Ministry of Ecology and Natural Resources

National Institute of Ecology

REPUBLIC OF MOLDOVA
STATE OF
THE ENVIRONMENT REPORT 2004

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REPUBLIC OF MOLDOVA STATE OF THE ENVIRONMENT REPORT 2004

The report is a scientific and practical paper presenting a holistic view on the status of the main ecosystem types as well as the situation of specific environmental media (water, soil, air and biota), taking 'into account the anthropic impact and their tolerance level. The report was developed in conformity with the Law on Environment Protection No. 1515- XII, Art.8 and Art. 16e by the Ministry of Ecology and Natural Resources which has designated the National Institute of Ecology for compiling the report.

The report is addressed to a large spectre of users studying or working in the field of environmental disciplines and environment protection.

The report was edited by Dr. V. Mosanu. The work was coordinated by Dr. Adam Begu,Director of the National Institute of Ecology.

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FOREWORD

The continuity of life on the Earth always depended on the natural resources. Nature is the cradle of mankind and was always considered an inexhaustible source of material and spiritual values. For thousands of years the humans seemed too insignificant to affect the natural order of things on the Earth. At the end of the 2" millennium AD the human civilization faced a situation it never was in before. The global resources proved to be finite and the global balance, vulnerable to anthropic impacts.

The concept df sustainable development was the idea responding to the new (and dramatic) global challenges. Like many countries, the Republic of Moldova made of sustainable development one of the main principles its environmental policy relies on. In March 2005, the Government approved the first National Report "Millennium Development Goals for the Republic of Moldova". One of the goals is to ensure the sustainability of the natural environment.

The Republic of Moldova faces a sheer number of environmental problems, of both local and transboundary origin. Finding solutions supposes first of all to define the problems and to identify their root causes. Complete and reliable information on the state of environment is a fundamental precondition of this.

This Report is continuing the range of State of the Environment Reports regularly prepared by the National Institute of Ecology. The Report has been developed by professionals in the field of environmental protection and related domains. Comprehensive information on different issues was collected and processed in order to present a relevant picture of environmental status of the country. This information provides a platform for decisions to be taken by the authorities in ensuring the sustainable use of resources, the perpetuation of the natural environment and a better quality of life for the citizens of the Republic of Moldova.

I would like to use this opportunity to acknowledge all the people who contributed to this Report, representatives of different government agencies, research institutions, universities, NGOs, etc. I am confident that this is a document to rely on in environmental decision-making and to serve for reference to those interested in environmental matters.

Constantin Mihailescu, Dr. hab.,
Minister of Ecology and Natural
Resources

TABLE OF CONTENTS

ACRONYMS

BOD	Biochemical Oxygen Demand
CFC	Chlorofluorocarbon
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DDT	Dichloro-diphenyl-trichloroethan
EHS	Electrical and Heat generation Stations
EMEP	European Monitoring and Evaluation Program
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
Gg	Gigajoule
GIS	Geographic Information System
GMO	Genetically Modified Organisms
HCFC	Hydrochlorofluorocarbon
HCH	Hexachlorocyclohexane
HMS	Hydrometeorological Service
ICPDR	International Commission for the Protection of the Danube River
INECO	National Institute of Ecology
ISO	International Standards Organization
IUCN	International Union of Nature Conservation
kWh	Kilowatt-hour
MW	Megawatt
MAC	Maximum Allowable Concentration
MAFI	Ministry of Agriculture and Food Industry
MDL	Moldovan Leu (pl. lei) (national currency)
MENR	Ministry of Ecology and Natural Resources
NATO	North Atlantic Treaty Organization
NEF	National Enrironmental Fund
NGO	Non-Governmental Organization
NIS	Newly Independent States
NSPAF	Natural State Protected Areas Fund
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substances
PCB	Polychlorinated Biphenyl
POP	Persistent Organic Pollutant
ppm	Part per million
REC	Regional Environmental Center
SEI	State Ecological Inspectorate
Tacis	Technical Assistance for the Commonwealth of Independent States (EU Programme)
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
USA	United States of America
USD	United States Dollar
WHO	World Health Organization
WMO	World Meteorological Organization
WPI	Water Pollution Index
WWTP	Waste Water Treatment Plant

Introduction

In 2004, the Republic of Moldova made sustained efforts towards mitigating environmental impacts and assuring the country's ecological security. Those efforts were manifested in the continuity of the national environmental policy and acting in line with the requirements of the international environmental agreements Moldova adhered to. The country continued to move on towards the gradual harmonisation of the national (primary and secondary) legislation with EU environmental law, requirements and approaches, taking account of the economic realities and country's possibilities. A number of environmental policy concepts, strategies, law amendments and by-laws were adopted, as well as public awareness campaigns were undertaken, aiming at improving the environmental conditions in the Republic of Moldova. Country representatives actively participated in most global and regional environmental events. Moldova hosted a series of international meetings and conferences that have helped the country to raise its profile and attract international resources and assistance to help solve national environmental problems.

The environment management system has acquired new strengths through the introduction of a number of new programmes and plans. Among them, the Poverty Reduction and Economic Growth Strategy and the joint EU-Moldova Action Plan have to be mentioned first and foremost. Both documents contain environmental and sustainable development objectives. The continuous development of bilateral cooperation programmes with neighbouring countries (Romania and Ukraine) also plays an important role in protecting the environment, particularly in the transboundary context. Enacting the Research and Innovation Code was another milestone of year 2004 which is expected to have long-term positive effects on economic development and to bring also environmental benefits.

The continuous increase of human consumption and implicitly the demand for natural resources, particularly in developing countries, raises the pressures on the environment, through overexploitation of natural resources and growing pollution. The Republic of Moldova makes no exception to this trend: the economic activities, notably in food processing, light industry, mining, transports, agriculture are at the origins of serious air and water pollution problems. The range of environmental problems also include degrading biodiversity, following the poor state of natural protected areas, shrinking areas of vulnerable and rare species and raise of invasive alien species, insufficient forest coverage. The forest areas are not only small, their spatial distribution is un-even and there are no connection corridors between many of them.

The waste problem is a continuously growing concern. The adequate waste management supposes combining coercive measures with economic instruments and public awareness raising. In industry, this implies the correct management of material fluxes, including implementation of cleaner technologies. The domestic waste problem can be tackled through managing the consumption patterns, organising the separate collection of waste, the correct siting of landfills/waste dumps, etc. Implementing cleaner technologies în Moldovan industry is slow, primarily due to low investments.

One of the top problems is increasing pressure on soils and landscapes: soil erosion is on raise, soil fertility is decreasing Environmental policies in Moldova traditionally focused on fighting non-compliance and combating water and air pollution; soil degradation was always less priority. It is important to apply a more holistic approach in environmental management undertaking measures for the protection and restoration of natural ecosystems as the basic elements of the landscape. This has to be done through developing a closer cooperation between land holders, physical planning and development institutions and land planning and management authorities.

1. THE NATURAL ENVIRONMENT AND SOCIAL ASPECTS

1.1. THE PHYSICAL CONTEXT

The Republic of Moldova is a small, landlocked and densely populated country situated between the western border of Ukraine and the eastern border of Romania. It spreads on 350 km from North to South and on 120 km from West to East, on the latitude of the capital city Chisinau. The country's territory is 33483.4 km^2. Moldova is part of the Black Sea watershed.

The country is relatively low-lying and hilly, with semi-arid steppe plains in the south. The hills at the central part of the country are densely forested, while cultivated crops have replaced the natural grass cover of the plains and steppes in the north and the south. The average elevation is 147 m above sea level. Absolute elevations hardly exceed 400 m, in the central part of the country (absolute maximum, 429 m).

Moldova has a temperate continental climate, with relatively mild winters with average daily temperature between -5°C and -3°C and little snow, as well as warm summers with limited rainfall. The average annual precipitation varies between 617 mm in the North and 546 mm in the South. The rainfall is erratic and droughts are frequent.

Moldova has a river system consisting of more than 3000 rivers and streams. The two largest rivers, carrying most part of Moldova's available water resources, are the Dniester (Nistru), with a total length of 1,352 km and 657 km within the country, and the Prut with a total length of 976 km and 695 km within the country. Both rivers originate from the Carpathian Mountains in Ukraine. In the middle and lower stretches, they form a natural border between Moldova and Romania in the West and between Moldova and Ukraine in the East.

The main feeding source for the small inland water courses is precipitation; the role of groundwater is limited. Such a feeding regime causes water level highs in rivers in spring, following the snow melt, and in summer, after torrent rains. Several times in the past, this originated in catastrophic floods.

Moldova has only a few natural lakes, most of them in the Prut and Dniester rivers floodplains. In the same time, over 3500 water reservoirs were created for various purposes (irrigation, fish-farming, leisure, industrial and domestic needs, flood attenuation). Two large reservoirs mainly serving for hydropower production were created on river Prut and on the Dniester.

The groundwater resources are limited. The shallow groundwater is a major drinking water source for the majority of the rural population. The deep groundwater often shows high salt contents and high concentrations of ammonia, methane and fluoride, predominantly caused by natural factors.

Three-quarters of the country is covered with fertile chernozem soils which are the main natural resource of Moldova. Rich soils and a favourable climate support substantial and diverse agricultural production ranging from wheat, corn, barley, tobacco, sugar beets, soybeans, and sunflower to fruit orchards and vineyards. Beef and dairy cattle, as well as pigs, sheep and poultry are raised on a family farm scale. The country does not have any major mineral deposits but natural resources include deposits of limestone, sandstone and gypsum.

1.2. NATURAL RESOURCES

1.2.1. Land Resources

The total land resources of the Republic of Moldova accounted for 3,384,600 ha, including 2,528,300 ha agriculture land (74.7%), out of which 1,845,400 ha arable

land (73.0%), 297,900 ha orchards and vineyards (11.8%), 376,900 ha hayfields and pastures (14.9%), 8,000 ha fallow (0.3%). The area of reclaimed land was 299,700 ha, including 230,000 ha irrigated land and 69,700 ha drained land (see Tab. 1.1).

Table 1.1

Land use categories

Category	Total area, ha	% of country's territory
1. Agriculture use	1,950,900	57.7
2. Residential areas	309,300	9.1
3. Industry, transport and other special uses	58,700	1.7
4. Nature protection, health protection, recreation	2,400	0.1
5. Forest fund	403,300	11.9
6. Surface waters	81,200	2.4
7. Reserve fund	578,800	17.1
Total land	3,384,600	100

The Republic of Moldova's land resources have a few distinctive characteristics, namely:

a) prevalence of rich chernozem soils, with high productive potential;
b) intensive land use (>75%);
c) fragmented landscape: 80% of agriculture land is situated on slope.

1.2.2. Water resources

Surface water resources account for 1.32 billion m^3 per year. The river network consists of 3621 water courses totaling about 16,000 km. The average river density is 0.48 km/km^2. The water resources include more than 3000 lakes, water reservoirs and ponds.

The Republic of Moldova is located within the limits of four catchment basins. Most part of the territory (67%), specifically in its northern, central and eastern part, is drained by the Nistru River. The river Prut drains approximately 24% of the country. The other two catchments belong to the (generally) small rivers that discharge into the Danube River or directly to the Black Sea.

The groundwater resources account for 3,454,000 m^3/day. Out of this volume, 2,187,000 m^3/day are approved for consumption, including 2,020,000 m^3/day for drinking purposes and 167,500 m^3/day for other economic purposes (including mineral waters). According to the Geological Agency of Moldova (AGeoM), currently there are approximately 7,000 abstraction boreholes from different groundwater horizons spread out on country's territory.

Mineral waters. The Republic of Moldova is rich in mineral/spa waters: 27 types of mineral water have been attested and 47 sources have been prospected. Particularly valuable are the iodine-bromine-sulphurous and salty waters in the South of Moldova, which are used in spa treatments. In the North reserves of radon-containing groundwater were prospected. The abundance of spa waters, combined with mild climate and other natural characteristics, forms a good basis for developing a network of curative institutions.

Industrial waters. A number of deposits of highly mineralized (70-100 g/dm^3) groundwater were identified in the South of the country, which could provide for industrial extraction of iodine, bromine and rare metals. The maximum concentrations

of chemical elements in groundwater may reach 30 mg/dm^3 iodine, 360 mg/dm^3 bromine, 380 mg/dm^3 strontium, 1 mg/dm^3 cesium, and 3 mg/dm^3 rubidium. The extraction of those elements could be economically viable in case all of them are to be extracted concomitantly with common salt.

1.2.3. Biologic and Forest Resources

The geographic position, climate and landscape of the Republic of Moldova provided conditions for the development of a rich flora. The vegetation belongs to two zonal types, namely steppe and forest steppe vegetation.

The steppe zone covers the plains and highlands situated south and east from the central Codrii Plateau and the Tigheci Hillocks. Besides, the steppe vegetation appears in the North of the country (the Bălţi steppe). Almost all former steppe areas are now used for agriculture so that only small plots of natural steppe communities can be found on steep hillsides or areas affected by landslides.

The forest steppe zone includes forest communities, mostly located on hills, alternating with steppe vegetation areas. The dominant forest species are English oak and durmast oak, sometimes in association with beech. In the South, pubescent oak groves are present on the hillsides. Paludal forests made of willow and poplar, are spread in the river plains.

The occurrence and abundance of animal species is dependant to a great extent on vegetal communities, which provide them food and shelter. The most common animals living in Moldovan forests are: the fallow deer, the wild boar, the fox, the badger, the squirrel, the marten, the wild cat. The bird species comprise: the oriole, the magpie, the hoopoe, the nightingale, the blackbird, etc. The steppe animal communities comprise several species of rodents and birds (the skylark, the quail, the partridge). The lakes, wetlands and marshes provide shelter and food to many birds, including migratory species. A number of rare and/or endangered animal species are protected by law (116 species are included in the Red Book of the Republic of Moldova, 2001).

According to the Land Cadastre, the forests covered 362,700 ha at the beginning of 2004 (10.7% of country's territory). The current forestation level is considered insufficient for an effective environmental balance. The area of forests per inhabitant in Moldova is 0.086 ha, as compared to 0.3 ha/cap. in Romania, 0.4 ha/cap. in Bulgaria, not to speak about countries like Sweden (2.5 ha/cap.) or Finland (3.7 ha/cap.).

Moldovan forests consist basically of communities of broad-leaved species (98%) dominated by oak (143,800 ha) and acacia (131,000 ha).

1.2.4. Mineral Resources

Moldova does not have major mineral deposits but natural resources include deposits of gypsum and other raw materials for building industry, as well as small reserves of oil and gas, lignite and iron ore.

Oil and gas. One deposit of oil and four deposits of natural gas were prospected in the South of the country. The reserves are very small: the oil field at Văleni has extractible reserves of about 500,000 tons of low quality oil while the gas fields, 300-600 m deep, account for between 20 and 370 million m^3. In 1995, a concession for prospecting and exploiting the oil and gas reserves on the territory of the Republic of Moldova was given to the U.S. company Redeco for 20 years.

Brown coal. Four deposits of lignite have been prospected in the South of Moldova, totaling 38 million tons. The coal layers, 0.1-2.6 m thick, lie in Neogene's sedimentary rocks, between 9 and 500 m under the surface of earth. The coal quality

is poor, with high content of ash and sulphur (4-13%). The coal is not being extracted due to limited reserves, poor mining and geologic conditions and the economic non-viability of the project.

Iron ore. One deposit of iron ore was identified with reserves evaluated at 280 million tons. The deposit is formed of a number of layers, 1-2 m to 15-20 m thick, located at 200-370 m beneath the surface. The average content of magnetite in ore is 25-35%. Under the current conditions, the deposit is considered to be unsuitable for industrial extraction.

Non-iron minerals. Currently, there are 411 prospected deposits of 17 types of mineral resources in Moldova.

Latest prospecting works showed the possibility to extend the range of exploitable mineral resources in Moldova by tripoli, diatomite, bentonite clays, helium, mineral waters.

Six deposits of tripoli with reserves totaling some 10 mil. tons have been prospected. This is a valuable resource that has a wide range of potential uses, e.g. as adsorbents, hydraulic premixes for cement, raw material for liquid glass and crystal production, building and insulation materials, etc. Similar uses are possible for diatomite, which is widespread in the country. The bentonite clays, with prospected reserves of 3.4 million tons, are excellent adsorbents, claydite raw materials, can have many potential applications in agriculture, etc.

1.3. Meteorological and Hydrological Characteristics

The year 2004 was generally warmer than usual (see Table 1.2). The average yearly air temperature at different meteorological stations exceeded the multiannual values by 0.5-1.2^{0}C. The absolute minimum values were between -12^{0}C and -18^{0}C (in January), the maximum values – between +32^{0}C and +35^{0}C (in July and August).

The precipitation was irregular and varied between regions. The maximum annual amount of precipitation in 2004 was recorded at Soroca meteorological station, in the North-East of the country (700 mm), the minimum at the Bălţi station, in the North (465 mm). Precipitation was deficient in the North as well as in the South of the country.

Table 1.2

Average annual temperature and precipitation in 2004, as compared to multiannual values in different regions of the Republic of Moldova

Region (station)	Average temperature, C		Average precipitation, mm	
	multiannual	year 2004	multiannual	year 2004
North (Briceni)	9.3	9.1	617	505
Center (Chişinău)	9.5	10.4	556	594
South (Cahul)	10.1	10.9	546	469

During summer time several cases of very heavy rainfall were recorded reaching the highest level on 22-24 August when 236 mm of precipitation fell at Soroca meteorological station within 24 hours, which is the absolute maximum attested at that station for the entire period of observations (more than 100 years). The extreme intensity of that event is to be mentioned (149 mm during one single hour).

Similar deluge was recorded in late August at the Leova meteorological station, in the South-West (166 mm of precipitation fell within 7 hours), again the absolute maximum for the entire period of observations in the South of the country.

The winter was late, shorter and warmer than usual (+0.5^{0}C, as compared to multiannual average). The amount of precipitation was generally higher than usual and the snow cover was maintained during the entire season. The spring was early and significantly warmer than usual, with a strong deficit of precipitation in the North of the country. The summer was late and close to the normal temperature regime; the precipitation, in general, was close to normal but very irregular and variable by region.

Hydrology. The discharge of the main rivers was well below the average multiannual values (tab. 1.3), notably for smaller internal water courses and during winter time.

Table 1.3

Discharge of the main rivers in 2004

River	Hydrometric station	Average multiannual discharge, m^3/s	River discharge in 2004, m^3/s	4 / 3
1	2	3	4	5
Nistru	Hruşca	312	252	81%
Prut	Şirăuţi	76,3	55,9	73%
Răut	Jeloboc	11,2	5,94	53%
Bîc	Chişinău	1,54	0,77	50%
Cogîlnic	Hînceşti	0,29	0,17	59%

In late summer there were heavy rains in the upper parts of the Dniester and Prut river basins that resulted in flooding events on the territory of the Republic of Moldova. The water level rose by 2-4 m in Dniester and by 2-3 m in Prut, locally the rivers' floodplains were inundated. Similar events were recorded on a few small internal water courses.

1.4. Demography and Environmental Health

Demographic and social processes. The current demographic situation in Moldova is a product of both long and painful transition (resulted in economic decline, poverty and social exclusion of large population groups), and a number of other factors of social, political, behavioral and cultural origin.

According to the October 2004 census, the country's population is 3.388 million[1]. About 39% of the inhabitants live in urban areas. The capital and biggest city is Chişinău (population close to 800,000) located in the central part of the country. Other important towns include Bălti, in north-central Moldova, Tiraspol and Bender, both located on the Dniester River.

The birth rate diminished significantly as compared to the early 1990s. In 2004, the birth rate was as low as 11.3‰, while the mortality rate reached 12.3‰. The natural growth showed again – for the 6th consecutive year – a negative value (-1.0‰). It is worth mentioning that the general mortality rate has a growing tendency; this indicator is higher for men than for women and, on the other side, significantly higher in the countryside than in urban areas.

The analysis of the mortality structure revealed that the main cause of death (56.5%) is cardiovascular pathology. In 2004, there were more deceased after infections, parasite and digestive disease, as compared to 2003. In the same time, fewer persons deceased of respiratory diseases, cancer, accidents, intoxications and trauma.

[1] Excluding the Transnistrian region.

The economically active population[2] was 1.433 million, a 3% decrease as compared to the previous year. The official number of economic emigrants is 345,000 persons, which makes up 24% of the total active population over 15 years old. Two thirds (67%) of the economic emigrants are men, 69% are rural residents.

The number of jobless persons in 2004 exceeded 116,000. The general unemployment rate was 8.1%, as compared to 7.9% in 2003. There are clear gender disparities for unemployment (men, 10.0%; women, 6.3%). The unemployment rate is reportedly higher in urban (11.9%) than in rural areas (5.0%). The rate of unemployment among young people (15-24 years) is on a downward trend (from 22.3% in 1999 to 19.7% in 2004). The share of young persons in the total number of jobless people was 26.5% in 2004.

Environmental health. The state on the environment has important implications on the public health. There is evidence of a general decline in the state of public health in Moldova over the past decade, measured in terms of incidence of various illnesses. Epidemiological data bring confirmation of the growing problem of water related diseases in Moldova caused mainly by microbiological contamination of the drinking water sources and the population life style.

In 2004, the general morbidity in acute diarrhea diseases has increased to 411 per 100,000 inhabitants, as compared to 381 cases per 100,000 in 2003. Another waterborne disease, hepatitis A, showed a decrease as compared to 2003. It has to be noted that the death rate caused by chronic hepatitis in Moldova exceeds this rate in neighbouring countries and is the highest in the central and southern regions of the country.

Besides the microbiological contamination of the drinking water sources, Moldova faces specific environmental health problems related to the chemical pollution/ composition of its waters:

- Nitrate pollution of shallow wells on which most rural population relies for drinking. The number of population exposed to high concentrations of nitrate exceeds 1.5 million.
- High fluoride content in groundwater sources in several regions of the country. Local population uses such water for drinking since there is no real alternative for it and this results in dental fluorosis and osteofluorosis. Over 12% of the country's population has dental fluorosis.
- Lack of iodine: 2/3 of the country's territory is an endemic province with iodine content under 0.005-0.010 mg/l. The lack of this element can provoke endocrine disorders and mental retardation.
- Excessive mineralization / salt content of the water caused by (naturally) high concentrations of calcium, sodium, magnesium, sulphate, cloride and hidrocarbonate ions. The long-term consume of highly mineralized water leads to increased morbidity in urinary lithyasis, cardiovascular and digestive diseases. The number of exposed population exceeds 1 million people.

[2] Excluding the Transnistrian region.

2. ECONOMIC DEVELOPMENT AND THE ENVIRONMENT

The importance of sustainable development and its relation to economic growth are now widely recognized. The environment and social resources are the basic foundation of all socio-economic activity. The satisfactory guardianship of the environment is a precondition for sustainable development. Human-environment interactions are complex.

Human activities are the underlying cause and driving forces of environmental degradation. Environmental policy-makers now realize that the most effective way of improving environmental quality is to integrate environmental considerations in the management of human activities.

The purpose of this part of the report is to present the basic facts on energy, industry, transport, agriculture, mining, and tourism relevant to a better understanding of their environmental impacts.

