservation law lays down the general provisions for energy activities, together with principles of development, functioning and management of energy. There is no special article in this law regulating environmental management in the energy sector - only the main safety and protection aspects for energy operators are addressed in the part on 'technical supervision'. DEP is responsible for the technical supervision of energy operators, together with the Department of Standardization, Metrology and Technical Control. The law contains an important article on energy conservation. It describes the obligations of companies to use energy resources efficiently and to finance research to improve energy efficiency.

Two laws, the electricity act and gas act, deal with the reform in the energy sector. They are similar. Attempts to prepare an analogous thermal energy act have not yet succeeded. The general statement of the electricity act (gas act) is that electricity (gas) shall be produced, transported, distributed and supplied efficiently from the economic point of view, observing the legislation concerning the safety of life, health, property, environment and labour protection as well as other laws and regulations in force. The electricity act prescribes that the methodology for tariff calculations shall include expenditures related to obligatory environmental protection when the respective energy units cease to operate.

Institutions involved in coordination between energy and environment

The Department for Environmental Protection, through its State Ecological Expertise and Ecological Inspectorate, assesses new projects, sets up admissible emission ranges (AER), and issues ecological passports. The two DEP divisions play an important role in the environmental management of the energy sector. After the licence is issued for a power plant and construction is completed, its operator has to identify emission sources and annual limits for pollution, for regular monitoring. All power plants have their own laboratories and measure their air emissions. However, only TPP-2 runs somewhat more advanced equipment for this purpose - gas analysers 344-XK-04 for the determination of NO_x and other gas concentrations, for the boilers 4 and 5 RDUV type. The

Environmental Inspectorate audits the records of the quantities of pollutants discharged. Their findings serve to levy emission charges according to rates determined for each pollutant.

Five principal agencies are responsible for the supply of energy. Electricity is the responsibility of Moldenergo, a fully vertically integrated State structure, which is within the jurisdiction of the Department of Energy and Energy Resources. Moldovagaz, subordinate to the Department of Gasification, is responsible for gas transmission and distribution, and is divided into 43 sub-units, which are currently being transformed into joint stock companies. In 1995 a new company Transgaz was created; it is currently responsible for gas transit. It is a joint venture between Moldovagaz and the Russian company Gazprom, with the latter owning 51% of the company's shares. The State Petroleum Fuels Agency and its subsidiary Tirexpetrol are involved in the import, transport, storage and distribution of oil products and coal. Lucoil Moldova, a newly established joint venture company, imports oil products from the Russian Federation. The Ministry of Municipal Facilities and Services is responsible for two organizations, Thermocom and Thermocomenergo, providing district heat.

There is no unit with environmental responsibilities in the Department of Energy and Energy Resources. The Department has ministerial status. An Environmental Unit (EnvU) in Moldenergo, consisting of two staff, is responsible for environmental management in all enterprises of Moldenergo. Operational environmental units with two or more staff exist in all power plants. They report to the chief engineer of the enterprise. The main statements on environmental management prepared by EnvU and implemented since 1994 are included in a 'standard of enterprise'. The standard is applied by Moldenergo. This document defines the main obligations of environmental managers in the enterprises of Moldenergo as follows:

- Preparation of plans for environmental protection measures;
- Control and regulation of technological process quality;
- Ecological expertise of new projects;
- Monitoring of emissions into air or water, and control of waste disposal according to the schedule approved by local environmental protection agencies;
- Control and regulation of environmental protection measures and actions in the enterprises;
- Economic analysis of environmental protection measures;
- Adjustment to and implementation of regulations, decisions, norms, standards and requirements related to environmental protection; and
- Environmental accounting.

All these activities in energy enterprises are coordinated and supervised by the EnvU of Moldenergo. There are several annual environmental reports available in the energy sector. Some of these reports, such as the Report on Air Protection, the Report on Toxic Waste Disposal, the Report on Water Utilization and the Report on Pollution Abatement Costs, prepared in enterprises, must be presented to the Department for Statistics.

Local agencies of DEP collect such reports as Calculations of Payments for Environmental Pollution, the Report on Toxic Waste Disposal and the Report on Environmental Protection Measures. The Report on Payments for Water Used and the Report on Water Utilization are to be harmonized with the Water Supply Organization.

The main questions of environmental management in energy enterprises are reflected in the annual report on technical and economic indicators of the enterprise, namely "Environmental Protection and Rational Use of Environmental Resources", prepared in EnvU of Moldenergo. The National Agency for the Efficient Use of Energy, funded by TACIS, which coordinates this activity in Moldova, was created in 1994. The aim of the Agency is to increase energy savings in ministries, departments, and economic actors, to analyse the situation in the energy market, and to facilitate the introduction of new technologies. It has conducted 24 energy audits in the industrial sector.

The Agency for Assistance to Restructuring Enterprises is a non-governmental, non-profit, independent legal entity. Its task is to coordinate the technical assistance in restructuring. Other NGOs are the National Council for Energy Conservation and the Centre for a Sustainable Energy Policy, both created in 1994. They are composed of scientists and specialists, and aim to generally develop the energy sector and make it more independent from imported energy sources.

Regulatory and economic instruments and measures

The administrative tools of environmental management in the energy sector are:

- Environmental impact and ecological expert evaluation;
- The setting of environmental pollution levels;
- The system of permits to pollute, under which maximum permissible levels for emissions and the disposal of pollutants in the environment (AER) are set for each enterprise;
- Ecological passports, summarizing the ecological impact in, for instance, MPC of gaseous emissions, sewage content in water, and specifying penalties for pollution;
- The licensing of activities using the environment.

The economic instruments available for environmental management in the energy sector are:

- Payments for air pollution, established under the respective provisional instructions (1991);
- Fines for violations of relevant legislation, and compensation for environmental damage.

For the country's energy-generating enterprises in 1993, emission charges amounted to 0.04% of the unit cost of production. In theory, payments for polluting the environment are made to extra-budgetary funds, both local and central, in a ratio of 70:30. In practice, however, such charges are levied only in Chisinau. Elsewhere, the funds only receive payments for damage and fines.

Table 9.10: Payments for pollution by power plants in Chisinau

			Lei/tonne, at current prices		
	1992	**1993**	**1994**	**1995**	**1996**
Total	**23,087**	**73,359**	**212,202**	**1,059,621**	**2,036,647**
TPP-1	4,743	13,894	22,199	89,444	119,444
TPP-2	16,859	38,730	181,763	936,842	1,859,166
Other	1,485	20,735	8,240	33,335	58,037

Source: Prepared from the reports of individual power plants on payments for environmental pollution, 1992-1996.

9.4 Conclusions and recommendations

The Republic of Moldova has formulated an advanced ecological policy for sustainable energy development. The implementation of the indicated programmes and actions would undoubtedly lead to considerable energy savings and entail important reductions in the level of pollution. However, it is encountering a number of obstacles, which are aggravated - if not caused - by the substantial economic recession that is facing Moldova like so many other countries in transition.

At the same time, all opportunities for improving the environmental situation in the energy sector do not seem to be exhausted. For example, at the levels of policy formulation and law-making, the plan for the demonopolization of the electric power sector, the electricity act and the gas act now complement already available policy documents and legal bases for energy management. The implementation of these instruments would advance the creation of a much needed comprehensive legal and normative framework, establishing the rights and obligations of all participants in the energy market

Recommendation 9.1:
The policy for the de-monopolization of electricity generation, and the electricity and gas acts should be implemented as a matter of priority.

The demonopolization and restructuring of the energy sector are crucial. It is necessary to demonopolize the energy sector, separating heat supply facilities, and power plants, and commercialize this sector. The question of decentralized energy supply should be broached in this context. The restructuring will require new regulatory institutions to be established. Rules and procedures for market activities, energy purchase procedures, network standards, and financial viability of the utilities should be developed and enforced. The envisaged national agency for energy regulation should be created with the full authority to regulate prices and tariffs.

Recommendation 9.2:
The envisaged national agency for energy regulation should be created so that it can deal with the full range of tasks entrusted to it. It should have sufficient resources to ensure programme delivery.

The restructuring of the energy sector, together with the decentralization of the supply units will bring

about changes in resource management. For example, after decentralization, municipalities will play an important role in energy management, possibly becoming the main actors in the implementation of energy-saving measures. This would reinforce the trend towards the development of energy-demand management, complementing the traditional focus on supply-side management. Thus, the staff of supply companies will need to be trained in demand-side management techniques. The above-mentioned national agency would possibly have to assume responsibility here too, as it will be involved in energy pricing. Its methodology will include an estimation of the expenditures required for environmental protection when energy units are closed down. Furthermore, the policy objectives of the Moldovan Government include supply security and environmental protection. Integrated resource planning, together with consideration of all social costs of energy production in conventional cost-benefit analyses, would possibly lead to the accelerated use of renewable energy resources and faster substitution of natural gas for solid fuels and high-sulphur content HFO. On the whole, integrated resource management techniques (i.e. development of energy supply together with implementation of energy-saving measures and a minimized impact on the environment) should be introduced in energy policy setting and management.

Recommendation 9.3:
The timely introduction of integrated energy resource planning should be seen as a matter of urgency, calling for the rapid development of appropriate demand-side management techniques and cost-benefit analyses, as well as the training of staff at all levels.

Energy conservation is already a very important energy policy objective in Moldova. The energy conservation law has been approved. A draft energy saving programme is prepared. It analyses the energy-saving possibilities and measures in all sectors of energy use and also in energy generation, transmission and distribution systems. The programme defines priorities for conservation action. It will require the installation of metering devices. The lack of measuring equipment means that there are insufficient incentives to save energy. Prototypes of such meters have been developed and assembled at Moldovan enterprises. The time seems to have come to envisage, possibly with foreign cooperation, the creation of national production facilities for meters.

Recommendation 9.4:
A programme for energy efficiency and the increased use of renewable forms of energy should be developed and implemented.

Recommendation 9.5:
Initiatives are required to facilitate the creation of national production facilities for energy metering equipment. Administrative procedures and related practical routines for the installation of the required production capacity that could interest joint ventures (particularly between SMEs) should be reviewed to make them as attractive as possible (simplicity of regulations; realistic taxation of profits).

Awareness of environmental problems associated with the energy economy can clearly be recognized in both energy policy and environmental management. However, this awareness does not appear to be fully translated into a clear action programme for implementation, distinguishing priorities on the basis of a comprehensive analysis and risk assessment. At the same time, such an action programme would constitute the necessary basis for a satisfactory integration of environmental concerns into energy planning and management. Of particular importance would be the criteria used in priority setting. Obviously, the assessment of the costs of the environmental effects of the production and use of energy could in many cases become one of the important criteria.

