

DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL REVIEWS 1998 MOLDOVA

EXECUTIVE SUMMARY



NATIONAL ACADEMY OF ECOLOGICAL SCIENCES



in cooperation with the

**Programme Coordination Unit
UNDP/GEF Assistance**



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Preface

The National Reviews were designed to produce basic data and information for the elaboration of the Pollution Reduction Programme (PRP), the Transboundary Analysis and the revision of the Strategic Action Plan of the International Commission for the Protection of the Danube River (ICPDR). Particular attention was also given to collect data and information for specific purposes concerning the development of the Danube Water Quality Model, the identification and evaluation of hot spots, the analysis of social and economic factors, the preparation of an investment portfolio and the development of financing mechanisms for the implementation of the ICPDR Action Plan.

For the elaboration of the National Reviews, a team of national experts was recruited in each of the participating countries for a period of one to four months covering the following positions:

- Socio-economist with knowledge in population studies,
- Financial expert (preferably from the Ministry of Finance),
- Water Quality Data expert/information specialist,
- Water Engineering expert with knowledge in project development.

Each of the experts had to organize his or her work under the supervision of the respective Country Programme Coordinator and with the guidance of a team of International Consultants. The tasks were laid out in specific Terms of Reference.

At a Regional Workshop in Budapest from 27 to 29 January 1998, the national teams and the group of international consultants discussed in detail the methodological approach and the content of the National Reviews to assure coherence of results. Practical work at the national level started in March/April 1998 and results were submitted between May and October 1998. After revision by the international expert team, the different reports have been finalized and are now presented in the following volumes:

Volume 1:	Summary Report
Volume 2:	Project Files
Volume 3 and 4:	Technical reports containing: <ul style="list-style-type: none">- Part A : Social and Economic Analysis- Part B : Financing Mechanisms- Part C : Water Quality- Part D : Water Environmental Engineering

In the frame of national planning activities of the Pollution Reduction Programme, the results of the National Reviews provided adequate documentation for the conducting of National Planning Workshops and actually constitute a base of information for the national planning and decision making process.

Further, the basic data, as collected and analyzed in the frame of the National Reviews, will be compiled and integrated into the ICPDR Information System, which should be operational by the end of 1999. This will improve the ability to further update and access National Reviews data which are expected to be collected periodically by the participating countries, thereby constituting a consistently updated planning and decision making tool for the ICPDR.

UNDP/GEF provided technical and financial support to elaborate the National Reviews. Governments of participating Countries in the Danube River basin have actively participated with professional expertise, compiling and analyzing essential data and information, and by providing financial contributions to reach the achieved results.

The National Reviews Reports were prepared under the guidance of the UNDP/GEF team of experts and consultants of the Danube Programme Coordination Unit (DPCU) in Vienna, Austria. The conceptual preparation and organization of activities was carried out by **Mr. Joachim Bendow**, UNDP/GEF Project Manager, and special tasks were assigned to the following staff members:

- Social and Economic Analysis and Financing Mechanisms: **Reinhard Wanninger**, Consultant
- Water Quality Data: **Donald Graybill**, Consultant,
- Water Engineering and Project Files: **Rolf Niemeyer**, Consultant
- Coordination and follow up: **Andy Garner**, UNDP/GEF Environmental Specialist

The **Moldavian National Reviews** were prepared under the supervision of the Country Programme Coordinator, **Mr. Ion Ilie Dediu**. The authors of the respective parts of the report are:

- Part A: Social and Economic Analysis: **Ms. Tatiana Belous**
- Part B: Financing Mechanisms: **Ms. Tatyana Lariusin**
- Part C: Water Quality: **Mr. Dumitru Drumea**
- Part D: Water Environmental Engineering: **Mr. Alexander Yakirevich**

The findings, interpretation and conclusions expressed in this publication are entirely those of the authors and should not be attributed in any manner to the UNDP/GEF and its affiliated organizations.

The National Academy of Ecological Sciences and the Parliament of Moldova

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1. Executive Summary

The length of the Prut River within Moldova's boundaries constitutes 695 km. The total water availability of Prut is estimated at 2.9 mln.m³/year in typical year.

The total available volume of surface water resources in the Moldavian part of the Danube River basin is estimated at 507.2 mln.m³ in a typical year, at 255.3 mln.m³ in a rainless year, and at 119.83 mln.m³ in a droughty year. The exploitable groundwater resources within the boundaries of the Danube catchment area are estimated at approximately 140 mln.m³/year (currently only half of these resources is used, i.e. 70 mln.m³/year).

The ecosystems of the Prut River basin are represented by 60 species of fish, out of them 8 species are endangered or threatened to be extinct; by 11 species of amphibian; by 7 species of reptilian, from which 3 species are endangered; 80 species of birds, out of them 15 species are endangered or threatened to be extinct, and by 16 species of mammals, out of them 7 species are endangered or threatened to be extinct.

Most wetlands have been drained except some areas directly adjacent to the Prut River.

In general in Moldova 38% of centralized water supply sources do not correspond to human health oriented sanitary-chemical requirements; 16% do not correspond to drinking water quality on nitrates content; 16% - on fluorides; 3% - on chlorides, and 3% - on sulfates. In 1997 in the Moldavian part of the Danube River basin 66.38% of all underground sources for drinking water supply did not meet sanitary-chemical standards, and 28.37% - did not correspond to microbiological requirements.

Within last years compared to other districts the average general disease rate has increased in districts Comrat, Vulcanesti and Glodeni. The higher rate of gastrointestinal diseases and cirrhosis is marked in the districts Hancesti, Nisporeni, Leova. The higher disease rate on stomach ulcer in adults is inscribed in districts Riscani, Glodeni, Cimishlia and Hancesti. Among rural population the high level of disablement due to general gastro-pathology is inscribed in the districts Cahul, Chiadir-Lunga, Ungeni, Briceni, Cantemir and Nisporeni. The higher rate of cardiovascular diseases is marked in districts Cahul, Edineti, Briceni, Comrat, Cimishlia, Nisporeni; the rate cerebro-vascular diseases - in districts Comrat, Chimislia, Nisporeni.

Population of the Danube catchment area (Prut River basin, Cahul River basin and Yalpugh River basin) in the Republic of Moldova constitutes 1,096,464 inhabitants (or 25% of the Republic's population), including 303,863 of urban population and 789,601 of rural population (1996). The quota of rural population in the Danube catchment area is 71.6%; the quota of urban population - 28.4%. Altogether there are 570 settlements in the Moldavian part of the Danube River basin. In 1996 on average population growth in the Moldavian part of the Danube catchment area constituted 1.09 per 1000.

According to multi-annual statistic data, the average domestic water demand for population living in the Moldavian part of the Danube River basin constitutes 177 l per day per capita; the average daily domestic demand per capita for urban population is 203 l, for rural population - 115 l, but this amount widely varies in dependence on district water availability. The share of urban population connected to centralized water supply system in the Moldavian part of the Danube River basin constitutes 73.3%, or 225,068 inhabitants out of 306,863; the share of rural population connected to the centralized water supply system constitutes 11.8%, or 99,373 inhabitants out of 789,601.

In 1996 the total theoretic domestic wastewater production in the Moldavian part of the Danube River basin constituted 14.87 mln.m³ (11.9 mln.m³ from urban population and 2.97 mln.m³ from rural population). The total realistic domestic wastewater production constituted 8.77 mln.m³ (8.46 mln.m³ from urban population and 0.31 mln.m³ from rural population). Average per capita production of domestic wastewater is estimated at 152 l per day; for urban population this amount

constituted 158 l per day and 75 l per day - for rural population. On average, the share of urban and rural population connected to centralized sewerage system constitutes 47.9% and 1.45% respectively.

Calculations made in the frame of the Nutrient Balances study for the Danube River basin show that total load of nitrogen on the water ecosystems in the Moldavian part of the basin Industry is responsible for 8 t of nitrogen, mineral fertilizers application 3750 t, organic fertilizers - 1900 t and erosion 12.5 – 20,000 tons.

In accordance with the data obtained from the Hydrometeo Service and reports from the National Institute of Ecology one can make a conclusion that concentrations of the mineral forms of nitrogen do not exceed admissible level. According to the standards reported concentrations of N-NO₃, N-NH₄ cannot be limit factor for the water use.

Moldavian soils have relatively high pH and high content of carbonates near the surface. In these conditions phosphorus compounds have low migration capacity and can be transported mainly with the runoff. Average concentration of this element in waters is normally 10-15 times less than of nitrogen. Concentration of this element also grows from upstream to downstream and after the confluence of the Prut River with Jijia concentration increases in 1.5 - 2 times.

In accordance with estimations made for the Nutrient Balances study industry is responsible for 1 t of phosphorus, mineral and organic fertilizers for 670 tons and erosion for 510 tons.

Phosphorus concentration in small rivers and water bodies is also much higher than in the Prut River. The reasons for it seem to be the same as for nitrogen.

Average concentration of BOD in the Prut River varies from 2.5 till 3.5 mg/l. Significant growing of the concentration of this ingredient has taken place after the confluence with the Jijia River. Approximately the same picture is for COD, whose level of concentration varies around 20 mg/l. Among heavy metals only Zn and Cu are included now in the routine monitoring programme in Moldova. The results of analyses show, that pollution of water ecosystems with these ingredients does not cause any serious problems and their concentration is much lower than maximum admissible level. Routine monitoring also has registered some pollution of the Prut River water by oil and other toxins.

Transition period in the development of national economy and cooperation with different partners from the European Union, USA, different international Institutions etc. caused appearance in Moldova of new economical units and new technologies. That is why, some other Hot Spots, often not traditional for the country have appeared for last 2 - 3 years.

At the same time it should be mentioned, that Danube part of the country is mainly agricultural area with strong predominance of rural population. Industrial enterprises are presented mainly by food and tobacco industry. All these factories are not big water consumers and water consumption is relatively small even in comparison with the eastern part of the country.

Due to the traditional features of national economy and existing sewer system all Hot Spots in the Moldavian part of the Danube River basin could be divided in the following groups: municipal (industrial wastewater are treated together with the municipal one); agricultural; dumps of industrial, agricultural and municipal wastes.

There are no special programs and projects aimed at the reduction of nutrient emissions in the Moldavian part of the Danube River basin. At the same time there was a pilot project in 1995-1996 sponsored by USAID for the development of organic agriculture. There were selected several farms in the northern part of the Prut River basin (district Briceni). In the framework of the project there were introduced advanced EU technologies for organic farms and several workshops for private landowners have been organized.

Actually, the final tender for the TACIS project with total amount of 2,5 mln. ECU is declared, which is aimed at the improvement of water management in the Prut River basin. It presumes reconstruction of some wastewater treatment plants in the Moldavian part of the Danube basin and through it reduction of nutrient and microbiological loads in the water ecosystems. This project will probably start at the end of 1998. Another project, which is going to be developed with the support from TACIS, is aimed at the wetland restoration on the whole territory of the country and feasibility study for the Vulcanesti dump. This project is at an initial stage. There was only a identification mission to Moldova and it is expected that it can be approved at the end of 1999. There are no special projects aimed at the reduction of the hazardous substances loads in the Moldavian part of the Danube River basin. The mentioned above TACIS project is also partially aimed at the reduction of microbiological pollution. In 1993-97 the total domestic environmental expenditures stabilized at the 1.1-1.3% of the GDP. This includes following components: I) operational costs (60-70% of total amount), consisting of expenditures on operation and maintenance of environment protection facilities, expenditures on the control over the state of environment, as well as expenditures on the activity of governmental agencies in the field of environmental management and protection; ii) expenditures on the capital repair of assets like water and wastewater treatment facilities (10% of total expenditures); and iii) capital investments in environment protection and rational use of natural resources (25% of total expenditures).

As per provision of funds, currently there are used following domestic sources of environmental financing in Moldova: state budget, local budget, enterprises' resources, and environmental funds.

