DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL REVIEWS 1998
UKRAINE

TECHNICAL REPORTS

Part A: Social and Economic Analysis

Part B: Financing Mechanisms

Ministry of Environmental Protection and Nuclear Safety

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: - 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 **Ukrainian National Reviews** were prepared under the supervision of the Country Programme Coordinator, **Mr. Vasyl Vasylchenko**. The authors of the respective parts of the report are:

- Part A: Social and Economic Analysis: **Ms. N. Tomashes'ska**
- Part B: Financing Mechanisms: **Ms. I. Sherban**
- Part C: Water Quality: **Ms. O. Tarasova**
- Part D: Water Environmental Engineering: **Mr. A. Obodovsky**

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Part A

Social and Economic Analysis in Relation to Impact of Water Pollution

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Glossary
on Social and Economic Aspects

watershed basin	part of earth surface and soils, from which water drains into water stream or water reservoir
water reach	section of the river, located upstream or downstream water hydraulic facility (dam)
drainage water	water that is disposed of by a drainage system after being filtered out from particular territory, in order to lower level of ground water
wastewater	water, resulting from domestic and industrial activities (except mine, quarry and drainage waters), as well as water formed on an urban territory owing to falling out of atmospheric precipitation
waters	all waters (surface, ground, sea ones) inherently present in natural water circulation
ground waters	waters located below earth surface level within mountain rocks of high part of earth crust, in all physical states
surface waters	waters in different water bodies located on the earth surface
water body	natural or artificially created peace of landscape or geological structure, where the waters concentrate (a river, a lake, a sea, a reservoir, a channel, an aquifer horizon)
water resources	volumes of surface, ground and sea waters of the appropriate territory
water availability	a characteristic of river run-off per definite period of time in comparison to its mean annual value
water balance	relationship between water resources available for use within a given territory and actual water needs for economic development, at different levels
water intake	a construction or an appliance for extraction of water from water body
reservoir	a surface water body with slow run-off or without it
water use	usage of waters (water bodies) for satisfaction of residential and industrial needs
water reservoir	an artificial reservoir with volume of more than 1 million m^3, constructed for storage of water and run-off control
contamination of waters	unfavorable changes of water composition and properties of the water body as a result of entering polluting substances
polluting substance	a substance that causes worsening of water quality
flood lands	by-river territory, that can be flooded or wetted during spring floods (high floods)

sanitary protection zone	the territory and the water area where a special sanitary-epidemiological regime is established to prevent worsening of water quality of sources of centralized communal-drinking water supply, as well as to ensure protection of water supplying systems
water extraction limit	maximum volume of water permitted for extraction from water body, being defined in the permit for special water use
low water period	a period of annual cycle, when low water is observed
water monitoring	a system of observations, collecting, processing, storage, and analysis of information concerning the state of waters, forecast of its changes and development of scientifically substantiated recommendations for making relevant decisions
lake	natural depression filled in with sweet or salt water
fishery water body	the water body (its part) that is used for fishery purposes
pond	artificially created reservoir with volume not more than 1 million cubic meters
water quality	characteristics of composition and properties of water which determine its fitness for concrete purposes of use

List of Abbreviations

GDP	Gross Domestic Product
BOD 5	Biological Oxygen Demand 5
DWSR	Danube Southern Water Supply Region
TWR	Transcarpathian Water Region
COD	Chemical Oxygen Demand
2 TP	Official State statistic information about water use
UDSL	Ukrainian Danube Steamship Line
GOST	State Standards
SNIP, SanPyn	Sanitary Rules and Norms
NRB-76/87	Radiation safety rules
MCP	maximum permissible concentrations
MEPNS	Ministry for Environmental Protection and Nuclear Safety
EC	European Community

1. Summary

Ukraine is located in the southeast of Eastern Europe and covers an area of 603,7 millions km² with a population of about 55 millions inhabitants. In 1997 urban population was 34,8 million (68% of the total population) and rural - 16,1 million. Total number of the Danube's basin population, urban and rural, has not reduced and even increased. In 1997 population was 3,08 million, which is higher then 1991 numbers. Danube basin population today is more then 6% of the total population of Ukraine. Urban population is 1,39 million (45%) and rural - 1,69 million (55%).

The Ukraine occupies the territory of 603,7 thous. Km^2. The Danube River basin square on the territory of Ukraine is 32,35 thous. Km^2, that makes 5,4% of total area. The basins of Lower Danube (from Reni-city to Delta) together with Prut and Tisa occupy 1,4%, 1,6% and 2,3% accordingly. The biggest area in relation to the whole Danube basin area in Ukraine has the Tisa basin - 44,6%. Next is Prut - 31%, the Danube riverbed - 20%, Siret - 6,7%.