2.1. Energy Sector

The Republic of Moldova is almost totally dependent on the imports of fossil fuels. The country imports both primary energy resources (natural gas, petroleum products and coal) and electricity.

The economic and structural reforms in the country resulted in a substantial reduction in industrial production, which in turn resulted in reduced energy consumption (table 2.1).

Table 2.1

Indices of energy consumption in the Republic of Moldova in 1990-2004

Indices	1990	1994	1998	2000	2004
Total consumption of primary energy resources, kilotons coal equivalent (Ktce)	14,269	4,636	4,218	5,150	6,521
Total consumption of electricity, thou. kWh	12,647	5,558	4,624	2,244	2,552
Consumption of primary energy resources per capita, Ktce	3.3	1.1	1.0	1.2	1.8
Consumption of electricity per capita, thou. kWh	2.9	1.3	1.1	0.6	0.7

The energy is “the blood of the economy” and energy consumption is, normally, well correlated to the state of economy. The above data reflect the real dynamics of country’s economic development during the last 15 years. The economy bottomed out in 1998-1999, and so did the consumption of energy. During 2000-2004 both total and specific energy consumption are on an upward trend.

The most important national energy generation units are: two electrical and heat generation stations (EHS) in the capital city Chisinau, the EHS “Nord” in Balti, the EHS in Dnestrovsc and two hydropower stations on the Nistru and Prut rivers. It must be noted that by far the largest electricity producer in the country is the Dnestrovsc station (2520 MW). The energy production capacity and efficiency of other important energy sources are presented in Table 2.2.

Natural gas is the main fuel used for power generation; in 2004, the fuel oil was used only occasionally. The specific consumption of fuel in power generation at EHS-1 and The EHS-2 was increasing in 2004, indicating lower efficiency, due to the depreciation of equipment related to poor financial status (bad debts) of both entities.

Table 2.2

Energy capacity and efficiency of energy generation units

	Units	EHS – 1			EHS - 2			EHS – Nord		
		2002	2003	2004	2002	2003	2004	2002	2003	2004
Consumption of natural gas	mil. m3 Ktce	83,694 97,640	81,274 92,279	76,262 87,122	312,93 356,51	286,027 326,496	278,88 318,95	37,79 43,16	44,14 50,49	47,39 52,8
Consumption of fuel oil	Kt Ktce	-	180,78 250,64	0,092 0,119	1,223 1,676	1,914 2,618	-	-	-	-
Electricity production	mil. kW	142,14	112,63	112,80	804,7	741,9	714,4	40,6	52,5	57,7
Heat production	000 Gcal	386,3	385,6	315,7	1069,2	1018,6	885,7	199	246	230
Specific consumption of fuel in power generation	g/kW	392,9	374,9	405,7	336,7	332,57	350,48	349,4	315,7	300,6
Specific consumption of fuel in heat generation	kg/Gcal	131,5	121,7	120,2	121,56	119,94	119,79	168,8	155,6	148,1
Power capacity	MW	66			240			24		
Heat capacity	Gcal	239			1200			528	330	350
Steam capacity	Gcal	200 540			660 540			400 455	200 455	200 455

EHS-Nord had a better management; the station significantly increased the power generation during 2002-2004 and demonstrated higher efficiency in power and heat generation.

The total capacity for heat generation is about 1800 Gcal. The cities of Chisinau and Balti have centralized heating systems. Other cities and towns rely on district boiler houses.

Presently Moldova imports approximately 30-40% of the energy consumed. Most power generation units have a high level of physical depreciation. Energy efficiency in the industrial sector is low. The specific energy consumption in processes is high and the energy losses are substantial.

The entire country is covered by the energy distribution network. The number of consumers not connected to the public energy network is totally insignificant.

Impact of the energy sector on the environment. The energy sector, along with the transport, has the largest contribution to the pollution of the atmospheric air. The use of fossil fuels releases into the environment large quantities of CO_2, SO_2, NO_x, and particulates. Out of the used fuels, natural gas is the most environmentally convenient, since it predominantly contains light hydrocarbons and is less polluting. The preponderent use of natural gas for power generation maintained the pollution of the environment from the energy sector within reasonable limits.

In accordance with the requirements of the Kyoto Protocol, the Republic of Moldova started the modernization of the energy sector, leading to the decrease of emissions. During the last years, the environment pollution from energy sources diminished.

Perspectives of the energy sector development in the Republic of Moldova. The main policy documents setting the sectoral strategies are: the National Programme of Renovation and De-Centralization of Heating Systems in the Settlements of the Republic of Moldova and the Energy Sector Development Strategy until 2010. The strategic goals are: to develop the heating sector as a combination of centralized and decentralized systems, to upgrade the existing EHS and to build new modern units, to transfer all existing EHS on natural gas, to implement the metering of heat and hot water consumption.

In most towns the former centralized heating system is now defunct and in many places is being replaced by a larger number of autonomous heating systems. The National Programme of Renovation and De-Centralization of Heating Systems, approved by the Government in 2003, set concrete proposals for modernizing the heating systems in 36 towns. The proposed systems are generally based on the co-generation of electricity and heat.

The priority investment projects in the energy sector aim at increasing the in-country generation capacity through upgrading the existing sources and creating a network of smaller EHS at regional and local level. Building regional/local EHS would increase the generation of electric energy and the efficiency of using existing capacities, thus decreasing the import of electricity. The heat generation would reach 2000 Gcal in 2010, and 2250 Gcal in 2015.

2.2. Industry

Moldovan industry suffered a dramatic decline in the 1990s, with an absolute minimum reached in 1999, and started its revival afterwards. Between 2000 and 2004, it grew 8-16% annually. The ongoing privatization and restructuring process, implementation of new corporate management, new contracts with external (especially EU) partners all contributed to improvements in the dynamics of the industrial sector. The Partnership and Cooperation Agreement with the EU opened new opportunities for Moldovan business. A number of joint-ventures have been created with foreign companies, especially in the light industry. A major share of industry has been privatized. Foreign companies or joint ventures account for one quarter of industrial production.

During the 1990s the country's economic structure changed significantly. The main industries are food and beverage production (55% of industrial production), paper and cardboard, furniture, leather, construction materials, and heavy machinery. Cement and glass production dropped as compared to the early 1990s, but is slightly recovering during the last years. Production of building materials, machinery and equipment, and furniture is still declining. The manufacturing sector is recovering well; in 2004, it regained the production level of 1996 (Table 2.3).

In general, the situation in the sector remains complicated. The structure of industrial production is not sufficiently diversified. Most industries did not reach the production level of the pre-transition period and industrial capacities are far from being fully used. Lack of investments led to a degradation of fixed assets. Depreciation of the value of capital reached 80-90 per cent in a number of enterprises. Industrial equipment has a high level of depreciation and huge investment is necessary for modernization.

Table 2.3

Structure of industrial production

Year	Total industrial output, mil. MDL	Manufacturing industry, mil. MDL	Electricity and heat production mil kwh / mil. Gcal	Extraction, thou. m^3		Production, kt		Structure of industrial production, %		
				Limestone + Sandstone	Sand + Gravel	Cement	Gypsum	Mining	Manufacturing	Electricity, gas, water supply
1990	11,5	n.a.	15,7/19,4	7705	6466	2288	110	n.a.	n.a.	n.a.
1995	4265	3565	1,2/ 7,1	771	376	49	13,6	0,8	83,6	15,6
1996	4690	3971	1,4/ 7,1	780	324	40	12,7	0,8	84,7	14,5
1997	5889	4459	1,5/ 6,6	887	346	122	14,4	1,0	78,7	20,3
1998	5982	4045	1,2/ 6,1	789	318	74	19,8	0,9	70,1	29,0
1999	7191	4669	1,1/ 4,6	586	318	50	18,5	0,8	68,1	31,1
2000	8168	6478	0,9/ 3,1	571	276	222	32,0	0,8	82,1	17,1
2001	10427	8108	1,3/ 3,3	608	307	158	55,2	0,7	80,4	18,9
2002	12624	10065	1,2/ 3,2	774	415	279	91,3	0,8	82,9	16,3
2003	15963	11034	1,0/2,4	n. a.	n.a.	255	n.a.	0,8	82,1	17,1
2004	17533	11935	1,0/2,3	327	715	440	491	1,2	87,4	11,4

n.a – data not available

The substantial reduction in industrial production in the 1990s resulted in reduced energy consumption. However since 2001 the final energy consumption in industry started to increase (about 5% annual growth) reaching in 2004 the level of 1995. The consumption of natural gas in 2004 was 133 million m^3, a 30%-increase as compared to 2001, with a particularly strong growth in food industry and mining.

The food, beverage and tobacco industry is the sector with the highest energy consumption, amounting to more than half of the total industrial energy use in 2004. Second in energy consumption with 23% is the group of industries including textiles, dressmaking, the leather industry and machinery. All other industry sub-sectors consume less than 10% of the total energy consumption in industry. The energy consumed by industry in 2002 was primarily from natural gas (54 per cent), followed by electricity (20 per cent), heat (17 per cent) and oil products and coal (9 per cent). In the late 1990s there was a shift from coal and oil products to natural gas; this has significantly reduced airborne pollutants emissions.

Energy efficiency in the industrial sector is generally low. The specific energy consumption in processes is high and the energy losses are substantial. Energy intensity in industry has been decreasing since 1999; however since 2001 it has been increasing again. The implementation of the sectoral programme of energy conservation brought significant energy savings: The big enterprises reporting to the Ministry of Industry have reduced the energy use in 2004 by 7.4%.

The water use for industrial purposes during the last 5 years stabilized around the annual level of 590 mil. m^3 (which is 50% reported to the 1995 level).

In 2004, a number of industries developed and implemented action plans which had - directly or indirectly - a beneficial impact on the environment. Industrial cleaner production programs are being implemented with technical assistance from the EU and other countries. So far, 25 industrial operators implemented such programs.

Investment is one of the major instruments of the industrial policy implementation. In 2004 investments in industry reached 204 million MDL, which is a 2.2 times increase as compared to 2003 and 6.7 times more than in 2000.

Environmental issues. The industrial sector is responsible for polluting emissions in air and water, for soil contamination and waste generation. Some industrial activities lead to 'landscape pollution', generate noise and other nuisances. Data on the environmental impact of industry is very limited. There is lack of integrated indicators of the industrial impact on the environment. Most often the emissions reported by enterprises are calculated on the basis of the input and technology process data instead of being directly measured, because almost all industrial laboratories have been liquidated. The emissions of greenhouse gases from industrial activities, calculated in CO_2 equivalents, in 1990 – 2004, are presented in fig. 2.1. The analysis of the limited data available on environmental pollution in industry shows that water use, waste generation, greenhouse gases emission and atmospheric pollution are gradually reducing while economic activity is picking up (i.e., positive decoupling trends).

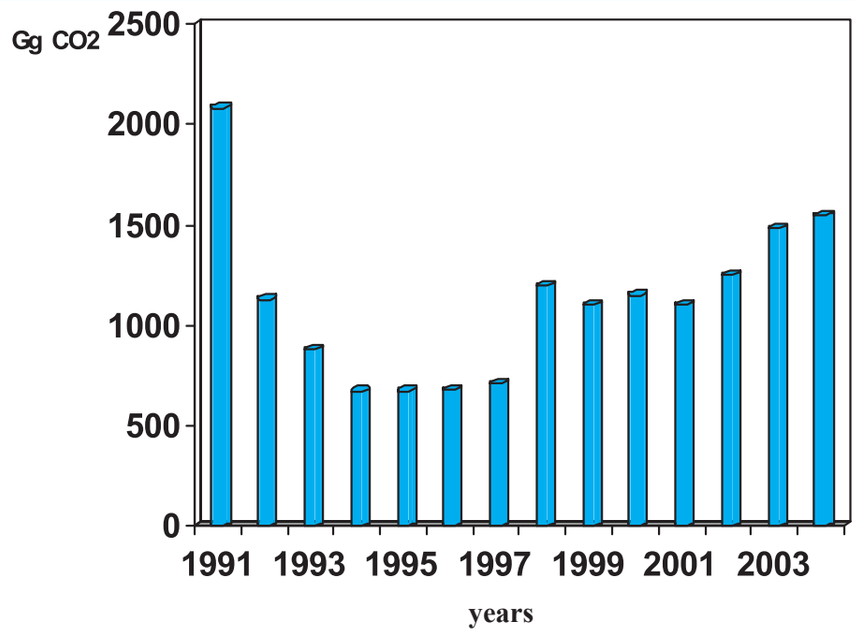

Fig 2.1. Greenhouse gas emissions, eq. CO_2

Generally, improvement of environmental efficiency in manufacturing can result from structural changes (promoting less polluting production) or/and technology upgrade (cleaner technologies, end-of-pipe pollution reduction measures). Despite several structural reforms have been implemented in Moldova, they showed little effect on the state of the environment. The waste management strategy, cleaner production centers and cleaner production pilot projects for each of the main industrial sectors have produced successful results. However, implementation of environmental policies in industry needs to be improved regarding their priorities and targets, their monitoring

and the weak coordination between responsible ministries. The lack of appropriate economic incentives and financing mechanisms has compromised expected improvements.Improving environment protection, along with maintaining production competitiveness, may be a major challenge in the industrial pollution control.

Environmental expenditure in the Republic of Moldova increased during the last years (in 2003-2004 only the Environmental Funds allocated 30-32 million MDL). Most of the money was spent on waste water treatment, solid waste management and biodiversity protection. In the near future, the market for cleaner technologies is going to increase, as a result of the need to upgrade the communal energy production equipment to comply with the requirements of the Kyoto protocol.

2.3. Transport

The transport sector is one of the main polluters of the environment. In Moldova the structure of transport is disproportionate: road transport accounts for 88% of the goods and passengers transportation; 11% are transported by rail, and 1% by other types (mainly air and fluvial) transport.

During the last 15 years the transports evolution followed the general economic decline. Increased economic activity starting with the year 2000 entailed the growth of transports. The share of road transport in the total transport structure increased on the account of steady growth of transport units (Table 2.4). In contrast with the growth of the park of vehicles, the road network remained almost unchanged.

Table 2.4

Number of the road and rail transport units in the Republic of Moldova between 1990 and 2004

Transport units	1990	1995	2000	2004
Locomotives	230	249	162	160
Lorries	76910	59888	61689	79387
Buses	11035	9181	14023	21853
Cars	208984	165941	238380	330479

The transportation of goods and passengers by rail dropped in the 1990s and is recovering since 2000. The rail sector was particularly affected by lack of investment in infrastructure and political factors (impediments in the secessionist Transnistrian region). During the last 15 years the railroad network did not develop (Table 2.5).

Table 2.5

Railroad and road network (km) between 1990 and 2004

Type of road	1990	1995	2000	2004
Railroad	1150	1160	1114	1120
Roads	10300	9400	9400	9332
including asphalt roads	8970	8900	8800	8905
Main roads	2800	2800	2800	3325
Local roads	6530	6600	6600	6007

Impact of transport on the environment. The road transport is a major source of air pollution in Moldova. About 431,000 of transport units, including 330,000 cars, were registered in Moldova at the end of 2004, and their number increases fast. Besides

the growing number of vehicles, their technical status is another matter of concern in terms of air pollution. Most of imported cars are second-hand (and sometimes very old) cars which makes them more susceptible as pollution sources.

The poor quality of Moldovan roads is another reason for significant air pollution problems, especially in the cities. The increase of the number of transport units affected the quality of the roads. During the last 15 years there was very little investment in road development almost no road reconstruction and rehabilitation works were implemented. The deplorable status of the roads is increasing the impact on the environment.

After the year 2000 the quasi totality of imported gasoline was unleaded. Data on the dynamics of fuels used in the transport sector during the last 15 years are presented in Table 2.6.

Table 2.6

Amount of fuels (kt) used by road transport in the Republic of Moldova in 2000-2004, as compared to the reference year 1990

Fuel type	1990	2000	2001	2002	2003	2004
Gazoline	663	117	128	162	192	242
Diesel	1006	157	210	255	287	274
LPG	14.0	6.8	6.2	9.6	9.6	n.a.

2.4. Agriculture

Agriculture activities involve about 75% of the country's lands, which is sensibly higher than in many other European countries, including Greece, 70%; Romania and Poland, 62%; or Italy, 58%. The share of arable land, orchards and vineyards is also high, a situation causing significant difficulties in maintaining a sustainable environmental balance between natural and anthropic ecosystems, and leading to degradation of the soil cover, the biodiversity and the environment as a whole.

As a result of the land reform, the structure of agriculture land use has changed. After privatization in the 1990s, a large share of land remained atomized in many individual plots. There are more than 1.3 million landowners. The privatization process resulted in an average landholding of 1.4 ha, often divided into more plots. In many cases it is not possible to use these small plots efficiently. Production of many traditional crops such as grain, sunflower or sugar beet is dependent on mechanization, and therefore can be performed only on bigger areas. In addition, the new farmers and owners lack experience, technical skills and finances to develop their production successfully.

At the beginning of 2004, approximately 36% of the land is under small farms of maximum 2-3 ha. The rest of agriculture land is consolidated to various extents and in various forms (e.g. leasing, cooperatives, farmers associations, etc.). A land market is developing and agricultural land is being further consolidated. More than half the land is leased and the number of land transactions is increasing rapidly.

From an environmental perspective there are aspects of the privatization that are causing problems. For example, parts of the forest protection belts are now private. Also water protection zones are often in private hands. The current status of agriculture land (fragmented in small plots) is limiting the implementation of sustainable and effective methods of agriculture and soil conservation. However, even larger farms/ cooperatives are not organized in this sense, which results in activation of soil erosion and landslides, and the general degradation of the soil cover.

Since the consolidation of agriculture land is ongoing, now it is crucial to promote the approach of adapting agriculture activities to the concrete features of the landscape. This would allow for better integration the use of agriculture technologies into natural material cycles and processes, and for better conservation of the soil's quality and fertility.

The present agriculture system practiced in the Republic of Moldova can be characterized as extensive and poorly organized. This is detrimental both to agriculture production and the status of soils and other natural resources.

The organic agriculture can be a viable solution limiting the negative environmental impacts of conventional agriculture and increasing the quality of agriculture products. The Government of the Republic of Moldova took action towards promoting organic agriculture. A pre-feasibility study concerning the capability of the Republic of Moldova to produce and export organic products was undertaken, which demonstrated the suitability of current conditions offered by Moldova for organic agriculture implementation.

Organic agriculture is one of the facets of a sustainable agriculture. The strategic goal of the national strategy of agriculture and rural development is sustainable development of the agriculture and food sector in correlation with environment protection and natural resources conservation. The country started to create the national policy and legal framework in this field. The Government approved the Concept of Organic Agriculture Development, developed jointly by the Ministry of Agriculture and Food Industry (MAFI) – the central authority for organic agriculture sector - and the Ministry of Ecology, Constructions and Territorial Development. The state standard „Guidelines on producing, processing, labeling and marketing the biologic agriculture and food products", enacted in 2002, introduced mandatory quality requirements for organic agriculture processes and products. MAFI developed a "Technical Regulation on Production and Processing Ecological (organic) Products" and designated the national Body for inspection and certification. In early 2005 the Parliament approved the Law on Ecological Agriculture and Food Production.

Yet, the Republic of Moldova does not have a functional system for agriculture producers' accreditation and the certification of agriculture production processes and agriculture products.

Organic agriculture is a new sector for Moldova. The number of farms applying organic methods is growing; however, there are no official data on the size of areas cultivated and production obtained in this emerging sector.

2.5. Mining

The mineral resources are the main source of raw materials for Moldovan industry. Currently, there are 411 prospected deposits of 17 types of mineral resources in the Republic of Moldova. About 900 quarries are used for minerals' extraction.

In the early 1990s, the extraction of minerals covered most of the country's needs in raw materials for the building industry while gypsum, limestone for sugar industry, lime for land reclamation, were exported. Following the economic downturn in the 1990s, the mineral extraction reduced considerably, for some raw materials – more than 10 times. The bottom was reached in 1995-1998, after that the sector started to come back to life. Since 2000, the extraction of mineral resources in Moldova is on a steady upward trend again. In 2004 the extraction of mineral materials grew 20% as compared to the previous year (Table 2.7).

Table 2.7

Amount of mineral materials extracted in 2003-2004

No.	Mineral material	Extracted amount (kt / thou. m^3)	
		2003	2004
1	Raw material for cement production: - limestone - clay	 216 91	 268 112
2	Gypsum	451	534
3	Moulding materials: - sand - clay	 72 -	 60 -
4	Limestone for sugar industry	30	63
5	Natural facing stones - sandstone - limestone	 1 -	 2 -
6	Saw limestone	392	352
7	Claydite raw materials - clay - argillite	 13 -	 21 -
8	Building blocks - limestone - gritstone - granite	 858 13 55	 998 14 74
9	Sand-gravel ores	661	871
10	Raw materials for bricks and tiles: - clay - sand	 - -	 27 -
11	Raw materials for ceramics production (clays)	-	21

Most of the mineral resources in Moldova are extracted through quarries, and only limestone blocks for construction, in mines. The extraction through quarries leads to destruction of the soil cover and accumulation of large amounts of wastes. Over 18 million m^3 of mineral waste is currently stored in waste dumps, including 15 million m^3 from limestone extraction and over 2.5 million m^3 from sugar industry. The amount of waste accumulated during mineral extraction is increasing by 2.8-3 million m^3 every year.

2.6. Tourism

The Republic of Moldova has a good potential for tourism development. The architectural patrimony comprises a vast number of objects, ranging from archeological sites to XX century buildings. It includes pre-historical monuments, Middle Age fortresses, monasteries, public buildings. The tourism industry is growing fast in Moldova and so does the impact of this sector on the environment.

In Moldova the tourism input in GDP was not very significant so far (1-1.5%). The Republic of Moldova is placed among the countries with a low level of tourism development, basing on the housing capacity and economic profits gained from tourism.

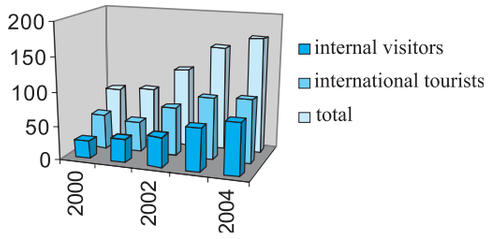

Fig. 2.2. Tourism develeopment in the Republic of Moldova (thousand visitors)

Starting with 1999-2000, the indicators of Moldovan tourism activity went upward both for local and foreign tourism (fig. 2.2). During the last five years, the internal demand for tourism services almost tripled. The number of international visitors also significantly increased.

The development of tourism is one of the Government priorities. The policy and legal framework for sector development is set by the Law on Tourism (2000), the Strategy of Sustainable Development of Tourism in the Republic of Moldova for the years 2003-2015, and the internaţional agreements Moldova adhered to.