Despite the fact that financial conditions and mechanisms of the market economy are developing in Moldova, the *state budget* still remains the main contributor to the funding of environmental expenditures. However, the dynamic of state financing has been negative, decreasing in 1997 to 0.23% of GDP that constitutes only 44% of the funds available in 1993. It should be noted, that state capital investments were the most hindered component, constituting in 1997 only 0.07% of GDP (or 31% in comparison with 1993). The capital investments into wastewater treatment facilities and sewage systems (around 70%), as well as investments into rational use of land resources (25-30%) predominated in the distribution of funds.

According to existing estimations, the *input of local authorities* into environmental financing, particularly into construction of environment protection facilities, is currently very low: 3.4% of total capital investments in 1993, 3% - in 1994, 2.2% in 1995, 0% in 1996 and 5% in 1997. At the same time, the responsibilities of local authorities in the field of management and financing of municipal services, such as water supply or waste collection and disposal, are much broader than previously.

Special extra budgetary funds - the *national and local ecological (environmental) funds* - were primarily established in 1990 for financing environment protection activities. The National Ecological Fund is functioning under the Ministry of Environment and local ecological funds - under the Regional Ecological Agencies (previously - under district authorities). The incomes of ecological funds were quite low: 0.01% of GDP in 1995, 0.02% - in 1996 and 0.01% in 1997. In relation to total environmental expenditure this constitutes only 0.13-0.26%. The balance sheet of NEF will depend very much on the environmental charges prescribed by the law on environmental charges (ecological taxes), and a substantially increase in Fund's incomes from taxes is foreseen in the near future. The environmental funds will have to spend about 60 per cent of their revenues on specific environmental projects.

Moldova has received financial assistance from the international sources - International Monetary Fund, the World Bank and European Bank for Reconstruction and Development, as well as grants from the organizations of the United Nations system, European Union, France, Germany, Italy, Japan, the Netherlands, Romania, Turkey, and the United States. According to 1996 data, the total amount of technical assistance exceeded US\$ 42 million. The main areas that received technical

assistance are: support for financial reform and the banking sector (27.38%), restructuring of enterprises (12.17%), development of entrepreneurship (11.87%), and development of social infrastructure (11.02%). Technical assistance for environmental protection amounted to only 2.18% of the total in 1996. Foreign direct investment (FDI) flows are modest in real terms but relatively large in comparison to GDP. In 1995, they represented 3.8% of GDP, or US\$ 15 per capita. Cumulative flows at the end of 1995 stood at US\$ 76 million, and at US\$ 121 million at the end of 1996. After a substantive increase between 1994 and 1996, FDI inflows diminished in the first half of 1997. The majority of FDI projects are directed to utilities and services (47%), manufacturing (13%), wholesale and retail trade (12%). Agriculture, construction and transport take less than 1% each. The MoE's role in promoting/preparing investment projects is quite weak at the moment, and reduced to the approval of the prepared documents with regard to environmental impact of the project. The low enforcement of environmental legislation sometimes leads even to disregard of this procedure.

2. Description of the State of the Danube Environment

The Prut River is the last major tributary of the Danube. Total length of Prut River is 967 km; its length within Moldova's boundaries constitutes 695 km. The total water availability of Prut River is estimated at 2.9 mln.m³/year in typical year.

The total available volume of surface water resources in the Moldavian part of the Danube River basin is estimated at 507.2 mln.m³ in a typical year, at 255.3 mln.m³ in a rainless year, and at 119.83 mln.m³ in a droughty year. The exploitable groundwater resources within the boundaries of the Danube catchment area are estimated at approximately 140 mln.m³/year (currently only half of these resources is used, i.e. 70 mln.m³/year). The total volume of water in aquifers horizons is roughly estimated at 25 times as much. On the territory of the Moldavian part of Danube River basin 2119 artesian wells, 62099 shallow wells and 252 springs are exploited. Currently used aquifers belonging mostly to upper, middle and lower sarmatian complex and partly to Silurian complex are not substantially polluted because of existence of protecting zones. Generally the share of used aquifers does not exceed 50%, what is lower than in other countries. However, overextraction of groundwater has caused significant decrease of water level in some areas; especially large depression in the Moldavian part of the Danube River basin is marked around town Comrat. In spite of the fact that total annual water resources appear adequate, there are local and seasonal difficulties with water supply, especially in the southern part of the Moldavian part of Danube River basin.

In the Moldavian part of the Danube River basin there are 40 main waterbodies with volume greater 1 mln.m³ each. The biggest natural lakes are located in the downstream of Prut River; all these lakes are connected to the river by natural channels.

The ecosystems of the Prut River basin are represented by 60 species of fish, out of them 8 species are endangered or threatened to be extinct; by 11 species of amphibian; by 7 species of reptilian, from which 3 species are endangered; 80 species of birds, out of them 15 species are endangered or threatened to be extinct, and by 16 species of mammals, out of them 7 species are endangered or threatened to be extinct.

Most wetlands have been drained except some areas directly adjacent to the Prut River. Along the Prut River there were originally significant areas of wetlands, but only small ones remains. Limestone quarries and the dredging of the riverbeds for sand are significant causes of environmental degradation, and in particular, habitats destruction of river ecosystems. Remaining species in the Moldavian part of the Danube River basin are very limited due to intensive use of land for agricultural needs and destruction of wetlands, and species number has been dramatically reduced over last years. The fish population also has reduced due to these activities in addition to riverbanks degradation and water pollution.

In general in Moldova 38% of centralized water supply sources do not correspond to human health oriented sanitary-chemical requirements; 16% do not correspond to drinking water quality on nitrates content; 16% - on fluorides; 3% - on chlorides, and 3% - on sulfates. In 1997 in the Moldavian part of the Danube River basin 66.38% of all underground sources for drinking water supply did not meet sanitary-chemical standards, and 28.37% - did not correspond to microbiological requirements. In particular, centralized and decentralized sources of drinking water supply do not correspond to sanitary-chemical standards: in district Briceni - 12% and 46%, in district Ungeni - 61% and 70%, in district Leova - 84% and 79%, in district Cahul - 57% and 85% and in district Vulcanesti - 50% and 100% respectively. The share of contaminated centralized water supply sources on nitrates content constitutes: in Chiadir-Lunga - 14%, in Cantemir - 13.6%, in Taraclia - 11.4%; the share of contaminated centralized water supply sources on fluorides content constitutes: in Chiadir-Lunga - 55%, in Comrat - 21%, in Edineti - 19.3%, in Falesti - 76%, in Glodeni - 71.3 %, in Hancesti - 37.7%, in Nisporeni - 21%, in Riscani - 44.5%, in Ungeni - 15%.

Within last years compared to other districts the average general disease rate has increased in districts Comrat, Vulcanesti and Glodeni. The higher rate of gastrointestinal diseases and cirrhosis is marked in the districts Hancesti, Nisporeni, Leova. The higher disease rate on stomach ulcer in adults is inscribed in districts Riscani, Glodeni, Cimishlia and Hancesti. Among rural population the high level of disablement due to general gastro-pathology is inscribed in the districts Cahul, Chiadir-Lunga, Ungeni, Briceni, Cantemir and Nisporeni. The higher rate of cardiovascular diseases is marked in districts Cahul, Edineti, Briceni, Comrat, Cimishlia, Nisporeni; the rate cerebro-vascular diseases - in districts Comrat, Chimislia, Nisporeni. In 1995 in districts Comrat and Ungeni have been registered 16 and 6 cases of cholera respectively.

Water pollution, soil erosion and degradation, loss of biodiversity, forest degradation and reservoir siltation are the key issues of environmental degradation.

3. Population Development and Water Sector Relevant Characteristics

Population of the Danube catchment area (Prut River basin, Cahul River basin and Yalpugh River basin) in the Republic of Moldova constitutes 1,096,464 inhabitants (or 25% of the Republic's population), including 303,863 of urban population and 789,601 of rural population (1996). The quota of rural population in the Danube catchment area is 71.6%; the quota of urban population - 28.4%. Altogether there are 570 settlements in the Moldavian part of the Danube River basin. In 1996 average population growth in the Moldavian part of the Danube catchment area constituted 1.09 per 1000.

According to multi-annual statistic data, the average domestic water demand for population living in the Moldavian part of the Danube River basin constitutes 177 l per day per capita; the average daily domestic demand per capita for urban population is 203 l, for rural population - 115 l, but this amount widely varies in dependence on district water availability. The share of urban population connected to centralized water supply system in the Moldavian part of the Danube River basin constitutes 73.3%, or 225,068 inhabitants out of 306,863; the share of rural population connected to the centralized water supply system constitutes 11.8%, or 99,373 inhabitants out of 789,601.

Taking into account the expected introduction of cost covering water prices it appears that average daily domestic water demand for population living in the Moldavian part of the Danube River basin will be 215 l per capita in 2010 and 240 l per capita in 2020. The average daily domestic water demand per capita for urban population is estimated to be at the level 240 l in 2010 and 275 l in 2020. The average daily domestic water demand per capita for rural population will constitute 180 l in 2010 and 205 l in 2020. It is expected that in 2010 total domestic water demand will be at the level 36.2 mln.m³; for urban population this amount will constitute 24 mln.m³, for rural population - 12.2 mln.m³. In 2020 total domestic water demand is estimated to be 58.8 mln.m³; for urban population - 34.1 mln.m³, for rural population - 24.7 mln.m³.

In 1996 the total theoretical domestic wastewater production in the Moldavian part of the Danube River basin constituted 14.87 mln.m³ (11.9 mln.m³ from urban population and 2.97 mln.m³ from rural population). The total realistic domestic wastewater production constituted 8.77 mln. m³ (8.46 mln.m³ from urban population and 0.31 mln.m³ from rural population). Average per capita production of domestic wastewater is estimated at 152 l per day; for urban population this amount constituted 158 l per day and 75 l per day - for rural population. In average, the share of urban and rural population connected to centralized sewerage system constitutes 47.9% and 1.45% respectively. Total domestic wastewater production will be at the level of 19.6 mln.m³ in 2010; for urban population - 17.4 mln.m³, for rural - 2.2 mln.m³. In 2020 the amount of domestic wastewater for urban population will constitute 26.5 mln.m³, for rural population - 8.4 mln.m³. In 2020 the total amount of domestic wastewater is estimated to be at the level of 34.9 mln.m³.

Generally, it is rather difficult to determine a direct connection between state of the population's health in the districts and quality of drinking water because there is a number of other socio-economic factors, and therefore state of human health needs to be considered in the context of both environment quality data and local social, economic and cultural conditions.

Microbiological contamination is reflected by outbreaks of water-borne diseases, and they are manifested by symptoms of acute intestinal infection. According to assessment of the Ministry of Health, 20% of all acute intestinal diseases could be attributed to contamination of drinking water. In the first turn, the quality of drinking water affects general disease rate, and in particular, the rate of gastrointestinal diseases.

4. Analysis of Actual and Expected Impact of Economic Activities on Water Demand and Potential Pollution of Aquatic Systems

Altogether total industrial raw water demand in Moldova in 1996 was 1128 mln.m³. Industrial raw water demand in the Moldavian part of the Danube River basin was at the level of 7.2 mln.m³. The proportion of raw water for industrial needs in the Danube basin compared to raw water demand for industrial needs in Moldova is quite insignificant and constitutes 0.62%. In 1995 this proportion was 0.7% (8 mln.m³ of water have been used in the Danube River basin and 1093 mln.m³ - total in Moldova).

In 1997 the abstraction of raw water for industrial needs was approximately at the level of the years 1995 and 1996 and constituted about 6-7 mln.m³.

Altogether about 20% of cultivated lands are currently under irrigation. In the Moldavian part of the Danube River basin the irrigation system covers 82,998 ha, however due to various causes not all-available lands in the districts are being irrigated and total surface area of irrigated lands could widely vary from year to year. In average annual water demand for irrigation is a portion of 20 to 70% of seasonal crop water requirements. In 1996 in the Moldavian part of the Danube River basin the average irrigation application rate was 1560 m³ of water per ha.

In 1996 due to raising of fees for water used for irrigation and for electrical energy, and also due to poor conditions of irrigation system the amount of water used for irrigation was in 2 times less compared to the year 1995, especially in the Moldavian part of the Danube River basin. Total in Moldova in 1996 raw water demand for irrigation was 274 mln.m³; in the Moldavian part of the Danube River basin - 56.77 mln.m³. Thus, the proportion of total national raw water demand for irrigation in the Danube basin constitutes 21%. In 1995 this proportion was at the level of 26% (105 mln. m³ from the Danube River system and 402 mln.m³ total in Moldova).