Recommendation 9.6:
A complete and detailed inventory of environmental effects of the production and use of energy should be developed, and lead to an action plan to mitigate the negative effects, including the installation of desulphurization and denitrification equipment at energy plants. The setting of priorities should make use of a general method, in which damages are assessed.

The system of economic instruments is clearly a major element in steering environmental improvements in the energy economy. At present, a comprehensive system does not yet exist, and the elements that are being applied do not always produce the desired results. For example, energy taxes, widely used in Europe, do not exist. If properly devised, they could be instrumental in both energy saving and fuel substitution. The existing recommendations to remove energy cross-subsidies, and to introduce differential pollution taxes that would be included in fuel prices, point in the right

direction. The substantial increase in real energy prices is also a major development, but the main reason for the continued high energy intensity in Moldova is a lack of investments in improving efficiency.

The saving of energy, given the lack of internal resources and the current overall situation of the Moldovan economy, is clearly among the policy objectives of particular importance. Here are some of the main financial policy measures that could lead to energy savings:

- Establishment of an energy savings fund which could, in particular, be used for financing selected energy saving measures;
- Setting of conditions that attract local and foreign investments leading to savings;
- Introduction of tax reductions or exemptions on energy-saving investments.

The promotion of energy audits in the industrial sector could highlight further potential energy savings in industry.

Both pollution charges and fines for excess emissions are currently too low and, thus, do not provide an incentive for pollution abatement. They have not been systematically adjusted for inflation. It is necessary to increase air pollution fees for NO_x, SO_2, CO, and particulates. Also, the current levies are not imposed in the country as a whole. Instead, they have been introduced in three cities by decision of the local public authorities, and actual charges for environmental pollution are levied only in Chisinau. To increase the effect of the economic instruments it is necessary to create a system of pollution taxes for Moldova as a whole, also for reasons of economic equity. At the same time, the methodology for setting pollution charges could be revised and standardized.

Recommendation 9.7:
The tool kit of economic instruments for the environmental management of the production and use of fuels should be revised and applied, as appropriate. Particular attention needs to be paid to the introduction of instruments that are capable of producing the envisaged results, including possibly tax reductions and/or exemptions for investments that are instrumental in energy savings.

Among the regulatory instruments, the system of environmental standards is of particular importance. European experience has shown that such standards need to be realistic to be enforceable. The present situation in Moldova is not yet close to this state of affairs. At the same time, the enforcement of standards is a major part of environmental management, and the Moldovan Government will not be successful, unless it pays sufficient attention to the issue. It requires as a first step the assignment of clear institutional responsibilities for the revision of the set of standards. The substance of Recommendation 4.3 is thus of particular importance to the proper management of environmental concerns in energy.

Chapter 10

ENVIRONMENTAL CONCERNS IN TRANSPORT

10.1 Trends and prospects of the transport sector in transition

General framework for transport policy and management

The available data about the transport infrastructure, the vehicle stock and market demand reflect the State's economic struggle. The drastic decline in production in nearly all branches has led to a corresponding decline in freight transport demand of about 80% between 1990 and 1995. Also, demand for passenger transport has decreased, although to a lesser extent. Public urban transport, on the other hand, has virtually remained stable. The reduced transport demand, together with the structural changes of the economy imply the following major consequences for the transport sector:

- The revenues of transport enterprises have declined, a development that, together with the extremely tight public budgets, reduces the financial possibilities for the maintenance and modernization of both infrastructure and vehicle fleets.
- The reorientation and restructuring of institutions places heavy burdens on all staff involved at the political and administrative levels. Their daily routine management under these difficult conditions is further complicated by the need to develop revised long-term strategies.
- The legal framework for transport management also being in transition, old procedures have to be changed and new rules and regulations drafted and enforced.
- The development and implementation of long-term transport policies and management are impeded by uncertainties about administrative jurisdictions. For example, the railway connections with Transnistria take more time than strictly required by the distance covered.

Transport infrastructure

Table 10.1 includes the main (rounded) figures for transport infrastructure and its development since 1990. The total length of roads amounts to 10 351 km (excluding farm tracks and minor roads), of which 64 km are four-lane roads. The major part (7 361 km) is under local responsibility, the remainder (3 170 km) under national supervision. Road network density is 0.31 km per km^2. The railway tracks are not electrified; the main 222 km line is double-tracked. Rail tracks are wide (Russian) gauge, except for a few kilometres near the

Table 10.1: Transport infrastructure

1000 km

	1990	1991	1992	1993	1994	1995
Length of railroads	**1.15**	**1.15**	**1.15 ***	**1.15 ***	**1.15 ***	**1.16 ***
Length of roads	**10.30**	**10.30**	**9.30**	**9.20**	**9.20**	**10.53**
of which hard cover	*9.70*	*9.80*	*8.80*	*8.70*	*8.80*	*10.06*
- National roads	**5.00**	**5.00**	**4.40**	**2.80**	**2.80**	**3.17**
of which hard cover	*4.90*	*5.00*	*4.30*	*2.80*	*2.80*	*3.17*
- Local roads	**5.30**	**5.30**	**4.90**	**6.40**	**6.40**	**7.36**
of which hard cover	*4.80*	*4.80*	*4.50*	*5.90*	*6.00*	*6.89*
Trolleybus routes *(km)*	**308**	**308**	**245**	**245**	**245**	**245**
Inland waterways	**1.2**	**1.2**	**0.6**	**0.7**	**0.6**	**0.6**

Source: Department for Statistics, 1997.

[1] As of 1992, data exclude Transnistria + Bender, except where indicated by an asterisk.

Romanian border. The major roads leading from Chisinau and Balti east- and westwards seem to have satisfactory capacity for long-distance road transport. The country has four airfields, one of which (Chisinau) serves international connections. Inland waterway transport does not play an important role in today's transport activities. This mode accounts for less than 1 per cent of goods and passenger transport.

Major destinations for eastbound rail transport are the Ukrainian and Russian markets. Chisinau is linked to the Odesa-Kyiv-Moscow lines. The main western connection leads to the border station of Ungheni and Iasi on the Romanian side, with further connections to the south (i.e. Bucharest). The rail connections from the third-largest city, Balti, lead to the smaller provincial towns in the north of Moldova and to destinations in Ukraine and in Romania. They are of minor importance and marked as 'secondary lines' in the international railroad statistics.

Vehicle fleet

Table 10.2 shows, in rounded figures, the development of the fleets from 1990 to 1995. Because of the reduced economic activity in Moldova and the reduced transport demand, an unknown part of the fleet may not be operated regularly. A lack of spare parts may have the same effect. According to a Ministry of Transport communication from 1996, 3 500 of the 5 000 lorries are idle for lack of business.

The privatization of the transport sector has not yet led to the modernization of vehicle fleets, nor to modern management structures, which have more or less remained unchanged. The national passenger car fleet consists mainly of vehicles from the former Soviet Union. The structure of ownership is not known. It can be assumed that a large share is owned by State institutions and former State enterprises. In the capital, Chisinau, an estimated quarter of the fleet is of EU origin. A significant part may have been imported as used cars, of 1980s model years. There are also modern passenger cars on the streets. They would normally be equipped with advanced emission control devices (catalysers with closed-loop control), requiring unleaded petrol for proper emission reduction.

The truck fleet is of old Soviet origin with a large part operating on petrol (partly switched to liquefied

Table 10.2: Vehicle stock

	1990	1991	1992	1993	1994	1995
Road transport						
Trucks (incl. pick-up trucks)	76,909	77,941	61,595	63,235	62,171	59,888
- of which: privately owned	..	..	*218*	*3,611*	*4,503*	*5,712*
Buses, excl. trolleybuses, and taxis	11,305	11,226	8,924	9,101	9,139	9,181
- of which: privately owned	..	..	*24*	*563*	*721*	*1,117*
Passenger cars	208,984	218,059	166,259	166,440	169,387	165,941
- of which: taxis	*1,108*	*1,055*	*830*	*732*	*685*	*493*
- of which: privately owned	*201,181*	*210,385*	*159,090*	*159,232*	*161,587*	*158,288*
Special vehicles (ambulances, fire engines, etc.)	20,328	19,632	16,155	15,241	15,228	14,589
Trolleybuses	605	628	532	530	510	500
Inland water transport						
Self-propelled freight diesel	14	9	5 *	5 *	5	1
Non-motorized cargo vessels	72	67	67 *	67 *	20	20
Tug + pusher-craft	49	48	47 *	47 *	12	12
Self-propelled passenger diesel	36	37	32 *	32 *	3	3
Railway transport						
Diesel engines	309	301	284 *	276 *	272 *	249 *
Freight wagons	..	..	..	..	12,224 *	14,097 *
Passenger coaches	486	502	514 *	512 *	488 *	488 *

Source: Department for Statistics, 1997.

[1] As of 1992, data exclude Transnistria and Bender except where indicated by an asterisk.

Table 10.3: Passenger transport (public modes only)[1]

million of passenger-km

	1990	1991	1992	1993	1994	1995
Total	**10,102**	**9 486**	**5 551**	**4 161**	**3,841**	**3,885**
of which by:						
Railroad	1,626	1,524	1,718 *	1,661 *	1,204 *	1,019 *
Bus, excl. trolleybuses	4,878	4,371	2,065	862	1,330	1,443
Taxi	164	129	52	27	19	15
Trolleybus	1,063	1,081	947	1,213	1,063	1,103
Inland waterways	19	15	2 *	1 *	..	..
Air	2,352	2,366	767 *	397 *	225 *	305 *

Source: Department of Statistics, 1997.

[1] As of 1992, data exclude Transnistria and Bender except where indicated by an asterisk.

or natural gas). They do not meet the requirements for efficient long-distance transport, and technically are not environmentally satisfactory. Their exact number is not known, nor are figures available about their sizes. More than 50% of the buses are fully written off and should be withdrawn from service and replaced. In the past, the Ministry of Agriculture owned the largest number of trucks for the transport of agricultural produce of the kolkhozes. With privatization also in this sector, these trucks are now owned by the joint-stock companies that have succeeded the kolkhozes.

Under the centrally-planned economy, the Ministry of Transport directly operated the freight transport business. Following privatization, the enterprises have in principle become joint-stock companies. Nevertheless, the vehicle stock used by the Ministry of Transport (MoT) is still reported to include about 5 000 lorries (trucks), 1 900 buses and 500 taxis (1996/1997). World Bank data for 1993 refer to 6 316 freight transport vehicles, of which 5 454 were of more than 10 tonnes.

All interurban and most urban bus operations, are carried out by former State-owned companies, also in most municipalities (except in Chisinau, where urban transport is operated by the municipality). In general, the buses are quite old and in poor shape. MoT is the supervisory agency for interurban bus routes and can issue licences to new competitors, if MoT sees a demand for this. The few buses in excellent condition are owned and operated by private companies serving international destinations, e.g. Turkish vehicles heading for Istanbul.