The impact of tourism on the environment depends very much on the organization of this activity, but also on the tourists' behaviour conditioned by their awareness, education level and cultural aspects. Unfortunately, the internal tourism in Moldova remains out of any form of organization/management from the authorities. The consequences are visible and unpleasant: damaged green areas, piles of garbage, water pollution, etc. This is affecting particularly the areas close to the residential zones, lakes or river valleys, and even natural protected areas. The lack of adequate organization leads to a clear seasonality in tourism activity causing the exceedance of environmental capacity in some places, which is a direct way to the degradation of the environment. In general, the rapid growth of tourism without proper management can erode the very basis of tourism, with potential heavy implications on the local and regional economy and the local people livelihood.

Ecological tourism. The eco-tourism is a recent form of the sustainable tourism, oriented towards raising environmental awareness and nature conservation. Unfortunately, the eco-tourism is not part of the environmental policy of the Republic of Moldova whose concept was approved by the Parliament in 2002. Neither is it part of national and local environmental action plans or sectoral strategies.

To be sustainable, the tourism activities have to take account of the delicate relationships between the natural, cultural and human environment and to keep the fragile balance that often characterizes the tourists' most popular destinations.

A major obstacle to the eco-tourism promotion is lack of awareness, knowledge, and experience in this field. Efforts have to be undertaken to provide all landscape reserves and other identified areas with proper infrastructure, to make them suitable for eco-tourists. Also, the capacity of the respective areas for sustainable eco-tourism has to be estimated.

The *Strategy of Sustainable Development of Tourism in the Republic of Moldova for the years 2003-2015* identifies, among the priorities of the tourism sector, the development of several specific domains. One of them is based on the long-lasting tradition of Moldovans in wine-making. Moldovan wines are a real visiting-card of the country. The strategy is to make of the whole popular tradition of wine-making a tourist attraction. The vineyards, the traditional wine-cellars with a special architecture and national colouring, wine-tasting ceremonies could be tourist attraction points and could provide a good basis for wine tourism promotion.

The Republic of Moldova has a good potential for developing the spa tourism. The watering places based on rich mineral waters' resources the country possesses could become a tourism product of international level on the condition that an adequate infrastructure is created.

3. STATE AND PROTECTION OF THE ATMOSPHERIC AIR

3.1. Air Quality

Air pollution originates from a large number of local and external sources and has many negative effects on the public health and the environment, e.g. acidification, eutrophication, climate change, etc.

In Moldova, the ambient air monitoring is the prerogative of the State Hydrometeorological Service, which has a network of 17 stations, located in five main industrial centers namely Chişinău, Bălţi, Tiraspol, Rîbniţa, and Bender. In 2004, almost 60,000 air samples were analyzed for particulates, sulphur dioxide, carbon monoxide, nitrogen dioxide, phenols, and formaldehyde).

Average annual concentrations exceeded the national standards (maximum allowable concentrations, MAC) for: particulates (in Bălţi), nitrogen dioxide (in Chişinău) and formaldehyde (in Bălţi, Chişinău and Tiraspol) (Fig. 3.1). The main contributors to this situation – which lasts for years – are the industrial activities, car traffic and insufficient cleaning of urban areas. The index of air pollution integrating all six analyzed parameters is highest in the biggest agglomerations (Chişinău, Bălţi şi Tiraspol), with an absolute maximum in Bălţi.

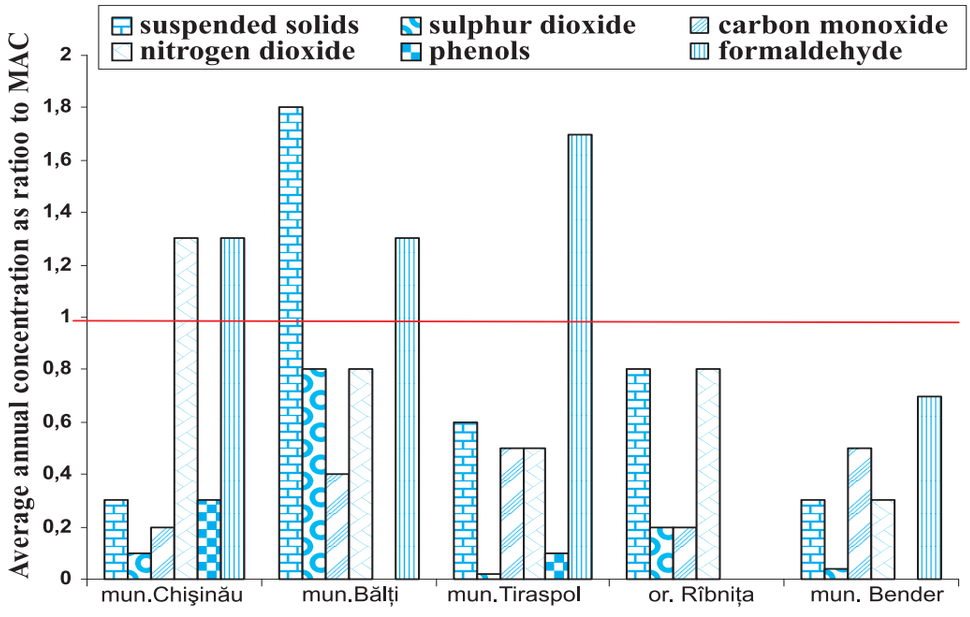

Fig. 3.1. Air pollution in the main urban centers of the Republic of Moldova in 2004

The general trend of air pollution level in the main cities during the last five years is downward.

Besides the air quality, the State Hydrometeorological Service is analyzing the chemical composition of atmospheric precipitation, at seven meteorological stations located in both urban and non-urban areas. The targeted parameters are: sulphate, chloride, hydrocarbonate, calcium, magnesium, ammonium and pH.

The concentrations of sulphate and hydrocarbonate reached a maximum in industrial areas (Rîbniţa, Camenca, Tiraspol). Chloride practically did not show significant variation, which is an indicator of lack of specific pollution sources in the monitored areas. The highest concentrations of calcium and magnesium at the Rîbniţa site is a clear indicator of pollution from the cement and building materials industries located nearby (Fig. 3.2).

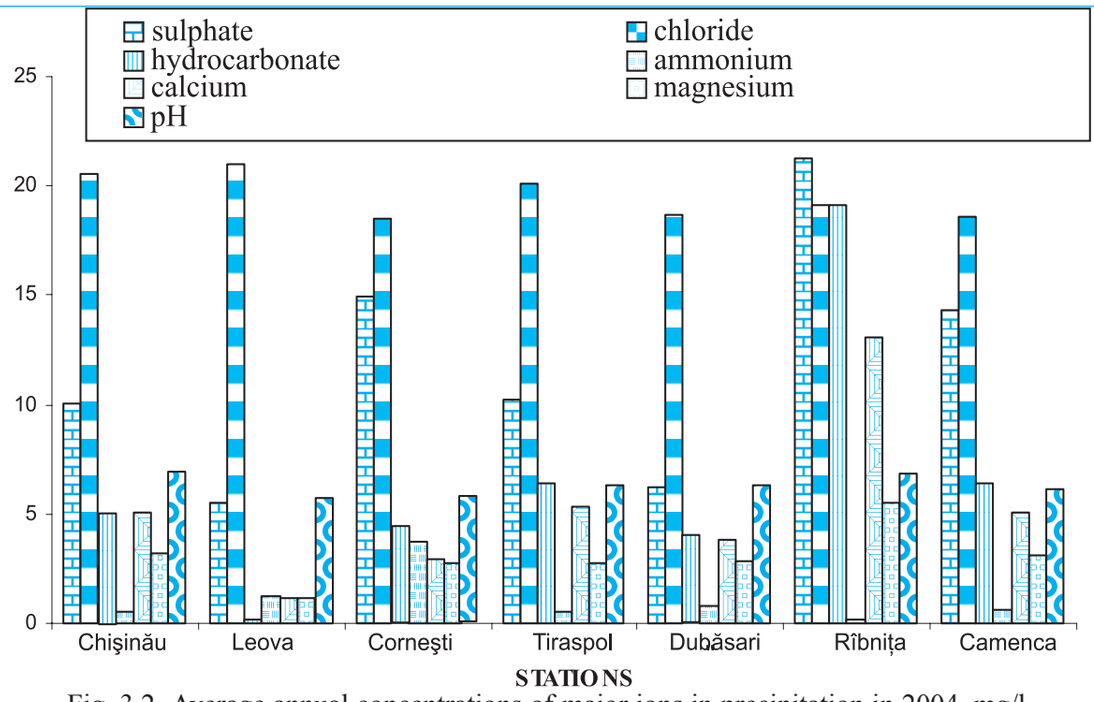

Fig. 3.2 Average annual concentrations of major ions in precipitation in 2004, mg/l

In 2004, the Hydrometeorological Service initiated the monitoring of heavy metals and persistent organic pollutants in atmospheric precipitation at two meteorological stations (Chişinău and Leova), using high resolution methods.

3.2. Air Pollution Sources

The quality of the atmospheric air is determined by three major sources of pollution: stationary sources (mainly the power and heat generation sector and the industry); mobile sources (transport and agriculture machinery); and transboundary pollution.

Stationary pollution sources. At present, approximately 4000 stationary sources of pollution are registered in the Republic of Moldova, including three power and heat generation units, 40 regional, 28 inter-regional, and 1639 local boiler houses, 530 gasoline and gas stations, 24 big fuel storage sites. From these, only 18 units are in the category of big sources with annual emissions of 100-5000 tons while the rest have emissions lower than 100 tons per enterprise and per year.

The energy and heat generation sector is by far the biggest stationary air pollution source in Moldova. The decrease of energy demand during the last years leaded to lower emissions and environmental impacts from this type of sources. Another factor that brought a decrease of impact is the large replacement of solid and liquid fuels by natural gas in combustion units.

According to the official statistics, the total amount of pollutants from stationary sources in 2004 was 17,369 tons, including: particulates – 3,345 tons; sulfur dioxide

- 2,005 tons; nitrogen oxides – 3,184 tons; carbon monoxide – 5,389 tons; others – 3,446 tons. These data do not include emissions from Transnistria, a region that is not controlled by the central government, where the biggest in Moldova, Dnestrovsk power station is located. The following estimate was made for emissions from all stationary sources, including the Dnestrovsk power station, basing on the amount of fuel burnt, combustion efficiencies and emission coefficients known. Those emissions totaled in 2004 approximately 36,600 tons, including: particulates – 5,907 tons, carbon monoxide – 9,372 tons, nitrogen oxides – 7,208 tons, sulfur dioxide – 7,955 tons, hydrocarbons – 2,701 tons and others – 3,446 tons. The dynamics of air emissions from stationary sources during the last 15 years is presented in Fig. 3.3.

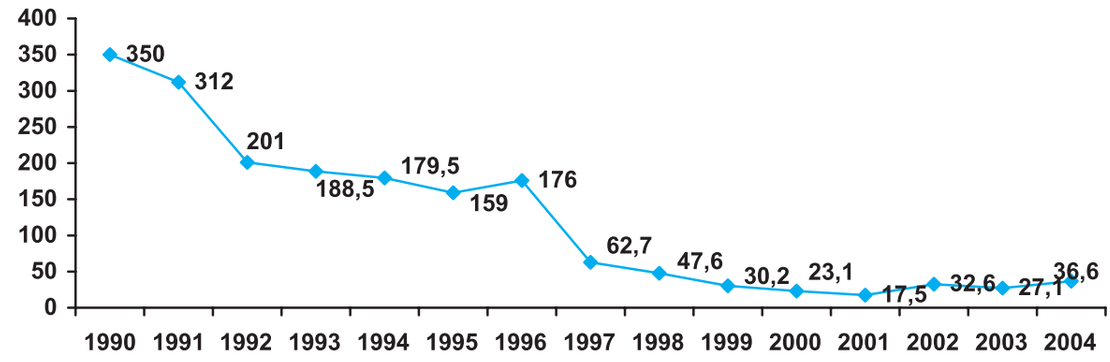

Fig.3.3. Dynamics of pollutins emissions from stationary sources (thou. tons)

Mobile pollution sources. Road transport is the main pollution source in this category, accounting in 2004 for approximately 200,000 tons or some 90% of the total emissions (Transnistria not included). This share is even larger in the big cities.

The road transport emissions depend on a number of factors such as the technical condition of cars, state of the roads and/or quality of gasoline. The enforcement of new requirements for gasoline (e.g. unleaded petrol and desulfurized diesel) contributed to the reduction of polluting emissions. During the last years (1999-2004) the share of unleaded petrol in the total volume of petrol imported has increased from 70% to 100%.

At the end of 2004 some 430,000 motor vehicles were registered in the country and the trend is still upward (Fig. 3.4). The technical condition of the cars has a significant influence on emissions. In Moldova, half of the fleet presently consists of cars being in use for 10 years and more while the number of new cars is relatively small.

The State Ecological Inspectorate, together with the road police, is regularly checking the cars in traffic for exhaust gas emissions. In about 10% of cases emissions above the allowed limits are recorded.

The financial resources allocated for road maintenance and traffic security are desperately low and did not exceed 7-10% of the necessary during the last years.

3.3. Transboundary Pollution

Over the last decades, the Central and Western European countries had significant contributions to the international pollution flows. The common understanding of the

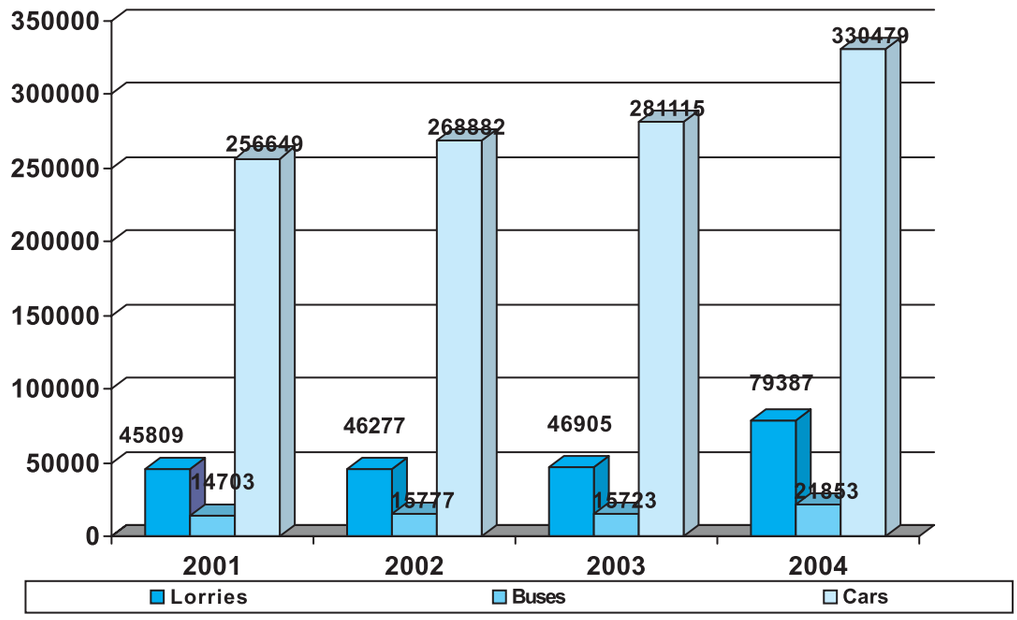

Fig. 3.4. Number of motor vehicles registered in the Republic of Moldova

need for joint actions to curb atmospheric pollution resulted in the adoption of the Convention on Long-Range Transboundary Air Pollution (Geneva, 1988).

According to data offered by the European Monitoring and Evaluation Program (EMEP), on the transboundary transport of polluting substances, the Republic of Moldova is a net exporter since the amount imported is 150 t lower than the amount exported. On the other side, the share of import in the total load of several pollutants is very high in Moldova, e.g. 84% for sulfur, 96% for nitrogen oxides and 45% for ammonium nitrogen. Most of the sulfur dioxide is coming to Moldova from Romania (32%) and Ukraine (18%), while the nitrogen oxides, from Ukraine (15%) and Poland (12%). The amount of transboundary sulfur depositions decreases from the North of Moldova (1000 eq/ha/year), to the Center (200-500 eq/ha/year) and the South (100 eq/ha/year). These loads do not exceed the WHO guide values, which fluctuate between 250 and 1500 eq/ha/year for different ecosystems.

In order to monitor the transboundary pollution flows and to lay a factual basis for regional and international cooperation in this field, a monitoring station was installed in 1987 at the western border of Moldova. The Leova station was integrated in the EMEP system. For different reasons, the station was out of use between 1995 and 2003. In 2004, this station has been re-activated. The station currently monitors a limited number of parameters (not all those stipulated by the Convention on Long-Range Transboundary Air Pollution) due to financial constraints. It provides valuable information concerning the quality of atmospheric precipitation. Putting this station into operation was dictated, *inter alia*, by the ratification by the Government of the Republic of Moldova of two Protocols to the Geneva Convention (on POPs and on heavy metals) in 2002.

In the framework of the Aarhus Protocol on heavy metals, the Hydrometeorological Service monitored in 2004 the content of priority heavy metals (Cu, Ni, Zn, Pb, Cd, Cr) in atmospheric precipitation at the Leova station, according to the EMEP program.

The concentrations of most heavy metals in precipitation correlate with their concentrations in the soil. The diminution of the lead concentration in atmosphere can be directly related to the restrictions imposed on the use of leaded petrol in the entire region.

3.4. Climate Change and Protection of the Ozone Layer

Climate Change. The annual WMO report stated that in 2004 the average air temperature at the surface of the earth exceeded by 0.44^0Ñ its average value during the reference period 1961-1990, and this is the 4th warmest year starting with 1861. In the Republic of Moldova, the year 2004 also was unusually warm. Scientific evidence and concerns are growing that global warming might be triggered by the increasing concentration of carbon dioxide and other greenhouse gases in the atmosphere. One of the responses to those concerns at the international level was the UN Framework Convention on Climate Change.

The Republic of Moldova is a signatory of the Convention on Climate Change, ratified on 9 June 1995. The country has developed the first national communication for the Conference of the Parties.

Greenhouse gas emissions. The anthropogenic emissions of CO_2 dominate in the structure of greenhouse gases (CO_2, CH_4, N_2O, NO_x, CO). The dynamics of CO_2 emissions in 1990-2004 is presented in Fig 3.5. In 15 years, the greenhouse gas emissions diminished approximately 4-fold, mainly on the account of energy sector and industry evolution (emissions from transport did not change significantly). During the period 2000-2004, the CO_2 emissions remained close to 6000 Gg. The pollution sources from the energy sector and transports have the greatest share in Moldova, with 4500 Gg and 2145 Gg CO_2, respectively. The natural gas has the greatest contribution to emissions reaching 58% in 2004.

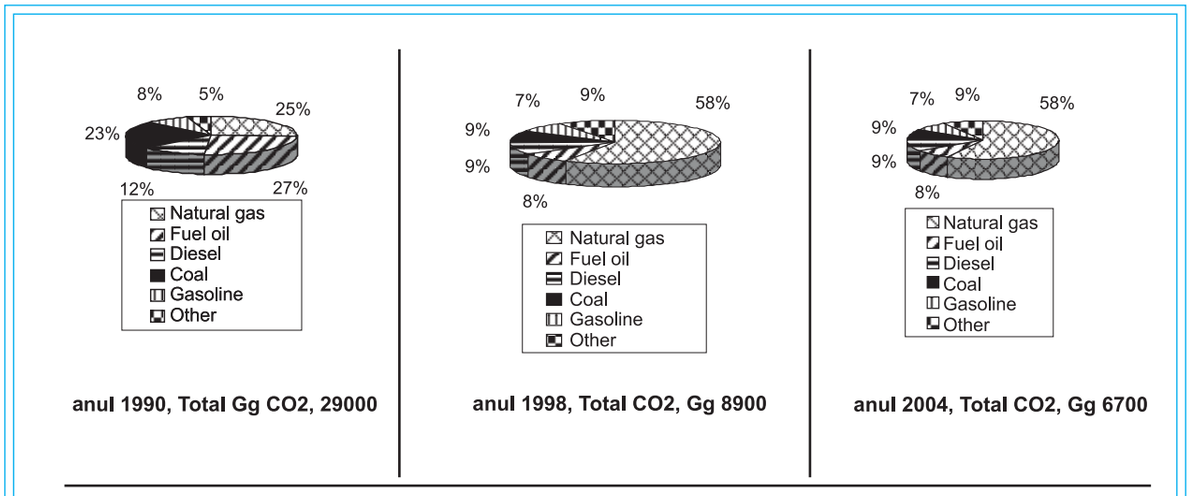

Fig 3.5. The dynamics of CO_2 emissions from burning fuels in 1990-2004.

Following the analysis of average seasonal values of air temperature and precipitation it was concluded that the process of general warming on the territory of the Republic of Moldova will result in warmer and wetter winters and hotter and dryer summers. The modeling predicts the extension of semi-arid and arid periods on the country's territory, starting with just the first evaluation period (2010-2039). The summer droughts will be more frequent and deeper. Intense rainfalls would lead to

higher erosion rate. Generally, a higher atmospheric instability is expected, which would increase the risks of natural calamities.

In 2003, the regional UNDP-GEF project „Capacity building for improving the quality of greenhouse gas inventories (Central Europe and CIS)" was launched in Moldova, aiming at creating a sustainable institutional and technical framework, allowing the targeted countries to improve their national capacities in this field.

Protection of the ozone layer. The Republic of Moldova is Party to the Vienna Convention on Protection of Ozone Layer (1985) and the Montreal Protocol (1987) with the amendments of London (1990) and Copenhagen (1992). In accordance with its international obligations Moldova applies restrictions to the import, export, re-export, transit and marketing of ozone depleting substances (ODS) as well as the equipment and products that contain such substances.

To this end were adopted the National Program of phasing out of ODS and the Regulation on the marketing and use of halogenated hydrocarbons. The strategy is to phase out the import and consume of ODS, in conformity with the Protocol schedule (CFC-12 totally out of use since 2008). The un-authorized import, export and re-export of ODS is strictly banned. The authorizations are issued by the Ministry of Ecology and Natural Resources. The Customs Department determines, jointly with the MENR, the custom checkpoints where transboundary transport of ODS can take place and enforces the legal requirements. The State Ecological Inspectorate was equipped with adequate instrumentation for determining the type of ODS. An electronic database was established on ODS reuse/recycling.

The Republic of Moldova does not produce any substance regulated by the Montreal Protocol. The refrigerating sector is the main consumer of ODS, using 51.45 tons ODP (ozone depleting potential) in 1996; 37.00 tons ODP in 1998; 17.231 tons ODP in 1999; 13.836 tons ODP in 2000; 21.894 tons ODP in 2001; 21.60 tons ODP in 2002; and 22.9 tons ODP in 2003. The quasi totality of these amounts is represented by chlorofluorocarbons (CFC) listed in Annex A, Group 1 of the Montreal Protocol. The substances from Annexes C and E of the Montreal Protocol are represented in Moldova by hydrochlorofluorocarbon-22 (HCFC-22) and methyl bromide. The latter is not allowed for agriculture use.

Due to new equipment for freons re-use and re-cycling during operation and maintaining of refrigerating installations, supplied to Moldova in the framework of a technical assistance project, as well as to training of the technical personnel and implementation of new industrial technologies, the use of ODS in the country decreased three-fold.