Climate, landscape and geological structure of Tisa, Prut and Siret basins cause rich and diverse vegetation. Forests cover 37% of the territory. Plants are represented mostly in the meadows - flood plains, highlands meadows, there are also marshes.

Flora consists of 1300 species of plants, that is more then one third of Ukrainian flora. In the mountain areas there are boreal and nemoral species of plants. In the plains there are forest as well as steppe types of plants.

Due to its geographical situation and specific natural and historic conditions Tisa basin region (Zakarpatska oblast), Prut and Siret basins (Ivano-Frankivsk and Chernivtsi oblast) have a unique fauna. Quantity of species is much bigger then in other regions of Ukraine.

Main water bodies of the basin are: Danube River and the adjoining lakes (Kahul, Yalpuh, Katlabuh, Kytai); Tisa River and its tributaries (Tersva, Tereblya, Rika, Borzhava); Latoritsa River, Uzh River, Prut with its tributary Cheremosh; Siret River. The Danube River basin on the territory of Ukraine is characterized by big amount of small rivers - 17612 in total. The rivers Latoritsa and Uzh belong to the Tisa River basin. To the Tisa basin also belong 9425 small rivers, to Latoritsa - 2922 small rivers and to Uzh basin belongs 1332 small rivers. The Siret basin includes 1461 small rivers, and the Prut basin includes 6289 small rivers. The Lower Danube includes 437 small rivers.

The ecological situation in Ukraine has been prepared by all the course of historical development. It has become especially grave after unjustified intervention in nature and distortion of balance of big natural complexes. Acceleration of the environmental crisis was due to:

- monopolistic exploitation of natural resources in the absence of actual sovereignty and the right to independently manage national wealth;
- super centralization of economic development;
- the use of the mechanism to regulate development and to allocate labor forces, which did not allow for any alternative;
- unavailability of a meaningful national ecological program, which would have specified time, resources and targets;
- high level of technogenical burden on environmental systems;
- uncontrolled urbanization processes;
- low level of logistics of environmental facilities and scare financing of environmental protection and reasonable use of resources;
- continuous under fulfillment of the tasks set as for putting into operation of nature protection projects and allocated capital investments;
- dehumanization of the society and deformity of moral relations between the nature and the human being.

Further recession, especially in environmentally hazardous industries, reduction of scope of construction and cargo transportation's, scale of resource consumption, use of herbicides and pesticides contributed to a substantial reduction in pollution of atmospheric air and water basins.

However, the ecological situation in the country is still adversely affected by poorer functioning of treatment facilities, facilities for utilization of noxious substances and waste products, cutting of nature protection allocations, and building of environmentally important projects. Besides, the environmental situation is aggravated by more frequent use of obsolete, worn out machinery and equipment, a low level of use of advanced resource saving and environmentally friendly ("green") technologies.

More than four fifths of the total quantities of pollutants are released in the atmosphere by power, coal, and metallurgical industries.

More than 22% of wastes released in Ukraine get into Danube, about 19% of wastes get into the river Siversky Donets, and more than 4% - in the Black Sea.

The problem of wastewater treatment remains serious. Nearly untreated effluent water is discharged by housing and domestic facilities (15%), agriculture (27%), and industry (57%).

As a result, the situation with water conservation is a very complex one. Excessive water intake, contamination of surface and ground water with industrial and agricultural run-offs, violation of hydrological regimes and natural balance in river basins have caused great damage not only to the basins themselves, and the environment at large, but they also have entailed social and economic losses, have enhanced morbidity rates, etc. Incidence of human illnesses caused by contaminated water is becoming rather common. Currently, a considerable portion of the Ukrainian population drinks low quality water. About 6% of centralized water supply lines, 10,3% municipal and 6,4% of departmental water supplies do not meet the hygienic norms and standards.

Water supplies of rural population are especially bad. Due to considerable chemical and bacteriological contamination of water sources, only 3,7 million people (24%) of rural population have guaranteed technical and drinking water supplies.

Total quantity of industrial and municipal wastes amounts to 25 billion ton, and the area of their storage, slag basins and rock dumps is 160 thousand hectares. Every year 1,45-1,95 billion of waste is produced, of which only 10 to 15 % are recycled. Infiltration of storage, burning of rock dumps, dust formation, and other kinds of toxic substances migration result in contamination of surface and ground water, degraded quality of ambient air, land and forest resources. Especially dangerous are toxic wastes, which present actual or potential health hazards.