In 1996 compared to the year 1995 the abstraction raw water for irrigation has dropped in 2 times in the Prut River basin and in 1.5 times - in the Yalpugh and Cahul Rivers basin. In 1997 water abstraction for irrigation needs was approximately 10% less compared to the year 1996 and constituted about 48-50 mln.m³.

In 1996 total wastewater discharge into the Danube River system constituted 36.06 mln.m³. From this amount 8.77 mln.m³ represented municipal discharge; 6.93 mln.m³ - industrial discharge and 20.36 mln.m³ have been discharged by agricultural units. 4.89 mln.m³ of these effluents have not been treated at all; the rest portion - 31.17 mln.m³ have been treated biologically. In Moldova, including Prut River basin and Danubian lakes basin there is no installed advanced wastewater treatment facilities.

In 1997 the municipal, industrial and agricultural wastewater discharge into surface water of the Danube River system was at the level of 1996. Also, at approximately the same level remained the proportion of non-treated and biologically treated wastewater.

There are 22 large and 561 local municipal and industrial solid waste disposals and specialized sites for sanitary treatment of solid waste covering 419 ha with total volume 8229 thousand m³ in the Moldavian part of the Danube River basin. Normally big disposals are located within 8-10 km of each district center or town. Besides, in rural area practically near each settlement is situated local solid waster disposal. There is information obtained from informal sources that some of these local disposals often are situated directly at the banks of small rivers. At least 25% of authorized disposals are currently exceeding capacity, however further construction of new disposals has been stopped because of economic crisis. Besides, in the Moldavian part of Danube River basin there is a number of illegal dumps with mixed industrial and municipal wastes, which pollute surface water

and groundwater. Monitoring data of the Ministry of Health indicate a high level of microbiological contamination of soil in the rural area. In fact, 15% of soil samples do not correspond to microbiological standards. In some localities 25% of soil samples are strongly polluted by helminthes.

There is not a single well-organized hazardous industrial and chemical waste disposal site in the Moldavian part of the Danube River basin. According to expert assessment, more than 700 tons of highly toxic waste is in stock, and 580 tons of them are pesticide residues. The rest of hazardous waste is mainly represented by metal hydroxides, petroleum products, oily and cyanide waste.

Despite that sometimes industrial waste disposals in the districts are being reported, in the annual reports on environment state there is no special division of solid waste disposals on municipal and industrial (non-toxic) disposals. Basically, they are collected, stored and treated together.

Besides, in each district on the Moldavian part of the Danube River basin, except Ungeni, there is a certain amount of stored non-used and prohibited pesticides. However in the reports on Environment State obtained from local ecological inspectorates there is no detailed descriptions how and where they are stored. Normally, these disposals represent roofed open sites without special arrangements for prevention pollution of soil and water.

According to the national plan of economic development elaborated in the past it was supposed that water use and relatively abstraction of raw water will increase significantly and by the year 2005 will reach about 3500 mln.m³. However, currently the existing “Complex Scheme of Water Supply and Sewerage Systems Development until the year 2005” is being revised and water management experts think that abstraction of raw water in Moldova will be at the level of 2500 mln.m³ by the year 2010 and 3370 mln.m³ by the year 2020. The abstraction of raw water from the Danube River system is estimated to be 207 mln.m³ in 2010 and 285 mln.m³ in 2020. For domestic needs will be abstracted 36 mln.m³ in 2010 and 59 mln.m³ in 2020; for industrial needs 15.5 mln.m³ in 2010 and 21.4 mln.m³ in 2020; for irrigation needs - 75 mln.m³ in 2010 and 85 mln.m³ in 2020; for other needs - 45 mln.m³ in 2010 and 60 mln.m³ in 2020.

It is assumed that total wastewater discharge from municipal, industrial and agricultural sectors into the Danube River system will be at the level of 64.1 mln.m³ in 2010, including 19.6 mln.m³ of domestic wastewater discharge, 14.7 mln.m³ of industrial wastewater discharge and 29.8 mln.m³ of agricultural wastewater discharge. In 2020 the total wastewater discharge will constitute 106.2 mln.m³, including 34.9 mln.m³ of domestic wastewater discharge, 20.3 mln.m³ of industrial wastewater discharge and 51 mln.m³ of agricultural wastewater discharge. Also, it is supposed, that proportion of non-treated wastewater will constitute 3% in 2010 and there will not remain non-treated proportion of wastewater in 2020; the proportion of biologically treated wastewater will constitute 87% in 2010 and 75% in 2020; the proportion of advanced treated wastewater will be 10% in 2010 and 25% in 2020.

5. Analysis of Water Quality Data and Description of Environmental Impact on Ecosystems and Human Quality of Life

There are not any integrated water quality classification schemes adopted in the Republic of Moldova. The evaluation of water quality is accomplished on the basis of Maximal Admissible Concentration (MAC) for each contaminant. There are two different kinds of MACs in use. One MAC is level for the water bodies, which are used for domestic purposes (human health oriented, sanitary MAC), and another - for the water bodies, which are used for fish farming purposes (ecologically oriented, environmental MAC). In case of complex usage of a water body (for drinking water supply and for fish farming) the quality of water can be evaluated as the basis of both schemes separately. In many cases, the environmentally oriented water quality standards are stricter in comparison with sanitary ones. In addition, the quality of water can be evaluated for irrigation purposes by means of specific water compounds norms.

The standards and ecological norms of the former USSR currently are applied in Moldova. Their validity was prolonged by decision of the Moldavian Standards Board until the formulation of corresponding national standards. Actually, water quality can be monitored for a number of substances, for which the Ministry of Health Ministry and Ministry of Fisheries of the former USSR set MACs.

There are not developed as well strategic water quality and water protection programmes in Moldova. Currently, the economic difficulties of the transition period force the authorities responsible for environment to amend the regulations they apply and make corresponding changes in their institutional structure, to review and expand the methods applied (including penalties, environmental charges, economical stimuli), reinforce monitoring systems and develop appropriate tools and instruments for this. Hence the task of the environmental authorities is to follow economic reforms towards the attainment of environmental goals. The key issues are to improve environmental protection legislation, including new standards, to switch the responsibilities from central bodies towards the local administration.

Moldavian part of the Danube River basin is presented by the basin of the Prut River (in Moldova) - 8300 km², Yalpugh and Cahul Rivers (in Moldova) - 4300 km² (lower Danubian lakes basins). Actually Prut River is monitored at the 6 stations. Half of them are part of the Trans National Monitoring Network.

The network for the water quality and quantity sampling was created at the beginning of the seventies. Danube part (Prut River) of the country was the border of the former Soviet Union with a strict regime and access to the river, even for sampling it was very difficult. That is why data about quality of this river are rather poor. Data on the Prut water quality in this time were not transparent for public and were published only in special editions.

Yalpugh River was studied in the mid of the seventies in the frame of the hydrotechnical constructions, which had been finished at the beginning of the eighties by the desiccation of the river valley and construction of the channel, which had to provide artificial water bodies, where TDS was 2,5 - 3 g/l with the Danube water, where TDS was 0,5 g/l. The results of the channel exploitation caused increasing TDS in the transported Danube water till 2-2,5 g/l (during transportation Danube water was saturated with the salts from rocks, evaporation etc.). It made impossible irrigation in the southern part of the country and actually artificial water bodies are used only for fishing and recreation. The process of siltation is very strong and it is expected that in the nearest time (10 - 12 years) that these lakes will disappear.

Environmental monitoring in the Republic of Moldova is carried out by different State Institutions. The following Institutions are involved in the monitoring of water resources:

- Ministry for Environmental Protection
 - Service "Hydrometeo" (Hydrological Department) - surface water quantity
 - Service "Hydrometeo" (Pollution Control Center) - surface water quality
 - State Inspectorate of Environmental Quality (Regional Ecological Agencies) - surface water quality, waste water
- Ministry of Health
 - Sanitary-Hygienic Republican Center (Districts sanitary-hygienic services) - surface waters and shallow groundwater quality
- Ministry of Agriculture and Foodstuff
 - State Water Management Consortium "Apele Moldovei" - surface water quantity
- Agency of Geology of Moldova "AGeoM" - groundwater quantity and quality

Each organization follows its specific goals and operates according to specific monitoring programmes (concerning sampling sites, sampling frequency, analytical equipment and methods). At recent times, these programmes are not sufficiently coordinated. There is no systematic information exchange between Ministries and data information network.

The Ministry of Health is responsible for the quality control of drinking water by chemical and bacteriological parameters. The samples of surface water and water from shallow wells are analyzed by Districts Sanitary-Hygienic Services and/or on the base of central analytical laboratory.

The control of the quality of wastewater and their treatment is the obligation of *Ministry of Municipal Services and Housing*.

The Ministry for Environmental Protection, the main responsible Authority in the fields of environmental protection, carries out surface water quality monitoring via Pollution Control Center in Kishinev. The samples are collected during field expeditions and analyzed in central laboratory. Currently there are 13 sampling sites on the Prut River and 2 sampling stations on small internal rivers (Ciugur, a tributary to the Prut River, and Lunga, a tributary to one of the Danubian lakes). The water quality measurements include about 30 hydro-chemical and 5 biological determinants. Biological samples are taken simultaneously with water quality samples during joint expeditions. Saprobic indexes are calculated and information on phytoplankton, zooplankton, zoobenthos, periphyton and bacterioplankton is used for the data interpretation. The analytical possibilities of Regional Ecological Agencies are extremely limited.

As a rule sampling is held by the 2-3 people from the laboratory staff. There were no special training courses for the sampling procedure and staff training. First training in this direction had taken place in 1996 in the frame of the Danube Environmental Programme and 8 people participated in this activity. On the base of this training there was developed a guide for sampling and 2 trained people were selected as responsible persons for the sampling in the Hydrometeo Service.

Another important part of the training activity in the frame of the Danube programme was analytical training in different Institutions in the EU and CEE countries (8 people participated in this training) in 1996. One of the drawbacks of the training was that delivering of the equipment will start probably at the end of 1998-beginning 1999 and it seems to be useful to repeat some training issues like GC, AAS and data handling. In accordance with the contract between the TACIS and Ministry of Environmental Protection of Moldova (National Institute of Ecology and Hydrometeo service) Moldavian Laboratories will be provided with modern analytical equipment -

AAS, GC with computer terminals, glassware etc. for 450000 ECU. It will strongly improve Moldavian capacities in the frame of the TNMN, local monitoring network and will allow to analyze ingredients, which are not analyzed now.

There are some types of quality control practice in Moldavian laboratories

- Internal control. This control is held between laboratories on the basis of analyses of the same sample and then results are being compared.
- International cooperation. Moldavian laboratories, especially those working within international agreements, participate in the interlaboratory studies and international projects such as QualcoDanube and EQUATE. The results obtained in the frame of these projects showed good compatibility especially for nutrients (more than 90% of tested samples) and fragmentary results on Cu and Zn. Unfortunately actual technical facilities do not allow to analyze heavy metals and some organic substances with instrumental techniques. Analyses, which were held, were made by using calorimetric method, which does not allow to make mass analyses and takes much time.
- Technical facilities for the quality assurance. It is one of the most acute issues in Moldova, because the standards used for calibration of equipment are very old and often inaccurate (on the base of discussion and analytical tests around 50% of standards, received from the former USSR are not pure enough). International cooperation in the frame of such projects allowed to calibrate existing equipment and to obtain relevant results especially for nutrients.
- Quantitative capabilities of equipment. As equipment used in Moldova is mainly from the former USSR time, it is very difficult to maintain it and that is why, often it does not work or its efficiency is low. One of the main problems caused by it, is small amount of samples, which does not allow to monitor all hot-spots, too long procedure for analyses and often quality loses in analyses.
- Internal control of assurance in laboratory management. The subject for control is the results of measurements obtained in the frame of metrological accredited and standard methodologies. Internal control is monitored by head of laboratory. This activity consists from two parts:
 - Preventive control for avoiding of rough error. This control must be made in the laboratories, where that random error was found, which does not depend on the interference components in the sample must not exceed 1/3. Such control includes in itself operative control after the results on the measurements of rough error and control on the stability of calibrations. Operative control must be held before current measurements of any ingredient. This control is made on the base of standards, which do not have any interference compounds, influenced on the results of calibration and the concentration of measured component is within working limits. If the number of results, having rough error exceeds 20% or occur 3 times, the causes of this phenomena must be analyzed and responsible persons (mainly head of laboratory) have to develop plan of actions to avoid them with the nomination of responsible people and dates.
 - Statistical control of measurements. This activity is held with the standard solutions and tested liquids. Statistical control is held during all control period. Recent laboratory management and analyses are made according to methodology presumed in the ISO standards. Quality assurance is developed among laboratories by analyzing of the same samples and by analyzing of the standards obtained from authorized Institutions. The results are presented to the state Institutions, which are responsible for the accreditation and control of the qualitative laboratory practice. In case of necessity, they provide technical and methodological assistance (very limited) for the improvement of quality parameters in the day to day activity.