3.5. Air Quality Management

The protection of air quality is the prerogative of the Ministry of Ecology and Natural Resources, through the development and enforcement of the policy and legal framework, organizing the monitoring of air quality, developing air protection strategies and plans. The Law on environment protection (1993) and the Law on the protection of atmospheric air (1997) create the framework for MENR activity. A number of regulatory and economic tools as well as coercive measures are used to assure compliance with the requirements of national law and international agreements,

During 2004, the State Ecological Inspectorate, together with the road police, has checked 10,643 cars for exhaust gas emissions. In 914 out of 8,344 controlled carburetor cars, and in 268 out of 2,299 diesel cars emissions above the allowed limits were recorded. This resulted in taking off the traffic 99 cars and imposing fines on 590 drivers and/or managers.

It has to be mentioned that Moldova has a relatively long experience with using electric public transport (trolley-buses), which is the least polluting type of transport. In 2004, the fleet of trolley-buses increased by 14 units as compared to 2003, totaling 415 units.

One of the efficient regulatory instruments is environmental permitting. In 2004, the State Ecological Inspectorate (SEI) issued 821 air emission permits for stationary polluting sources. 708 of the checked economic entities were found acting in breach of the law and administrative court actions were initiated against them. The most frequent environmental violations are: working without environmental permit and malfunction of purification/treatment installations.

The industrial and energy units presently have 2293 gas purification installations; 162 of them are not in operation. In 2004, 66 new installations have been commissioned.

The economic downturn of the 1990s contributed to the interruption of self-monitoring activities in most of the industrial and power units, except for a few biggest entities in Chişinău and Bălţi. In 2004, SEI took 5,735 samples from the stationary sources at 76 enterprises. 15 units were found to be not in compliance with permit requirements, exceeding the prescribed emission limit values (ELV), specifically for NOx and particulates.

Combating air pollution in industry is confronted with a number of technological and economic problems. These are: lack of effective methods for capturing nitrogen oxides, phenols, formaldehyde, VOC, and ammonia emissions, on the one side, and too small pollution charges and penalties for non-compliance, on the other side. The level of current air pollution charges is incomparably lower than expenditures necessary for complying with air protection requirements and it is simply economically unprofitable to try to keep up with prescribed ELV. Generally the penalties for non-compliance are too small to serve as a serious disincentive to environmental offenders. Quite often, offenders prefer to pay the penalty and to keep working in breach of law.

The implementation of economic methods of environmental management („Polluter pays" principle) is facing difficulties and the accumulation of financial resources in the national and local Environmental Funds is small. The money accumulated in 2004 from air pollution charges totaled approximately 2 million MDL (some 160,000 USD), which is 0.6 million MDL less as compared to 2003.

Despite the mentioned above, several enterprises undertook technological changes, which contributed to the diminution of air pollution, e.g. replacing solid/liquid fuel for gas, installing analytic and purification equipment, etc.

4. STATE AND PROTECTION OF AQUATIC RESOURCES

4.1. State of Aquatic Resources

Surface water quality. Surface water monitoring is the task of the State Hydrometeorological Service (HMS), which has a network of 49 stations on 16 rivers and 7 water bodies. The HMS monitors 49 chemical and 5 biological parameters in water.

The water quality in Nistru, Danube and Prut rivers did not change significantly as compared to previous years (Fig. 4.1 and 4.2). The integrated water pollution index (WPI) – the average ratio between the concentrations of 6 selected pollutants (ammonium, nitrite, nitrate, BOD_5, oil products and phenols) and their MACs – indicated an improvement in several sections.

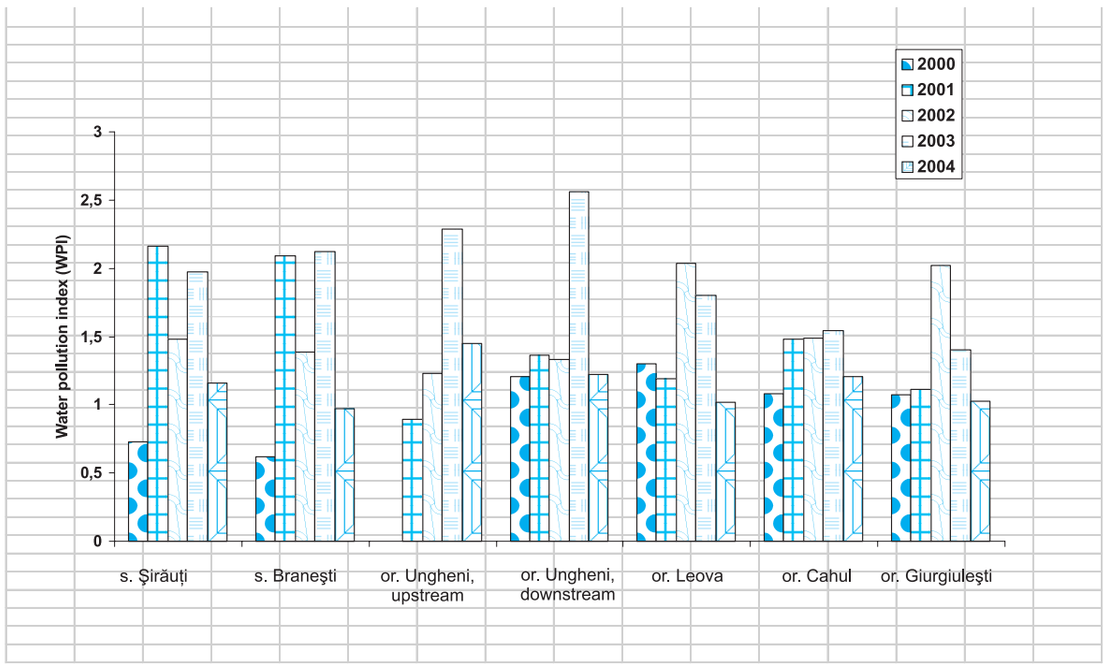

Fig. 4.1. Water quality in river Prut, 2000-2004

The oxygen regime was satisfactory except for a few cases in summer time when dissolved oxygen in the Danube, Dniester and Prut rivers decreased to 4.5-5.5 mgO_2/dm^3. Generally, the large rivers mentioned above show a moderate pollution level (water quality class II-III). The average annual concentrations of ammonium and nitrite were well below maximum allowable concentrations (MAC), while phenols and copper slightly exceeded the MAC values in Dniester and Prut. No cases of high/extremely high pollution were recorded.

The pollution of small internal water courses remained severe, with water quality classes III–V („moderately polluted" - „intensely polluted"). The river Bac, flowing through Chisinau (the capital city), is badly affected due to the inflow of poorly treated wastewater and runoff water as well as its low dilution capacity. Recorded concentrations of ammonium, BOD_5, oil products, phenols, and detergents downstream of Chisinau exceeded tens and even hundreds of times the MACs. The concentration of dissolved oxygen on this stretch of the river went as low as 1 mgO_2/dm^3. The recorded level of

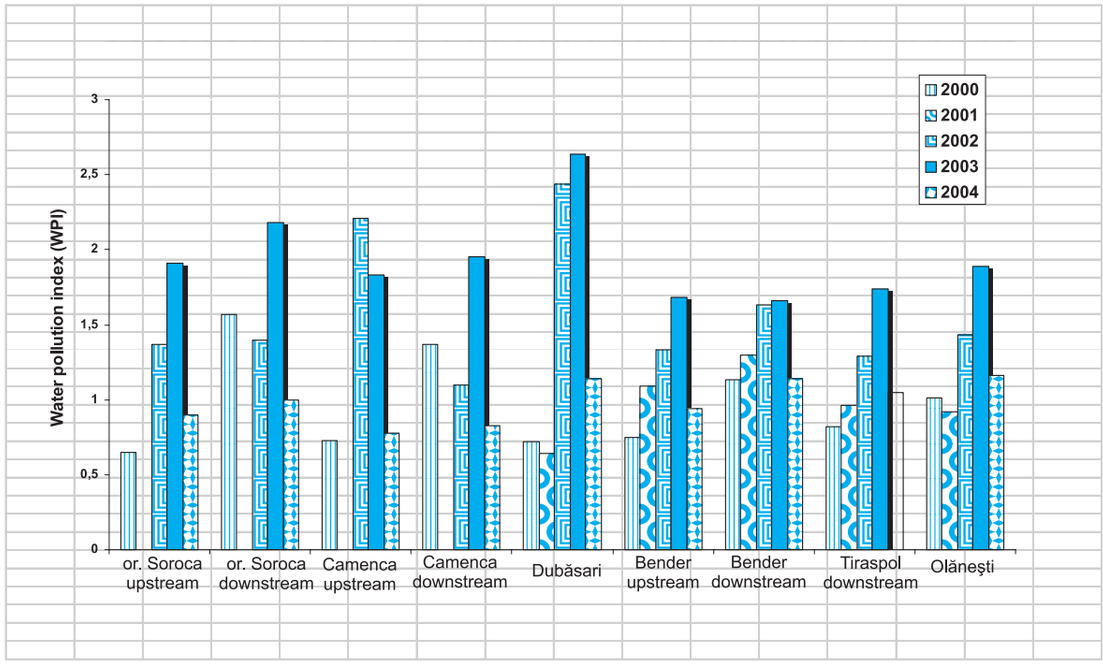

Fig. 4.2. Water quality in river Dniester, 2000-2004

nitrite in river Cogâlnic, downstream of the town Hânceşti, exceeded up to 70 times the MAC level. Along the year, 12 cases of extremely high pollution were registered, when the MAC was exceeded 100 times or more, as well as 61 cases of high pollution, when the MAC was exceeded 10 times or more.

The most heavily polluted small rivers, in urgent need of rehabilitation measures, are Bac (downstream of Chisinau), Raut (downstream the city of Balti until confluence with the Dniester river), Cogalnic (downstream the town of Hancesti), Lunga (upstream and downstream the town of Ceadar-Lunga).

The hydrobiological monitoring of the Prut, Danube and Dniester rivers showed the water quality class III ("moderately polluted"). The small internal rivers predominantly fall in class IV ("polluted"). The sanitary-epidemiological status of surface waters used as bathing waters or for potable purposes is poor: on average, 22% and 50% of water samples failed to meet sanitary-hygienic standards in 2004, for chemical and bacteriological parameters, respectively.

The phytoplankton communities of the small tributaries to the Prut river are now much less divers than a few decades ago. The samples collected in 2004 totaled 196 species of algae as compared to 517 species according to a survey in the early 1960s. The composition of species also changed: species preferring cold and clean waters have disappeared, the share of green algae diminished markedly.

Zooplankton communities of river Prut comprise 39 species and are less abundant than a few years ago. The macrozoobentos of the river ecosystems includes 65 species. The average biomass of zoobenthos (without mollusks) is 4.1 g/m^2, while in the middle course of the river it reaches 27 g/m^2 indicating a high level of organic pollution.

The saprobiologic analysis of the water quality reveals that the middle course of river Prut can be characterized as beta-mezosaprobic (class III, "moderately polluted") while the lower stretch is rather alfa-mezosaprobic, with higher degree of organic pollution (class IV, "polluted").

Groundwater quality. The quality of groundwater is largely influenced by the geologic and geochemical conditions, notably by the natural anomalies of fluoride, strontium and selenium. In different aquifers, the concentrations of fluoride range from 0.2 to 18.0 mg/l, the strontium, between 0.1 and 17.0 mg/l and selenium, between 0.01 and 0.17 mg/l. Often ammonia naturally occurs in concentrations as high as 20 mg/l. In the same time, evidence is growing that the human factor plays an increasingly important role in the pollution of deep groundwater aquifers. Despite the lower abstraction of groundwater following the economic downturn, the pollution of deep aquifers increased via the infiltration of polluted water from the surface and supposedly through abandoned boreholes. As a result, an increasing number of deep groundwater sources are polluted with nitrogen compounds and so is the water in centralized water supply systems in several towns.

The large number of abandoned boreholes is one of the current concerns in Moldova. An inventory made by the State Ecological Inspectorate identified 1,630 such deep artesian wells (out of a total of 7,000) being out of use. They are usually abandoned without any supervision and can become major pollution sources for groundwater layers. These boreholes have to be conserved or decommissioned.

The shallow groundwater is highly vulnerable to anthropic impacts. The range of natural and man-induced pollutants includes nitrates, pesticides, sulfates, etc. Water hardness often exceeds the sanitary-hygienic standards by 2-5 times and more. The water quality in wells, does not comply with the national standard for potable water: 87% of the shallow groundwater samples exceed the MAC for nitrate.

The quality of groundwater abstracted for drinking purposes is particularly poor in the central and the southern region of the country, where half of the groundwater samples do not comply with quality standards for chemical parameters. Microbiological pollution is also widespread, particularly in the Center and the South (10% to 20% of water samples taken from water supply systems). In the same time, no outbreaks of water-born diseases were registered in 2004.

4.2. Water Pollution Sources

The water pollution sources are most often categorized as point sources and non-point (diffuse) sources. The point-source discharges of municipal and industrial wastewater are usually known and monitored and their pollution loads can be quantified. On the other side, non-sewerage dwellings, agriculture fields, as well as occasional or accidental spills have a non-organized character and are, therefore, difficult to monitor and control.

In the Republic of Moldova, the major point-source discharges are monitored. This primarily includes the wastewater discharges of the large water users and the municipal wastewater treatment plants. In the same time, data provided by the State Ecological Inspectorate (SEI) showed that other sources can be equally or more dangerous for the environment (e.g. water runoff from industrial sites, waste dumps) than point sources. The runoff from residential and industrial areas contributes to the surface waters significant loads of pollution (notably oil products and suspended solids). Domestic wastewater discharges from non-sewered population (70% of the total dwellings in Moldova) is another major pollution source.

Other potential major pollution sources are the filtration beds of sugar factories, sludge decantation beds of wastewater treatment plants (WWTPs), manure heaps, etc. Unfortunately, the environmental impacts of these pollution sources are not monitored. Lack of data hampers the sound assessment of the situation and taking

adequate pollution mitigation measures to prevent further degradation of surface and ground waters.

On the other side, the wastewater treatment plants play an important role in surface waters protection. Approximately 580 WWTPs with biological step have been built in Moldova by the early 1990s. An inventory made by SEI in 2004, identified only 93 WWTPs, operating at low (25-30% of installed) capacity and providing a poor treatment of wastewater. Out of those, only four WWTPs ensured the required quality of effluents. The other 89 treatment units failed to comply with the treatment requirements; some of them work with the mechanical step only, many have a high degree of depreciation and need significant investments for rehabilitation. All WWTPs were transferred on the balance of municipal authorities, which lack qualified personnel as well as resources for investment and operating costs. These factors result in continuous worsening of treatment at WWTPs in Călăraşi, Cantemir, Orhei, Edineţ, Ungheni, which discharge poorly treated effluents to the rivers (concentrations of BOD_5 and suspended solids exceeding the required limit values 5 to 34 times).

However, the amount of organic matter (BOD), suspended solids and ammonium discharged in 2004 to the surface waters has reduced considerably compared to 1990-1995.

It must be noted that the number of small WWTPs (treatment capacity under 400 m^3/day) decreased sharply (Fig. 4.3). Such units usually operate in small settlements where the lack of resources for maintenance and/or rehabilitation is particularly acute.

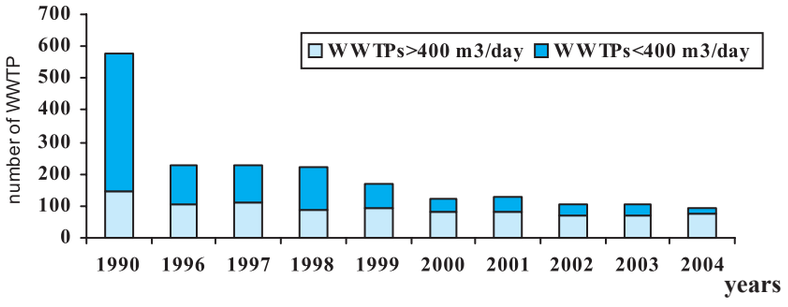

Fig. 4.3. Number of WWTPs in operation

In the early 1990s, the big livestock, pig and poultry farms were major sources of pollution. Their number decreased markedly during the last decade: in 2004 there were only 75 farms left (out of 210 in the past) and the number of livestock in there is relatively small, so that they represent a smaller environmental problem now. In the same time, most livestock is raised now in the private households. The animal waste is not anymore concentrated in a limited number of sites; it is spread everywhere, on both private and public land, threatening the drinking water sources and the surface waters. This major pollution source became more diffuse and less manageable.

Another source of surface waters pollution is the non-observance of protection strips along the water courses: Within the settlements, these are transformed into domestic waste dumps while outside residential areas the land is often cultivated until the banks of the rivers thus resulting in water pollution with eroded soil particles and agri-chemicals.

4.3. Transboundary Pollution

All major water courses in Moldova (the Danube, Prut and Dniester rivers) are transboundary in character. The management of transboundary rivers requires the

joint effort of the neighbor countries (Moldova–Romania; Moldova–Ukraine) and is regulated by international conventions, in particular the Convention on Protection of Transboundary Rivers and International Lakes (1992) and the Convention on Cooperation for the Protection and Sustainable Use of the Danube River Basin (1994).

In the framework of the Danube Convention, the Hydrometeorologica Service regularly exchanges information with relevant authorities from Romania and Ukraine regarding the water quality in transboundary rivers. An accident emergency warning system is working in the Danube basin through the Principal International Alert Centers (PIAC) set in every Danube country, including Moldova.

The quality of transboundary rivers was on an upward trend during the last years. In 2004, no cases of high or extreme chemical pollution of transboundary water courses were recorded.

The operation of the hydropower complex in Novodnestrovsk (Ukraine) resulted in the modification of hydrologic and temperature regime, as well as the hydrochemical and hydrobiological status of river Nistru within the boundaries of the Republic of Moldova. This modified the current velocity and brought an increase of water turbidity and siltation of the riverbed in the downstream reaches. Since the station was put into operation, the temperature in the downstream reaches of the river dropped due to releases of cold water from the deep layers of the Novodnestrovsk reservoir through the turbine outlets. Thus, in summer time the water temperature in Nistru river at Otaci, just downstream the barrage, is fluctuating between 11-14şC, as compared to the normal average of 23şC. The un-natural temperature regime has a deep impact on the life cycles of water organisms as well as the physical and chemical processes in the river.

4.4. Management of Water Resources

Currently the main source of water abstracted in Moldova for different uses is the Dniester river (83.6%). Groundwater provides 15.2% of water used, river Prut contributes 1%, and the remaining 0.2% are abstracted from small internal rivers and water reservoirs.

The total volume of water abstracted for different purposes (industry, domestic, irrigation, etc.) did not change significantly during the last years. In 2004, it accounted for approximately 900 million m^3, which is some 3,000 million m^3 less than in 1990, mainly due to the drop in industrial and irrigation use (Fig. 4.4).

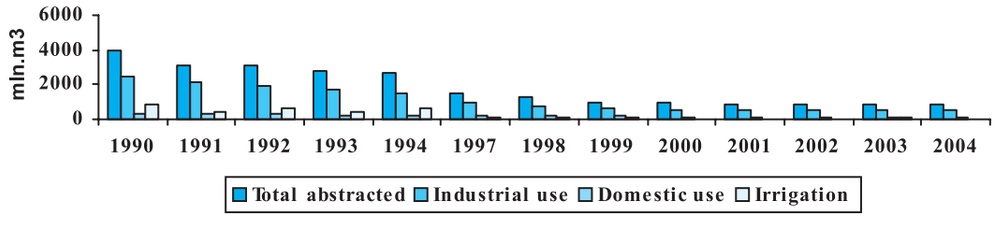

Fig.4.4. Water use for different purposes (million m^3)

The volume of effluents discharged by the WWTPs to the surface waters decreased accordingly. In total, 692 million m^3 of effluents, including 560 million m^3 of cooling water from the Dnestrovsk power station, were evacuated to the surface waters. What is worrying is the steady decrease of well treated wastewater along with the increase of poorly treated one (Fig. 4.5).

In 2002, the Government approved the Program of water supply and wastewater treatment for the settlements of the Republic of Moldova until 2006 requiring

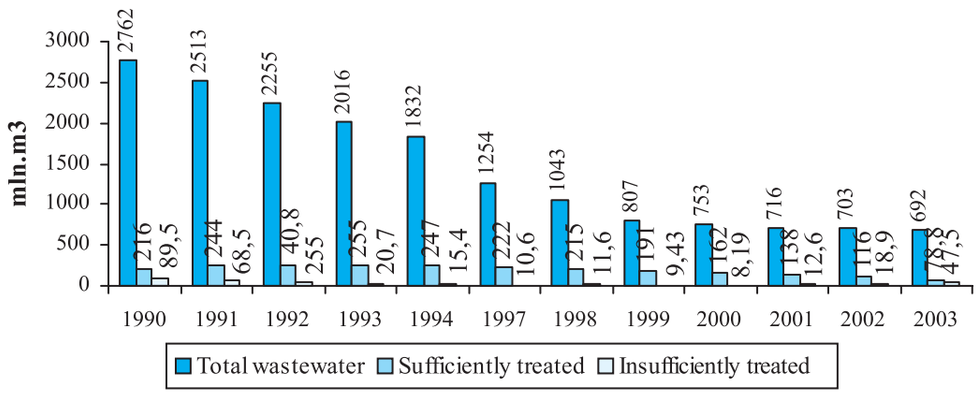

Fig. 4.5. Wastewater treatment (million m^3)

investments amounting to 1.24 billion MDL (approximately 100 million USD). In 2004, water supply and sewerage systems rehabilitation works were implemented in a number of towns, worth 114.7 million MDL. It must be noted that the state budget contributed only 10.9 million lei, the National Environmental Fund (NEF). 10.3 million MDL, while the bulk of the money came from local sources and foreign investments (Fig. 4.6).

The most significant foreign investments in the water supply sector were made by the EBRD, the World Bank, the Government of Denmark and the Kuwait Fund of Economic Development.

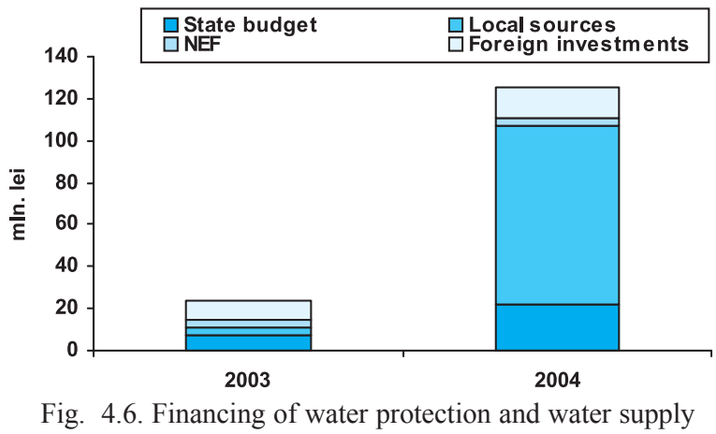

Fig. 4.6. Financing of water protection and water supply measures, million lei

In the framework of the Cooperation Program between the Republic of Moldova and Denmark, water supply rehabilitation works were implemented in the towns Edineţ, Călăraşi, and Străuceni, worth 43.6 million MDL. The World Bank Water Supply and Sewerage Pilot Project (12 million USD) is currently implemented in the towns Orhei, Cahul, Soroca and Ştefan Vodă.