In 1994, total environmental expenditures amounted to 21,3 trillion karbovanets, or US$ 470 million, of which capital investments amounted to 5,3 trillion karbovanets, and current expenditures – 16,0 trillion karbovanets.

Expenditures on environmental protection accounted for 2,2 % of the national income of Ukraine and for 0,34% of the GDP.

The charges established in Ukraine for discharges and disposals, storage of waste do not cover the losses incurred by the economy. For many reasons, funds from deductions for investments in environmentally friendly technologies are rather limited, payments are preponderantly of a fiscal character and fail to fulfill their promotional function. To a great extent this is conditioned by discrepancies between the effective economic and environmental legislation, and by the lack of an efficient economic mechanism to regulate ecological relations on microlevel during transition.

The Ukrainian economic situation demands that radically new relations between state environmental agencies and natural resource users be shaped and implemented. They should be based on law, the foundation of which is property and environmental interests. Reorientation of

environmental activities should provide for the development and introduction of new environmental norms, standards and limitations, and a system for financing and promotion of environment conservation and resource saving in economic development of Ukraine. From this point of view, expertise of the World Trade Organization, of the European Union and of other influential international organizations are useful, as they have succeeded in solving serious environmental problems in other parts of the world. It is of a great importance for Ukraine.

2. Description of the State of the Danube Environment

2.1. Water Resources

Less then 4% of the Danube basin is situated on the territory of Ukraine. At the same time it constitutes 20 % of the country's water resources.

The Ukrainian part of Danube basin covers 4 oblast of Ukraine: Zakarpatska, Ivano-Frankivsk, Chernivtsi and Odessa. The population of these regions is approximately 3,08 million (1,38 million is urban population and 1,69 million is rural population).

The main water bodies of the basin are: Danube River and the adjoining lakes (Kahul, Yalpuh, Katlabuh, Kytai); Tisa River and its tributaries (Tersva, Tereblya, Rika, Borzhava); Latoritsa River, Uzh River, Prut with its tributary Cheremosh; Siret River.

According to the basin-administrative principle which takes into consideration areas (countries) of the rivers departure (entry) from (into) Ukrainian borders Danube basin can be divided into several regions and sub regions:

- **Transcarpathian Water Management Region**

  Tisa basin region (Zakarpatska oblast) with following sub regions:

  1. Uzh and Latoritsa basins, those rivers flow through territories of Check Republic and Slovakia;
  2. Tizsa basin which flows through the territory of Hungary.

- **Upper-Prut Water Management Region**

  Prut and Siret Rivers basins (Ivano-Frankivsk and Chernivtsi oblast) region with following sub regions:

  1. Prut basin in Ivano-Frankivsk oblast;
  2. Prut basin in Chernivtsi oblast, which flows through territories of Moldavia and Romania;
  3. Siret basin in Chernivtsi oblast, which flows through the territory of Romania.

- **Danube Southern Water-Supply Region**

  Riverbed of Danube basin (Odessa oblast) with following sub regions:

  1. Basin of the river-bed of Danube River, which comes from the territory of Romania;
  2. Basin of the Danube lakes with the part of the water intake on the territory of Moldavia.

The territory of Ukraine is 603,7 thousands km^2. The Danube basin covers 30,8 thousand km^2, which is 5,1% of the total territory. Lower Danube basin (from the town of Reni to the delta) and also Prut and Tisa basins cover 1,4%, 1,6% and 6,7% accordingly.

The biggest area in relation to the area of Danube basin within Ukraine borders is covered by Tisa - 44,6%. Then comes Prut - 315, Danube riverbed (channel) - 20% and Siret - 6,7%.

Information was given by the State Statistics Committee of Ukraine. Characteristics of the water intake territory of the individual tributaries and total Danube basin are taken from the information in the State water register of Ukraine, its information is summarized by the State Committee for Water Management and State Hydrometeorology Committee and it is official.

Table 2.1. gives information on the surface of Danube tributaries basins in Ukraine and their relation to the total surface of the country.

Danube water resources meet 6% of Ukrainian economy needs; they totally meet Zakarpatska oblast needs, 67% of Chernivtsi oblast needs, 14% Ivano-Frankivsk oblast needs and approximately 40% of Odessa oblast needs (Information from Nat. Report, 1996).