Transport activities

Tables 10.3 and 10.4 show the recent developments in passenger and freight transport performance in the various transport modes. The demand has fallen significantly in all modes. Both the road and the rail systems have a structural over capacity, which is likely to continue in the immediate future. It can also be expected that the type of transport services in demand will change with the country's structure of production. It is likely that the features of transport demand will be characterized by smaller loads with higher specific values, logistic integration of transport chains, and especially also higher transport volumes towards central European countries. It is not yet clear whether the previously State-owned, now formally privatized, transport company will be able to meet future demand. The experience in other countries shows that private passenger cars and trucks will take an increasing share of the transport markets, with rail transport finding it very difficult to compete.

According to 1995 data from the Department of Energy, transport (excluding agriculture) accounts for about 10 per cent of final energy consumption. In addition, a significant share of agricultural energy consumption can probably be attributed to the transport of agricultural products. See Table 9.3 for data on the use of energy in transport.

Urban transport in Chisinau

The municipality of Chisinau is the only one in the country to operate its own public transport company.

Table 10.4: Freight transport

in million tonne-km

	1990	1991	1992	1993	1994	1995
Total	**21,843**	**19,685**	**10,831**	**6,746**	**4,795**	**4,269**
of which:						
Public transport total	**17,016**	**13,604**	**8,391**	**5,215**	**3,676**	**3,265**
- *of which:* Rail transport	15,007	11,883	7,861 *	4,965 *	3,533 *	3,134 *
Road transport	1,673	1,465	496	230	1,250	1,121
Inland water	317	238	27 *	18 *	0	0
Air transport	19	18	7 *	2 *	1 *	3 *
Non-public transport total	**4,827**	**6,081**	**2,440**	**1,531**	**1,119**	**1,004**
- *of which:* Rail transport	195	317	167	62	11	11
Road transport	4,632	5,764	2,273	1,469	1,108	993

Source: Department for Statistics and Ministry of Transport, 1997.

[1] As of 1992, data exclude Transnistria and Bender except where indicated by an asterisk.

About 80 to 90 per cent of all urban passengers (600 000 on an average day) are estimated to use it. Currently, the public company runs 412 trolleybuses from three depots and 230 buses with combustion engines from a special depot. The trolleybuses are of a Russian make, while the others are produced in the Czech Republic. During the last five years, none has been replaced. Due to financial problems and the corresponding lack of spare parts, only 230 to 240 of the 412 trolleybuses operate daily. The same is true for 70 to 80 of the other 230 buses. Demand for urban transport in Chisinau does not show particular peaks during the day, as the social conditions prevailing in the transition period force people to ride a lot during the day, in pursuit of various activities to earn their living.

The Chisinau Transport Authority intends to continue to rely on trolleybuses so as to reduce human health risks associated with exhausts from combustion engines. If finances were available, the fleet would be renewed with trolleybuses of the Czech Republic make as those in operation now. A change to gas (LPG or compressed natural gas (CNG)), as is currently happening in several European and American cities, is not being considered, because the experiences with operating such vehicles were not convincing. A Turkish-German manufacturer has been designated to renew the diesel buses.

The packed trolleybuses in operation demonstrate that there is a high demand for additional transport services in the city. About 900 privately owned smaller buses (minibuses, each with about 10 to 12 seats) operate in the city. The State-owned taxi company (under MoT) also operates about 500 vehicles, and an additional 1 000 private taxis are licensed. There is also an uncounted number of private drivers, who regularly, or occasionally, transport passengers for a fare.

The private minibuses were allowed to operate, because the municipal company could not satisfy demand and was even forced to cut lines for financial reasons. The licences are issued by MoT after decision by the municipality. The minibuses form associations to serve certain routes. The vehicles are either owned by individual drivers or by companies. This additional supply of urban transport services is not enough to meet demand. Licensing procedures did not become fully clear to the EPR Team. There are also market entry fees for a licensee, which were unofficially estimated to be about 3 500 Lei. Likewise, private bus operators were said to be charged a monthly tax of 500 Lei. According to the municipality, taxes differ by route, number of seats in the vehicle, and average occupancy.

For the public transport company, the high share of non-paying passengers is a severe problem. The State designated more than 40 categories of passengers who are entitled to ride for free, including students, pensioners, etc. However, the State does not compensate the transport company for these fare losses. A regulation that will deal with this problem is said to be in the parliamentary pipeline. There are also many fare dodgers.

The public company foresees that ticket sales cover 32% of operating costs. The remainder is financed jointly by municipal and State subsidies. However, for the 1997 budget only 10 per cent of the State subsidies that had been applied for were actually granted.

Expected future developments

The expected restructuring and recovery of the economy will affect future demand for transport services. The current disruption of the traditional orientation of the Moldovan production sector towards the Commonwealth of Independent States (CIS), and the problems associated with the establishment of market-oriented companies suggest that it may take a while before transport demand reaches its previous volume.

An annual future growth of the order of 8 to 10 per cent is expected for the passenger car fleet. This trend towards private motorization would parallel the experiences of other countries in transition to a market economy. It increasingly leaves public transport to the poorer sections of the population and changes the characteristics especially of urban transport. Congestion will increase rapidly, and there might be constantly growing pressure for more road capacity and traffic management investments. Both developments narrow the financial possibilities for future modernization of the public transport systems.

10.2 Environmental effects of transport

Air pollution

Moldova's Department for Statistics has calculated the total amount of emissions from motor vehicles. The emission factors used differentiate between petrol and diesel. In addition, factors are given for LPG and CNG (see Table 10.5). Gas engines do not have a significant share of the fuel use and can be ignored for the purpose of estimating total emissions. According to Moldovan experts, the emission factors were derived from the admissible standards. In other words, no in-use factors are available. In Moldova, the exhaust emission standards of the Soviet Union still apply. According to an international survey on regulations, these standards can be compared to ECE regulations (see Table 10.6). According to MoT, the emission regulations of the country in which the car was produced are valid, except that catalysers are not mandatory in Moldova, irrespective of the regulations prevailing in the country of production.

Lead and sulphur dioxide (SO_2) emission factors are not influenced by vehicle condition and driving patterns, but can be derived directly from fuel specification data. The estimates prepared by the Department for Statistics can be used for certain calculations. For example, they lead to the conclusion that the average lead content of petrol is 0.23 grams per litre. If the general assumption is applied that only about 75 per cent of the fuel's lead is emitted into the atmosphere while the other part remains in the engine and the exhaust system, the lead content would be 0.3 g/l. The official information points to about 0.2 g/l. Such levels were common in western Europe (where it ranged from 0.15 to 0.3 q/l) before the introduction of unleaded petrol and catalytic technology in the mid-80s.

Table 10.5: Emissions from road vehicles

kg per kg of fuel

	Petrol	Diesel	LPG	CNG
Carbon monoxide (CO)	0.4440	0.1250	0.4400	0.2200
Hydrocarbons (HC)	0.0800	0.0550	0.0850	0.0500
Nitrogen oxides (as NO_2)	0.0250	0.0350	0.0250	0.0250
Particulates	0.0006	0.0200	..	..
SO_2	0.0020	0.0200	..	..
Pb	0.0003	...	..	..
PAH, Benzo(a)pyrene	0.232×10^{-6}	0.312×10^{-6}	..	..

Source: GOST 17.0.0.04-90/Tab. 17, communicated from the Moldovan Ecological Inspectorate.

For the sulphur content of diesel fuel, the emission factor table indirectly shows a value of about 0.7 per cent (calculated from the factor of 0.02 mass emissions of SO_2 per mass fuel). This is far above western figures even of the mid-80s, when less than 0.3 per cent was normal (with a legal standard of 0.3 in most countries). In the beginning of the 90s, the EU level dropped below 0.2 per cent, and the latest efforts aim at a level of 0.05 per cent to reduce particulate emissions and allow the use of diesel particulate filters.

Although the overall share of SO_2 from mobile sources is relatively small because of high emissions from stationary sources, local SO_2 pollution in urban areas may be affected significantly by vehicle traffic. Consequently, it is urgent to control the sulphur content of diesel fuel.

Technical features of the road vehicles that are of importance for air pollution include the engine type - the only parameter for which some data are available. Table 10.7 gives an overview of the petrol and diesel

Table 10.6: Exhaust emission standards

Vehicle type	Implementation date	Regulation	Comments
* Petrol-fuelled passenger cars (without catalysers)	1986	GOST 37.001 054-86	Similar to ECE R 15.04
* Petrol-fuelled passenger cars (with catalysers)	1986	GOST 37.001 054-86	Conforms to ECE R 83
* Diesel engines - exhaust emissions	1981	GOST 37.001 234-81	CO 9.5, HC 3.4, NOx 14.35 g per bhp-hr (ECE R 49 test mode)
* Diesel engines - black smoke emissions	1984	GOST17.2 01-84	Full load smoke, emission limits between 60% and 34% opacity varying with nominal air flow
** Petrol-fuelled passenger cars	1987	GOST 17.2.2.03-87	Emission control
** Diesel engines	1975	GOST 21393-75	Emission control

Source: Faiz/Weaver/Walsh 1996, CONCAWE 1995.
Note: * standards for stand testing.
** standards for mobile technical inspections.

shares in public passenger and in freight transport on the road.

In general, monitoring of air quality in Chisinau did not provide evidence of excesses of established limits, with the exception of NO_2. Nitrogen dioxide concentrations show an increasing tendency. The monitoring system measures only CO and NO_2 concentrations.

A general problem in dry countries is the dust from unpaved roads and from erosion. Of the 3 099 km of urban roads, 1 191.5 km are not paved. Of the 10 529 km roads outside urban areas, 4 138 km are not paved. Traffic on these streets may contribute substantially to airborne particulates of all sizes.

Another possible direct effect of transport on the environment concerns noise. The composition of the vehicle fleet, especially its age and its maintenance conditions, indicates that the level of transport noise is high. The existing road surfaces may also contribute to high noise levels.

Land use and impact on soil

There is no need to build new roads, as the capacity of the existing road network is sufficient. Nevertheless, major renewals are necessary and have started with the help of a programme financed with an EBRD loan. Such road works generally require ecological expertise, which, in this programme, had been provided before the agreement was signed.

According to available documents, land with a rating above 80 points cannot be used for anything other than agriculture. The practical adherence to this provision could not be confirmed by MoT.