The rehabilitation of the sewerage systems has attracted little investments so far. It is recommendable to consider – during the rehabilitation of small/medium-size WWTPs – replacing the current biological step (with suspended sludge and active aeration) for new systems with fixed microflora, which are much less energy consuming. To reach the necessary degree of treatment, the third treatment step has to be implemented whenever possible, going for the simplest methods like biological ponds, using aquatic vegetation, etc.

Most small settlements in Moldova are supplied from groundwater sources, which often pose quality problems. This calls for development of modern but low cost potabilization technologies for water from groundwater sources, using preponderantly local materials. In parallel, alternative methods of wastewater treatment have to be

considered that could be effective and cost-efficient in villages (e.g. constructed wetlands, reed beds).

The abstraction of groundwater dropped in the 1990s, however the pollution of groundwater did not decrease as expected, quite the opposite. It is considered that one of the main causes is the increasing direct contamination through the borehole wells. To stop the progressing pollution of groundwater via this channel it is necessary to urgently decommission the abandoned boreholes and to put under stricter control the issuing of permits for groundwater abstraction.

5. STATE AND PROTECTION OF SOILS

5.1. Land Resources and Status of Soils

The Republic of Moldova is endowed with fertile soils. Chernozems cover almost three quarters of total land area. These fertile soils are the main natural resource of the country and give a good basis for crop production. As much as 75% of total land is used in agriculture and 73% of agricultural land is arable land (Table 5.1).

Table 5.1

Statistics on agriculture land, ha (2004)

Total land	3,384,600
Agriculture land:	2,528,300
including arable land	1,845,400
including perennial crops	298,000
including pasture	374,100
including irrigated land	300,000

Agriculture had a deep impact on the soil processes, through changing the balance of organic substances, the thermal and water regime, and the nutrients turnover. The general status of the soils can be characterized through distribution of areas with different site quality (Table 5.2).

Table 5.2

Site quality of soils in the Republic of Moldova

Site quality class	Site quality value, points	Area, thousand ha	Share of agriculture land, %
I	81-100	689	27
II	71-80	536	21
III	61-70	382	15
IV	51-60	382	15
V	41-50	303	9
VI	21-40	153	6
VII	<20	178	7
Average	65	2,556	100

The soil classes I and II constitute the most valuable natural heritage of the Republic of Moldova. Soil classes III-VII (site quality under 70 points) cover 52% of the agriculture lands and are all degraded to a certain extent. 13% of the agriculture lands have very low site quality (under 40 points) and fertility.

The fertility of Moldovan soils suffered along the last two centuries of intensive agriculture, but the processes of soil degradation particularly increased in the XX century and have been exacerbated during the last 10-15 years. Disturbed crop rotation and dropped application of mineral and organic fertilizers resulted in a significant negative balance of humus and nutrients in the soils and leaded to their biological degradation. During the last years the amount of manure incorporated under the crops did not exceed 0.2 t/ha on average, while the recommended quantity is 10 t/ha.

During the last 12-15 years, the area of perennial herbs decreased from 180-200,000 ha to 45-50,000 ha. As a result, the negative balance of humus reached 0.6–0.8 t/ha annually and soil fertility diminished markedly. Currently the average content of humus in Moldovan soils is 3.0-3.5%, as compared to 4-5% in the 1950s and 5-6% at the end of the XIX century.

According to data provided by the Soil Institute, the average pondered content of mineral nitrogen in soil in 1989 was close to the optimum level (115 kg/ha). Presently, only 2-5% of investigated areas correspond to this level. The content of $N\text{-}NO_3$ recorded in 2002 (34 kg/ha) is four times less than the optimum level. The average concentration of mobile phosphorus in soils is presently 18–21 mg/kg, which is at the limit between moderate and low content. In 5–6 years the phosphorus reserves will be exhausted and the soil quality will return to the status of un-fertilized soils (the natural content of phosphorus in Moldovan soils is 10–15 mg/kg). It must also be noted that the deficit of phosphorus is decreasing the efficiency of nitrogen uptake by the crops, thus diminishing the harvests and/or raising the production costs.

The permanent tillage of arable soils affected their natural grain structure. Destructurization leaded to the modification of soil physical properties: reduced permeability and aeration, compaction and formation of a crust. This prevents the nutrients reaching the crop roots and results in decompensation of nutrient balance and deficitary water regime in the topsoil layer. The deterioration of the soil structure is also caused by the intense dehumification of arable soils. It is estimated that soil fertility decreased by 10% as a result of secondary compaction of the soils.

The conservation of Moldovan soils fertility requires as a minimum: (i) incorporating 6-7 million tons of manure each year; (ii) increasing the share of nitrogen-fixating crops within field crop rotations to 20-25%, with accumulation of 30-35 kg of nitrogen per ha; (iii) applying optimum amounts of mineral fertilizers, including 100,000 tons of nitrogen and 91,000 tons (40 kg/ha) of phosphorus; (iv) observing the crop rotations; (v) minimizing soil tillage.

5.2. Sources of Soil Pollution

Soil pollution is a major concern since no effective treatment method exists to restore the natural qualities of the soils. Polluted soil can be rehabilitated only under the long-lasting influence of natural factors.

An important factor of the anthropic impact on soils is the application of fertilizers and pesticides. During the last decade the volume of mineral fertilizer incorporated in agriculture soils has been reduced dramatically but is recovering during the last 2-3 years; the use of organic fertilizer simply collapsed and no signs of this trend reversal are visible (Fig. 5.1-5.2).

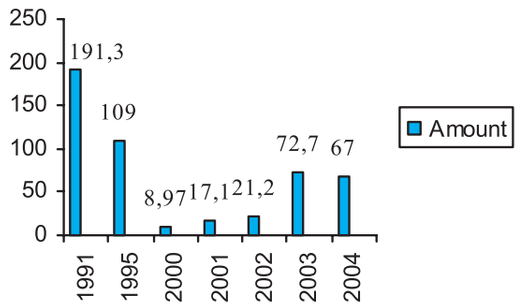

Fig. 5.1. Mineral fertilizer use (,000 tons)

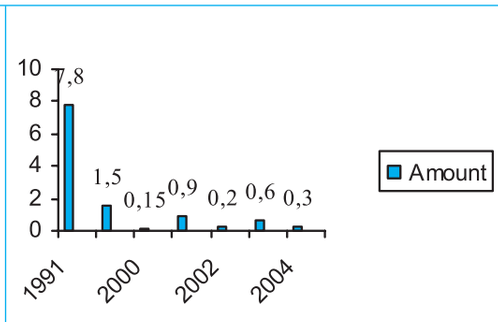

Fig. 5.2. Organic fertilizer use (million tons)

Effects of poor management of pesticides

The use of pesticides has also dropped. However, pollution of soils in the vicinity of former pesticide storehouses remains an actual problem. More than 200 storehouses have been dismantled during the last years and some of the remaining are in a poor condition, unfenced, unguarded, without doors and windows, thus being sources of chemical pollution. Recent investigations of the State Ecological Inspectorate (SEI) showed a significant pollution of these sites and adjacent areas with organochlorinated pesticides.

On the other side, the HMS monitoring program on pesticide residuals in agriculture soils, implemented on 52 sites all-around the country in 2004, showed a preponderantly low level of soil pollution with organochlorinated pesticides (Fig. 5.3). The ΣDDT residuals in soils amounted to 0.038 ppm on average. The MAC (=0.1 ppm) was exceeded in 8.7% of samples and there was one episode of significant exceedance of the standard (1.433 ppm) registered. The average recorded level of ΣHCH isomers in investigated soils was 0.01-0.02 MAC. Copper and nitrate exceeded the MAC episodically.

The above results are confirmed by the soil survey undertaken by the Center for Agrochemical Service involving 30,000 ha of agriculture land. The concentrations of DDT and ΣHCH in the soils were clearly decreasing along the last three years. The general conclusion is that there is no risk of contamination of soils and foodstuffs with these substances anymore. This does not exclude, however, the existence of small areas, adjacent to old pesticide storage facilities, which could be polluted with DDT and ΣHCH. The monitoring of triazine pesticide did not reveal significant concentrations of those in any region of the country.

The background pollution of soils with pesticides was investigated in the scientific reserve "Codru" and in the Bălţi and Bugeac steppe. The average content of ΣDDT and ΣHCH was close to their concentrations in other investigated lands.

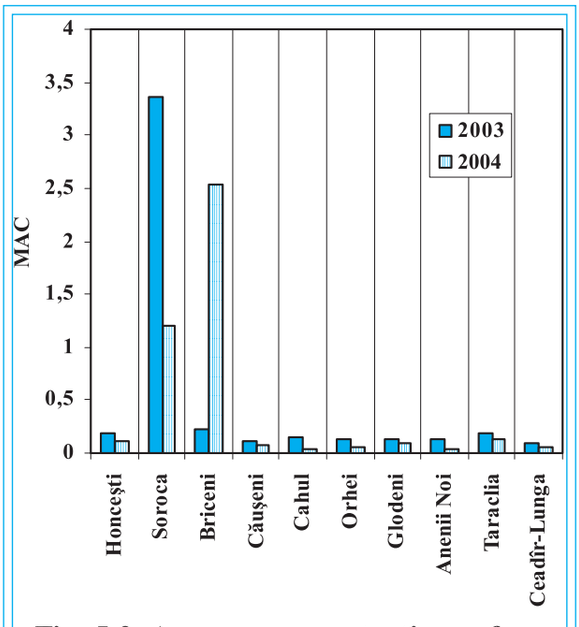

Fig. 5.3. Average concentrations of ΣDDT in soils, as ratio to MAC

5.3. Soil Degradation and Desertification

The degradation of soils implies the reduction or total loss of their biologic or economic productivity caused by anthropic or natural processes. The main factors favouring the soil degradation processes in Moldova are the following:

Geological structure can determine the formation of a hydrologic regime contributing to increased activity of landslides and erosion as well as to high salinity of groundwater.

Landscape has a major influence on the forms and intensity of erosion and landslide processes. In this sense, the most important landscape features are: the degree of territory fragmentation; altitudes variation; average inclination; length and abruptness of hillsides, etc. The territory of Moldova is predominantly a hilly plain interspersed with deep river valleys. In Moldova, more than 80% of agriculture lands (about 2 million ha) are situated on hillsides. These (mostly arable) areas are susceptible to erosion. According to last evaluations, the area of lands affected by erosion exceeds 850,000 hectares or approximately 35% of agriculture land (Fig. 5.4).

Erosion is causing annually losses of fertile soil from agriculture lands of 26 million tons, on average. This quantity of topsoil contains: humus, 700,000 tons, nitrogen, 50,000 tons; and phosphorus, 34,000 tons. This causes major economic losses by diminishing agriculture productivity. The indirect damages from erosion refer to: siltation of water bodies; pollution of soils and groundwater with agri-chemicals washed out from the hillsides; destruction of roads and hydrotechnical works, etc. The total annual economic losses from erosion are estimated at 2,432 million MDL (approximately 200 million USD).

Climate. The heavy rains often occurring during the warm period of the year increase the risk of erosion.

Anthropic activities. The main factors contributing to the intensification of erosion processes are: large share of arable land; deforestation (esp. forest belts); ploughing along the slope; improper planning of the road network; insufficient use of grassing, exaggerated share of several crops (e.g. corn, sunflower) in crop rotations, tillage with heavy machinery.

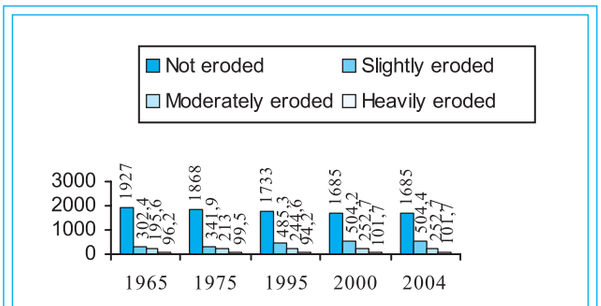

Fig. 5.4. Soil erosion in Moldova (,000 ha)

Dehumification of arable soils is a global process, which is unlikely to be stopped within the present system of conventional agriculture.

Soil mapping recently (2004) implemented on 70,000 hectares by the Center for Agrochemical Services, revealed that most agriculture soils in Moldova have a poor to moderate humus saturation.

The highest losses of humus occur in eroded soils but non-eroded soils also are subject to dehumification. During the last 30 years the normal arable soils have lost on average 10% of their productivity through intense dehumification.

Deterioration of lands by landslides. The total area of lands affected by the landslides is 40,000 ha. The most affected part of the country is the central part. During the last years, the area of landslides enlarged annually by 1000 ha (Fig. 5.5).

The number of active ravines is about 6200 and the lands completely deteriorated by ravines account for approximately 80,000 ha. The ravines take out of the agriculture use about 1000 ha of lands each year. The respective economic losses are estimated at MDL 83 million per year.

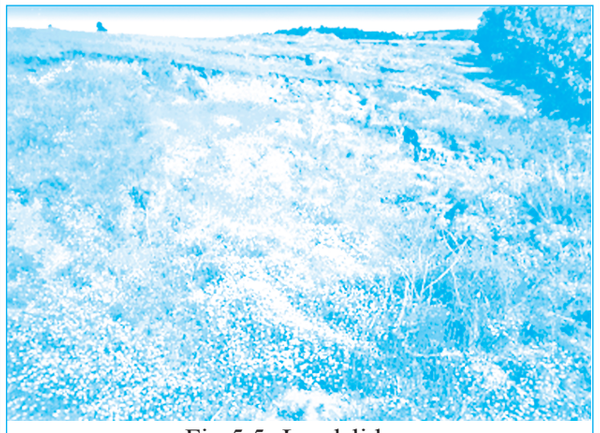

Fig.5.5. Landslides

Salinization and alcalinization of the soils. The total area of alkalinized soils is 107,500 ha, of which about 35% are arable lands and 65% are pastures. The rehabilitation of such soils demands extensive and costly reclamation works, including drainage in river valleys. The total area of salinized soils approaches 112,200 ha, of which 30% are arable lands and 70% are pastures.

Irrigation often leads to the deterioration of soil structure; compaction, salinization and alcalinization of soils; raising the groundwater level and its mineralization, etc. The state of 13,000 ha of irrigated lands is poor. The productivity of those lands decreased on average by 30%. During 2004 , only 14,000 ha have been irrigated.

Deep ploughing. In the process of establishing large plantations of vineyards and orchards approximately 546,000 ha of land were ploughed as deep as to 50-60 cm. This resulted in disruption of the original natural alternation of soil layers and bringing to the surface the subjacent soil horizons with low humus and high carbonate content. This decreased the fertility of the topsoil layer (0-30 cm), a process which is particularly strong in the case of deep ploughing of eroded soils. Using former orchards and vineyards for field crops cultivation showed a significant drop in the productivity of those lands.

Biologic degradation of the soils. The intensive use of arable lands, associated with widespread processes of physical and chemical degradation, leaded to the biologic degradation of soils. Microbiologic processes of humus mineralization have intensified, the activity of saprophagous microflora decreased, which conversely leaded to the increase of number and abundance of toxic species of microflora. The modifications mentioned above resulted in dehumification, soil de-structuring, decreasing of purification capacity.

The Republic of Moldova is affected by desertification. One of the factors of desertification is the general ecological disbalance. The natural and semi-natural ecosystems (forests, forest belts, hayfields, pastures, wetlands, water bodies) account for only 17% of the Moldovan territory. Soil erosion and landslides are other major driving forces of desertification, along with factors of political, social, cultural and economic origin. Desertification is affecting sustainable development through poverty spreading out, poor public health, emigration, etc.

5.4. Management of Land Resources

The sustainable management of land resources implies combining the activities and technologies in a way to ensure concomitantly high biologic productivity, food security, soil protection, economic viability and social acceptance.

The management of land resources in the Republic of Moldova is dealt with by the local public authorities and several ministries, state departments and agencies.

5. STATE AND PROTECTION OF SOILS

The land reform is effected by the local administrations, MAFI, the Ministry of Economy, the State Agency for Land and Cadastre. Supervision over the use of lands is the prerogative of the Government through the State Service for Land Property Regime, and the local public authorities. The State Ecological Inspectorate enforces the legal requirements concerning the land and soils protection. In the same time, it is considered that Moldova lacks a unified hierarchic system of administration, control, regulation and protection of land resources including research and prospecting, cadastral, monitoring, design and reclamation institutions.

The Republic of Moldova has the legal framework necessary for land management. The main legal acts are: the Land Code, the Law on Property, the Law on State Regulation of the Land Property Regime, the State Land Cadastre and Land Monitoring, the Law on the Farmer Household, the Law on the Land Tax and Way of Taxation, the Law on the Normative Price and Way of Land Sell-Purchase. They are accompanied by a layer of secondary legislation.

Despite the existing institutional and legal framework, the impression is that currently the land management in Moldova is rather chaotic and ineffective than based on clear strategies and targets. The process of adaptation of the state authorities to the new economic and social environment in agriculture is still under way. The violations of land legislation are many (2,138 cases identified in 2004) while the compliance assurance and enforcement capacity is deficient.

The replacement of big collective farms by a large number of small private farms and cooperatives, and the atomization of agriculture land brought in a lot of new economic, social, and environmental problems. Solving them implies setting and implementing a comprehensive system of land administration and management using a number of economic and administrative tools and based on a proper information system. In the field of environment, this would aim at fighting the soil degradation processes and ensuring the sustainable use of agriculture soils.

Consolidation of land and agricultural production is a clearly expressed objective of the state authorities. Most soil scientists consider it as a positive step towards better land planning and applying more effective land conservation measures.

6. BIOLOGIC AND LANDSCAPE DIVERSITY

6.1. Status of Vegetal Resources

The vegetal resources of the Republic of Moldova can be categorized as: forest, steppe, meadow, aquatic and paludal resources.

The forest resources comprise the whole of the products and benefits obtained from forest management. The Republic of Moldova has 362,700 ha of forests covering 10.7% from the country's territory, which is a very low figure as compared to the European average (29%) or the countries of the same biogeographic region – Romania (28%), Bulgaria (35%) or even Hungary (19.5%).

Moldovan forests preponderantly (98%) consist of broad-leaved species, dominated by oak species and acacia. Beech, ash and hornbeam are other common species (fig. 6.1).

The forest coverage differs between different parts of the country: 8.1% in the north, 14.5% in the centre and 7.7% in the south. The Codrii Hills in the central part of Moldova have the highest concentration of forest.

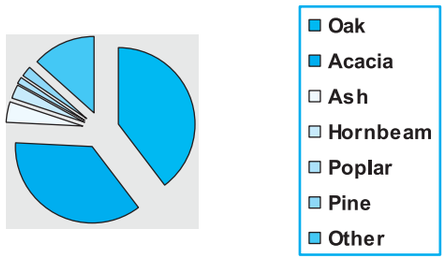

Fig. 6.1. Distribution of forests by species

The responsibility for forestry management is with the state agency Moldsilva. The forestry authorities manage 89% of the forest fund, the municipalities 9% and other authorities 2%. Only 400 ha of forests are private. Tree and secondary products from the forests are important for the official as well as unofficial economy.

Forests are an important stabilizing factor for the environment. They should be managed well and the forest area should be increased in order to preserve biodiversity, to stabilize land threatened by erosion and landslides and to protect water resources. All Moldovan forests are categorised as of functional group 1, having exclusively environment protection functions. Forests make up 95% of protected areas, the total area being 63,000 ha.

The total volume of wood in Moldovan forests has been estimated to be 45.3 million m^3 or 125 m^3/ha. The mean gross annual increment is 3.3 m^3/ha while the total growing stock is about 1.2 million m^3 per year. The most productive are poplar standings (310 m^3 /ha), the least productive is acacia (132 m^3/ha). Forest cuttings (for maintenance, regeneration, clearing and sanitary purposes) increased from 374,000 to 439,000 m^3 between 1997 and 2003. Annually 3,000-4,000 ha of forest is being regenerated. As a result of declining protection efforts the problem of forest pests and diseases has increased significantly over the past ten years.

Besides wood, the forests provide a long list of secondary products including berries, nuts, mushrooms, medicinal plants, game, etc. Moldsilva collects annually in the forests over 2000 tons of secondary forest products, which is mostly exported as raw material for pharmaceutical industry.

Moldovan forests host 1008 species of vascular plants, out of which 60 species have been included in the Red Book of the Republic of Moldova. The forest vegetation includes 137 forest associations from 11 forest formations. The biggest formations are: *Querceta petraeae* (52 associations), *Querceta roboris* (26 associations) and *Fageta sylvaticae* (16 associations).

Besides forests, Moldova has 30,500 ha of forest protection belts and 18,500 ha of bushes planted to combat soil erosion, to protect field crops and water bodies. These areas have declined due to illegal cutting for firewood. Many of them degraded because of lack of proper maintenance and invasion of alien species like box elder (*Acer negundo*). However, they still play an important stabilizing role in the agriculture landscapes and in maintaining the ecologic balance.

The targets established by the first National Report „Millennium Development Objectives for the Republic of Moldova" (2005) are to increase afforested land to 11% by 2006, 12.1% - by 2010 and 13.2% - by 2015.

The steppe and meadow herbaceous communities covered in pre-historical times more than half of this territory. Presently (2004) they cover 376,900 ha, which is 11.2% of country's territory. They host 790 species of vascular plants, out of which 30 rare species have been included in the Red Book of the Republic of Moldova. The steppe and meadow vegetation includes 165 herbaceous associations from 30 formations. The biggest formations are: *Agrostideta stoloniferae* (20 associations), *Festuceta valesiacae* (18 associations), *Puccinelieta distantis* and *Elytrigieta repentis* (11 associations each), *Bortichloeta ischaemi* (9 associations).

The steppe communities are dominated by xerophytic plants, adapted to droughts and semi-aride conditions. In the past, steppe vegetation covered large areas in the north and south of the present territory of the Republic of Moldova. Nowadays, only a few spots of natural steppe communities have been preserved in the south of the country.

The meadow communities have largely been degraded. As a result of hydrotechnical works implemented in the river floodplains the groundwater level deepened and the habitats got dryer. Many characteristic plants were replaced by ruderal species, the biologic productivity of meadows decreased. Most of these areas are used for pasture, and this is another factor of meadows degradation.

The aquatic and paludal vegetation comprises about 60 species of vascular plants, as well as 57 associations from 14 formations. The biggest formations are: *Phragmiteta australis* (16 associations), *Typheta angustifoliae* (10 associations), *Potamogehetoneta perfoliati* (6 associations) and *Glycerieta maximae* (7 associations).

This type of vegetation was associated with areas in the floodplains and valleys of the main rivers, including natural lakes, wetlands, etc. In 1960, the total area of wetlands made up some 26,000 ha. Most of the wetlands were drained in the 1970-1980s, and the area of paludal communities shrinked.

On the other side, the aquatic vegetation conquered new areas as a result of human activities. The active siltation of water reservoirs upstream of the barrages or river embankments created conditions for development of reed and bulrush. The reed beds have an economic value for local population, being used for construction, artifacts or fodder, particularly during dry years. Other species are also used for different purposes, e.g. the duckweed (*Lemna*) and *Salvinia natans* – as feed for poultry and geese; *Acorus calamus* – for medicinal purposes.