Table 2.1. Main hydrological characteristics of the small rivers of Danube basin on the territory of Ukraine

River basin	Surface in Km^2 (Ukrainian portion)	Length of the Ukraine. portion	Total number of small rivers		Small rivers less then 10 Km		
			number	total length	number	total length	average length, Km
Danube in general	32350 (150)		17612	35163	17279	28811	1,67
Tisa	11300 (8010)	201	9425	28986	9277	16157	1,74
Latoritsa	4900 (2870)	144	2922	6767	2867	5855	2,04
Uzh	2010 (2010)	107	1332	2541	1316	2389	1,82
Siret	2200 (2070)	100	1461	2667	1433	2221	1,55
Prut	17400 (10450)	299	6289	11590	6174	9367	1,52
Cheremosh	2530	80	3216	4591	3181	5855	1,25
Lower Danube	6300	174	437	1920	395	1069	2,70

Table 2.2. The biggest lakes of the Danube basin

Name	Square, Km^2		Depth, m		Length, Km	Maximum width, Km	Volume, m^3
		Surface	Average	Maximum			
Yalpuh	4300	149,0	2,6	6,0	25,0	7,0	327,4
Kahul	941	90,0	2,0	7,0	25,0	8,0	180,0
Kaharliy	4430	82,0	1,0	2,0	20,0	10,0	82,0
Katlabukh	1290	68,0	0,7	4,0	21,0	6,0	47,6
Kytay	1410	60,0	1,7	5,0	24,0	3.0	102,0
Kartal	57	19,0	-	0,5	-	-	-
Sofian	227	3,7	-	4,0	6,5	1,0	-

Analysis of the water quality of the lakes shows two tendencies:

- decrease of the soluble oxygen in all the reservoirs it reaches maximum of 19% in lake Kahul;
- increase of BOD5 index practically in all water bodies with maximum - 54,5% in Katlabuh. It can be explained by the growth of phytoplankton, which takes in soluble oxygen and is the reason of the BOD5 index increase too.

Table 2.3. Water storage and ponds in Danube River basin

River	Ponds			Water storage					Total volume		
	number	water surface area, thous. hectares	total volume, million m^3	number	water surface area thous. hectares	volume, million m^3		million m^3	% of normal run-off	distributed over watershed area in layer, mm	per resident per year, m^3
						total	useful				
Danube, total	602	3,83	56,50	33	53,06	1308,0	610,00	1364,50	41	41,0	496
Tisa	53	0,38	6,61	9	1,30	52,0	49,99	58,60	1	5,0	51
Siret	50	0,23	2,60	-	-	-	-	2,60	1	1,0	15
Prut	414	2,34	31,62	2	0,14	4,5	2,09	36,15	1	4,0	35
Cheremosh	12	0,01	0,15	-	-	-	-	0,15	1	0,1	-
Small rivers	73	0,87	15,52	22	51,62	1251,5	557,92	1267,00	-	154,0	-

In the Danube basin there are at present 35 water storages and 602 ponds occupying an area of 56,9 km^2 and containing 1,36 km^3 of water. The useful volume employed for the runoff control is about 0,70 km^3. The total volume of the artificial water basins, distributed over the watershed area, amounts to a 41 mm thick layer; over 490 m^3 of it falls annually at a resident. The Odessa region accounts for more than 70% of the total number of water storage in the Danube basin, 97% of their volume, and 98% of their-surface area. The largest number of ponds is in the Ivano-Frankovsk and Chernovtsy regions (70% in all), and the largest volume of water accumulated in them in the Chernovtsy (34%) and Odessa (33%) regions.

Territorial peculiarities of the manpower distribution within the Danube basin are decisively resulting from natural conditions inherent to their areas in the Ukraine. We distinguish three water-management regions: Transcarpathian (within the Tisa basin), Upper-Part (including the riverbed of the Siret River), and Danubian or Southern Region (Danube from the confluence of the Prut River down to the mouth).

Transcarpathian water-management region

The Transcarpathian water-management region occupies an area of 12.800 km^2 (42 % of the Ukrainian part of the Danube's basin, or 2% of the republic's area) and encompasses all the territory of the Transcarpathian oblast. In the north it borders on the Lvovskaya oblast, in the north-east and east - on the Ivano-Frankovskaya oblast. In the north-west, the frontier is with Poland, in the west - with Czechoslovakia, in the south-west - with Hungary, in the south - with Rumania pass.

In the Transcarpathian water-management region there are 13 administrative regions and 10 towns, two of the towns being of oblast subordination, as well 28 urban settlements and 561 country settlements are situated.

An essential feature of the geographical situation of this area is that it is crossed by important mains: railways, oil pipelines, gas-lines, electric-power lines.

The Transcarpathian water-management region is located within the physic-geographical country - the Ukrainian Carpathians. Mild climate, mountain landscapes, availability of large amount of mineral springs and other natural resources favor a development of its multisided economy complex, a considerable part of which is occupied by recreation. Climate-soil conditions in the Transcarpathian lowland favor a development of the agriculture.