The construction and upgrading of roads give rise to concerns about erosion and landslides. Plans regularly foresee the immediate greening of the

Table 10.7: Bus and truck fleets by type of fuel used

%

	1991	1992	1993	1994	1995
Bus transport					
- *of which:* Petrol-fuelled	0.7	1.7	5.8	6.7	4.5
Diesel-fuelled	45.8	53.1	63.6	55.2	54.6
% of trolleybuses in urban transport	52.1	67.8	86.7	84.7	84.1
Freight transport					
- *of which:* Petrol-fuelled	7.4	9.2	18.0	14.3	11.7
Diesel-fuelled	44.9	48.8	54.6	53.5	61.3
Trailer	26.7	23.2	18.6	18.1	17.0

Source: Department for Statistics, 1997.

road's shoulder and the planting of bushes. However, these plans are often not implemented for a lack of finance. In addition, sheltering woods have often been cut illegally. Data about the extent of these problems are not at hand.

10.3 Recognition of environmental dimensions in transport policy

Objectives and legislation

The Law on Environmental Protection of 1993 does not refer explicitly to the transport sector. However, several generally applicable regulations apply also to transport. For example, article 3 introduces the responsibility of all natural and legal persons for damage to the environment and the polluter-pays principle, although this is not stipulated for the transport sector. In practice, therefore, transport activities damage the environment without transport users being held responsible - like in so many other countries.

Article 22 in Chapter 3, section 2, of the 1993 Law states that a State ecological evaluation is introduced to minimize the impact of 'new economic activities' on the environment, and to evaluate the consequences of 'the current economic activities'. Article 24 states: 'Are subject to compulsory assessment, new programmes and projects for the economic and social development of the Republic of Moldova: (1) separate zones, towns, regions (districts), villages for heating, water, gas and electricity supply, and systems for sewerage, urbanization and public services and amenities of territories; (2) building, extension, reconstruction and modernization of economic and social units likely to affect the environment, independently of their location, source of finance, amount of investment, ownership, type of building and equipment; (3) building roads, railroads, naval routes, works for the reconstruction of watercourses and hydrotechnical building of watercourses, irrigation systems, dams, drainage systems; ... (10) any other activities that might affect the quality of the environment.' Policy documents concerning especially the problems of transport and the environment were not available.

The new laws on air protection and payments for environmental pollution include specific chapters on air pollution from transport.

Institutional arrangements

The Ministry of Transport (MoT) is responsible for the national transport policy. Attached to the Ministry is the Design Institute, which drafts road network extensions and supervises construction works. The development of rail facilities is also among its duties. Within the Ministry, the Division of Traffic Security, Trade Protection, Ecology and Standards is responsible for environmental issues. The regional bodies of MoT deal with problems of regional and local interest.

The Ecological Inspectorate of DEP deals with transport issues, as these are of relevance for air pollution or other transport-related problems. Among other things, the local inspectorates are involved in vehicle emission checks. According to DEP, special liaison units are to be located in all other ministries and comparable administrations. Nevertheless, such a unit does not exist in MoT, nor does there seem an obligation to create one.

The Department of Energy and Energy Resources deals with transport issues because of its responsibility for the import and production of fuels. The fuels used in the transport sector are petrol, diesel, LPG and CNG. In addition, electricity is used by trolleybuses. The railways rely on diesel in the absence of electrified tracks.

The Road Police under the Ministry of Internal Affairs registers vehicles. It is also involved in checking vehicle emissions, supporting the staff from the regional ecological inspectorates.

The Ministry of Finance influences the cost and, thus, the use of the various transport modes by imposing taxes. This is done exclusively for revenue-raising purposes and without the involvement or consultation with experts of the authorities mentioned above.

The Department of Standardization sets norms for products used in the transport sector, such as fuel and emission standards for vehicles.

Regulatory instruments for environmental management in transport

During the annual safety check, all vehicles have to

pass a measurement of idle-CO (petrol-fuelled vehicles) or of smoke density (diesel-fuelled vehicles). Public vehicles, e.g. buses, are checked twice a year. Vehicles that pass the test receive a sticker (talon) which is sometimes attached to the windscreen, although this is either not mandatory or not enforced. During certain months of the year the road police carries out clean air programmes, with roadside controls to check compliance with exhaust standards. Vehicles with stickers issued less than six months ago are exempted from control measurements.

Details of the measurement procedure and the limits applied for the enforcement of diesel checks are not yet clear. Companies with large diesel fleets and garages can ask for inspectors to carry out the test there.

Soviet Union fuel standards remain valid. Due to a lack of laboratory facilities, DoE does not find it possible to control imported fuel. It is unclear what the average figures are with respect to, for instance, the sulphur content and cetane number of diesel fuel, or the aromatics and benzene content of petrol. Octane numbers of marketed petrol range from about 76 to 96.

Currently, petrol contains about 0.2 to 0.3 g of lead per litre, but unleaded petrol is planned to be phased in widely in 1998/99. This is important for the operation of cars equipped with catalytic converters that are already in use and whose number will increase, as they are being imported mainly from EU countries. The availability of unleaded petrol seems to be very limited at the moment. The fact that it is not available at all locations, as well as its higher price, makes misfuelling (tampering) very likely, undermining the efficiency of the catalyser, or destroying it altogether. First steps have been taken to encourage the use of unleaded fuel by differentiating fuel taxes.

In the medium and long term, the crucial point for improving exhaust and noise emissions is the implementation of stricter standards for new vehicles entering the fleet.

Economic instruments for environmental management in transport

Moldova has decided to use economic instruments to achieve a more sustainable transport economy rather than to rely on traditional command-and-control policies only. Taxes on fuels and vehicles according to their environmental impact, and road user charges have been imposed as a result.

For fuels, the tax difference between unleaded and leaded petrol is reported to be only 0.5 per cent - unleaded is charged 0.5 per cent, leaded 1.0 per cent. Assuming a net price of 1 000 Lei per tonne or 1.37 Lei per litre, the difference of 0.3 per cent is only 4 bani per litre. This is far too low to cover the higher production as well as the additional distribution costs for unleaded as compared to leaded petrol. Today, prices at filling stations are about 1.85 Lei for leaded and 2.05 Lei for unleaded petrol of the same octane number. Without additional measures, there is no efficient market incentive to use unleaded fuel. The major tax parameter for fuel is an undifferentiated excise duty (customs tax) of 600 Lei per tonne of petrol (diesel being taxed at 200 Lei per tonne). Also, the value-added tax (VAT) of 20 per cent is not differentiated.

In its Annex 10, the 1997 State budget mentions a 5 per cent import duty on vehicles that are more than 7 years old, while only 3 per cent are imposed on younger vehicles. Vehicles that are more than 10 years old are banned from import. While this was included in the 1997 Budget Law, the state of enforcement of the provision remains unclear. VAT also differentiates according to the age of vehicles between 15, 20 and 25 per cent, but in the 'wrong' direction: for vehicles up to 3 years old, the customer has to pay 25 per cent, while on those that are 7 to 10 years old VAT is only 15 per cent.

The concept of true cost pricing - by for instance taxes or road user fees - fits in with Moldova's objectives of reducing subsidies. In the beginning of 1997, revised regulations were introduced to change the import duty on both trucks and passenger cars but also the taxes on cars, trucks and buses that enter the Moldovan road network. Border police charges fees according to the expected kilometres that will be driven inside Moldova, and to the type of vehicle. Basically the approach taken could reflect the real cost of transport. The Ecological Inspectorate checks vehicle exhaust emissions. Charges are levied, if measurements show emissions above the 3.5 per cent of CO allowed. The level of charges depends on the excess.

10.4 Conclusions and recommendations

The Moldovan authorities have expressed their will to reach sustainable development. For the transport sector, certain measures have been taken to protect the environment against adverse impact, especially of motorized road transport. Financial constraints and other structural adaptations brought about by the transition process, as well as a lack of capacity to implement and enforce effective regulations are major limiting factors. Given all the structural problems, the initiatives taken by the responsible political and administrative bodies to move forward are impressive. This is true not only for transport issues in their narrow sense but also for the integration of environmental objectives into strategies and measures.

Among the obstacles to progress, the deficiencies in cooperation between the various administrative bodies have to be highlighted. Improved cooperation demands sharing all available information and a broad involvement of relevant government institutions in decision-making. A common view has to be developed as to the direction of desirable developments, the roles to be entrusted to the various institutions involved in this process, and the instruments that are to be applied in this process.

Emphasis is to be given to the involvement of citizens in the development of a social consensus about transport policy. There is ample evidence from a large number of countries that transport projects can trigger major social conflicts with considerable negative consequences on investment. This is not surprising, as transport affects important aspects of people's daily lives. Public participation in transport decision-making is therefore a vital component of an efficient transport policy.

The institutions involved in transport issues rank the protection of the environment very high in their duties. Instruments like EIA, other regulatory measures and several economic instruments are in place. Despite these very positive basics, there are major deficiencies with respect to the implementation of effective environmental measures. A strictly institutional view of problems dominates, excluding major aspects from consideration, because the main mandates for their solution happen to be allocated elsewhere. For example, the question of future vehicle and fuel standards is not discussed by the experts of MoT, but is totally left to the institution dealing with standards. A similar situation applies to vehicle emission checking, in which MoT is not involved at all. Also, DoE does not discuss fuel taxes, because these are the exclusive domain of the Ministry of Finance, etc.

Recommendation 10.1:
A working group on sustainable transport development should be established. It should consist of experts, be headed by the Ministry of Transport and involve all relevant public institutions (DEP, Ministry of Finance, Department of Standards, Department of Energy, and others). The group should set relevant objectives for sustainable transport, time schedules for legislative and investment activities, and measures to encourage public participation.

The performance of the institutions also may fall short of expectations, because their capacity to deal with ongoing problems is inadequate. For example, managing the transport sector in a free market economy needs different institutions and staff qualifications than running a State-dominated transport system. Setting 'the rules of the game' and supervising independent economic agents, which will be the main future duties of MoT and its agencies, require excellent legal and economic experts, with transport engineers contributing to the activities. Reorganizing the Ministry and retraining staff clearly take time, but a concept for this should be developed soon. Similar considerations apply to environmental management, independently of the allocation of responsibilities.

Recommendation 10.2:
A master plan for the training of (a) the members of the sustainable transport group, and (b) environmental managers of transport activities, should be developed and implemented.

Reducing transport demand is the most sustainable way to serve the environment. It can be beneficial to the national economy, too. The high transport volume in many of the former centrally planned economies was not only a burden on the environment but also on the economy. Decentralizing services to the markets instead of monostructures serving large areas could have both economic and ecological benefits. Whether smaller production units and distribution distances would be more economically viable, is a matter deserving consideration.

The key questions concerning the future evolution of the environmental aspects of transport are linked to

the development of the country's vehicle fleets for the different transport modes. In general, both regulatory and economic instruments are already in force to provide the basis for a deliberate policy aiming at an environmentally more favourable development of vehicle fleets. The most important regulatory instruments concern vehicle specifications, control of in-use vehicle standards, and fuel standards.