Sediment discharges are not measured in the routine monitoring and during the flow measurements. That is why it is really difficult to estimate pollutants loads, which can be contained in them. Due to the insufficiency of financial resources, the processes of siltation were measured last time at the beginning of the nineties. All reservoirs on the small rivers were built on the base of 20-30 years functioning.

Statistical procedure is carried for the next issues of statistical calculations:

- limits of permitted errors for each analysis
- calculation of the parameter of rightness
- control of stability of graduate characteristic (calibration curves)
- statistical control of reproductivity of current analyses (each analyze is carried out in 3 repetitions, if results are compatible and more repetitions till the level of reproductive results)

In case of leakage, alarm situations etc. analyses are made due to necessity, which is determined by current conditions of accidents. In case of high water no special sampling activity is presumed. Sediment discharges have not been measured in Moldova. Some fragmentary studies were held for Dnister River (out of the Danube basin) in the seventies. Main attention was paid to the studying of siltation processes in water bodies.

Data storage has been made on the paper and published as annual reports (qualitative and quantitative parameters) till the beginning of the nineties. These reports could be used only for service purposes without free access to them. Actually new data are also stored on paper or in PC without being included in the information network. Data obtained in the last 5-7 years are not published at all, but according to legislation everybody can have free access to them. Unfortunately, local authorities often charge financial resources for the use (copying) of the raw data.

Actually only mineral forms of nitrogen are analyzed in Moldova. The concentration of all forms of nitrogen grows from upstream to the downstream of the rivers. Reported average annual concentrations, which are based on monthly measurements, do not exceed maximum admissible levels (in some cases they are very close to the admissible limits). At the same time it should be mentioned that concentrations of all forms of nitrogen grow after the confluence of the Prut River with the Jijia River, coming from Romania.

Concentration of the mineral forms of nitrogen in Yalpugh River is higher than in the Prut River. The reasons for it can be low dilution capacity of small rivers, high frequent of water bodies, where the depth is less than 2-3 m and erosion of fertile soils from agricultural crops. Taking into account that economic activity in the basins of small rivers is approximately the same, density and style of life of population is also very similar from basin to basin one can assume that water quality in small rivers is close to each other.

Calculations made in the framework of the Nutrient Balances study for the Danube River basin show that Industry is responsible for 8 t of nitrogen, mineral fertilizers application 3750 t, organic fertilizers - 1900 t and erosion 12,5 - 20.000 tons.

In accordance with the data obtained from the Hydrometeo Service and reports from the National Institute of Ecology one can make a conclusion that concentrations of the mineral forms of nitrogen do not exceed admissible level. According to the standards reported concentrations of N-NO₃, N-NH₄ cannot be limit factor for the water use.

Moldavian soils have relatively high pH and high content of carbonates near the surface. In these conditions phosphorus compounds have low migration capacity and can be transported mainly with the runoff. Average concentration of this element in waters is normally 10-15 times less than of nitrogen. Concentration of this element also grows from upstream to downstream and after the confluence of the Prut River with Jijia concentration increases in 1.5 - 2 times.

According to estimations made for the Nutrient Balances study industry is responsible for 1 t of phosphorus, mineral and organic fertilizers for 670 tons and erosion for 510 tons.

Phosphorus concentration in small rivers and water bodies is also much higher than in the Prut River. The reasons for it seem to be the same as for nitrogen. Recent standard for phosphorus in Moldova is 3.5 mg/l. Actually environmental and sanitary authorities recognize that it does not reflect real situation and should be revised. Target standard is presumed to be 1 mg/l. The reported concentrations of this element in the rivers of the Moldavian part of the Danube River basin are much lower and cannot limit water use from the rivers.

Measurements of total nitrogen and phosphorus are being held in the Moldavian routine monitoring programme.

Average concentration of BOD in the Prut River varies from 2.5 till 3.5 mg/l. Significant growing of the concentration of this ingredient has taken place after the confluence with the Jijia River. Approximately the same picture and for COD, whose level of concentration varies around 20 mg/l.

Among heavy metals only Zn and Cu are included now in the routine monitoring programme in Moldova. The results of analyses show that pollution of water ecosystems with these ingredients does not cause any serious problems and their concentration is much lower than maximum admissible level.

Routine monitoring also has registered some pollution of the Prut River water by oil and other toxins.

Generally, according to estimation the water of the Prut River corresponds to drinking quality standards in terms of mineralization, pH, DO, chlorine, sulfates, oil compounds, N-nitrite and N-nitrate, silicon, copper. At the same time, in many cases, the concentrations of some components were higher than adopted limits. The exceeding concentration rates (indicated in brackets) were indicated for sodium (1.2 - 2.0 times), BOD (1.1 - 2.5), phenols (4 - 9), organochlorine pesticides, NH₄ (1.3 - 1.5), copper (6 - 7), zinc (8 - 12). The water of the Ciugur River (tributary of Prut with monitoring sampling site) did not correspond to drinking water standard in terms of BOD (1.3 times), phenols (12.0), copper (8.0) and zinc (11.0).

The running surface water in the Danubian lakes basin is extremely polluted and could not be used for drinking purposes. Exceeding concentrations of BOD (1.9 - 2.5 times), oil (1.1 - 2.2), phenols (9.0), NH₄ (2.4 - 2.6), copper (10), zinc (8 - 13) are detected.

According to the multi-annual statistics the average concentrations of SS in the Prut River are fluctuating mainly in limits 490 - 670 mg/l (in some years the average annual concentration of SS can reach 900 - 1000 mg/l), in the Prut tributaries - 170 - 525 mg/l (800 - 1300 mg/l), in the Danubian lakes basin - 2500 - 5000 mg/l (9800 - 11000 mg/l).

The surface water in reservoirs located in the north part of the Prut basin is limited for drinking purposes by sodium (1.4 - 3.1 times) and pesticides contamination. In central part of the Prut basin the water of reservoirs is polluted by sulfates (1.1 - 2.8 times for drinking standard), sodium (5.6 - 18.9) ions and total mineralization (1.3 - 3.9). For reservoirs located in the southern part of the Prut and the Danubian lakes basins the exceeding of standards was indicated for chlorine (up to 1.7 times for drinking), sulfates (up to 3.1), sodium (up to 14.1) and mineralization (up to 3.2).

Within last years to a significant extent due to water quality compared to other districts the average general rate of diseases inscribed in districts Comrat, Vulcanesti and Glodeni was higher. The higher rate of gastrointestinal diseases and cirrhosis is marked in districts Hancesti, Nisporeni and Leova. The higher rate of stomach ulcer diseases in adults is inscribed in districts Riscani, Glodeni, Chimislia and Hancesti. Among rural population a high level of disablement due to gastro-pathology is inscribed in the districts Cahul, Chiadir-Lunga, Ungeni, Briceni, Cantemir and Nisporeni. The higher rate of cardiovascular diseases is marked in districts Cahul, Edinesti,

Briceni, Comrat, Chimislia, Nisporeni; the higher rate of cerebro-vascular diseases - in districts Comrat, Chimislia and Nisporeni. According to analytical assessment, the extremely polluted sources for centralized drinking water supply cause higher risk for population health in districts Chiadir-Lunga, Ungheni, Leova, Glodeni.

In the Moldavian part of the Danube River basin the average infant mortality rate is 17 per 1000. The average mortality rate due to infectious diseases of adult population is 15 per 100000. The average mortality rate due to diseases of digestive system including cirrhosis is 131 per 100000. In average, the general disease rate in the Moldavian of the Danube River basin constitutes 223 per 100000. Morbidity rate due to hepatitis A constitutes 252 per 10000; the average rate of morbidity due to dysentery is 42 per 100000. Besides, in 1995 in districts Comrat and Ungeni have been registered 16 and 6 incidences of cholera respectively.

6. Identification, Description and Ranking of Hot Spots

Previous list of hot spots prepared for the SAP was developed at the end of 1993. Data used for Moldavian National Review referred to 1991 and first half of 1992. Actually many of industrial and agricultural enterprises, which played an important role in national economy at the end of the eighties - beginning of the nineties are not working at all or only partially.

Transition period in the development of national economy and cooperation with different partners from the European Union, USA, different international Institutions etc. caused appearance in Moldova of new economical units and new technologies. That is why, some other Hot Spots, often not traditional for the country have appeared within last 2 - 3 years.

At the same time it should be mentioned, that Danube part of the country is mainly agricultural area with strong predominance of rural population. Industrial enterprises are presented mainly by food, tobacco industry. All these factories are not big water consumers and water consumption is relatively small even in comparison with the eastern part of the country.

Due to the traditional features of national economy and existing sewer system all Hot Spots in the Moldavian part of the Danube River basin can be divided in the following groups:

- municipal (industrial wastewater are treated together with the municipal ones)
- agricultural
- dumps of industrial, agricultural and municipal wastes

The communal central systems of water supply are exploited in 56 settlements. The total capacity of water pumping of these systems is 1075 thousands m^3 /day. Towns Cahul, Leova, Ungheni, Cantemir consume together 44.1 thousands m^3 per day.

The annual water supply for different purposes from the Prut River is 13.5 mln. m^3 (domestic and industrial needs), which is distributed through pipelines. Average water consumption in Moldova (form distribution network, including industrial, agricultural and other needs) is 310 l/day per capita. WWTPs of main towns in the Moldavian part of the Danube catchment area treat 26.9 thousands m^3 /day. The volume of treated waters is 94% of all water consumption from the *distribution network* in the Moldavian part of the Danube basin . Emissions from WWTPs in the Prut River are around 10 mln. m^3 per year or 27 thousands m^3 /day and the rest is created in the basins of small rivers Yalpugh and Cahul. The volume of untreated waters is 6% and the common length of sewer system (collectors) in the Moldavian part of the Danube River basin is 2200 km. Irreversible losses and leakage in the distribution network are 30-40% of all water consumption.

The conditions of emissions of sewage waters are determined by regulations of usage and protection of water resources on the base of Maximal Admissible Emission (MAE). These MAEs are confirmed by SS and BOD from 3 to 5 mg/l. Other ingredients normally correspond to the State Standards.

Actual practice of collecting of the wastewater presumes, that majority of agricultural and industrial discharges are treated together with municipal ones. Industry in the Moldavian part of the Danube River basin is mainly represented by the food industry and that is why list of pollutants is very similar with the list of wastewater from population polluters. Agricultural emissions treated at the municipal treatment facilities are coming mainly from animal farms (many of them are not working since 1993-94). That is why main pollutants originating from WWTPs are presented by organic substances, nitrogen, phosphorus, BOD etc.

Main part of pollutants originating from agriculture refers to the application of organic and mineral fertilizers, pesticides and wastes from animal farms. In comparison with the end of the eighties - beginning of the nineties, when the average use of mineral fertilizers was on the level of 220 kg/ha

of a.c. (active component) for N and P, actual average use is now on the level of 10 kg of N and 1 kg of P per ha. Amount of organic fertilizers has also strongly reduced and consists actually of 0,3 tones per ha annually (6-8 tones at the end the 80-s).