Acvaculture of algae from genus *Spirulina* has been recently implemented following the research by the Institute of Microbiology and the State University of Moldova. Several pharmaceutical products based on *Spirulina* have been placed on the market.

6.2. Status of Animal Resources

The fauna of the Republic of Moldova comprises 462 species of vertebrate and about 14,500 species of invertebrate animals. Among vertebrates, there are 70 species

of mammals, 281 species of birds, 14 species of reptiles, 14 species of amphibians, and 82 species of fish. Most invertebrates are represented by insects (12,000 species).

The diversity and abundance of animal communities is highly conditioned by the status of the natural ecosystems. The anthropic pressures affected all natural ecosystems in Moldova, but the steppe, meadow and aquatic biocenosi suffered the most. This had an impact on the animal communities too.

The forest ecosystems host the largest number of vertebrate species as compared to other ecosystems. Moldovan forests suffer from many anthropic pressures. This had a negative impact on several populations such as the marten (*Martes martes*), the wild cat (*Felis silvestris*), some species of bats, the hawks, the red forest frog (*Rana dalmatina*), the green frog (*Hyla arborea*).

The terrestrial vertebrates from steppe and meadow ecosystems also are in a difficult situation. Populations of the ground squirrel (*Citellus citellus*), the spotted squirrel (*Citellus suslicus*), the polecat (*Mustela putorius*), the steppe viper (*Vipera ursini*), the banded chicken snake (*Elaphe quadrivittatus*), the skylark (*Alauda*), are continuously shrinking. The same is valid for several species of amphibians living at the edge of their areas such as the brown frog (*Rana temporaria*), fire-bellied toad (*Bombina bombina*) and the yellow-bellied toad (*Bombina variegata*).

The ornitofauna comprise 177 nesting species. A large number of birds in aquatic ecosystems are migratory species. During the last years, including 2003, the number of nesting birds as well as their abundance reduced considerably. The reptiles include 8 species, including species of Central European, Mediterranean and Ponto-Caspian origin.

The Red Book of the Republic of Moldova (second edition, 2001) includes 14 species of mammals, 39 species of birds, 8 species of reptiles, one species of amphibians and 37 species of insects. The species included in the Red Book and the rare species, are predominantly predators (birds, mammals), bats, reptiles and aquatic animals.

Several species of animals (*Sicista subtilis, Neomys fodiens, Rhnolophus ferrumequinum, Neophron percnopterus, Falco cherrug, Bubo bubo, Circus macrourus, Vipera ursini, Elaphe quatuorlineata* etc.) do not reproduce anymore in the natural conditions or are at the brink of extinction. During the last years, the populations of hunting species also reduced considerably (e.g. stag, roebuck, wild boar, hare, pheasant, partridge, duck, and goose).

The state of natural ecosystems in the Republic of Moldova is degrading continuously and faster, as compared to the neighbouring countries (Romania, Ukraine); consequently the animal populations also are decreasing. This is a result of high anthropic pressures and the vulnerability of local ecosystems, communities and animal populations at the edge of their areas.

Hunting species. The number of red deer, fallow deer and wild boar remained stable. The population of pheasant is decreasing. Continuous degradation of the aquatic ecosystems put under increasing threat the hunting birds. The gray goose (*Anser anser*) did not nestle in the Lower Prut wetlands anymore, while the mallard (*Anas platyrhynchus*), the variegated duck (*Anas strepera*), the red duck (*Tadorna ferruginea*) show poor reproduction rates. Along with natural ecosystems degradation, poaching and the large number of stray dogs also have a marked negative effect on hunting species.

6.3. Natural State Protected Areas

The Law on the Natural State Protected Areas Fund (NSPAF), approved in 1998, set the legal basis for creating and maintaining the NSPAF, the principles and

mechanism of implementation, as well as the prerogatives of the central and local authorities, economic entities, NGOs and citizens on this matter.

The Law instituted 12 categories of natural protected areas, including eight of them corresponding to the IUCN classification: scientific reserve, national park, nature monument, natural reserve, landscape reserve, resource reserve, multifunctional management area, biosphere reserve; and four categories of national interest: botanical garden, dendrological garden, landscape architecture monument, zoological garden. The requirements of the Law on NSPAF have been detailed in the framework statutes for every category of natural protected area, as well as in specific statutes for every natural protected area.

The NSPAF comprises 1225 objects totaling 66,467 ha or 1.96% of country's territory. Concerning the legally designated protection areas, the Republic of Moldova is lagging behind most European countries, including Ukraine (3%), Romania (4.8%), not to speak about Germany (13%) or Austria (25%).

Most protected areas in Moldova are scientific reserves and landscape reserves (52% and 29%, respectively), followed by natural reserves of medicinal plants (7.4%), natural forest reserves (4.2%) and geologic and paleontology nature monuments (4.0%). Protected areas of steppe and meadow vegetation, and landscape architecture monuments are very small.

Despite measures taken in order to conserve and extend the natural protected areas, their present state is poor. The NSPAF Law is not properly enforced and its requirements are often violated. Following the land reform, many of protected areas are now managed by economic entities, mayoralties, schools, etc., which neither show interest nor have the capacity for maintaining them in good condition.

The cases when the status of protected areas is not observed are many. Just in the protection zone of a natural monument of European importance, the karst cave „Emil Racovita" and the adjacent karst area located in the North of the country, the Moldovan-German joint venture „Knauf" is extracting gypsum using the explosion method. Limestone is extracted in the proximity of the landscape reserve „La Castel" and on the territory of the nature monument „Trinca Canion". It goes without saying that such activities are leading to deterioration of protected sites and to soil, groundwater and air pollution.

The scientific reserve „Prutul de Jos" is affected by illegal tree cuts and livestock grazing. Oil wells are located on the territory of the reserve, and the owner (Redeco Company) does not entirely comply with environmental requirements. Part of the geologic and paleontology nature monuments is currently used as waste dumps; their territory is not delineated, no warning or indicating posters exist (e.g. Brinzeni Reefs, Burlanesti Canion, Varatic Canion, Duruitoarea Canion, Proscureni Reef, etc.).

The scientific reserves are forest areas and are managed by the State Forest Agency „Moldsilva" and not by the central environmental authority, as the Law requires. Thus „Moldsilva" is cumulating the functions of forest protection and exploitation of forests. In the case of the planned 55,000 ha Lower Dniester nature reserve, forestry interests have interfered and have at least temporarily stopped the process of setting up the reserve. The regime of integrally protected zones of the scientific reserves is generally observed, but some of them do not comply with all statutory requirements, e.g. the required minimum area. Another current problem is the need to re-evaluate the scientific reserves boundaries.

The state of natural reserves is generally good, protection zones are marked and warning posters are installed. In some forest natural reserves the protection regime is only partially observed, and grazing, fishing and waste dumping episodically occur.

The state of the landscape reserves, comprising 41 sectors, is pretty bad and practically they do not correspond to IUCN criteria. Lack of finance does not allow for meeting even the most elementary requirements of the Law on the NSPAF and the international conventions. The intensively visited areas are under severe impact and both the landscape and biodiversity is suffering. This concerns the landscape reserves Saharna, Tapova, Trebujeni, Ivancea, Capriana, „Suta de Movile", etc. The management of these areas is deficient: there are no fitted stopovers for visitors; tourist routes are not marked; rules for visitors are not visualized; etc. The supervision from the authorities is practically missing; consequently legal requirements are not enforced. A serious impediment to observing the protection regime is the tenure problem since areas within several landscape reserves have been privatized and economically used.

An important particularity of Moldova is the inclusion in the NSPAF of 13 etalon sectors of soils (resource reserves). Most of these areas are in a poor state: no landmarks; sometimes they are used for agriculture purposes; often the local authorities even do not know about their existence.

The multifunctional management areas include 32 sites. The protection regime of these areas is only partially observed. The natural zones subject to a special protection regime are not delineated, no landmarks, no warning posters.

During the last decades the landscape architecture monuments (old parks) and the architecture monuments (mansions, family tombs, and other buildings) have most suffered. During the last years, the condition of many of them has been aggravated.

Action is being taken to conserve and extend the natural protected areas. The first National Report „Millennium Development Objectives in the Republic of Moldova", approved by Government decision, foreseen increasing the protected areas from 1.96% until 2.2% in 2010 and 2.4% in 2015, which is still too small as compared with the Central and Eastern Europe average (9%).

The State Ecological Inspectorate, in cooperation with the local authorities and the police, undertook a number of compliance checks and took action in order to enforce the Law on NSPAF. In 2004, the main offenses revealed were related to the violation of the regime of protected areas through extraction of minerals (limestone, sand, gravel, etc.), grazing and other illegal activities on their territory.

6.4. Natural and Historical Heritage

Joining the natural environment and historical heritage is very important for the sustainable development of the country – this is a basic principle of the Convention on European Landscape (Florence, 2000). On the one side, the landscape can be an important economic resource, attracting many tourists; on the other side, it is an important component of the living standard. The Republic of Moldova signed the Florence Convention, which entered into force on 01.03.2004.

The natural patrimony of the Republic of Moldova includes important natural objects and picturesque landscapes, which represent an intrinsic value but also a potential tourism resource. Many of representative sites have been offered a protection status (one of the 12 categories of natural protected areas).

About 15,000 historical and cultural monuments have been identified so far in the Republic of Moldova dating from different historical époques. Out of those, 5698 sites are included in the official Register of monuments under state protection, including 891 ecclesiastic buildings, two medieval fortresses (Tighina and Soroca), 17 castles and parks, about 700 urban architectural monuments, and a large number of archeological sites, some of them of international significance.

The Republic of Moldova has the largest number of cave monasteries (52) among the other European countries. According to evaluations of international experts these complexes can become attractive tourist sites. They are integrated in superb landscapes, usually in rocky areas, and are surrounded by archeological sites. Among the most known and valuable monuments are Butuceni – a cave complex comprising caves, grotto, churches, and hermitages, as well as Tapova, Bechir–Soroca (VI–VIII century), Saharna (XII–XIII century), Mateuti, Japca, Marcauţi–Holercani.

The museums are a valuable component of the national cultural heritage. They host over 700,000 artifacts of inestimable material, scientific and artistic value. The richest collections are in the Ethnography and Natural History Museum, the National Historical Museum, the Museum of Archeology and Ethnography, the Museum of Popular Handicrafts, etc.

6.5. Invasive and Introduced Alien Species

The location of the Republic of Moldova at the interference of three biogeographic regions (Central-European deciduous forests, Mediterranean forest steppe and East–European steppe) determined the richness of its flora and fauna, with elements from different regions. On the other side, several species of plants and animals live in Moldova at the edge of their natural areas, which is increasing their vulnerability to anthropic factors. The transformation of natural ecosystems by the man leaded to their fragmentation, the isolation and decrease of populations, and the extinction of several indigenous species. The freed ecological niches are occupied by foreign species.

Increasing international contacts are a major factor contributing to the proliferation of ruderal invasive species. Many of them have been naturalized in Moldova and are spreading further, e.g. *Grindelia squarrosa*, *Ambrosia artimisiifolia*, *Xanthium albinum*, *Abutilon theophrasti*, *Mirabilis nyctaginea*. Most of this species are of American origin. The invasive plant species have to be kept under control since many of them comport risks for the environment, public health and agriculture. Measures are necessary in order to stop or limit their dissemination on country's territory in the future.

Many alien animal species have been introduced deliberately in Moldova. Since the 1950s several species have been acclimatized including the raccoon dog, the ondatra, the sika deer and the pheasant. Along the years, the raccoon dog and ondatra got invasive, while the sika deer started to displace the local species red deer (*Cervus elaphus*)..

Several invasive species like the Colorado potato beetle, the phylloxera, etc. have been introduced without will. Others spread naturally namely the jackal, the ring dove, the black woodpecker (*Dryocopus martius*) and the Syrian woodpecker (*Dendrocopus syriacus*).

The number of invasive animals in the Republic of Moldova totals about 150 species, including 100-120 species in agri-ecosystems and 15 species in forests. The alien invasive animal species are more aggressive, causing a significant economic damage. Concomitantly, they suppress the normal reproduction and development of many local species.

In the same time, the existent national policy framework and policy instruments are not developed enough. The European Strategy on alien invasive species could serve as guidance for developing the national policy in this field. One of the first steps would be designation of the national authority, to coordinate the activity of different agencies, to prepare a national strategy and to develop efficient financial mechanisms in this field. Further, action has to be taken to inventory and monitor the alien species

and to prepare an information system and specialists in this domain. Strengthening of the quarantine authorities, empowered to take real measures against the dispersion of invasive species, must be considered.

The invasive alien species are a global problem; therefore international cooperation should be actively promoted. This must concern both cooperation in the framework of relevant international agreements (e.g. Bern and Rio Conventions), as well as promotion of regional initiatives of cooperation in transboundary areas and coordination of activities with the international organizations which have relevant experience.

Last but not least, general public awareness must be raised, including via introduction of relevant information in education curricula.

The Republic of Moldova is currently implementing the GEF project "Development of the Ecologic Network in the Middle Prut area". The project planned, *inter alia*, to eradicate the invasive box elder (*Acer negundo*) from the territory of the scientific reserve "Pădurea Domnească", as a case study of eliminating invasive species from natural ecosystems.

6.6. Genetically Modified Organisms

In Moldova the research in the field of biotechnology and genetic engineering is in the incipient phase. Several biotechnologies are being used in agriculture and medicine. In agriculture, applied research is focused on developing biologic plant protection methods, in order to diminish the pesticide pressure. In pharmaceutics, biotechnology methods are being used for production of biologically active substances. No research centers exist in Moldova producing GMO; however GMO products and crops are imported. Most of the products are not labeled accordingly.

In 2004, nine samples of soya products from the Moldovan market have been tested for GMO in a specialized laboratory from the U.K. The test showed that six products including soya flour and soya meat, imported from the USA, Israel, Poland, Ukraine, and Brazil contained 5% GMO, while the soya products originating from Moldova and the Netherlands did not.

To regulate the production, testing, release to the environment, import, export, transportation, etc., of GMO the Government of the Republic of Moldova adopted the *Law on Biologic Security* (21.12.2001), and ratified the *Cartagena Protocol on Biosecurity to the Convention on Biologic Diversity* (11.10.2002).

According to the Law, marketing of GMO and GMO products can be done only being authorized by a National Commission. However, the enforcement of this legislation is a problem due to lack of monitoring (specialized laboratories, certified methods) and financing.

In December 2003, the Republican Center for Biologic Security was created at the State Moldovan University, with the contribution of the Ministry of Education and the Ministry of Ecology, Construction and Territorial Development. The Center will focus on testing GMO and identifying their possible negative effects.

7. WASTES

According to statistics, the reported amount of wastes generated on the territory of the Republic of Moldova in 2004 is 3.142 million tons, and the stock at the end of the year is 4.881 million tons (Fig. 7.1, 7.2). The amount generated increased as compared to the previous year, mainly due to wastes from the mining industry, the food and beverage industry, the communal sector, and the animal husbandry. Most of generated wastes have been eliminated through different methods (destroyed, dumped, used, or transferred) (Fig. 7.2). The amount of waste used in 2004 doubled as compared to 2003, which can be explained by the implementation of 2000 *National Programme for the Use of Production and Domestic Waste*.

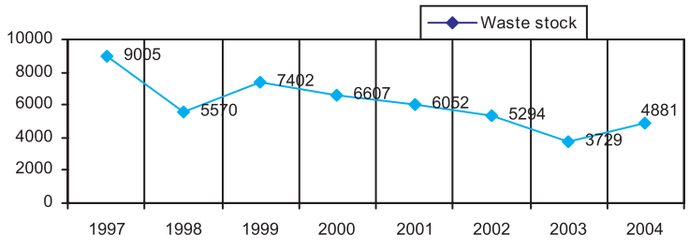

Fig. 7.1. Waste stock (at the end of the year) in the Republic of Moldova, thousand tons

According to the official classification the wastes are categorized as production (industrial) waste and municipal waste. The latter include all wastes generated in residential areas (mostly solid domestic waste, but also food residues, wastewater treatment sludge, etc.).

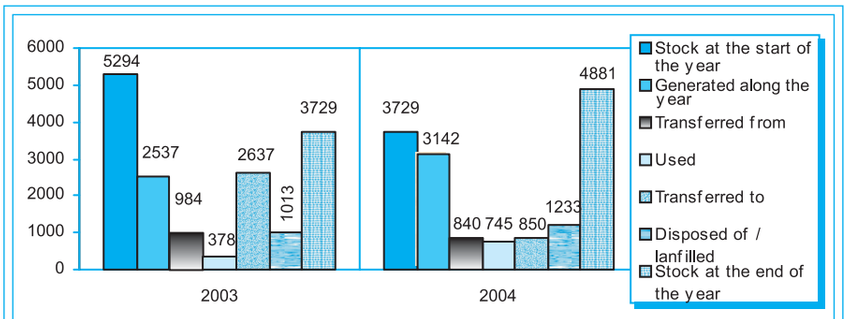

Fig. 7.2. Waste balance in 2003-2004, thousand tons

7.1. Domestic Wastes

Presently, approximately 26.8 million m^3 of domestic wastes are deposited at official and non-official landfills.

The area of landfills is growing fast, from 1072 ha in 2000 to 1352 ha in 2004. The area of non-official landfills (684.5 ha) is larger than the official one (568 ha). The official landfills are generally overloaded. Domestic waste poses the biggest concern in rural areas. In most villages, it is mixed with manure and other organic waste and is often dumped at un-authorized sites (ravines, streams, etc.). Along the last 4-5 years, the amount of landfilled domestic wastes was in the limits of 1.1-1.2 million m^3 per year.

7.2. Production Wastes

Large amounts of production waste are generated in the extracting/mining industry, food and drinks industry, energy sector, etc. (Table 7.1). In the period 2001-2003, the amount of production wastes was decreasing, due to restrained economic activity. In 2004 this downward trend was interrupted, which could be explained by the industrial and consumption growth.

Table 7.1

Amount of wastes generated by the industrial sectors, thousand tons

Year / Sector	2001	2002	2003	2004
Mineral extraction / mining	4843	4004	3002	3725
Livestock breeding	723	553	481	509
Food and beverage industry	345	226	54	313
Municipal utilities	50.9	347.1	96.3	180.2
Domestic sector	47.0	44.6	44.5	42.9
Inorganic chemistry	15.7	11.1	11.4	11.3
Agriculture waste	10.5	7.3	3.6	6.5
Metal scrap	8.4	11.1	0.9	49.7
Forestry	2.3	2.6	2.1	3.3
Non-ferrous metal scrap	1.4	0.3	0.3	0.36
Glass, porcelain, faience	1.8	0.7	1.9	2.8
Paper waste	6.1	5.0	9.7	12.2

Hazardous Industrial Wastes. In 2004, 936 tons of hazardous wastes were generated by the Moldovan industry, which is confirming the general declining trend recorded during 2001-2004 (Fig. 7.3). The stock of hazardous waste was also declining, due to disposal, re-use, and transfer to other users or landfilling.

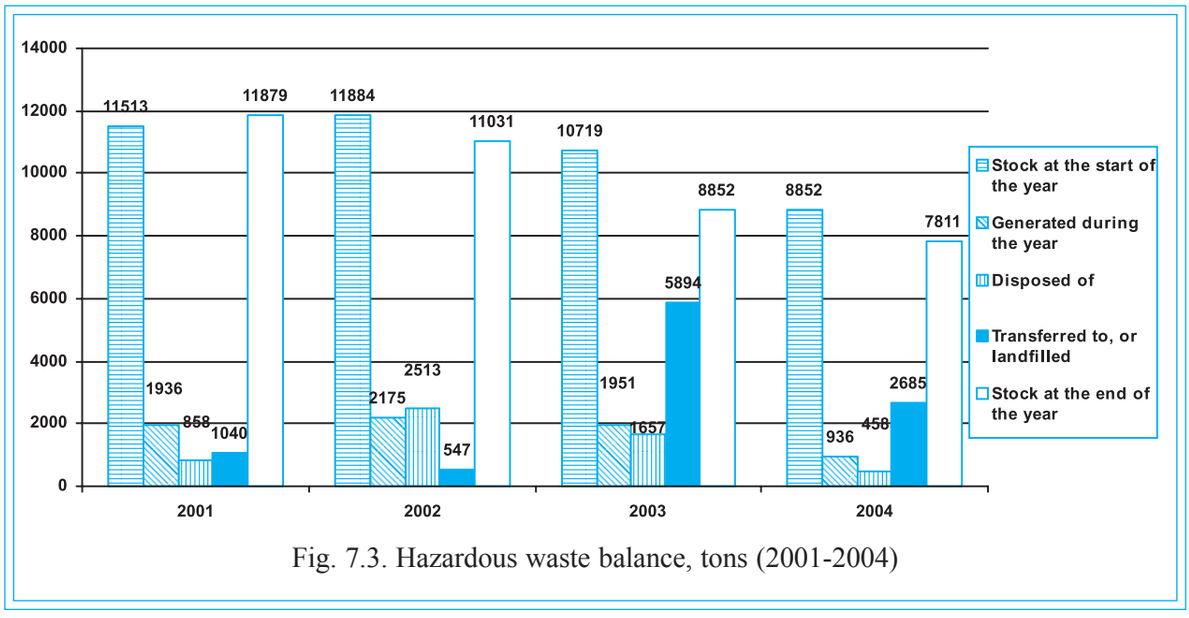

Fig. 7.3. Hazardous waste balance, tons (2001-2004)

According to the Soviet system of waste classification, which is still applied in the Republic of Moldova, hazardous wastes are ranked under 4 toxicity categories:

class I - wastes containing heavy metals (Cu, Cd, Pb, Hg, Cr), cyanide, part of the obsolete pesticides, formaldehyde, luminescent lamps, DDT;

class II - wastes containing petroleum, vanadium, solvents, wastewater treatment sludge, inorganic acids, paint and varnish wastes, part of the obsolete pesticides;

class III – photo-reagents, cuprozan, nitrafen;

class IV – phosphorus-containing wastes, detergents, metallurgic wastes, etc.

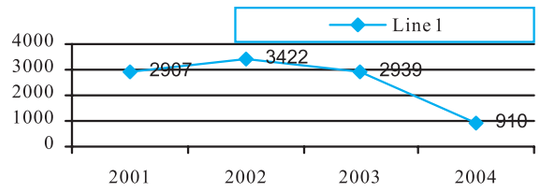

Fig. 7.4. Stock of the class I hazardous waste, tons (2001-2004)

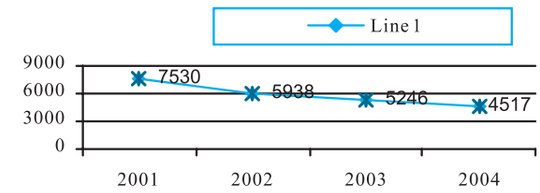

Fig. 7.5. Stock of the class II hazardous waste, tons (2001-2004)

The stocks of hazardous wastes of all toxicity categories showed a downward trend during 2001-2004 (see, for example, Fig. 7.4-7.5 for the most dangerous wastes). Most of the class 1 hazardous waste is represented by the ferro-cyanides, which are accumulated in the wine industry. The technologies implemented during the last years allowed to deal with this type of waste successfully; thus the ferro-cyanide stock accumulated so far on the premises of wine industries, is diminishing now (from approximately 7,500 tons in 2001 to 4,500 tons in 2004). The class II hazardous wastes stock is also decreasing rapidly, due to the processing of significant amounts of galvanic wastes by a private firm.