According to MoT, Moldova does not intend to apply regulations other than CIS regulations, for reasons of its membership. Moreover, the question of future road vehicle standards is not considered important, as the country does not produce any cars. This argument in particular ought to be reconsidered; many other non-car-producing countries have decided to import only cars that meet advanced environmental requirements. It appears to be important to accept that the renewal of the passenger car fleet should in the longer term be based on the generalization of catalytic technology and, thus, the use of unleaded petrol. One regulatory solution ensuring this would be to implement vehicle standards according to 91/441/EEC or, to achieve the actual EU level, 94/12/EEC. The situation is similar for heavy-duty vehicles (trucks and buses). CIS countries seem to apply ECE R 49 or 49/01, reflecting a standard of emission control of the late 70s or mid-80s. The situation in EU today would, according to 91/542/EEC, include significantly lower NO_x standards, and advanced particulate control.

Recommendation 10.3:
The selection of road vehicle standards for imported cars should be reconsidered and possibly adapted to advanced EU legislation.

Fuel standards are very important with respect to the sulphur content of both diesel and petrol. It is recommended that EU standards should be introduced and a laboratory equipped to control fuel quality. All vehicles manufactured during the past 10 years can run on unleaded petrol. A few very old models may need the lubricating effect of lead for their piston rings, but this problem can be solved cheaply by selling an additive at filling stations.

Recommendation 10.4:
Fuel standards that are aligned on European practices should be introduced in accordance with a clear programme. The use of unleaded petrol for all cars should be promoted in all possible manners.

Economic incentives should support a shift within the vehicle fleet towards cleaner cars. Import duties - as well as annual vehicle taxes - should be lowered for passenger cars, buses and trucks meeting the most advanced environmental standards. In other words, import duties and taxes should be looked upon not only as instruments for raising public revenue, but also as economic steering tools for environmental policy objectives.

The planned policy for the import of cleaner cars could work very well for the renewal of the fleet if the tax rates were set to influence market conditions. The lack of reference remains a problem, especially that of exhaust emission standards, upon which differential tax rates should be based. Cleaner cars are those that meet advanced emission standards - the age of a car is not the decisive factor for exhaust emissions. A 5-year-old car equipped with a three-way catalyser and closed-loop control would, if properly maintained and driven only with unleaded petrol, emit about 90 per cent fewer harmful substances than a newly produced car of, for instance, CIS origin, where only Regulation ECE 15/04 would be applied, reflecting European technical standards of the early 1980s. It appears, too, that new cars of CIS origin often fail to meet the type I-test of idle-CO, while western cars of some age with some hundred thousand kilometres on the clock would in fact comply.

The economic instruments currently applied to modernize the fleet are a first step in the right direction. Differentiation of import taxes according to the emission standards met at the time of production would be more efficient than differentiating by age of the vehicle. Cars without catalysers, or those meeting only low standards, should be taxed more than modern ones. This raises the issue of product standards: economic instruments can be used successfully only when the regulatory frame in terms of standards, quality control, and supervision by State agencies is implemented, too. Road pricing, i.e. charging user fees according to vehicle type and mileage, is an excellent tool for charging road users according to the cost of constructing and maintaining roads, as well as to the burden that their vehicles impose on the environment.

Recommendation 10.5:
The full range of economic instruments should be developed to meet environmental objectives. Preferential import duties and other taxation should

be levied on road vehicles incorporating advanced technology to reduce air emissions.

Effective vehicle emission control greatly helps to improve air quality. The current system of vehicle checks should be modernized. Experiences in Europe and the United States show that a centralized system with private or semi-private operators is the most efficient and reliable. At least, central quality control, and analysis of results, strict sticker validity control training and independent supervision of the inspectors are all elements that could be implemented within a short time. All this should be done under the responsibility of MoT, the role of the police being limited to controlling the stickers' validity.

Recommendation 10.6:
A new system of vehicle emission control under the exclusive authority of the Ministry of Transport should be implemented and enforced.

Higher car ownership and the increasing wealth of at least part of the population will lead to sub-urbanization. As a consequence, the number and the average distance of private passenger car trips will tend to grow. In the absence of strong countermeasures, car traffic will increase dramatically, as will congestion and air pollution. At the same time, public transport is losing market share - creating pressure for the introduction of special measures. A clear priority for public transport, on the one hand, and parking regimes at least within the town centres, on the other, are part of a comprehensive push-and-pull strategy - 'push' standing for a reduction in car use following increased parking costs, and 'pull' describing the increased use of public transport, walking and biking as the infrastructure and services for these modes improve. Coordination of transport policy and management with urban development planning, influencing the location and density of settlements, could help to reduce future increases in demand for car transport.

One serious impediment to the development of a policy encouraging public transport (and rail goods transport) seems to be a certain hesitation with which the legal and economic basis for a modern transport system is being laid. For example, procedures for registering private businesses in the public transport sector should be transparent. Unjustified market barriers inhibit the chances of competitors of the public companies and should be abolished. Only the qualification and financial viability of economic actors should be preconditions for market access in the passenger and freight transport business. In addition, licensing procedures for new transport companies should stipulate the use of modern vehicles, and the licences could be limited to, for instance, five years. This would allow the licensing institution to create incentives to provide a good service and use the least polluting vehicles. Such incentives should include tighter vehicle standards, enforcement of vehicle control in use, and improvements in public transport to make it a viable alternative. Improving roads and conditions for pedestrians and cyclists is urgent as well.

For the purposes of long-term sustainable development, land-use planning, transport planning and environmental aspects ought to be integrated. The increase in transport demand resulting from the sub-urbanization in Moldova is a real challenge for the future. Good land-use planning reduces the need for motorized transport and supports an efficient public transport system.

The integration of traffic minimization in land-use regulation could perhaps benefit from the 'ABC' concept developed in the Netherlands. It matches the spatial potential and the demands of different uses. Supermarkets or service units with many visitors (A category) are allowed to be located only near rail and bus stations with a high level of service. While only those facilities that generate little passenger traffic (C category) are allowed to be located outside. B category facilities fall in between A and C. New production facilities are to be located where rail service is possible.

Recommendation 10.7:
A comprehensive policy encouraging the use of public transport and rail goods traffic should be developed and implemented. It should be well coordinated with urban development and other forms of spatial planning. The policy should include provisions enabling the licensing institution to control the implementation of environmentally sustainable provisions for transport.

Municipal public transport companies - like the one in Chisinau - face very serious economic problems. In the capital, all buses are in poor shape. Investments in modern equipment, and significant staff cuts will be necessary. It should not be expected that a good level of service in public transport can be offered without State subsidies. In west European cities, fares cover about 50 per cent of

the total cost, the remainder being covered by the State and/or local communities. A legal basis for a sustainable financing system should be developed.

Recommendation 10.8:
The economic restructuring of municipal public transport companies, as well as the modernization of their vehicle fleets, have become top priorities. To avoid major disruptions in public transport systems, provisions for improved market access by competitors of the public companies have to be complemented by the implementation of adequate financial safety provisions for the public companies.

Also in the area of modal shifts, it would be worthwhile to evaluate the future prospects of inland waterway transport. It may be that a significant contribution to the country's total transport can be made by this energy-efficient transport mode.

Recommendation 10.9:
The possible future role of inland waterway transport should be explored.

The availability of reliable data is of importance not only for the development of adequate abatement policies and the subsequent environmental management, but also for monitoring the results of such policies. While practically all data on wastes originating from transport activities are deficient, air emission data play a crucial role in this connection. The availability of reliable emission data is hindered by many factors, i.e.:

- The national energy balance statistics cover only official imports. Imports through other channels seem to be substantial, but their quantity is unknown.
- The distinction between imports of leaded and unleaded fuels relies exclusively on the declaration of importers.
- There does not seem to be any quality control of imported fuels to enable the estimation of, for instance, CO emissions from petrol-, or particulates from diesel-fuelled vehicles.
- Emission factors date back to 1983 and seem to be from the former Soviet Union. The figures reflect fleet conditions characteristic of vehicles produced in the 1960s and 1970s.
- The shares of CO and HC emissions that originate from transport are unknown. HC emissions are likely to be underestimated, because evaporative emissions from petrol vehicles and vapour from filling up vehicle tanks are not counted. However, HC emissions from various stationary sources, fuel storage and handling, use of solvents in dry-cleaners and production facilities, use of paints, are most probably not included either.

Under these circumstances, the emission data available give only a rough idea of the role of transport in air pollution. A proper assessment of the magnitude of this problem may be seen as a precondition for its solution. More reliable emission data should therefore be sought.

Recommendation 10.10:
The air emission inventory should be revised for reliability and completeness, making use, to the extent possible, of CORINAIR practices. The implications of this task are such that the producers of environment, transport and energy data should cooperate in it.

Chapter 11

ENVIRONMENTAL POLLUTION AND HUMAN HEALTH

11.1 Status of human health and its monitoring

The population of Moldova is relatively young, with more people below 15 years of age and fewer people aged 60 years or more (13%) than most European countries (except Albania). Little more than half this population (54%) lives in urban areas, which puts Moldova among the less urbanized countries in Europe (together with Albania and Portugal). The proportion of urban population was about 32% in the early 1970s.

Life expectancy and mortality

Several indicators show a deterioration in the health status of the Moldovan population in the past five or six years. Life expectancy at birth decreased from 69.0 years in 1989 to 65.9 years in 1995, with a greater fall in males (by 3.5 years, to 62.0) than in females (by 2.6 years, to 69.7). To some extent the decline was connected with the increase in infant mortality observed after 1992 (from 18.4 per 1000 live births in 1992 to 21.5 in 1995), but life expectancy at 1 year of age has also decreased in recent years (from 69.5 years in 1989 to 68.2 in 1992, and 66.3 in 1995). Life expectancy at birth in Moldova is similar to the average in the newly independent States, but 5.5 years lower than the central and east European average and 11.4 years lower than that in EU countries. The reduction in life expectancy through deaths before 65 years of age is estimated to be 11.4 years, which is less than the average in the newly independent States (12.7 years) but markedly more than in central and eastern Europe or EU (8.3 and 5.3 years, respectively).

The overall trend in infant mortality rates has decreased in the last 15 years, with the exception of the sharp increase in 1993-94. The WHO definition of live birth has been gradually introduced since 1995. In the transitional periods, the criterion of the birth weight (> 500 g in the WHO definition) is applied loosely, with a provisional 1000 g threshold. This change in definition was not reflected in an increase in reported mortality. In 1995 and, according to preliminary data, also in 1996, infant mortality rates dropped slightly. In recent years, infant mortality in Moldova has oscillated around the values observed in the two neighbouring countries, Ukraine and Romania, and is 9% lower than in the newly independent States on average. However, the Moldovan indicator exceeds the central and east European average by 45% and is 3.5 times higher than the EU average. The differences are even bigger for post-neonatal mortality (which is determined, to a large extent, by sanitary conditions): the rates in Moldova are 83% higher than the central and east European average and over four times higher than in EU.