Agricultural sources of pollution are mainly presented by diffuse sources, where any treatment is impossible. Main point sources of pollution from agriculture are animal farms, which actually are not working, but manure accumulated for many years is a significant source of pollution especially for underground aquifers.

Another pollutant originating from agriculture is pesticides use. Actually the amount of pesticide application is on the level of 3-4 kg/ha and half of this amount is presented by copper sulfate (at the end of the eighties pesticide application was on the level of 10-12 kg of a.s./ha).

On the base of the results obtained from material accounting for the Nutrient Balances study for the Moldavian part of the Danube River basin, actually the most important source of nitrogen and phosphorus for Moldova is erosion. In accordance with estimations it gives 2000 - 2300 tons of N and 130 - 200 tons of P.

Actually due to the structural changes in agricultural practice, approximately the same amount of animals is in the private husbandry, without any treatment or deposited facilities. Recently private households have become main producers of meat in Moldova. Treatment facilities at the private households are absent and produced manure is not treated. It is stored directly near the settlement or is used adjacent to the domestic cultivated area. Thus rural settlement can be estimated as a diffuse source of pollution especially with nutrients, BOD, bacteria and viruses.

Each town and big settlement in the Moldavian part of the Danube River basin has its own solid waste disposal site. In addition to it there is a pesticide dump near the Danube bank (14 km). All these dumps and waste sites including the landfills can be estimated as hot spots.

Unfortunately there are no analytical data concerning the chemical composition of solid waste. Therefore it is possible to assess, that they can have influence on the quality of surface and especially underground water quality. Nevertheless, due to the absence of especially hazardous enterprises in the Moldavian part of the Danube River basin and main features of national economy one can admit that chemical composition of these sites can originate mainly from nutrients, BOD, some heavy metals like Cu, Zn, Pb and Cr.

High Priority Hot Spots are the Municipal Wastewater Treatment Plants for Ungeni Town and for Cantemir Town and the Industrial Site of the Vucanesti Dump. Medium Priority Hot Spots are the Municipal Wastewater Treatment Plants for Bricenia for Edinet, Cahul, Comrat and Taraclia. Medium Priority Agriculture Hot Spot is the Edinet Pig Farm. Low Priority Hot Spots consisted of the Municipal Wastewater Treatment plants for Riscani, Glodeni, Falesti, Nisporeni, and Leova.

7. Identification and Evaluation of Pollution Reduction Measures

7.1. National Targets and Instruments for Reduction of Pollution

In Moldova there are no developed strategic water quality and water protection programmes. However, in spite the difficulties of transition period the ecological authorities are going dramatically to amend the situation in the sphere of applied regulations, including environmental charges, penalties and various economic motivation; of reinforcing of monitoring systems and developing of tools and instruments. The key issue is to improve ecological legislation, to establish new standards and to transfer some responsibilities from central ecological authorities to local ones. In the past the strategy for natural resources exploitation and environmental protection mostly was based on rendering emissions and wastewater harmless after the production cycle rather than avoiding inappropriate use of water and reducing the amount of waste originated in the applied technologies. According to estimations made in Nutrient Balance, currently the wastewater treatment facilities constitute about 88% of total environmental protection assets.

Priorities in environment protection policy within transition period have been outlined in National Strategic Action Plan (1995). The basic target goals are concentrated on water resources management. In respect of water quality aspect the reduction of pollutants in discharging wastewater is supposed and establishment of new water quality standard systems. Also, in the National Strategic Action Plan water related issues, such as water resources, water quality and prevention of its pollution, water supply, quality of irrigation water, monitoring etc. have been nominated as actions of highest priority.

The state of humans health and their welfare depend on water quality. In Moldova the state of population health is rather poor. Besides, because of insufficient water quality, drainage of major part of wetlands, large-scale extraction of river sand, building of hydrotechnical constructions and other anthropogenic causes the direct and indirect destruction of habitats and loss of biodiversity can be observed. Water of good quality is essential not only for organisms living in water but for other wildlife depending on this water. In this connection currently there is a necessity to realize that rivers, streams, lakes and wetlands are a national treasure, because clean waters support incredible diversity of animal and plant life, support sources of drinking water, use for recreation etc.

So, the national targets of reduction of water pollution are to maintain human health and to eliminate health risk in water resources, to provide sources of nutrition, and to maintain and restore biodiversity. The achievement of these issues relates to solution of such issues as:

- comprehensive evaluation of water resources conditions and elaboration of a concept of protection and rational use of water resources and water-balanced systems based on sustainable development approach
- elaboration of scheme for river basins use aimed at protection of water resources; encouragement of putting into force of watersaving technologies in industry and agriculture
- development of ecological criteria for assessment of permissible loads into surface waters
- developing and putting into force of integrated parameters and criteria for maintaining of ecological balance in waterbodies
- development of methods of water quality prognosis in the waterbodies aimed at optimization of activities in use and protection of water resources
- evaluation of contemporary and perspective storage of groundwater resources
- preparation of methodical ground for rehabilitation and maintenance of proper ecological conditions in waterbodies designed for certain uses.

The governmental declarations related to water pollution prevention mostly concern the following adopted laws: The Constitution of the Republic of Moldova (1994); Protection Areas of Rivers and Lakes (1983); The Law on Environmental Protection (1993); Water Code of the Republic of Moldova (1993); Code on Underground Resources (1993), Law on Industrial Wastes (1997) and Law on Toxic Substances (1998). Besides, there are pending decisions of the Government of the Republic of Moldova: Fee for Water; Protecting Actions for Prut River; Activity in the Field of Chemical Wastes and Non-Used Pesticides Harmlessness Admitted on the Territory of the Republic of Moldova; Regulation of Water Management. Besides, the Parliament of Moldova has ratified and jointed some international conventions: on Biological Diversity; on Wildlife and Natural Habitats Protection in Europe; Bucharest Declaration; Convention on Transboundary Effects of Industrial Accidents; Danube River Convention (the ratification of this Convention is supposed to be at the end of 1998) and some others.

Altogether activities on water protection are elaborated with consideration of schemes of complex use and protection of water resources.

Within last years in Moldova much has been done to improve the ecological situation and to ensure the rational use of natural resources. However, currently it is quite complicated because of difficulties of transition period to market economy and lack of financial resources to support environmental programmes; lack of distinct legal framework outlining the responsibilities of central and local authorities; insufficient power of environment protection authorities and poor economic discipline.

The system of actual policies and strategies has been elaborated over the last few years and it was realized at two levels - administrative and economic. At the administrative level the ecological control has been strengthened because of the occurrence of a big number of environmental law violations. In order to minimize the environmental damage resulting from construction and reconstruction of economic enterprises obligatory Environment Impact Assessment has been introduced. To prevent the environment pollution the allowed rates of pollutants in aquatic and air basins were defined by the Moldstandard and Ministry for Environment Protection; state standards of the former Soviet Union have been approved as national standards. A number of activities related to environment has to be considered, approved and licensed to relevant organizations: exploitation of underground resources not related to the their extraction; exploitation of mineral water resources; use of natural resources; ecological audit; waste treatment; elaboration of ecological ground in the project documentation; training of environmental specialists etc.

According to the Law on Environment Protection, a number of economic instruments are provided: charges for natural resources use (water, soil, flora, fauna); fees for environmental pollution; fines in the case of ecological legislation violation; fiscal discounts for rational use of the natural resources, installation of environmental friendly technologies, for waste reduction, use of closed water cycles in technological process etc.

Currently in Moldova a quite small share of home gross product is established by Government for expenditures on environment protection activity, maintenance of healthy environment and restoration of natural resources.

7.2. Actual and Planned Projects and Policy Measures

There are no special programmes and projects aimed on the reduction of nutrients emissions in the Moldavian part of the Danube River basin. At the same time there was a pilot project in 1995-1996 sponsored by USAID for the development of organic agriculture. Several farms in the northern part of the Prut River basin were selected (district Briceni). In the framework of the project there were introduced advanced EU technologies for organic farms and have been organized several workshops for private landowners.

Currently, the final tender for the TACIS project with total amount of 2,5 mln. ECU is declared, which is aimed at the improvement of water management in the Prut River basin. It presumes reconstruction of some wastewater treatment plants in the Moldavian part of the Danube basin and through it reduction of nutrient and microbiological loads in the water ecosystems. This project is scheduled to start at the end of 1998.

Another project, which is going to be developed with the support from TACIS is aimed at the wetland restoration on the whole territory of the country and feasibility study for the Vulcanesti dump. This project is in an initial stage. There was only a recognition mission to Moldova and it is expected that it can be approved at the end of 1999.

There are no special projects aimed at the reduction of the hazardous substances loads in the Moldavian part of the Danube River basin.

The above-mentioned TACIS project is also partially aimed at the reduction of microbiological pollution.

8. Analysis of National Financing Mechanisms

8.1. Policies for Funding of Water Sector Programmes and Projects

In the National Environmental Action Plan of the Republic of Moldova (1995) have been outlined main strategies, policies and prior environmental reforms on environment and water pollution reduction, on socio-economic development toward sustainable development and healthy environment. The most important issue is to keep a balance between economic reforms, and the conducting and applying of an ecological approach in the industrial and agricultural development. In this connection the Government is going to start reforming the national economy toward rehabilitation of environment, what implies the elaboration and use of advanced technologies; new technical level of industrial and agricultural processing based on the preservation of natural resources, including energy resources, which finally should promote the rehabilitation and maintenance of environment. In fact, priority actions related to protection of natural resources, enlargement of forestry area and protected areas include: enforcement of status in the existing protected areas; establishment of protective status in the Lower Prut National Park and in remaining wetlands in the lower Prut in accordance with Ramsar Convention; improving of monitoring and enforcement of status to protect forest resources; establishment of strictly enforced penalties and financial rewards for illegal logging; developing of public awareness programs towards protection of scarce natural resources from illegal activities. At the macro-economic level state policy will be oriented at the effective economic policy, which should promote minimum damage to the environment. At the micro-economic level state policy will be oriented at the integration of principles of environment protection approach into all sectors with the introduction of environmental friendly technologies, reduction of local raw materials use and energy consumption. In the National Environmental Action Plan have been outlined the strategies in conducting of reforms in agricultural sector, and economic mechanism of natural resources management. Regarding the agrarian reforms special attention will be paid to the observance of ecological requirements. It means that: areas designed to be protected by the state must be excluded from the privatization list; in the process of privatization should be taken into account the spatial distribution of the private plots to increase conservation efficiency. Also, ecological requirements include transition of agricultural technologies on the biological basis with a minimum use of pesticides and chemical means for plant growth regulation; stimulation of ecologically clean production; use restrictions in areas highly vulnerable to erosion and posing major risk to water resources; observance of agricultural microtechnologies, which are based on a territorial management scheme and on crop rotation system; improvement of agro-ecological training for managers of agricultural units; establishment pilot watershed conservation projects with participation of private landowners; research and education programs on sustainable agricultural practices, including integrated pest and nutrient management, efficient irrigation, and conservation tillage practices.

In agricultural sector the transition from concentrated and excessive forms of organization to a system of use of agro-environmental possibilities of soil and on bio-ecological principles will be encouraged. However, taking into account the process of privatization, next ecological issued will be considered: financing of environmental programmes from means obtained from privatization; promoting the privatization of environmental non-friendly enterprise, which are important for development of national economy; early privatization of units, which need to be replaced to other areas or to be reconstructed in order to cause less damage to environment, responsibility for previous pollution and stored wastes.

Economic mechanism of natural resources management is supposed to be focused on the stimulation of cautious use of renewed and non-renewed resources. Normally, this mechanism is realized through credit-financial and budget-tax policy and expressed in planning and state

financing of activities on exposure, assessment, protection of natural objects and restoring of violated or exhausted natural resources; charges for natural resources use and fees for environment pollution; easy tax terms and credits to economic units, which introduce new technologies with decreased use of natural resources use; easy tax terms for commercial banks and investment funds in the case of their participation in long-term ecological projects financing; establishing realistic prices for natural resources; stimulating of activity directed at the restoring of renewed natural resources; tax imposing for use of contaminated natural resources; introducing the system of state orders for enforcement of environment protection activity from budget means. In developing tax reform policies the main consideration will be given to reducing any disincentives to clean production and abatement technology in order to promote pollution reduction. Enterprise taxation needs to consider allowing accelerated depreciation of clean production technology for tax purposes.