The luminescent tubes, containing mercury, are included in hazard class I. They are considered to be dangerous to the environment and health, if broken. At the end of 2004 there were 650,920 of such lamps in stock.

Another type of hazardous waste (class II) is vanadium-containing waste, accumulated from using heavy fuel in power stations. Presently, almost 900 tons of such waste is accumulated in Moldova (approximately half of it, at the EHS-1 in Chişinău).

Persistent Organic Pollutants. The persistent organic pollutants (POPs) are a category of chemicals which are toxic, persistent, accumulate in the fatty tissues of living organisms, are prone to long-range transboundary transport and are likely to cause significant adverse human health or environmental effects near to and distant to their sources. The POPs include a number of organochlorinated pesticides, the polychlorinated biphenils (PCBs) and some by-products of industrial and combustion processes (dioxins and furans). The Stockholm Convention on POPs, adopted in May 2001, has become the expression of international concerns as regards this hazard. By joining the Stockholm Convention the Republic of Moldova assumed the obligation to take immediate action to protect the environment against POPs.

Organochlorinated pesticides. The Stockholm Convention on POPs lists 9 substances used as pesticides: aldrin, dieldrin, endrin, chlordane, heptachlor, DDT, mirex, hexachlorobenzene and toxaphene. None of the POPs pesticides is allowed for use in the Republic of Moldova. However, between 1950 and 1990 about 22,000 tons of persistent organochlorinated pesticides, including POPs, were used in Moldovan agriculture. Along the years, large amounts of expired pesticides were accumulated, which became a major threat to the environment and human health. Besides, following the accumulation of scientific evidence on the risks of some pesticides for human health, a number of organochlorinated pesticides of the first generation (e.g. DDT) were banned in the 1970s. In 1978, a pesticide landfill was built in the South of the country. Between 1978 and 1988, 3940 tons of obsolete pesticides, including 654 tons of DDT were buried there.

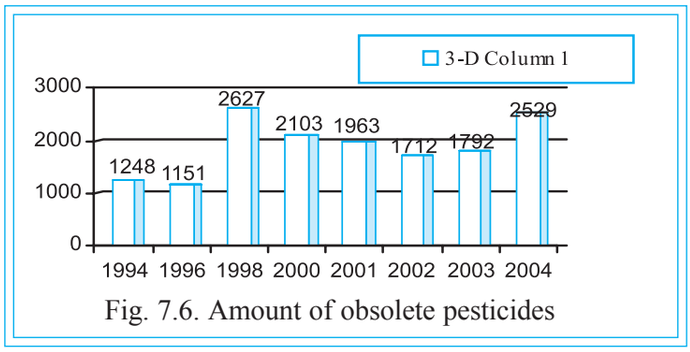

Fig. 7.6. Amount of obsolete pesticides

During the last decade, the application of pesticides in agriculture dropped but the old stocks remain a problem. By the early 1990s, over 1000 pesticide storehouses were constructed in Moldova, which in general were adequately fitted for a safe storage. During the land privatization process these storehouses got out of control. Between 1991 and 2003 about 60% of the storehouses were destroyed, and only 20% out of the remaining are in good condition. Part of the stored pesticides was stolen and used by private owners lacking knowledge about their exact origin and application rules. Another part of obsolete pesticides is stored in unfitted facilities, unguarded, in deteriorated packs without labels, which is putting at high risk the health of local population and the environment. The amount of obsolete pesticides currently stored in Moldova is presented in Fig.7.6.

Part of the obsolete pesticides presumably refers to the category of POPs. It must be stated that 934 tons of obsolete pesticides have not been identified, and they may contain POPs pesticides (tentative expert estimates suggest that POPs may represent some 20% of this stock). A comprehensive evaluation of risks associated with obsolete pesticides stockpiles and contaminated areas was never undertaken in the Republic of Moldova.

In November 2003, the Ministry of Defense together with the Department for Emergency Situations started the process of repackaging and transportation of obsolete pesticides to centralized storage facilities. By the end of 2004, this work was completed to 60%. As a result, the entire quantity of obsolete pesticides, currently stored in several hundreds of unfitted facilities, will be transferred to 37 rayon storages, where they could be stored safely until an acceptable final disposal solution is found. There are good chances for the Government to be supported in this operation by the GEF „Sustainable POPs Management» project, which is in the appraisal phase.

Polychlorinated biphenils. This category of synthetic chemicals has largely been used in electric power installations (transformers, capacitors, switches), due to their excellent dielectric properties. Since the 1970-1980s, when scientific evidence accumulated concerning their toxicity and extraordinary persistence, the PCBs started to be taken out of use. However, due to the long life cycle of many power installations, these substances may still be in use. The Stockholm Convention, ratified by the Republic of Moldova, requires the complete elimination of these substances by 2028. The National Implementation Plan for the Stockholm Convention, approved by the Government, identified the energy sector as priority sector for the PCBs elimination, while the targeted electric power equipments are capacitors and transformers.

An inventory revealed that presently approximately 20,000 capacitors containing 213 tons of PCB oils are owned by the energy companies. Most of the capacitors are out of use and are stored on the territory of electrical substations allover the country, waiting to be disposed of. Another 20 tons of PCBs are in smaller capacitors owned by energy consumers (industries, military installations, etc.). Thus, the total amount of PCBs in capacitors is estimated at 234 tons, which must be disposed of. Existing disposal methods are very costly. The country does not have technical, human and financial capacity to deal with this problem.

Approximately 23,000 tons of potentially PCB-contaminated dielectric oils are currently used in transformers. The problem is that presently there are no records on whether the oil in every particular transformer is contaminated or not. The experts estimate that only a minor part of the transformers in the Republic of Moldova could contain PCBs or be PCB-contaminated. The GEF „Sustainable POPs Management» project will support the Government in eliminating the PCB-filled capacitors and in testing the oils in transformers, switches and other power equipment, to identify the contaminated installations. As long as it was not tested the equipment must be considered as PCB-containing or PCB-contaminated one and must be treated accordingly.

7.3. Waste Management

The average amount of waste generated in economically advanced countries is presently 800-1000 kg per person and per year. In Moldova the average quantity is 340 kg, including Chisinau with 400 kg per person and per year.

During the last years some positive changes in this field were attested. This is confirmed by the reduction of the amount of land filled waste due to the activity of new businesses in the field of waste handling. The local authorities also play an increasingly important role in the management of wastes.

The National Program for the Use of Production and Domestic Waste played a role by defining the main objectives in this field (e.g. waste minimization, increasing the re-use of wastes) and mainstreaming the efforts of the involved authorities and the public. Several of the proposed instruments for achieving the objectives are:

- Raising public awareness on the health risks from inadequate handling of wastes and influencing the consumption patterns
- Implementation of separated collection of wastes
- Introduction of economic incentives for re-using the wastes.

The Republic of Moldova has the basic legal framework for waste management but suffers from the lack of the implementation mechanisms. The primary legislation is broad in character while the secondary layer of legislation (normative acts, guidelines, standards) is deficitary. The inventories and reporting on wastes often are formal and do not necessarily reflect the real situation.

The local authorities have an important role in waste management. The Law on Production and Domestic Wastes ask for a joint participation of the local authorities and the businesses in the development of local (“territorial”) programs for waste management. An important step was the development of the „Program of waste management in Chişinău” which will contribute to improvements in this sector in the biggest urban agglomeration of the country.

8. NATURAL AND TECHNOGENIC DISASTERS

8.1. Natural Calamities and Emergency Situations

Natural calamities - droughts, heavy rains (often with hail), massive floods, hurricanes, snow storms, extremely cold winters, and other destructive processes - became increasingly frequent in Moldova. In 2004, a number of natural phenomena occur, destructive in their nature and entailing high material and social costs.

In January 2004, a severe snowstorm with strong wind affected the country, forming locally snowdrifts of 2-3 m deep. Four persons died in the rural area and communication between settlements was interrupted several days.

During the warm period heavy rains (often with hail) occurred at several occasions in May, July and August. Sometimes they were accompanied by storms and vortexes. Six people died and important material damages were recorded–from affected private households, losses in agriculture production and damaged infrastructure–amounting to approximately 93 million MDL (7.5 million USD).

Moldovan landscapes are naturally susceptible to landslides, a quality that is often triggered by some human activities like construction on dangerous slopes resulting from poor physical planning. In 2004, the landslides caused material damages totaling 2.8 million MDL.

In total, the Department for Emergency Situations recorded in 2004, 46 natural disasters in which 13 persons died while the costs of these events totaled 96.8 million MDL. The areas most affected are presented in Fig. 8.1.

Among the situations of anthropic origin registered by the Department for Emergency Situations in 2004 were several cases of intoxication of people and cattle with chemicals and one case of mass disease contagion by people. As a result of these biological and chemical incidents six people died and 81 other persons were affected.

8.2. Radiological Situation

The radiation background in Moldova is determined by the natural radioactivity as well as by global deposition caused by the atmospheric tests of nuclear weapons in the 1950s–1980s, and the Chernobyl accident of 1986. Burning fossil fuels in power plants, construction materials, exhaust gases from transport also contribute to the background radioactivity.

During 2004, the radiological situation remained stable. According to data gathered by the Hydrometeorologic Service from 17 monitoring stations, the level of gamma radiation in 2004 did not change significantly as compared to the period 2000-2003 varying between 9 iR/h and 16 iR/h, which is considerably lower than the threshold set by the national norms of radioprotection. The radiologic monitoring of atmospheric depositions in 2004 showed normal values of total gamma/beta activity varying depending on the season (the maximum – in the warm period) and meteorological factors.

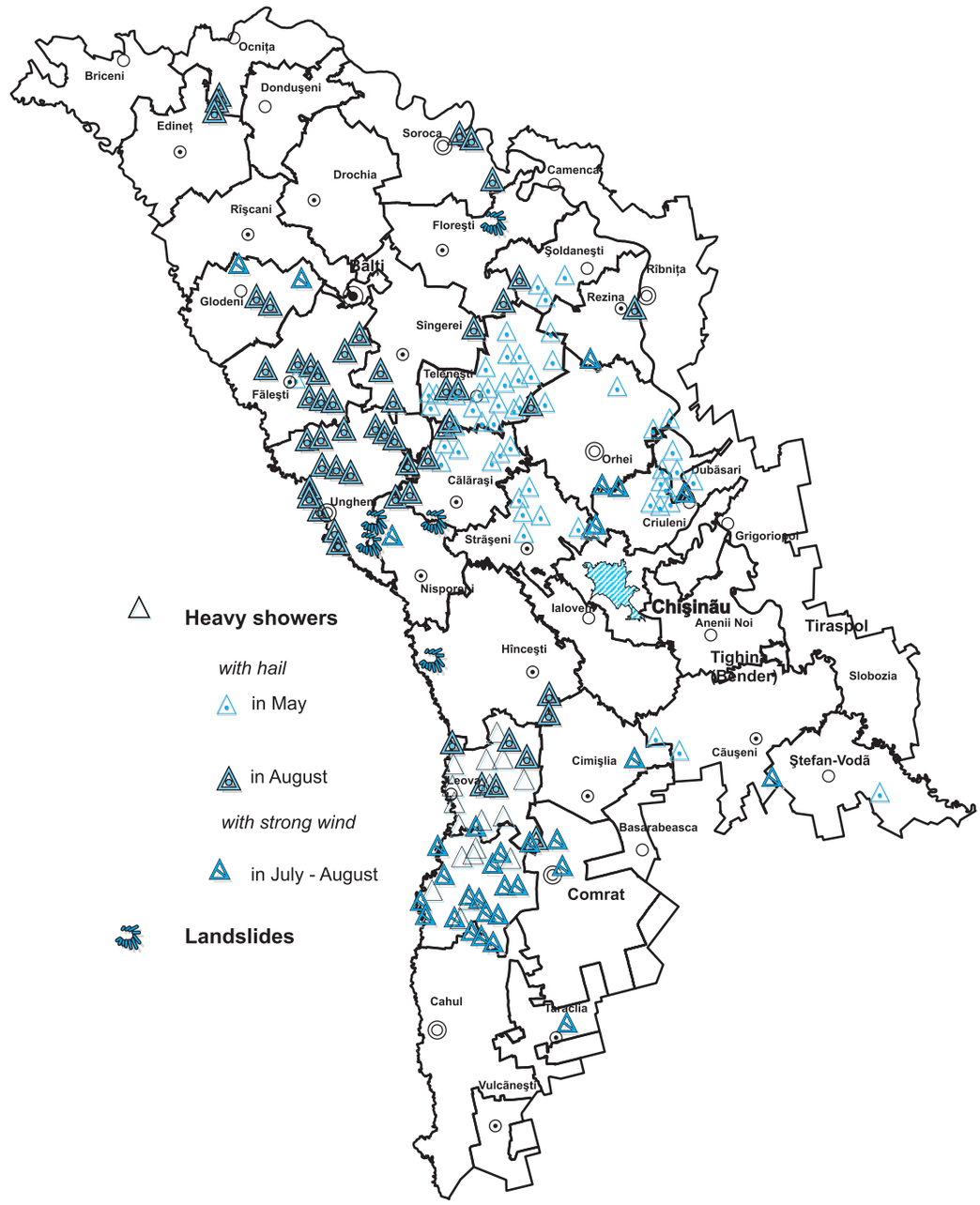

Fig. 8.1. Areas affected by natural disasters in 2004.

According to the data provided by the National Institute of Ecology and the National Center of Applied Soil Science, the highest values of gamma radiation (24 iR/h) as well as concentrations of Sr-90 and Cs-137 in soil, were found in spot areas in the north of Moldova (Soroca rayon), contaminated after the Chernobyl accident of 1986. During the years past, Sr-90 and Cs-137 have migrated deeper in the soil (Fig. 8.2).

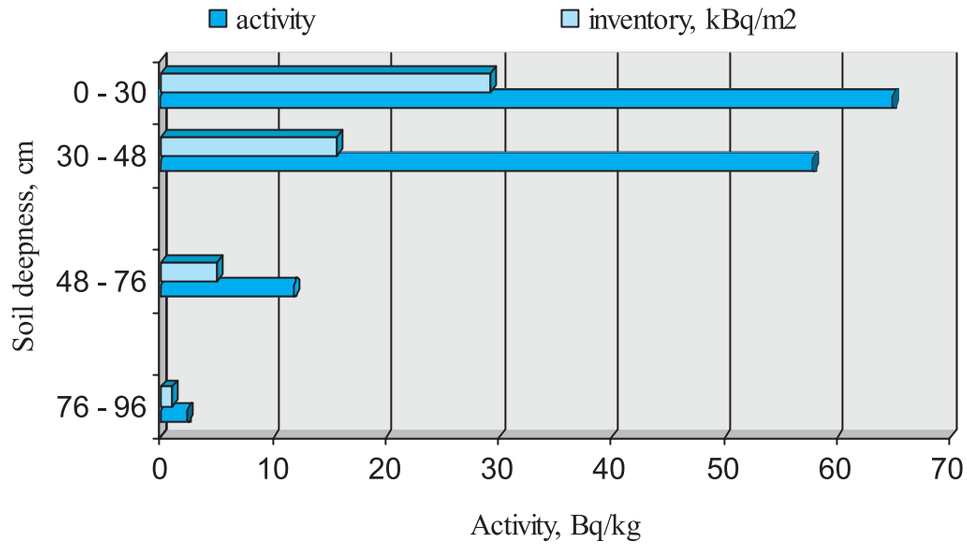

Fig. 8.2. Content of Cs-137 in the soil (Oclanda, Soroca)

The National Center for Preventive Medicine reported in 2004 average values of radio nuclides in drinking water, surface waters, soil, raw materials, food products, and medicinal plants, which were comparable to previous years, and well within the national hygienic standards (Tab.8.1).

Table 8.1

Average content of radioactive substances in environmental media and foodstuffs

No.	Investigated media	Global beta activity, Bq/kg	Strontium-90 Bq/kg	Cesium-137, Bq/kg
1	Atmospheric air	$3{,}2 \cdot 10^{-8}$	$1{,}38 \cdot 10^{-8}$	$1{,}28 \cdot 10^{-8}$
2	Drinking water	2,55	0,51	<1,0
3	Minewaralter	10,0	2,0	<1,0
4	Soil	25,3	5,1	13,6
5	Milk	5,4	1,08	1,0
6	Beef	17,6	3,5	-
7	Pork	11,87	2,37	1,78
8	Fish	12,35	2,7	1,0
9	Poultry eggs	5,3	1,6	1,0
10	Legumes	21,0	4,2	1,0
11	Fruits	3,5	<0,7	1,0

The main natural sources of continuous irradiation are Radon-226, Toron-232 and their disintegration products. The components of natural irradiation are external

irradiation (0.73-0.85 mSv/year and internal irradiation (1.77 mSv/year). The average concentrations of radon in different residential buildings were between 19.2–52.0 Bq/m^3.

The main artificial sources of irradiation of the population are: the medical radio diagnosis, nuclear medicine, radiotherapy şi occupational exposure. The share of irradiation from natural sources is 72%, from artificial sources, 28%.

Presently there are over 260 institutions and organizations in the Republic of Moldova using sources of ionizing radiation and radioactive materials. In 2004, no cases of over-exposure of the personnel as well as the general public were recorded.

9. ENVIRONMENTAL MANAGEMENT

As signatory of a number of international conventions in the field of environment and decisions of international environmental fora (the Global Summit on Sustainable Development in Johannesburg, 2002; the Pan-European Environmental Ministers Conference in Kiev, 2003) the Republic of Moldova has committed itself to:

- take necessary actions for the protection of the environment and the public health, by removing the causes of their degradation;
- adopt the legislation for controlling, reducing and preventing the activities which could affect the environment;
- cooperate in developing procedures necessary for implementing the provisions of international Conventions and decisions of important environmental fora;
- cooperate in the field of environmental research.

In order to meet these requirements special funds have been secured in the framework of the respective conventions for the financial support of the signatories. The Republic of Moldova benefits from financial assistance for implementing projects in the field of environmental audit; approximation of EU legislation; development of strategies for polluting emissions reduction.

One of the instruments of environmental management in Moldova is the system of environmental standards. ISO 14001 (1996) is the core standard for environmental management systems. Other relevant international standards are ISO 14004 (Principles, systems and application techniques of environmental management systems), ISO 14010 (Environmental audit), ISO 14011 (Audit procedures), and ISO 14012 (Qualification criteria for environmental auditors). The Republic of Moldova adopted a number of similar standards: SR EN ISO 14001 (1997), SR EN ISO 14010 (1997), SR EN ISO 14011 (1997) and SR EN ISO 14012 (1997).

Action is being taken to conserve and extend the natural protected areas. Ecological research is implemented to provide scientific basis for protecting representative areas. Effective practical measures for the conservation and rehabilitation of the architectural complex and park in village Taul have been undertaken. Protection measures have been undertaken towards the conservation of the karst cave „Emil Racoviţă" – a geological monument of European importance. The National Institute of Ecology evaluated the environmental situation in 20 settlements and developed recommendations on the environmental management of those residential areas. Two local action plans were developed in the villages Bulboaca and Costeşti, aiming at resolving environmental problems at the local level using the community approach.

The State Ecological Inspectorate (SEI) in cooperation with local authorities and the police took a number of actions for enforcement of environmental legislation. In 2004, more than 9,300 cases of environmental offence were filed in administrative courts and sanctions totaling 1.4 million MDL were imposed. The SEI experts participated in the commissioning of 1475 economic units as well as in allocating the land for new developments (1208 cases). 168 development projects have been subject to state environmental assessment ("expertise"). These activities allowed environmental concerns being taken in due account and adequate protection measures being introduced in the project designs.

The economic tools used by the authorities comprise fees, taxes, and charges. Taxes with direct environmental destination, based on the «polluter pays» principle, include: the land tax, charges for use of natural resources, charges for waste disposal,

and charges for polluting emissions. Indirect environmental taxes include the fuel taxes and taxes on cars import.

In 2004, environment management activities were implemented in several sectors of the economy. Notably, the Ministry of Energy approved real measures contributing to the reduction of environment pollution:

a) in the power sector – development of the electricity production capacity through upgrading the existing power units and building new ones, more efficient and less polluting.

b) in the heating sector – reconstruction of several heating units for co-generation, reorganization and development of the heat supply network in the towns. The expected environmental effect is reduction of heat losses resulting in energy savings. The National Program of rehabilitation and de-centralization of the heating systems in 36 towns of the Republic of Moldova will mainstream the efforts in this field.

c) in the gas sector - accelerated gasification of the country; at the end of 2004, 425 out of the 1588 settlements in the country have been supplied with natural gas. The share of natural gas in the energy balance of the country reached 55%.

d) in the fuel sector - replacement of solid fuel with renewable energy resources. The National Program for Renewable Resources Use was submitted for the Government consideration. The Program foresee the replacement of 6% of the fossil fuels by alternative energy sources by 2010.

The Hydrometeorological Service continued the monitoring of surface waters, air, soil and radiation background across the country, presenting operative environmental information, particularly valuable for the early warning of the authorities and the public as well as the neighbour countries concerning environmental accidents and emergency situations.

One of the specific tasks of the MENR is the development and modernization of the integrated environmental monitoring system (IEMS). The main activities undertaken in 2004 in this field were the following:

1. Laboratory network. No significant changes have occurred in the analytical capacity of the environmental laboratories due to financial constraints. MENR is supporting the laboratories contributing to their operating costs from the resources of the National Environmental Fund. However, this is usually not enough for seriously upgrading the labs instrumentation.

Other institutions providing a great deal of analytical work are: the National Center of Preventive Medicine under the Ministry of Health and Social Protection, and the Institute for Soil, Agrochemistry and Hydrology Studies „N. Dimo" and the Center for Agrochemical Services, both reporting to the Ministry of Agriculture and Food Industry.

2. Information system. Activity was continued to improve the environmental information system through the integration of the information system of the MENR and its subdivisions (HMS, SEI, INECO and AGeoM), the development of GIS system, the system of environmental indicators, electronic databases, etc. Sectoral information systems are being developed by the Ministry of Health, the Ministry of Agriculture and Food Industry, the Department for Statistics and Sociology, etc.

The HMS was assigned the role of implementing agency of the integrated environmental monitoring. The Center for Environmental Monitoring was created within the HMS, with the purpose of managing the entire monitoring cycle at the national scale, including collection, processing, interpretation, evaluation and presentation of environmental information. In 2003, the Center activities focused on adjusting the working procedures and developing the reporting formats, including all needed

environmental indicators. Unfortunately, institutional and mental barriers remain high, many holders of environmental information do not comply with legal requirements in this field and, consequently, the organization of a free information flow on environmental matters is still a plan rather than reality.