Cardiovascular diseases are the most commonly registered cause of death (46.8%), followed by cancers (10.0%) and digestive system diseases (8.6%). Unfortunately, the proportion of deaths classified as due to “ill-defined conditions” exceeded 15% in 1995 (compared to 3% in 1989). Due to this change in cause of death diagnosis, it is impossible to attribute a substantial part of the overall increase in age-standardized mortality (by 33% from 1989 to 1995) to individual diseases diagnosed as causes of death. The available data indicate an increase in mortality rates due to cardiovascular diseases (by 17% in the period 1989-95) as well as to diseases of the digestive and respiratory systems (by 29% and 18%, respectively). At the same time, the mortality rates due to malignant neoplasms oscillated around the level of the early 1990s, after a significant increase over the previous decade. Still, the age-standardized cancer mortality rates are some 20% below the level observed in central and eastern Europe and EU.

Only 1% of all deaths is classified as caused by infectious and parasitic diseases. The mortality is lower than the average in newly independent States (by 35%), slightly exceeds the rates in neighbouring Romania and Ukraine, is 30% higher than the central

and east European average and 2.2 times greater than in EU.

Registered morbidity

General registered morbidity stood at 3 547 cases per 100 000 people in 1996. This rate is 13% lower than five years earlier, with a more pronounced decline in rural areas. As discussed below, this decline may reflect more closely a decline in the use of medical services than an improvement in the health status of the population. The number of registered acute intestinal infections has decreased as well (Table 11.1). It can be assumed that most of those cases are related to contaminated food and drinking water.

Table 11.1: Number of registered cases and incidence of acute intestinal infections

Diagnosis	1995	1996	
	Cases	Cases	Incidence per 100 000 inhabitants
Bacterial dysentery	2,902	1,814	41.9
Enteritis of known aetiology	4,684	3,574	82.6
Enteritis of unknown aetiology	9,706	7,074	163.5
Cholera	240	0	0.0
Hepatitis A (HbA)	10,229	6,458	149.2

Source: Ministry of Health.

The reported decline in acute intestinal infections is judged to correspond well with the real disease incidence. The country's economic problems are mentioned as some of the reasons for this drop. The decrease in product distribution, in collective food distribution and lower density (fewer children) in kindergartens all help to stem the spread of communicable diseases.

If confirmed in the coming years, the fall in HbA morbidity will be a very good indicator of improved sanitary conditions. However, it is estimated that, in the north, 100% of the population aged 40 or more has antibodies of HbA, indicating that hepatitis is endemic in the region.

System of mortality and morbidity monitoring

The system of mortality registration is well established in Moldova. Medical doctors identify the cause of death and note it on the death certificates, which are centrally coded. The causes of death are recorded in the computer record according to the International Classification of Diseases (from 1996 - 10th revision). Both place of residence and place of death are recorded (rayon and settlement code). Some 18-20% of deaths occur in hospitals and this proportion has remained unchanged in recent years. However, the rate of autopsies has decreased in the same period. This does not explain the increase in ill-defined causes of death.

Population data are obtained from the population register. The last census was conducted before Moldova's declaration of independence, but the registration of births, deaths and (international) migration is believed to be sufficiently strict to provide precise population size estimates for mortality calculations.

Morbidity data are collected by all physicians working in public health services. The impact of medical services provided outside the State-run services is believed to be small: the few existing private practices are concentrated in dentistry, diagnostic services or cosmetic surgery. The markedly lower registered consultation rates among rural populations are probably due to the fact that these populations are less inclined to use medical services, especially for mild diseases. Also, the decline in the consultation rates in recent years may be due to a drop in check-ups, the fact that fewer drugs are provided free of charge, and that the need for medical certificates for sick leave has decreased. The impact of those changes on consultation rates is unknown, but must be considered in the analysis of trends in the population's health status.

The notification of communicable diseases is well developed and is judged to work properly. The information is collected by all medical doctors and is reported monthly to the regional medical centres. Selected cases are reported by telephone. Annual statistics are based on verified and corrected data.

11.2 Health risks associated with environmental factors

Drinking water

Drinking water is delivered to the homes of 56% of Moldovans. This proportion reaches 98% in urban areas but is only 18% in rural areas. Therefore, the main sources of drinking water in rural areas are individual wells. Due to the prevailing geological conditions, most of the wells are shallow (3-12 m deep) and, therefore, prone to contamination. In some areas of the country (populated by close to 200 000 people) water is scarce and, in hot, dry summers, disappears from the wells. This creates the need for

water transport and storage, which may lead to secondary pollution of drinking water.

The risk of water pollution increases with the scarcity of sewage disposal facilities: only 9% of the rural population has access to hygienic sewage disposal. Intensive (especially in the previous decade) agricultural activities and the use of large quantities of agro-chemicals have affected water quality as well. In the centralized water distribution systems, breakdowns, pressure drops and interruption of water supply are common, increasing the risk of secondary contamination of water and posing a health risk. However, no data on this issue were available.

The operators of water supply systems are responsible for regularly monitoring the quality of the water supplied to the consumers and its conformity with the sanitary standards (Instruction of MoH, 31 October 1995). Territorial Centres of Hygiene and Epidemiology perform independent controls. The Centres are the only agencies controlling the quality of water in decentralized systems (individual wells). However, they have insufficient capacity to test all existing wells annually. The standards allow up to 10 coliform bacteria to be detected in each 1000 ml of water (which exceeds the WHO Guideline of no detectable bacteria in each 100 ml of water).

The monitoring indicates that a substantial proportion of drinking water delivery systems does not meet hygienic standards (Table 11.2). The most common (some 80%) reason for disqualification is classified as "insufficient quality of water catchment area".

Table 11.2: Monitoring of drinking water sources, 1996

Source of drinking water	Sources tested	Sources not meeting standards
	Number	*%*
Sources of communal systems	3,936	15.3
Water distribution systems	1,770	31.1
Decentralized sources (wells)	73,500	15.0

Source: Ministry of Health.

The percentage of drinking water samples not meeting the standards is almost twice as high in decentralized systems (wells) than in the communal water distribution systems (Table 11.3). However, the test failure rates of water from communal systems increased significantly in 1996 as compared with previous years, in respect to both sanitary-chemical and microbiological parameters. In both communal and decentralized systems, sanitary-chemical parameters exceeded the standards more often than microbiological parameters.

Starting in 1996, more detailed information on the sanitary-chemical parameters is recorded based on a subset of samples subject to a more specific analysis. The results indicate that less than 16% of samples from communal systems which fail to meet sanitary-chemical quality criteria contain nitrates in concentrations exceeding the standard (45 mg/l, see Table 11.4). Therefore, other reasons (mainly organoleptic properties of the water) determine sample disqualification. However, a high level of nitrates is found in most of the samples failing sanitary-chemical standards in decentralized sources of drinking water. In recent years, the maximum concentration of nitrates measured in the drinking water of decentralized systems has only rarely exceeded 150 mg/l. These levels were much higher in the 1980s, before agriculture activity started to decline.

Table 11.3: Samples not meeting drinking water quality standards, 1993-1996

%

	Sanitary-chemical parameters		Microbiological parameters	
	Communal	Decentralized	Communal	Decentralized
1985-88*	11.4 - 14.5	..	5.0 - 8.6	..
1989*	20.5	..	7.9	..
1990*	21.1	..	8.7	..
1991*	15.4	..	11.1	..
1992*	34.6	..	8.4	..
1993**	35.6	69.0	8.4	24.3
1994**	39.2	70.0	6.5	24.2
1995**	37.2	66.0	9.3	25.1
1996**	46.9	68.9	11.0	26.7

Source: Materials of the Ministry of Health* and NCSAHE**.

Table 11.4: Monitoring of nitrates in drinking water , 1996

Source of drinking water	Number of samples	% of samples with nitrates >45 mg/l
Sources of communal systems	1,941	6.8
Water distribution systems	3,047	7.5
Decentralized sources (wells)	6,025	61.3

Source: Materials of NCSAHE.

In some regions of the country (Nisporeni, Ungheni, Falesthi, Calarashi), populated by more than 500 000 people, groundwater contains fluoride in concentrations of 5-12 mg/l (the WHO water quality guideline is 1.5 mg/l). Consumption of this water without removal of excess fluoride leads to fluorosis. It has been reported that up to 25% of the population in selected towns of high-fluoride areas show symptoms.

In a limited number of samples, the presence of pesticides was tested as well. In 1996, in seven out of 879 samples taken from decentralized drinking water sources (i.e. in 0.8% of the samples), the concentration of pesticides exceeded standard levels (though the measured levels were low, close to the limit of detection). It is suspected that the contamination might have occurred due to an accidental spillage of the chemicals into the water source. In none of the 215 samples taken from communal water supply systems was an excess of pesticides detected.

The detected pollution of drinking water with chemicals constitutes a potential health risk, though the decreased intensity of agrochemicals use makes this risk smaller than in the previous decade. Epidemiological studies performed in the 1980s indicate a 3-fold increase in general morbidity of children living in areas with levels of nitrates exceeding 170 mg/l as compared to the children living where nitrates levels remained below 45 mg/l. In some acute cases, nitrates may contribute to methaemo-globinemia in small children, though most of the exposure is likely to be indirect, and would involve food. There is no registration system which could confirm that such cases have been diagnosed.

Microbiological pollution of drinking water, besides its detection through water quality monitoring, is reflected by the outbreaks of water-borne disease. In most cases, they are manifested by symptoms of acute intestinal infection. In a number of outbreaks, the HbA virus was a cause of the disease (Table 11.5).

Besides outbreaks of water-borne diseases, microbiological pollution of drinking water determines the background incidence of acute intestinal diseases. The National Centre for Scientific and Applied Hygiene and Epidemiology (NCSAHE) estimates that some 20% of all acute intestinal infections can be attributed to drinking water contamination, resulting in approximately 4000 cases annually.