Some measures directed at the enforcement of land conservation policy and stopping the further land degradation are going to be undertaken: enforcement land use restrictions for land, which shows severe chemical contamination and causes groundwater contamination; introduction a set of programmes for lands, which serve as a buffer zones for protection of water resources; developing afforestation and vegetation cover programmes for lands, which are at slopes and would protect watersheds; establishment of a conservation programme for national reserves and wetlands.

The Ministry for Environment Protection intends to improve cooperation with sectoral Ministries, other institutions and non-government organizations in order to develop and completely incorporate environmental impact assessment and environmental audits into the economic development programmes. A special attention is going to be paid to possibility for free public access to environmental information and opportunity to participate in decision-making process.

8.2. Funding Mechanisms for Water Sector Programmes and Projects

Generally on-going and new environmental projects are financed through the state budget from two types of resources:

- government's own resources;
- external loans or grants (in whole or in part).

In addition, the government provides some state guarantees for loans to former state enterprises or organizations. Over time, the government envisages that the municipalities and local authorities will increasingly take a greater share of responsibility for planning and budgeting of their own projects. Generally, the total allocation of the investment (budget and foreign loan component) is based on an assessment of available sources for financing, from both the domestic budget (including special budgets) and from foreign loans (both commercial and concessional). Since amortization payments are increasing in the 1998-2000 period the prudent limit for external borrowing is falling. The loan component of the investments consists of both loans taken by the government for direct financing of the investment programmes and for guarantees of foreign loans taken by non state organizations for projects included in the programme. In total Moldova will have about \$537 m of resources at its disposal, which could be used for financing of the Public Investment Programme.

In 1998-2000 the investments will be directed mostly toward rehabilitation of existing infrastructure to support the emerging private sector. Rehabilitation and modernization are being given a higher priority in existing investment programme than new investments because small investments made now can save large investments for replacement infrastructure in the future and small investments now can recoup benefits from investments made in the past which were not completed. In addition, energy and utilities investments create the opportunity to recoup costs through new user charges.

The major challenge in outlining of investment programme is to balance demands from the following sources against a limited availability of government funding whilst at the same time, ensure that the ceilings set together with the IMF, for engagement in foreign debt, are respected. The sources for projects investment include the following:

- *donors*: a stock of on-going or recently started donor projects/programmes, which represents a clear-cut package for sectors consisting of an investment project proper, associated technical assistance, management, rules and regulations such as procurement as well as monitoring and evaluation of the project;
- *donors*: new offers for donor loan-funded projects;
- *line ministries/local authorities*: emphasis on completion of construction projects currently funded only through local resources;
- *line ministries/local authorities*: proposals for investment programme projects submitted as their highest priorities.

8.3. Actual Cost and Price Policy

Penalties for license exceedance are paid in progressive ratio. Duration for such kind of license could be permanent; constitutes till 3 years (short-term), or 3-25 years (long-term). Normally in practice the duration of the license varies from 1 to 5 years. The water Code also stipulates that the users must pay for water according to legislation. Actually the charge for the water use is fixed by the governmental decision (1994) and constitutes: from surface water - 0.2% of the minimum salary for 10 m³ (0.001\$ per m³); from groundwater - 0.5% of minimum salary for 10 m³ (0.002\$ per m³). At the moment the rate of national currency is next - 4.88 Lei is equal to \$1; 5.37 Lei is equal to 1 ECU.

For the licensing of wastewater discharges into surface water the responsible institutions are the Department for Environment Protection and Sanitary-Epidemiological Service; the duration of such kind of license is a period between 1 and 5 years. According to Water Code the discharge of waste water is permitted only if: i) it is not result to exceeding of maximum allowed concentration in receiving water; ii) the users provide the treatment of wastewater to the degree required by the ecological, water management and sanitary authorities. The base for calculation of fees or charges are wastewater volume-related and pollution load-related. These payments are made on the account of extra-budgetary Ecological Fund and could be used for improving of environmental conditions. It is necessary to underline, that pollution fees and fines and natural resources user charges inadequately reflect the social cost of environmental degradation and do not provide pollution reduction or use natural resources more efficiently. Fees, fines and charges will to be raised and indexed to inflation.

Payments for environmental pollution are realized according to relevant Regulations approved by the Ministry for Environment Protection. The decision of the Parliament concerning the putting into force of the Law on state budget stipulates that the government must set the amount of payments for environmental pollution and establish the mechanism of payment gathering. Generally, the following types of payments have been established:

- for aquatic resources pollution. Its amount depends on the content and level of toxic pollutants in the wastewater discharging in the sewerage systems or in natural waterbodies. In case when discharges exceed the fixed limits the payments are being enhanced in a progressive mode;
- payments for waste dumping are also being counted in dependence on toxicity of waste content and its amount (however, currently payments for waste dumping are not gathering in the Moldova).

In 1998 payments for water use have been established at the next level:

- for each 10 m³ of water from surface and underground sources except water used for mineral water production - 10% of minimum salary (1.8 lei, or 0.38 USD)
- for each 10 m³ of water used for mineral water production - 10% from its market value
- for exceeding of allowed volumes of water abstraction payment is imposed to be 10 times as much
- for surface water used for irrigation and fish-farming in the allowed limits payment constitutes 5% of minimum salary (0.9 lei, or 0.19 USD)
- for water used by thermal power station for cooling in the allowed limits payment constitutes 3% of minimum salary (0.54 lei, or 0.15 USD)

The calculation of fees for wastewater discharge depends on such parameters as type of pollution, the concentration of pollutants during discharge and quality of receiving surface water. For wastewater discharge into the waterbodies (rivers, lakes) or aquifers fee for pollution is established in accordance with fixed (allowed) norms of maximum admissible discharges on indexes of pollutants in the project documentation.

Fees for specific indexes of pollutants are realized by water users, who discharge wastewater into the centralized sewerage system. The list of these indexes and maximum admissible concentrations of pollutants is established by the service of exploitation of wastewater treatment plants in agreement with environment protection authorities. Fee for wastewater discharge in allowed limits (maximum admissible concentration, maximum admissible discharge) is determined as a product of tax norm and amount of pollutants. Fee for wastewater discharge exceeding allowed limits of pollutants is determined as a product of tax, amount of pollutants, and coefficient of exceeding of existing concentration of pollutants over normative concentration. Conversion of realistic amounts of pollutants into conventional tons is realized through multiplication of pollutants amount on coefficient of hazard A of chemicals. Fee for wastewater discharge on filtration fields is determined as a product of tax norm (0.108 lei or 0.023 USD) on total volume of discharge. Fee for water discharge from fish farms, and for run-off from the territory of enterprises is imposed only for exceeding of allowed pollution and it is determined as a product of tax norm, coefficient 5 and index of exceeding (in conventional tons).

Anti-pollution fees include payments for pollution of aquatic resources and for pollution from waste disposals. Discharges within established limits have to be paid at the usual order; all extra discharges have to be paid at the 5 as higher than tax norm. However, majority of enterprises do not make these payments; within last years the average amount of payment constituted about 0.1-0.3% of budgetary revenues.

Fee for waste disposals for industrial enterprises keeping wastes on their territory is determined as a product of tax and volume of wastes in tons. Fee for waste disposals at the specialized sites in the allowed limits is determined as a product of tax norm and volume of waste in tons; fee for waste in the amount exceeding allowed limits is imposed to be 5 times as higher.

8.4. Actual and Planned Public and Private Investments for Water Quality and Wastewater Management Projects

The level of investment in Moldova has been low and continues to be low. This leaves little resources for the replacement of worn out facilities let alone new investment. In such a situation it is important to focus the available resources on those investments, which are of highest priority to the country, and to make sure that existing investments are managed effectively. Energy, agricultural restructuring, transport infrastructure, utilities, constructions and the social sphere are

priorities for this public investment programme. Some other sectors such as telecommunications, public transport, industry, trade and commerce are excluded because their functioning is better assured by the private sector.

Concerning agricultural restructuring, the Parliament of Moldova has recently enacted legislation, which provides an initial framework for the land market and removes lease controls on private land. A liberal price and market regime for agriculture has been introduced. Progress has been achieved in the de-monopolization of input supply and grain handling.

The Government is promoting further acceleration of large-scale farm restructuring. It is envisaged that the restructuring of at least 500 large-scale farms will be completed over the next 18 months. The restructuring will be based on full privatization of land, i.e., physically identified land plots for each beneficiary with individual titles. The new landowners freely decide on the way they wish to continue farming. Land will remain in individual private ownership in the various forms of newly emerging farming organizations, and these forms provide opportunities for further restructuring and modifications in land use. A uniform cadaster system is being established along with other legal and institutional conditions. The Government is thereby setting up a system of clear and enforceable ownership rights necessary for a functioning land market, a pre-condition for the success of land reform.

In a land-locked, predominantly agriculturally based economy, transport constitutes a big share of the water pollution. A well researched road strategy has been elaborated and priorities for new construction to ensure Moldavian territorial control of routes, which currently wind in and out over adjacent borders, has been put in place. There also has been a plan for upgrading, rehabilitating and modernization of key road developed. In the railway sector, the lack of repair and maintenance has now led to a difficult situation for exploitation. A Danube River Oil Terminal in Guirgiulesti in the south of the country, has been in preparation as a private investment project for several years. A considerable additional long-term infrastructure investment is needed to ensure the functioning of the terminal and the transport of oil to the central and northern regions. Examples of additional infrastructure include railway, road, electricity, utilities, and possible dredging, increased road haulage capacity for transportation.

The most important activity in the utilities sector is the development of the water supply, sewerage and refuse disposal systems. Supply of each utility is variable in both geographic distribution and quality. Taking the country as a whole, the existing deficiencies result directly in low indices of quality of life and, indirectly, relate to declining health indicators.

Water supply is a particularly important problem in rural areas where supply is not only limited in quantity (sometimes water supply constitutes near 50 liters per capita per day over two, two-hour periods of supply) but also of quality where, in many cases in the southern districts, irrigation water is higher in quality than domestic supply. In these areas, supply is provided by wells where water quality has been affected by high levels of fertilizer use over the years. In urban areas, water quality is affected by old, corroding pipes and poor maintenance of the systems. The same holds true for sewerage where both networks and plants need improvement.

Refuse disposal is rudimentary, based on land in-fill. There is no treatment of hazardous waste or any recycling or recovery of useful waste. Considerable economic benefit is lost by the absence of sorting and recycling and prevention of the effects of hazardous waste would be highly economical to health and safety. The main objectives in utilities sector are:

- development and modernization of water distribution network, wastewater treatment modernization;
- financing of uncompleted assets of water supply and sewerage networks and plants in rural and urban areas through microprojects.

9. Development of National Pollution Reduction Programme and Investment Portfolio

9.1. Project Identification, Description and Cost Estimation

The short list of running and completed projects in Moldova related to the Pollution Reduction Programme includes:

Creation of National Register for Toxic Waste

The objective of the project is to create the National Register of Toxic Wastes. This will improve the management of toxic wastes in the country.

Total cost: 16.000,00 USD

Integrated Water Management of the Costesti-Stanca Reservoir on the Prut River

The project is intended to elaborate an action plan for the management of water resources in order to ensure a sustainable water use by various users in Romania and Moldova, including the sensitive river ecosystems. Other objectives are to develop a plan for reduction of pollution loads into the reservoir in order to prevent accumulation of micropollutants in sediments and eutrophication and to establish a bi-lateral monitoring programs to control the quality of water and sediments in the reservoir.