3. Staff training. A number of workshops and seminars were organized in 2002-2003 dedicated to improving the qualification of laboratory staff.

In 2003-2004 integrated information on the environment in the Republic of Moldova was presented for:

- Europe's Environment: the third assessment. Environmental assessment report Nr.10. European Environmental Agency. Copenhagen, Denmark. 2003, 343p.; http://www.eea.eu.int;
- Annual statistics on the Republic of Moldova, 2003;
- Republic of Moldova State of the Environment Report 2003.

10. ENVIRONMENT PROTECTION ACTIVITIES

10.1. Environmental Research

Environmental research is present in the activity programs of many scientific institutions and universities. It concentrates on the evaluation of structure, functioning and dynamics of the components of natural and anthropic ecosystems under the impact of local and transboundary factors. The National Institute of Ecology focuses on integrated research in natural ecosystems, using a more holistic approach. Besides, INECO undertakes studies in specific domains, not covered by other institutions, such as waste management, atmospheric processes, transboundary pollution, and problems of the urban environment.

The research and development projects are financed on the competitive basis, in the framework of the state programs, each involving many research institutions. This would increase the research efficiency since complex and multidisciplinary studies would be possible involving the best researchers from different fields. In December 2003, the Parliament approved the strategic priorities of research and development for 2004-2010, with 9 priority themes including the continuation of the theme „Ecosystems functioning, biodiversity and sustainable use of natural resources". So far, this theme was implemented by the following institutions and along the following lines:

- Seismology, geodynamics, and geologic processes: quality issues in groundwater and migration of toxic elements in Moldovan landscapes (Institute of Geophysics and Geology).
- Environmental chemistry: studies on sorption mechanisms of organic and inorganic pollutants on activated carbons and mineral adsorbents (Institute of Chemistry).
- Development of methods for conservation of the genetic diversity of spontaneous flora and fauna în natural and semi-natural ecosystems (Botanical Garden, Institute of Zoology).
- Modifications of the natural landscapes and their impact on human life (Institute of Geography).
- Development of advanced methods and technologies for water treatment. Study of the autopurification processes in aquatic systems (Institute of Chemistry, State University of Moldova).
- Studies on the protection of geologic environment and mineral resources use (Institute of Geophysics and Geology).
- Development of the national network of zoological monitoring (Institute of Zoology).
- Development of GIS for the purpose of modeling the structure and dynamics of landscapes (Institute of Geography).
- Development of physiological methods for optimizing the production processes and minimizing environmental pollution (Institute of Plant Physiology).
- Development of ecologic criteria for conservation, protection and reclamation of less productive soils (State University of Moldova).
- Development of methods of biodiversity conservation and reproduction of biologic resources in natural ecosystems. Study of rare plants and plants at the brink of extinction in Moldova (State University of Moldova).
- Strengthening the human resources in the field of sustainable development and environment protection (Technical University of Moldova).

The National Institute of Ecology concentrates its studies on the following domains:

- Evaluation of the environmental status of aquatic resources. Development of advanced methods and technologies for water treatment.
- Development of ecologic criteria for conservation, protection and reclamation of less productive soils.
- Development of methods of biodiversity conservation and reproduction of biologic resources in natural ecosystems.
- Assessment of environmental quality basing on bioindicators.
- Study of the status of representative natural ecosystems: motivating scientifically their protection regime and the extension of natural protected areas.
- Development of waste management methods minimizing their impact on the environment.
- Development of methods and technologies of diminution of radionucleids levels in agriculture ecosystems.

According to the Law on Environmental Protection (1993) the National Institute of Ecology is responsible for the preparation of the annual state of the environment report.

10.2. Legal Framework

The main directions of the environmental policy of the Republic of Moldova are laid down in a number of laws and strategic documents adopted following the country independence: the Law on Environment Protection (1993), the National Environmental Action Plan (1995), the National Strategy and Action Plan for the Conservation of the Biologic Diversity (2001), the Concept of Environmental Policy of the Republic of Moldova (2002), the National Program on Environmental Security (2003).

The legal framework in the field of environment got an impressive development during the last decade: 33 laws were adopted reflecting the main principles of sustainable development. In the same time, most secondary legislation (regulations, standards, etc.) date from the Soviet times and often are old-fashioned. For example, current environmental standards do not always correlate with the principles set in the laws. The standards have been developed basing on zero-risk approach; this made them generally inflexible and often unfeasible. During the economic transition, many industrial operators find it particularly difficult to comply with the rigid norms, due to many financial and even technical reasons. A certain flexibility in standards application (e.g. a transition period) would allow the old enterprises to get time for implementing new and cleaner technologies.

Updating the environmental legislation is still a preoccupation in the Republic of Moldova. In 2004, new primary and secondary legislation acts were developed, as well as amendments to existing legislation were made including the Law on the Animal Kingdom, the Law on Production and Domestic Wastes, the Law on Environmental Pollution Charges, the Water Code, the Code of Administrative Offences. An important fact was the development of instructions for the valuation of environmental prejudice. Moldovan authorities declared that the country is aiming to adopt EU approaches and principles in the field of environment and the *acquis communautaire* as a reference point for developing national legislation.

The MENR developed the National Strategy on the reduction and elimination of persistent organic pollutants (POPs) and the National Implementation Plan of the Stockholm Convention on POPs, approved by Government decision in October 2004.

The MENR actively participated in developing the compartment „Environment protection and sustainable use of natural resources" from the Strategy of Economic Growth and Poverty Reduction, approved by the Parliament of the Republic of Moldova in December 2004.

Presently, the MENR is working on some 20 legal acts, including the Law on the National Ecologic Network, the Law on the Red Book, the Regulation on pastures, etc.

10.3. Environmental Security

The obligation to ensure the environmental security derives directly from the Constitutional right of every citizen of the Republic of Moldova to a sound environment. In 2002, the Ministry of Ecology, Construction and Territorial Development prepared the National Program and the Action Plan for environmental security.

The main processes endangering the environmental security, as defined in the Program, are the following:

- extreme geologic and hydrologic processes;
- soil erosion;
- industrial accidents;
- environment degradation resulting from heavy pollution;
- anthropic environmental impacts;
- loss of biodiversity;
- radioactive pollution.
- transboundary impacts:
  - greenhouse effects;
  - depletion of the ozone layer;
  - acid rains;
  - industrial accidents;
  - surface waters pollution;
  - air pollution.

The legal framework harmonized with the requirements of the EU law and the international agreements create the basis for ensuring the environmental security. Compliance with national environmental law, implementation of the environmental security Action Plan, active cooperation within the framework of international conventions, transboundary cooperation and reliable environmental monitoring, are all contributing to environmental security assurance.

An essential element of the environmental policy prevention principle and environmental security assurance is the environmental impact assessment.

The main tasks of the authorities in ensuring environmental security are: (i) control over the implementation of National Program and the Action Plans for environmental security; (ii) development of sectoral and local environmental security action plans; (iii) public information and awareness raising; and (iv) promotion of transboundary cooperation at all levels.

10.4. International Cooperation

An important international cooperation landmark was the participation of the official delegation of the Republic of Moldova in the 5th European Ministerial Conference on Environment and Health in Budapest (23-25 June 2004). The Ministers of environment and health signed a joined Declaration and adopted an Action Plan on the environmental health of children. In parallel with the official agenda, the Minister

of Ecology and Natural Resources had a series of meetings with the ministers of the environment from other countries, on a number of issues including: waste management, environmental monitoring, legal approximation with EU, cleaner technologies etc.

In September 2004, the 2nd preparatory meeting for the „Kiev+1" Conference in Tbilisi, was held in Chişinău. The meeting was attended by representatives of donor organizations and international bodies.

To give impetus to bilateral and multilateral cooperation in EECCA region and to extend the „Environment for Europe" process, in Tbilisi (Georgia) was held the Conference of environmental ministers of EECCA countries. The Moldovan delegation actively participated in the conference. It had meetings with representatives of the donor community and international organizations in order to promote environmental projects and attract financial resources. There were negotiations on environmental issues with the Governments of Belgium and People's Republic of China. A cooperation agreement was signed between the Ministry of Ecology and Natural Resources of the Republic of Moldova and the Ministry of Environment of Poland.

In 2004, the Republic of Moldova adhered to the Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. A number of other international agreements were ratified:

– the Stockholm Convention on Persistent Organic Pollutants;

– the Agreement on cooperation in the field of study, exploitation and use of mineral resources;

– the Memorandum of understanding between the Republic of Moldova and Denmark on cooperation for implementing the mechanism of non-polluting development, defined in the Kyoto Protocol to the UN Framework Convention on the climate change;

– the Protocol on the privileges and immunities of the Parliamentary Assembly of the Black Sea Economic Cooperation Organization.

France supported the implementation of the „Water data center" project, which is a step forward towards joining the European standards in the field of water resources management. The water databases can provide an indication on the evolution of the water environment and signal on the need to take measures for its protection. The extension of the GIS uses in Moldova, promoted by the project, would allow a better mapping and evaluation of environmental indicators.

In 2004, work was initiated on the Strategy of bilateral cooperation with the Czech Republic. The Strategy is going to be approved by the Governments of both countries in 2005.

In October 2004, the Parliament ratified the Memorandum of understanding between the Republic of Moldova and Denmark on cooperation for implementing the mechanism of non-polluting development. This agreement is particularly important because it keeps the cooperation with Denmark in the environmental field, in the situation when this country suspended other mechanisms of technical assistance, considering their low efficiency for the sustainability of developing countries. Denmark chose other mechanisms of assistance, including the mechanism of non-polluting development. Presently, one of the Danish priorities in financial assistance is cooperation on climate change in the framework of the Kyoto Protocol.

10.5. Implementation of International Environmental Conventions

The Republic of Moldova adhered to 18 international conventions in the field of environment. The following activities were undertaken recently for the implementation of conventions requirements:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979), ratified by the Parliament on 23 June 1993.

In October 2003, the Ministry of Ecology hosted an international seminar on alien invasive species, organized with the support of the Convention Secretariat, and attended by participants from Italy, Portugal, Romania, Ukraine, Russia and Moldova. Following this seminar, the report on the status of invasive species in Moldova was prepared and national experts participated in the development of the European Strategy on alien invasive species

Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991), ratified by the Parliament on 23 June 1993.

An international conference in the framework of the European Initiative for Water Protection was organized in Chişinău.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992), ratified by the Parliament on 23 June 1993.

The Republic of Moldova signed bilateral cooperation agreements on monitoring the transboundary waters and environmental information exchange with Romania and Ukraine. The focal point is in permanent contact with the Convention Secretariat. Moldova participates in the OSCE project "Transboundary cooperation and sustainable management in the Dniester river basin" is ongoing.

Convention on Transboundary Effects of Industrial Accidents (Helsinki, 1992), ratified by the Parliament on 23 June 1993.

The activities undertaken in the framework of this Convention resumed to the participation of Moldovan representatives in the NATO Expert Group on military and environmental problems.

UN Convention on Biological Diversity (Rio de Janeiro, 1992), ratified by the Parliament on 16 March 1995.

Two National Reports on biodiversity conservation were prepared. The project „Creation of the ecologic network in the middle part of the Prut river basin" is in development phase.

UN Framework Convention on Climate Change (Rio de Janeiro, 1992), ratified by the Parliament on 12 June 1995.

The Republic of Moldova received technical and financial assistance, and benefited of access to international information and experience in the field of climate change.

Workshops on the implementation at national level of the mechanisms of non-polluting development were held in the framework of the project „Evaluation of capacity building needs at the national level". The Moldovan delegation participated in the Conference of the Parties.

The MENR is the beneficiary of a grant from the Japanese Government on the creation of the institutional framework for developing and implementing carbon fund projects.

Convention on Long-range Transboundary Air Pollution (Geneva, 1979), ratified by the Parliament on 9 July 1995.

Republic of Moldova signed three out of eight existing Protocols to this Convention namely the Aarhus Protocol on Persistent Organic Pollutants; the Aarhus Protocol on Heavy Metals; the Gothenburg Protocol on Combating Acidification, Eutrophication and Ground Level Ozone. The Hydrometeorologic Service monitors the chemical quality of atmospheric precipitation, including heavy metals and POPs, in transboundary context (Leova monitoring station).

Convention on the Protection of the Ozone Layer (Vienna, 1995), Montreal Protocol on Substances that Deplete Ozone Layer (1979), ratified by the Parliament on 27 July 1996.

The basic legal framework for implementation of the Vienna Convention in Moldova was enacted. The licencing procedure for ozone depleting substances (ODS) was improved. Training was provided for technical staff from refrigerating sector concerning the modern methods of servicing the refrigerators and air conditioners. Training was provided to the Customs Service on the monitoring of ODS. The State Ecologic Inspectorate was equipped with instrumentation for CFC identification.

Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 1989), ratified by the Parliament on 10 March 1998.

In May 2003, the Government approved the Regulation on the control of transboundary movements and disposal of wastes, establishing the concrete procedures of implementation of the Basel Convention.

UN Convention on Combating Desertification (Paris, 1994), ratified by the Parliament on 24 December 1998.

The Republic of Moldova benefited of technical and financial assistance for development of the National Action Program for combating desertification and the National Report on Convention implementation. In the framework of the Convention, the specialized institutions received guidance documents, information on international experience and results obtained in this field.

The sub-regional project "Capacity Building for Drought Prevention and Monitoring in the Northern Part of the Black Sea Region" was developed jointly with experts from the National Institute of Meteorology and Hydrology in Romania.

Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Sofia, 1994), ratified by the Parliament on 17 March 1999.

In 2004, the national report on the implementation of the EU Framework Water Directive was prepared and submitted to the Convention Secretariat. During 2006, the Republic of Moldova will preside at the International Commission for the Protection of the Danube River (ICPDR). To prepare this mandate, the MENR set a special commission and approved a work plan.

Convention on the Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (Aarhus, 1998), ratified by the Parliament on 7 April 1999.

Guidelines for civil servants and the civil society on the implementation of the Aarhus Convention requirements were developed in the framework of the „ Environmental information and public awareness raising in Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine" project. Workshops were organized for representatives of the central and local authorities on ensuring the public access to environmental information and the public participation in environmental decision-making. Three regional seminars on the access to justice in the field of environment were organized jointly with REC-Moldova.

Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971), ratified by the Parliament on 14 July 1999.

The Republic of Moldova is in the initial stage of Ramsar Convention implementation. The country became member of this Convention following the acceptance by the Secretariat of Convention of the first wetland area of international importance („Lower Prut Lakes", No. 1029). During 2004, activities were undertaken to improve the management of the lower Prut area. Materials are being prepared for promoting another wetland area, with the participation of national experts from relevant research institutions.

Convention on Conservation of Migratory Species of Wild Fauna (Bonn, 1979), Agreement on Conservation of bats in Europe and Agreement on Conservation of African–Euro-Asian Migratory Water Birds, ratified by the Parliament on 28 September 2000.

The annual report on Convention implementation was prepared and submitted to the Secretariat. Moldovan representatives participated in the meeting of the expert group on the protection of bats.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Washington, 1973, adhered to on 28 September 2000.

A brochure was prepared on the "Legislation on the implementation of the CITES Convention". Workshops were organised with representatives from the State Environmental Inspectorate and the Customs Service on the implementation of the CITES Convention,

Convention on European Landscape (Florence, 2000), ratified on 12 October 2000.

The Convention entered into force on 1 March 2004. Following the spirit of the Convention recommendations were prepared on the concept of the Chişinău urban development plan and the development plan for the territory of the Republic of Moldova as well as the rehabilitation of several historic monuments.

Convention on Persistent Organic Pollutants (Stockholm, 2001), ratified on 19 February 2004.

In October 2004, the Government of the Republic of Moldova approved the National Strategy on the reduction and elimination of persistent organic poppultants and the National Implementation Plan for the implementation of the Stockholm Convention on POPs.

Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam, 1998), ratified on 25 November 2004.

10.6. Environmental Projects

One of the mechanisms of mainstreaming the limited financial resources into the priority areas of environment protection is the National Environmental Fund (NEF). In 2004, the NEF Administration Council approved the disbursement of approximately 25 million MDL (2 million USD) for 262 projects, including:

112 projects in drinking water supply (10.3 million MDL),
37 projects in waste management (4.3 million MDL),
34 projects in environmental awareness raising (1.5 million MDL),
13 projects in international cooperation activities (1.4 million MDL),
25 projects in forestation and urban management (1.1 million MDL).

Other NEF disbursement lines included support for projects in: (i) biodiversity conservation; (ii) rehabilitation of environmentally degraded areas; (iii) obsolete pesticides management; (iv) upgrading the technical capabilities of environmental agencies; (v) environmental research; (vi) rehabilitation works after environmental accidents or natural disasters; etc.

Due to improvement of the mechanism for environmental pollution charges collection and the introduction of charges on the import of goods that may cause pollution during their use (fuel oil, tires, dyes, batteries, luminescent lamps, plastics), the NEF incomes increased considerably during the last years. In 2004, the NEF revenues amounted to 34.8 million MDL and the expenditures to 23.3 million MDL.

The ongoing environmental projects provide a valuable contribution to solving the complex problems in this field and to raising environmental awareness. In 2004, several technical assistance projects with foreign financing were ongoing. The main project-related information follows in table 10.1.

Table 10.1

Technical assistance projects

Project	Financing agency	Duration
Agriculture Pollution Control Project	GEF	March 2004 – December 2009
Biodiversity conservation in ecosystems of the Lower Nistru	GEF	April 2002 – April 2005
Enabling activities for implementation of the Stockholm Convention on Persistent Organic Pollutants in the Republic of Moldova	World Bank	July 2002 - July 2004
Development of the national biosecurity network in the Republic of Moldova	UNEP/GEF	November 2002 – November 2004
Capacity building for improving the quality of greenhouse gas inventories (Central Europe and CIS)	UNDP, GEF, Switzerland	June 2003 – May 2006
Setting the institutional framework for implementation of the Montreal Protocol in the Republic of Moldova	UNEP	1999-2004
Evaluation of the capacity building needs at the national level	GEF, UNDP	July 2003 - March 2005
Cleaner production in selected NIS countries - Moldova, Georgia and Kazahstan	Tacis	February 2003 – January 2005
Creation of the Ecologic Network in the middle Prut river basin	World Bank	September 2004 – April 2005
Public information, education and awareness raising on environmental matters in the NIS	Tacis	December 2002 – December 2004
Water supply and sewerage systems in settlements of the Republic of Moldova	World Bank	June 2003 – June 2007

10.7. Environmental Education

Creating an environmental culture is possible only through permanent education, starting with the childhood and continuing with primary school, high school, university and professional activity period. Presently, there are no integrated state programs for preschool and school education in the field of environment.

The current system of environmental education in the Republic of Moldova is organized as follows. At the preschool stage, environmental education aims at creating basic hygienic habits in children and making them realize the existence of environmental problems. In primary school, the basics of environmental culture are laid, and the main ideas on the unity of nature and the correct attitude towards the natural environment are inoculated.

At the gymnasium stage, the basis for positive and rational attitude towards the environment has to be created. In this phase the students get the basic notions on environment protection and ecology as well as on the role of nature and natural resources in the evolution of civilization. In high school, environmental education is focused on the interaction between the nature and human society. Environment protection is considered as a component of the human culture.

As an extracurricular activity, the Ministry of Education in cooperation with the MENR organizes "ecological hours" in schools. In March–April, all education institutions participate in tree planting and cleaning activities.

Several environment protection and biodiversity conservation matters are included in pre-university and university curricula for different disciplines (botany, zoology, geography, chemistry, etc.). This refers to both state and private universities, such as the State University of Moldova, the State Agrarian University, the University of Ecology and Socio–Humanistic Sciences, the Technical University of Moldova, the Free International University, the University of Medicine and Pharmacy, the Institute of Real Sciences, the Tiraspol State University. These education programs provide general overviews on the problem. Besides, several universities (e.g. Technical University, Agrarian University, and State University of Moldova) use curricula which focus on environmental issues in particular sectors of the economy.

10.8. Contribution of the Civil Society

The commitment of the Republic of Moldova to implement the principles of the Aarhus Convention on the access to information, public participation in decision making and access to justice in environmental matters and the requirements of the national legislation imply a wide public participation in finding solutions for complex environmental problems. This calls for continuous public awareness activities within different civil society groups.

The level of public participation is directly dependent on the level of awareness on environmental and public health issues. Presently, the participation of people in environmental programs implementation is sporadic (e.g. tree planting, cleaning of springs and drinking wells, etc.).

Approximately 300 environmental NGOs and civil associations are registered in the Republic of Moldova, half of them outside the capital Chisinau. Annually, 50-60 environmental NGOs benefit of grants but relatively few NGOs activate on a permanent basis.

The Republic of Moldova has a relatively advanced environmental legislation and NGOs have large rights in decision-making, environmental compliance control, environmental assessments, etc. In October 2003, 140 public associations and

organizations participated in the third forum of Moldovan environmental NGOs held in Chisinau, under the auspices of REC Moldova. One of the forum outputs was the Memorandum of cooperation between NGOs and the Ministry of Ecology stipulating the right of the NGOs to environmental information and their large involvement in developing and implementing environmental programs and plans.

NGOs representatives are regularly invited to workshops, round tables, conferences, etc. organized by the MENR. NGOs are represented in the administrative councils of the NEF and the local environmental funds, in the working groups created for facilitating the implementation of the international environmental conventions. At several occasions, NGOs representative were included in the national delegations to different international fora.

Public involvement is more efficient when mechanisms of sectoral and inter-sectoral cooperation are in place. For example, in Chisinau, a core of about 15 organizations cooperates on a permanent basis for the implementation of different environmental projects. In 1998, 12 NGOs created the National Nuclear Anti-Transit Committee. This NGOs coalition aims at informing the public on the environmental and health risks comported by the transportation of radioactive wastes from the Kozlodui nuclear power plant (Bulgaria) to Russia through the territory of Moldova. A similar NGOs coalition is focusing its activity on environmental issues in the Dniester river basin.

The universities and pre-university institutions are an active element in implementing environmental programs. Most students participate in activities such as cleaning the urban and natural areas, tree planting, etc. In 2003, over 118,000 people participated in such activities on the national day “A tree for our future”, which resulted in planting 285,000 trees and bushes. 707 illegal waste dumps were liquidated covering a total area of 80 hectares, and 2524 wells and 481 springs were looked after. Forests were planted on 88.5 ha of new areas and re-planted on 111.5 ha of old forests areas; regeneration works were implemented on 146 hectares.

The press, radio and TV provide a considerable support to the civil society. A number of publications such as “Natura”, “Ave Natura”, and “Vreau sa stiu” newspapers, “The Environment”, “Alternatives” and “Gutta” magazines, REC Moldova information bulletins, as well as the radio broadcasts “Ecoterra” regularly provide environmental materials of interest for the general public. The National Environmental Fund provides grants for issuing leaflets, posters, etc. at occasions of environmental significance. Every year, some 30 titles are published with the financial support of the NEF, REC-Moldova and technical assistance projects.

The Environmental Information Center functioning at the MENR premises annually serves approximately 2000 solicitants. The creation of similar information centers was initiated in some regions of the country (Cahul, Bălţi, Ştefan-Vodă).