Moreover, contact with surface waters contaminated by micro-organisms increases morbidity. The incidence of acute intestinal diseases is 2-5 times higher in populations having access to open waters than in those living further away from rivers. Also, a correlation was found between the use of water from lower parts of rivers to irrigate (spray) fields and the incidence of acute intestinal diseases in populations living close to the rivers. An acute example of the health effect of open water contamination was an outbreak of cholera (240 cases, with 5 fatal) in 1995. The cases were registered in 6 out of the 44 regions

Table 11.5: Reported outbreaks of water-borne diseases

	Number of outbreaks	Total number of cases	Number of cases in the worst outbreak
1993	4	390	220
1994			
- acute intest. infection	2	179	103
- HbA	1	42	
1995	-	-	-
1996			
- acute intest. infection	1	14	..
- HbA	3	230	156

Source: Materials of NCSAHE.

of the Republic and spread from cases imported to Tiraspol region from Ukraine. The spread of the disease in Moldova has been linked to exposure to water from rivers and irrigation canals.

Special studies conducted in 1992 and based on data from 1986-1990 indicate an association between the incidence of HbA and proximity to selected small rivers (Byk, Tchugur). As in other regions of the country, non-treated sewage is discharged into those rivers from human settlements and farms. Among the adults living close to these rivers and, possibly, having occupational contact with the waters from those rivers (field irrigation), the registered HbA was two to eight times more common than in residents of areas without direct exposure to the water from these rivers. In some cases (district of Ryskani), a similar difference in HbA incidence was observed in children aged 7-14 (127 per 10 000 in those living close to the Tchugur vs. 53 per 10 000 in those without contact with the river). However, antigens of HbA were detected in all 47 samples of water from this river. This was not the case in the Byk river, where 3 out of 47 samples showed HbA antigens.

A similar analysis of the incidence of dysentery and HbA in regions situated along the Prut river was performed using data from 1990-94. A significant increase in the incidence rates of both diseases was found in populations potentially having (occupational or recreational) exposure to waters from this river.

Pathogens detected in the samples of surface water include *vibrium cholerae* (in all samples with pathogens), non-A hepatitis (90% of samples with pathogens) and *Salmonella* (30% of samples with pathogens). Hepatitis A was detected in 30 out of 771 water samples collected from the Byk and Reut rivers (4.2%).

Ambient air pollution

Monitoring of ambient air quality is mainly conducted by the Hidrometeo network focused on urban areas. The regional Centres for Hygiene and Epidemiology perform some additional measurements in the "sanitary protection zones" surrounding selected enterprises where sources of air pollution are located. The monitoring methods conform to the old norms of the former Soviet Union. Measurements are done 3-4 times per day, for 20 minutes each time. The methods lack the precision necessary to assess the health impact. According to the evaluations performed in Ukraine and the Russian Federation, assessments of 24-hour average concentrations based on these data are very uncertain. The evaluation of the particulate matter measurements in Ukraine suggests a lower limit of detection of 0.25 mg/m^3. In Moldova, the concentration of particulate matter is recorded above 0.1 mg/m^3, but health effects can be expected at levels well below this concentration.

The monitoring data are reported as annual averages only. Considering the lack of clear sources of particulate pollution, the reported concentrations are rather high (for 1996: 0.15 mg/m^3 in Chisinau and Ribnita, 0.32 mg/m^3 in Tiraspol and 0.37 mg/m^3 in Balti) (see Chapter 4). If the reported data correspond to actual pollution levels, this concentration of suspended particles may have considerable health effects. The National Environmental Action Plan estimates the expected health impact of air pollution with particulate matter in Moldova and its costs. Though the assumptions and the parameters used for the calculations may be questioned, the real impacts should correspond to the range estimated in the NEAP report (close to 200 premature deaths and hospital admissions annually, over 5 000 emergency room visits, etc.).

The reported annual mean concentrations of SO_2 are quite high in Balti (0.059 mg/m^3) though they were lower in 1994-96 than in the previous years. Linked with high levels of particulate matter and high concentrations of NO_2, these data are an indication of quite severe air pollution, which could have a significant impact on the population's health. In the other three towns, the reported concentrations of SO_2 do not indicate a risk to health.

Outside Balti, the reported concentrations of nitrogen dioxide should not be of health concern, though the increasing trend in Chisinau should be evaluated more closely. Since the main source of this pollution is in all likelihood road traffic, the increasing trend in NO_2 concentrations is probably associated with an increase in the respirable fraction of suspended particulates, VOCs and other components of air pollution with recognized health effects.

(Hazardous) wastes

The extent of the population's exposure to the toxic components in waste has not been assessed. The Centres for Hygiene and Epidemiology conduct, on a limited scale, soil monitoring. Out of 660 samples, 9 (1.4%) did not meet sanitary standards because they

exceeded the levels of nitrates (5 out of 629 samples) or metals (Cu, As, Mo or Mn - in 3 out of 22 samples). Few soil samples were tested for the presence of heavy metals. A greater number of water samples were tested, but their contents of Zn, Pb or Cr did not exceed standard levels. The persistence of organic chemicals from pesticides and other agro-chemicals used intensively in the past may be of health concern. However, there are no data which could indicate present exposure of the Moldovan population to these chemicals.

Food quality

The control of food quality is performed only at the enterprises which have formal licences for food production. The results of the monitoring performed by the Centres for Hygiene and Epidemiology are summarized in Table 11.6. Evidently, microbiological pollution of the food products is detected the most often; nitrates in food exceed standard levels as well.

Table 11.6: Results of food monitoring , 1996*

Contaminants	Number of samples	% samples failing standard
Nitrates	11,609	3.5
Toxic elements	5,101	0.8
Pesticides	8,323	0.3
Mycotoxins	646	1.1
Hormonal drugs	183	0.0
Antibiotics	383	0.5
Radionucleids (imported food)	1,240	0.2
Microbiological pollution	46,723	9.0

Source: National Centres of Hygiene and Epidemiology.
* Enterprises with licences

Food produced for own use or sold on the markets is not subject to regular control. Sporadic tests performed at the markets indicate that 70-80% of the food does not conform to microbiological standards (though no pathogenic micro-organisms have been detected).

Besides the problems with food contamination, the deficiency of proteins and of certain micro-elements in food (e.g. iodine) is judged to be of health concern.

11.3 Public health protection against environmental risks

Legal framework and policy objectives

The 1993 Law on Sanitary-Epidemiological Protection of the Population provides the main legal framework for the public health activities. More specific regulations are provided through Ordinances of the Ministry of Health. They include the hygienic rules for the centralized and decentralized supply of drinking water and for waste treatment, issued in 1995-96. The Law on Food Quality was submitted for approval to the Parliament in 1994 but has not yet been implemented.

Also relevant to environmental health are the laws on environmental protection as well as on consumer protection, both adopted by the Parliament of the Republic of Moldova.

According to Moldova's laws, hazardous wastes should, in principle, be processed or stored by the producer at the place of production. The Ministry of Health has issued rules for the storage and treatment of toxic wastes (1 February 1995). Border controls include a review of the documentation related to the transported goods and, for the transport of potentially toxic substances, the health services are requested to investigate before an import permit is granted. However, there are no facilities allowing for direct control of the goods of unknown and potentially toxic composition at the borders. Equipment to detect radioactive materials is available at the borders and is routinely used by the customs.

Institutional framework

The Ministry of Health is responsible for disease prevention as well as for treating those affected. Issues related to the effects of environmental factors are the responsibility of the Chief State Medical Officer, who has the rank of deputy minister. The Chief Sanitary Doctor also acts as Director of the National Centre for Scientific and Applied Hygiene and Epidemiology.

Public health services are delivered by 46 Centres for Hygiene and Epidemiology (41 rural, 4 in major towns and 1 national). The system has a staff of over 750 people. It is responsible for monitoring the epidemiological situation in the country, for preventing impacts of pollution on health and for managing detected outbreaks of disease.

Several organizations are involved in State control of food quality. The most comprehensive system is run by the (regional) Centres for Hygiene and Epidemiology of MoH. They control the entire cycle

of food production as well as the safety of food products. Exported foods are subject to Moldova's standards. Agencies of the Ministry of Agriculture are responsible for veterinary control. To some extent, trade inspectors are also involved in the food safety assessment through the implementation of consumer protection legislation. Only the Centres for Hygiene and Epidemiology have a sufficient laboratory base outside Chisinau. Contacts and information exchange between all organizations and control agencies are deemed to be weak, and there is no central assessment of the food safety situation.

Action plan and research activities

The national environmental health action plan is still in the early design stages. Its project committee is being identified.

The governmental water supply plan included in the public investment programme adopted in 1994 (Decision #83, 23.02.1994) stipulates that 100% of the population should have access to a centralized water supply by 2005. Three waste-water treatment plants have been planned as well. However, a "Drinking water" programme proposed to the Government in 1995, has not been adopted because of a lack of funds. This programme, prepared in three optional versions, includes a plan for bottled water supply and considers various methods of groundwater cleaning.

Several studies have been conducted to demonstrate a link between morbidity and pollution of the environment. All the reviewed studies were based on routinely collected morbidity data and consisted of cross-sectional comparisons between populations residing in territories with different levels (assumed or measured) of environmental pollution. Such a study design has been common in the newly independent States and its weaknesses are well recognized. Assuming uniform quality of morbidity registration, they may describe the differences in health status well, but the causal link between these differences and the environmental pollution is difficult to prove with this methodology. Specially designed studies and well formulated and evaluated hypotheses are necessary to better assess the magnitude of the impacts of environmental pollution on health.

11.4 Conclusions and recommendations

It appears that the work on the National Environmental Health Action Plan is an urgent requirement. Construction of this plan with the existing environmental action plan should be ensured not only during the conceptual phase, but also in implementation.

Recommendation 11.1:
The drafting of the national environment and health action plan should be finished, taking into account the work already completed under the National Environmental Action Plan. Both plans should be implemented in close coordination.

Owing to the country's difficult economic situation, less attention is paid to public health protection in general, and its relation to environmental risks in particular. It is, therefore, important to exhaust all possibilities for meeting minimum standards for both carrying out research into health risks and preventing potential adverse impacts of environmental degradation on human health.

Recommendation 11.2:
National capacities should be developed for applied health research, into the quality of the environment and the effects of pollution.

Public health risks prompted by water pollution remain the most serious. Water contamination in shallow wells is common and constitutes a significant health risk. The estimates attributing about 4 000 cases of acute intestinal infections annually to the microbiological contamination of water are quite credible.

Recommendation 11.3:
The enforcement of the options of existing programmes for the supply of safe drinking water should be the main management concern once they are selected. It is necessary to reduce the population's exposure to fluoride in drinking water so as to eliminate fluorosis, observed in large parts of the population living in high-risk areas.

The detected pollution of drinking water with chemicals constitutes a potential health risk, though the decreased intensity of the use of agrochemicals makes this risk smaller than in the previous decade. Recent trends in the results of drinking water quality monitoring indicate a further increase in health risk, mainly that posed by microbiological pollution.

Recommendation 11.4:
Improving the microbiological quality of drinking water should be recognized as a top priority. Nitrate pollution is another priority concern.