Total cost: 300.000,00 USD

Toxic Waste Incineration in Cement Kilns

Presently big amounts of toxic wastes (galvanic sediments, old and banned pesticides) are stored on the territory of industrial and agricultural units. There are no special sites in Moldova, where such wastes can be stored. One of the possible solution is the incineration of some toxic wastes in cement kilns. The costs of the re-construction of a cement kiln in order to be used as a toxic wastes incinerator constitutes 5% from the cost of a standard commercial incinerator. The requested sum is to be spent for installation of a waste disaster, the procurement of a control system, and the training of the staff.

Total cost: 1.000.000,00 USD

Creation and Maintaining of Environmental Training Center

The main activities of the Center will be the environmental knowledge exchange and spreading of international experience in this field and training of specialists, organizing of environmental regional seminars.

Total cost: 100.000,00 USD

New Technologies for Treatment of Waste and Waste Containing Heavy Metals

The following activities are planned: (1) Evaluation of the total amount of galvanic wastes accumulated in Moldova; (2) Elaboration of new treatment technologies for such wastes.

Total cost: 50.000,00 USD

Creation of the National Environmental Information System

The project is conceived as a three phase process of substitution of existing mode of collecting, analyzing, keeping and transmission of information with electronic information management. NEIS is planned to be a virtual network of interconnected computers distributed territorially among environmental organizations in order to implement modern technology of information management, provide public access to environmental data and facilitate decision making process.

Total cost: 605.000,00 USD

Energy Efficiency Programme

Support to the Energy Efficiency Programme: energy audit, staff training, energy awareness programme. Extension of residential energy saving measures.

Total cost: 0,68 MECU

Development of Energy Conservation Programmes at the National and Local Levels

Development of energy-use statistics; implementation of energy-saving survey; of audits; of a pilot scheme for offices of the NEEO at regional level to provide advice to consumer demonstration of energy efficient technologies; training in energy saving.

Total cost: 1,25 MECU

Improvement of Traffic Flows in Trans-European Network Corridors II and IX

Activities: actions to improve traffic flows on corridors Germany-Russia and Finland-Greece.

Total cost: N/A

Port of Giurgiulesti Oil Terminal

Appraisal study for potential European Bank for Reconstruction and Development (EBRD) financing of Guirgiulesti oil reception facilities to Moldavian Parliament and EBRD approved project.

Total cost: 0,45 MECU

Management Gas and Oil Pipelines Extensions to Ukraine and Moldova

Activities: seminars.

Priority Emergency Investments in Oil and Gas Pipelines

Assistance to improve security of gas pipelines.

Total cost: 6,0 MECU

Regional Seas Programme - Black Sea, Caspian Sea and the Danube River Basin

Funding of selected parts of the Strategic Action Plan Implementation Programme: wetland rehabilitation; pesticides dumps; industrial waste treatment and others.

Total cost: 1 MECU

Prut River Management

Creation of an Environmental Information System; development of river & ground monitoring strategy; development of wastewater management strategy; modernization of monitoring laboratories.

Total cost: 2,5 MECU

Raising Public Awareness, Developing Environmental Media and Resourcing Good Practice

Development of the capacity of the media to report environmental issues; continued support to the CIS Inter-Parliamentary Assembly; building of the Best Practice Resource Center for promotion of Best Practice models; transfer of the resources to the new REC.

Total cost: 2,5 MECU

Widened Environmental Action Programme

Support to the activities of the Regional Environmental Center in project preparation, creation of mechanism for financing feasibility studies, environmental legal advice service; intra-ministerial and intra-NIS environmental cooperation and enhancement of environmental awareness.

Total cost: 6,50 MECU

Development of Common NIS Environmental Policies

Support to the establishment of common national environmental action plans for NIS countries. Colloquia, documentation and training.

Total cost: 4,00 MECU

Environmental Programme for the Danube River Basin

Accident Emergency Warning System and Monitoring, Laboratory and Information Management for Ukrainian and Moldavian part of the Danube Basin (TACIS)

Overall objective: i) To enable Ukraine and Moldova to meet their international obligations under the Danube River Protection Convention in the establishment of the Danube Accident Emergency Warning System and the Danube Trans National Monitoring Network (TNMN); ii) To promote regional (Danube basin-wide) cooperation, investment preparation and the elimination of health risk in water resources, control on water quality and developing proposals for the pollution reduction and pilot projects.

Specific objective: To provide the equipment, training and expert advice required for establishing AEWS and TNMN systems in Ukraine and Moldova.

Total cost: 1,0 MECU

Development of Common Environment Policies in the Newly Independent States (NIS) and Mongolia (completed in June 1998). The main objective of this TACIS-financed project was to assist the NIS countries and Mongolia to develop effective capacity for addressing the serious environmental problems they face. This is being achieved through: (i) providing long term advisers, to be resident in the country for up to one year; (ii) short-term assistance in the areas such as environmental priority setting, cross sectoral environmental issues, environmental legislation, public participation, project preparation, and environmental economics; (iii) organizing training courses and workshops in the key areas at a sub-regional level with a focus on common NEAP frameworks, trans-boundary issues and participation in international conventions.

Building Capacity for the Implementation of the National Environmental Action Plan in Moldova (UNDP, on-going). This project aims to assist the Ministry for Environmental Protection of Moldova by enhancing its capacity to implement the National Environmental Action Plan (NEAP). This will be achieved through the institutional strengthening, support for development of the local environmental action plans and mechanisms of their realization for each of the Regional Ecological Agencies; and the identification and promotion of projects fitting NEAP recommendations.

Raising Environmental Awareness and Developing Environmental Media in the NIS and Mongolia (on-going). The overall objective of this TACIS project is defined as follows: to raise awareness of possible solutions to environmental problems and to build the capacity of selected groups in tackling environmental problems. The programme will work to increase the coverage of environmental problems in the mass media, increase the NGOs' efficiency and work with the Governments of the region to support the environmental legislative process.

Pilot Project on Developing NEAP Environmental Indicators in Moldova (completed). In order to facilitate the evaluation and monitoring of the NEAP implementation process, the Organization of Economic Cooperation and Development supported the development of a set of environmental indicators. This project involved the participation of international consultants and experts from Moldavian institutions responsible for the natural resources management and environment protection.

Environmental Performance Review of Moldova (completed). In the framework of this project the UN/ECE environmental experts reviewed the current environmental policy and the degree of integration of environmental policies into the economic and social ones.

Farm Environmental Management Demonstration Programme (completed). The Environmental Policy and Technology Project, sponsored by the United States Agency for International Development, was facilitating during 1995-1996 the introduction and demonstration of agricultural production techniques and methods that could lead to environmental improvements in Moldova. In cooperation with government agencies, NGOs and the farming community, three locations were selected to introduce there the farming practices and techniques that offered both cost effective and ecological means to advance the agricultural sector of Moldova.

Study on the Quality of Rural Drinking Water (completed). This project was implemented during 1996-1997 by the Department of Environmental Protection with the financial assistance of the World Bank. The overall project objective was to contribute to the implementation of sustainable land-use and water resources management practices in Moldova. Specific objectives of the study were (1) to assess the actual state of groundwater pollution in selected pilot areas, and (2) to develop and introduce concepts on reduction and control of groundwater pollution from anthropogenic sources.

Moldova 21 (recently approved by UNDP). Through this project the global Capacity 21 programme will assist the Republic of Moldova to undertake a series of activities aimed at the development of the Moldova 21 Action Programme, which would focus at: upgrading the existing institutional framework and reviewing the state policy for launching a participatory process for designing a unified vision on Moldova's path to the 21st Century; supporting the cross-sectoral integration of the existing and future economic, social and environmental initiatives in the country; and strengthening the capacities of local and international actors as well as the knowledge of the general public on the key sustainable development issues. The coordination and monitoring of the Moldova 21 project will be assigned to the High Economic Council under the Presidency of the Republic of Moldova.

Small GEF Grants within the Environmental Programme for the Danube River Basin. This regional programme was designed to create a framework for the long-term solution of the problem of pollution in the Danube River Basin. In the framework of this programme, the UNDP office in Moldova supported the participatory development of the Danube Strategic Action Plan with the involvement of Moldavian experts and non-governmental community, as well as assisted Moldavian environmental NGOs in building their capacity to solve problems of a basin-wide character at the local level. The small project component is going to be renewed in the nearest future.

Domestic resources for funding of environmental projects

In 1993-97 the total environmental expenditures stabilized at the 1.1-1.3% of the GDP. This includes following components:

- operational costs (60-70% of total amount), consisting of expenditures on operation and maintenance of environment protection facilities, expenditures on the control over the state of environment, as well as expenditures on the activity of governmental agencies in the field of environmental management and protection;
- expenditures on the capital repair of assets like water and wastewater treatment facilities (10% of total expenditures); and
- capital investments in environment protection and rational use of natural resources (25% of total expenditures).

As per provenience of funds, currently there are used following domestic sources of environmental financing in Moldova:

1. state budget,
2. local budget,
3. enterprises' resources, and
4. environmental funds.

Despite the fact that financial conditions and mechanisms of the market economy are developing in Moldova, the *state budget* still remains the main contributor to the funding of environmental expenditures. However, the dynamic of state financing has been negative, decreasing in 1997 to 0.23% of GDP that constitutes only 44% of the funds available in 1993.

To be noted, that state capital investments were the most hindered component, constituting in 1997 only 0.07% of GDP (or 31% in comparison with 1993). The capital investments into wastewater treatment facilities and sewage systems (around 70%), as well as investments into rational use of land resources (25-30%) predominated in the distribution of funds.

The enterprises resources channeled to capital investments in environment protection facilities increased last years. For instance, in 1993 only 15% of the capital investments were available from the own funds of enterprises. By 1997 it encountered 65% of total capital investments in environmental protection. However, this figure is quite changing because of general tendency to invest in activities with an immediate profit.

According to existing estimations, the *input of local authorities* into environmental financing, particularly into construction of environment protection facilities, is being very low: 3.4% of total capital investments in 1993, 3% - in 1994, 2.2% in 1995, 0% in 1996 and 5% in 1997. In the same time, the responsibilities of local authorities in the field of management and financing of municipal services, such as water supply or waste collection and disposal, are much broader than previously.

Special extra budgetary funds - the *national and local ecological (environmental) funds* - were primarily established in 1990 for financing environment protection activities. The National Ecological Fund is functioning under the Ministry of Environment and local ecological funds - under the Regional Ecological Agencies (previously - under districtual authorities). The incomes of ecological funds were quite low: 0.01% of GDP in 1995, 0.02% - in 1996 and 0.01% in 1997. In relation to total environmental expenditure this constitutes only 0.13-0.26%. The balance sheet of NEF will depend very much on the environmental charges prescribed by the law on environmental charges (ecological taxes), and a substantial increase in Fund's incomes from taxes is foreseen in the near future. The environmental funds will have to spend about 60 per cent of their revenues on specific environmental projects.

International sources for funding of environmental projects

Moldova has received financial assistance from the International Monetary Fund, the World Bank and European Bank for Reconstruction and Development, as well as grants from the organizations of the United Nations system, European Union, France, Germany, Italy, Japan, the Netherlands, Romania, Turkey, and the United States.

According to 1996 data, the total amount of technical assistance exceeded US\$ 42 million. The main areas that received technical assistance are: support for financial reform and the banking sector (27.38%), restructuring of enterprises (12.17%), development of entrepreneurship (11.87%), and development of social infrastructure (11.02%). Technical assistance for environmental protection amounted to only 2.18% of the total in 1996.

The task to co-ordinate international technical assistance for environmental protection was assigned to the Division of Environmental Strategies and Programmes. The same division is the GEF Focal Point. However, until now its influence and functions was reduced to the subdivisions of the Ministry, hardly having a real impact in the cross-sectoral context.

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

The MoE's role in promoting/preparing investment projects is quite weak at the moment, and reduced to the approval of the prepared documents with regard to environmental impact of the project. The low enforcement of environmental legislation sometimes leads even to disregard of this procedure.

9.2. Institutional Planning Capacities in Public and Private Sectors

Moldavian Institutions have accumulated a lot of experience in the designing and developing of different projects in cooperation with different international and local institutions.

Institute "CEPROSERVING" participated in the designing and development of the construction project for the oil terminal on the Moldavian part of the Danube bank, oil deposits in Ungeni, railway from the oil terminal to Cahul etc. This Institute has also experience in the designing and development of the construction projects for the WWTPs.

Institute ACWAPROIECT has experience in the designing and construction of the irrigation and drainage systems, channels, drinking water supply network, dams, water bodies etc.

National Institute of Ecology in cooperation with other subdivisions of the Ministry for Environmental Protection in Moldova has accumulated experience in designing of different action programmes, plans etc. Experience accumulated in the Institute was largely used during the development of different impact assessment studies in different parts of the country, development and designing of different environmental standards, normatives etc. Essential part of the activity of the Institute is dissemination of international experience in environmental protection and management in Moldova.

Different workshops, seminars and training courses held in Moldova for last 5 years in the frame of different international activities and projects have strongly increased planning capacities of local authorities and Institutions. According to estimations more than 1500 specialists from different Institutions in Moldova participated and have a beneficiary from such activity.

9.3. Implementation Capacities in Public and Private Sectors

Actual implementing capacities strongly depend on financial situation for the project implementation. Practice shows, that implementation also depends on the training of the staff from implementing agency. Experience accumulated in the construction practice shows (recovering of food industry enterprises, developing of the irrigation system, future recovering of the pig farm in Cahul district etc.) that there were no significant problems in the implementation of the projects developed with the technical assistance and cooperation with international donors.

Moldavian Institutions have been being successfully involved in the implementation of different projects aimed at the pre-investment and feasibility studies aimed at the improvement of the drinking water supply network, quality assurance practice in laboratory management, development

of the action programmes etc. These projects have influenced very positively the improvement of the institutional capacities of Moldavian Institutions and structural changes in Moldavian economy. Generally, Moldavian Institutions have good capacities for the implementation of non-structural projects.

Annexes

Projects Portfolio

Sector	Donor(s)	Level	Total cost	Project title	Duration	Start date
Status						
Completed						
Type of financing	grant					
<i>Capacity building</i>	EU Tacis Programme	Regional	n/a	DEVELOPMENT OF COMMON ENVIRONMENT POLICIES IN THE NEWLY INDEPENDENT STATES AND MONGOLIA	8 months	1997
<i>Capacity building</i>	Organization for Economic Co-operation and Development	National	30,000 USD	PILOT PROJECT ON DEVELOPING NEAP ENVIRONMENTAL INDICATORS IN MOLDOVA	8 months	1996
<i>Capacity building</i>	The World Bank	National	200,000 USD	DEVELOPMENT OF THE NATIONAL ENVIRONMENTAL ACTION PLAN IN MOLDOVA	14 months	1994
<i>Capacity building</i>	United Nations Economic Commission for Europe	National	200,000 USD	ENVIRONMENTAL PERFORMANCE REVIEW OF MOLDOVA	12 months	1997
<i>Energy</i>	EU Tacis Programme	National	0.68 MECU	EXTENSION OF ASSISTANCE TO THE GOVERNMENT OF MOLDOVA IN THE FURTHER DEVELOPMENT AND IMPLEMENTATION OF AN ENERGY EFFICIENCY PROGRAMME COVERING THE INDUSTRIAL AND RELATED ECONOMIC SECTORS	28 months	1996
<i>Land resources</i>	United States Agency for International Development	National	2,500,000 USD	ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT	24 months	1995
<i>Ozon depletion</i>	Global Environment Facility / United Nations Programme for Development	National	80,000 USD	FORMULATING COUNTRY PROGRAMME AND PREPARATION OF TECHNICAL ASSISTANCE/INVESTMENT PROJECTS FOR IMPLEMENTING THE MONTREAL PROTOCOL IN MOLDOVA	12 months	1997

Sector	Donor(s)	Level	Total cost	Project title	Duration	Start date
<i>Public participation and awareness</i>	EU Tacis Programme	Regional	n/a	RAISING ENVIRONMENTAL AWARENESS AND DEVELOPING ENVIRONMENTAL MEDIA IN THE NIS AND MONGOLIA - PHASE 1	10 months	1997
<i>Public participation and awareness</i>	German Technical Co-operation	National	n/a	DEVELOPMENT OF ENVIRONMENTAL PROTECTION SECTOR IN MOLDOVA (GTZ)	24 months	1996
<i>Public participation and awareness</i>	Global Environment Facility / United Nations Programme for Development	National	43,000 USD	SMALL GEF GRANTS WITHIN THE ENVIRONMENTAL PROGRAMME FOR THE DANUBE RIVER BASIN	24 months	1996
<i>Water resources</i>	The World Bank	National	200,000 USD	STUDY ON THE QUALITY OF RURAL DRINKING WATER	15 months	1996
Status						
On-going						
Type of financing						
Capacity building						
	EU Tacis Programme	Regional	n/a	WIDENING OF THE ENVIRONMENTAL ACTION PROGRAMME TO THE NIS AND MONGOLIA	24 months	1998
<i>Capacity building</i>	United Nations Development Programme	National	100,000 USD	BUILDING CAPACITY FOR THE IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL ACTION PLAN IN MOLDOVA	24 month	1997
<i>Energy</i>	EU Tacis Programme	National	1.25 MECU	DEVELOPMENT OF ENERGY CONSERVATION PROGRAMMES AT NATIONAL AND LOCAL LEVELS	24 months	1996
<i>Forests</i>	Ministry of the Environment of Finland	National	N/A	DEVELOPMENT OF THE NATIONAL STRATEGY OF SUSTAINABLE FOREST MANAGEMENT	12 months	
<i>Global warming</i>	Global Environment Facility / United Nations Programme for Development	National	325,000 USD	ENABLING MOLDOVA TO PREPARE ITS FIRST NATIONAL COMMUNICATION IN RESPONSE TO ITS COMMITMENTS TO THE UN FCCC	24 months	1998

Sector	Donor(s)	Level	Total cost	Project title	Duration	Start date
<i>Water resources</i>	EU Tacis Programme	National	1.00 MECU	ACCIDENT EMERGENCY WARNING SYSTEM AND MONITORING LABORATORY AND INFORMATION MANAGEMENT FOR THE UKRAINIAN AND MOLDOVAN PARTS OF THE DANUBE RIVER BASIN	24 month	1998
<i>Type of financing</i>	Loan					
<i>Energy</i>	European Bank for Reconstruction and Development	Local	34.7 MECU	ENERGY EFFICIENCY PROJECT TARGETED AT DISTRICT HEATING NETWORK	n/a	1997
<i>Energy</i>	The World Bank	National	10,000,000 USD	WORLD BANK ENERGY PROJECT	n/a	1997
<i>Land resources</i>	The World Bank	National	11,800,000 USD	FIRST AGRICULTURAL PROJECT	n/a	1997
<i>Water supply and sanitation</i>	European Bank for Reconstruction and Development	Local	41.00 MECU	CHISNAU WATER SERVICES REHABILITATION	1997	
Status	Proposal					
<i>Type of financing</i>	Grant					
<i>Biodiversity and protected areas</i>	Global Environment Facility / World Bank	Regional	750,000 USD	WATER QUALITY AND BIODIVERSITY CONSERVATION OF MIDDLE AND LOW DNIESTER AREA IN MOLDOVA	n/a	
<i>Biodiversity and protected areas</i>	To be determined	Local	100,000 USD	DEVELOPING THE CODRII NATURAL AREA IN THE REPUBLIC OF MOLDOVA	6 months	
<i>Capacity building</i>	To be determined	National	85,000 USD	TRAINING ON ENVIRONMENTAL PROJECT DEVELOPMENT FOR THE LOCAL ENVIRONMENTAL AND PUBLIC AUTHORITIES	8 months	
<i>Ecotourism</i>	United Nations Development Programme	National	To be determined	ECOTOURISM AS A TOOL FOR SUSTAINABLE DEVELOPEMENT OF MOLDOVA	36 months	
<i>Food quality</i>	To be determined	Local	500,000 USD	CLEAN PRODUCTION PILOT PROJECT IN A SUGAR FACTORY IN DROCHIA	To be determined	

Sector	Donor(s)	Level	Total cost	Project title	Duration	Start date
<i>Ozon depletion</i>	Multilateral Fund of the Montreal Protocol / UNDP	National	393,450 USD	REFRIGERANT RECOVERY AND RECYCLING PROGRAMME	12 months	
<i>Ozon depletion</i>	Multilateral Fund of the Montreal Protocol / UNDP	National	700,000 USD	PHASING OUT OF CFCs IN THE PRODUCTION OF DOMESTIC REFRIGERATORS	12 months	
<i>Ozon depletion</i>	Multilateral Fund of the Montreal Protocol / UNEP	National	135,000 USD	INSTITUTIONAL STRENGTHENING: ESTABLISHMENT OF A NATIONAL OZONE UNIT	36 months	
<i>Ozon depletion</i>	Multilateral Fund of the Montreal Protocol / UNEP	National	61,000 USD	TRAINING IN MONITORING AND CONTROLLING OF ODS	3 months	
<i>Ozon depletion</i>	Multilateral Fund of the Montreal Protocol / UNEP	National	91,300 USD	TRAINING OF TRAINERS IN REFRIGERATION	12 months	
<i>Public participation and awareness</i>	EU Tacis Programme	National	1 MECU	SUPPORT TO THE REGIONAL ENVIRONMENTAL CENTRE IN MOLDOVA	12 months	
<i>Radiologic hazard</i>	To be determined	Regional	1,500,000 USD	CONTROL AND MANAGEMENT OF RADIOLOGICAL HAZARD IN THE NATIONAL AND TRANSBOUNDARY CONTEXT	24 months	
<i>Waste management</i>	JICA	National	To be determined	DEVELOPMENT OF MASTER PLAN AND FEASIBILITY STUDY ON SOLID WASTE MANAGEMENT IN MOLDOVA	18 months	
<i>Waste management</i>	To be determined	Local	1,500,000 USD	CUPCINI BIOGAS PROJECT	12 months	
<i>Waste management</i>	To be determined	National	2,600,000 USD	BIOGAS PILOT PROJECT IN MOLDOVA	24 months	
<i>Water quality and pollution</i>	To be determined	National	45,000 ECU	DEVELOPMENT OF A REALISTIC SYSTEM OF WATER QUALITY STANDARDS	6 months	
<i>Water resources</i>	EU Tacis Programme	Regional	2.48 MECU	PRUT RIVER TRIBUTARIES: ENVIRONMENTAL REVIEW, PROTECTION STRATEGY AND OPTIONS	30 months	
<i>Water resources</i>	To be determined	Regional	2.27 MECU	SEDIMENTS ASSESSMENT IN THE PRUT RIVER	24 months	

Sector	Donor(s)	Level	Total cost	Project title	Duration	Start date
<i>Water resources</i>	To be determined	Regional	5.0 MECU	UKRAINE-MOLDOVA DNISTER RIVER BASIN MANAGEMENT SYSTEM: COOPERATING IN THE SUSTAINABLE USE AND PROTECTION OF TRANSBOUNDARY WATERS	24 months	
<i>Water supply and sanitation</i>	To be determined	Local	480.000 USD	DEMONSTRATION PROJECT FOR RURAL WATER SUPPLY DEVELOPMENT	To be determined	
<i>Water supply and sanitation</i>	To be determined	Local	700.000 USD	LOCAL GROUNDWATER RESOURCES AND THEIR ADEQUATE UTILIZATION FOR WATER SUPPLY IN RURAL AREAS	To be determined	
Status	Recently approved, to be launched					
Type of financing	Grant					
<i>Biodiversity and protected areas</i>	Global Environment Facility / World Bank	National	125,000 USD	BIODIVERSITY STRATEGY, ACTION PLAN AND NATIONAL REPORT	14 months	1998
<i>Capacity building</i>	United Nations Development Programme	National	150,000 USD	MOLDOVA 21	24 month	1998
<i>Water resources</i>	EU Tacis Programme	National	2.50 MECU	PRUT RIVER WATER MANAGEMENT	24 months	1998
<i>Water resources</i>		Regional	1.00 MECU	SELECTED ACTIONS IN MOLDOVA AND UKRAINE FROM THE ENVIRONMENTAL PROGRAMME FOR THE DANUBE RIVER BASIN	18 months	1998