Microbiological contamination of surface water by untreated wastes constitutes a significant health risk through both recreational and occupational exposure. The health effects include HbA and cholera.

Recommendation 11.5:
Surface and groundwaters should be better protected from contamination by communal sewage and run-off from agricultural land.

Though the ambient air monitoring data are scarce and not very reliable, adverse impacts of pollution with suspended particulates may be expected, especially in Tiraspol and Balti.

Recommendation 11.6:
The air quality monitoring system should be reviewed and modified to better assess the health risks and better control pollution.

The control of the hygienic quality of food does not include food produced outside the State-owned sector. The results of spot checks on other food (e.g. sold on the markets), as well as poor hygienic standards of the marketplaces, indicate a health risk due to microbiological contamination of the food.

Recommendation 11.7:
A system for controlling the quality of food consumed by the population should be improved and should include the control of food produced by suppliers without special licences.

ANNEXES

I. Selected environmental and economic data
II. Selected bilateral and multilateral agreements

Annex I

SELECTED ENVIRONMENTAL AND ECONOMIC DATA

	Rep. of Moldova	
TOTAL AREA (1 000 km^2)	33.7	
POPULATION		
Total population, 1996 *(100 000 inh.)*	43.2	
- % change (1980-1995)	8.2	
Population density, 1996 *(inh./km^2)*	128.2	
GROSS DOMESTIC PRODUCT		
GDP, 1995 *(US$ 1 000)**	1,419,819	
- % change (1990-1995)	-62	
per capita, 1995 *(US$/cap.)*	394	
INDUSTRY		
Value added in industry, 1995 *(% of GDP)*	..	
Industrial output		
- % change (1990-1995)	-56	
AGRICULTURE		
Value added in agriculture, 1995 *(% of GDP)*	..	
Agricultural output		
- % change (1990-1995)	-36	
ENERGY SUPPLY		
Total supply, 1995 *(Mtoe)*	4.8	
- % change (1990-1995)	-53	
Energy intensity 1995 *(toe/US$ 1 000)*	1.28	
- % improvement (1990-1995)	41	
Structure of energy supply, 1995 *(%)*	100.0	**
- Solid fuels	11.9	
- Oil	22.7	
- Gas	27.5	
- Nuclear	-	
- Hydro, etc.	37.9	
ROAD TRANSPORT		
Road traffic volumes, 1995		
- billion veh.-km	7.2	
- % change (1990-1995)	-147	
- per capita *(1 000 veh.-km/cap.)*	1.66	
Road vehicle stock, 1995		
- 10 000 vehicles	31.9	
- % change (1990-1995)	3.0	
- private cars per capita *(veh./1 000 inh.)*	36.6	

* From the Department for Statistics, Republic of Moldova.

** Without data from Transnistria.

	Rep. of Moldova
LAND	
Total area *(1 000 km²)*	33.7
Major protected areas *(% of total area)*	1.42
Nitrogenous fertilizer use, 1995 *(tonne/km² arable land)*	538
FOREST	
Forest area *(% of land area)*	9.6
Use of forest resources *(harvest/growth)*	0.41
Tropical wood imports *(US$/cap.)*	-
THREATENED SPECIES	
Mammals *(% of known species)*	43
Birds *(% of known species)*	24
Fish *(% of known species)*	20
WATER	
Water withdrawal *(% of gross annual availability)*	49
Fish catches *(% of world catches)*	..
Public waste water treatment *(% of population served)*	70
AIR	
Emissions of sulphur oxides, 1995 *(kg/cap.)*	4.4
Emissions of sulphur oxides, 1995 *(kg/US$ 1 000 GDP)*	..
Emissions of nitrogen oxides, 1995 *(kg/cap.)*	4.84
Emissions of nitrogen oxides, 1995 *(kg/US$ 1 000 GDP)*	..
Emissions of carbon dioxide *(tonne/cap.)*	..
Emissions of carbon dioxide *(tonne/US$ 1 000 GDP)*	..
WASTE GENERATED	
Industrial waste *(kg/US$ 1 000 GDP)*	..
Municipal waste *(kg/cap.)*	300
Nuclear waste *(tonne/Mtoe of TPES)*	..
NOISE	
Population exposed to leq > 65 dB (A) *(million inh.)*	..

Annex II

SELECTED BILATERAL AND MULTILATERAL AGREEMENTS

	Worldwide agreements		Republic of Moldova
	As of 15 November 1997		
1949	(GENEVA) Convention on Road Traffic	y	
1957	(BRUSSELS) Int. Conv. Relating to Limitation of Liability of Owners of Sea-going Ships	y	
1958	(GENEVA) Conv. Fishing and Conserv. Living Resources of High Seas	y	
1963	(VIENNA) Convention on Civil Liability for Nuclear Damage	y	
1969	(BRUSSELS) Intern. Convention on Civil Liability for Oil Pollution Damage	y	
	1976 (LONDON) Protocol	y	
1969	(BRUSSELS) Conv. Intervention on the High Seas in Case of Oil Pollution Casualties	y	
1971	(RAMSAR) Conv.- Wetlands of International Importance	y	
	1982 (PARIS) Amendment	y	
	1987 (REGINA) Amendments	y	
1971	(GENEVA) Conv. on Protection against Hazards from Benzene (ILO 136)	y	
1971	(BRUSSELS) Conv. Establishment of an International Fund for Compensation of Oil Pollution Damage	y	
1972	(PARIS) Conv. Protection of the World Cultural and Natural Heritage	y	
1972	(LONDON) Conv. on the Prevention of Marine Poll. by Dumping of Wastes and other Matter	y	
1973	(WASHINGTON) Conv.-International Trade End. Species	y	
	1983 (GABORONE) Amendment		
1973	(LONDON) Internat. Conv. for the Prevention of Pollution from Ships (MARPOL)	y	
	1978 (LONDON) Protocol (segregated balast)	y	
	1978 (LONDON) Annex III on Hazardous Substances	y	
	1978 (LONDON) Annex IV on Sewage		
	1978 (LONDON) Annex V on Garbage	y	
1974	(GENEVA) Conv. on Prot. against Hazards from Carcinogenic Subst. (ILO 139)	y	
1977	(GENEVA) Conv. on Prot. against Hazards from Air Poll., Noise and Vibration (ILO 148)	y	

Source: UNECE and Moldova/DEP.

(continued)

	Worldwide agreements		Republic of Moldova
	As of 15 November 1997		
1979	(BONN) Conv.-Conservation Migratory Species of Wild Animals	**y**	
	1991(LONDON) Agr. Conservation of Bats in Europe	**y**	
	1992 (NEW YORK) Agreement ASCOBANS	**y**	
1982	(MONTEGO BAY) Conv. on the Law of the Sea	**y**	
1985	(VIENNA) Conv.-Protection of the Ozone Layer	**y**	**R**
	1987 (MONTREAL) Prot.-Subst. that Deplete the Ozone Layer	**y**	**R**
	1990 (LONDON) Amendment to Protocol	**y**	
	1992 (COPENHAGEN) Amendment to Protocol	**y**	
1986	(VIENNA) Conv. on Early Notification of Nuclear Accidents	**y**	
1986	(VIENNA) Conv. on Assistance in the Case of Nuclear Accident	**y**	
1989	(BASEL) Conv.-Control of Transbound. Movts of Hazard. Wastes	**y**	
1990	(LONDON) Conv. Oil Pollution Preparedness, Response and Cooperation	**y**	
1992	(RIO) Conv.-Biological Diversity	**y**	**R**
1992	(NEW YORK) Framework Conv.-Climate Change	**y**	**R**
1994	(VIENNA) Conv. on Nuclear Safety		
1994	(PARIS) Conv. to Combat Desertification		

Source: UNECE and Moldova/DEP.

	Regional and subregional agreements		Republic of Moldova
	As of 15 November 1997		
1950	(PARIS) Intern. Conv. for the Protection of Birds	**y**	
1957	(GENEVA) European Agreement-Intern. Carriage Dangerous Goods by Road (ADR)	**y**	
1958	(GENEVA) Agreem.-Adoption Uniform Cond. of Approval and Recognition for Motor Vehicles Equipment and Parts	**y**	
1968	(PARIS) European Conv.- Protection of Animals during Intern. Transport	**y**	
	1979 (STRASBOURG) Additional Protocol	**y**	
1969	(LONDON) European Conv. -Protection of Archeological Heritage	**y**	
1973	(GDANSK) Conv.- Fishing and Conserv.of Living Resources in Baltic Sea and Belts	**y**	
	1982 (WARSAW) Amendments	**y**	
1974	(HELSINKI) Conv.Prot. Marine Env. Baltic Sea	**y**	
1976	(BARCELONA) Conv. Prot. Mediterranean Sea against Pollution	**y**	
	1976 (BARCELONA) Prot. Dumping	**y**	
	1976 (BARCELONA) Prot. Co-operation in Case of Emergency	**y**	
	1980 (ATHENS) Prot. Land-based Sources Pollution	**y**	
	1982 (GENEVA) Prot. Spec. Protected Areas	**y**	
	1994 (MADRID) Prot. against poll. from exploration/exploitation		
1979	(BERN) Conv.-Conservation European Wildlife & Natural Habitats	**y**	**R**
1979	(GENEVA) Conv.-Long Range Transboundary Air Pollution	**y**	**R**
	1984 (GENEVA) Prot.-Financing of Co-op Programme (EMEP)	**y**	
	1985 (HELSINKI) Prot.-Reduction of Sulphur Emissions by 30%	**y**	
	1988 (SOFIA) Prot.-Control of Emissions of Nitrogen Oxides	**y**	
	1991 (GENEVA) Prot.-Volatile Organic Compounds	**y**	
	1994 (OSLO) Prot.-Further Reduction of Sulphur Emissions		
1991	(ESPOO) Conv. Env. Impact Ass. in a Transboundary Context	**y**	**R**
1992	(HELSINKI) Conv. Protection and Use of Transboundary Waters and Intern. Lakes	**y**	**R**
1992	(HELSINKI) Conv. Transboundary Effects of Industrial Accidents		**R**
1992	(HELSINKI) Conv. Protection Marine Env. Baltic Sea (2nd)		
1992	(BUCHAREST) Conv. Protection Black Sea Against Pollution	**y**	
1992	(PARIS) Conv. Protection Marine Env. North-East Atlantic		
1993	(LUGANO) Conv.- Civil Liability for Damage from Activities Dangerous for the Environment		
1994	(LISBON) Energy Charter Treaty		**S**
	1994 (LISBON) Prot. on Energy Efficiency and Related Aspects		**S**
Source:	UNECE and Moldova/DEP.		
	y = in force; **S** = signed; **R** = ratified.		

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