An average density of population is 98,3 persons per 1 km^2 (in the Vinogradovskiy region - 162, in the Rustskiy region - 127 persons per km^2). Five local systems of the population are distinguished: Uchgorod-Perechin, Mukachevo-Svalava, Beregovo-Vinogradov, Hust-Tyachev and Rahov systems. The largest towns are Uchgorod (124.900 habitants), Mukachevo (89.100 habitants), Beregovo (31.000 habitants), Vinogradov (26.000 habitants). The region is efficiently provided with labor resources. 66% of all employed persons are engaged in a production sphere, and among them 36,8% - in industry, 10% - in agriculture, 6.5% - in construction, and 8% - in transport (all figures are given for year 1996).

The territory of the Transcarpathian water-management region is criss-crossed by 9429 rivers, having a total length of 18.986 km, among which 152 rivers have the lengths of more than 10 km each. The rivers belong to the basin of Tisa, which is formed as a result of confluence of the White Tisa and Black Tisa. The rivers Teresva, Terebla, Rika, Borchava fall into Tisa within the territory of the Transcarpathian water-management region, while Latoritsa and Uzh with its confluent Turiya - outside the territory of this region. Nearly all of them take a beginning in the mountains and flow for the most part from east towards south-west.

All the south slope of the Ukrainian Carpathians is characterized by strong erosion; it is overcut by the valleys of the upper Tisa and its right side confluent. The Tisa River system has a dendrite form. The basins of its confluent (up to Rika) as a rule have an elongated form; its well-defined

divide pass along the mountain ranges reaching considerable heights. The average height of the water intakes amounts to 800-1200 m, their average gradients have the values of 200-400%, and the width varies from 10-15 km (the rivers Kosovskaya, Shopurka, Terebla) to 20-30 km (the rivers Teresva and Rika).

Depending on their regimes the rivers are classified by the mountain streams (their upper and middle sections) and plain rivers (the lower currents of most rivers that flow on the Transcarpathian Lowland). The average drainage density is 1,7 km/km^2; it varies from 1,3 km/km^2 upon a plain to 2,0 km/km^2 in the mountains. The feeding for the most part is provided by rains (40% of an annual discharge) as well as by snow and ground water.

All the rivers of the Transcarpathian water-management region are characterized by the floods after downpours (8-l0 floods over a year, including 1-4 floods with the water discharge upon floodland). There are 137 lakes in the territory of the region. For the most part the lakes are of the glacial and barrier origins, of small dimensions; the largest of them is Sinevir. In the region, 62 ponds and storage lakes are constructed (the area of the water table is 1,7 km^2). The water resources, being sufficient for the region, are utilized for the industrial and public water supply, generation of the electricity, hydro improvement of the lands, fish industry, recreation and other purposes.

The Transcarpathian water-management region is a region of mineral waters of unique chemical compositions. There nearly all known aquatic species have been found. To the present time, the ways of the formation of each species of the waters are researched and put on a map, the chemical compositions are examined: up to 50 components in each of the 365 species of the mineral waters of this region. Their discharge reaches 13.000 m^3 per 24 h. The Transcarpathian mineral waters are characterized by a wide range of mineralization - from 0,1 to 156 g/l, by the temperatures from 7 to 89^{0}C, presence of the therapeutically active and industrially valuable components, various gas-composition with prevalence of the carbonic acid.

The Upper-Prut Water Management Region

The Upper-Prut Water Management Region occupies an area of 11.600 km^2 (32% of the Ukrainian part of the Danube basin) and includes 5 administrative regions, 4 towns (2 of them - Kolomya and Yaremcha - are subordinated to the oblast), 9 urban settlements, 239 country settlements with a population of 563.800 persons (including the 176.780 urban habitants) of the Ivano-Frankovskaya oblast, and 6 administrative regions, 7 towns (Chernovtsy is a town of the oblast subordination), 6 urban settlements, 259 country settlements with a population of 721.700 persons (including 356.100 urban habitants) of the Chernovitskaya oblast.

The Upper-Prut Water Management Region is located within the Prut riverhead basin, which occupies an area of 9.400 km^2 (including 6.200 km^2 of the Ivano-Frankovskaya oblast and 3.200 km^2 of the Chernovitskaya oblast), and the Siret riverhead basin, which occupies an area of 2.200 km^2 and is located in the Chernovitskaya oblast.

The left Danube tributary - Prut - takes its beginning on the north-east slope of the Carpathians - the mountain mass Chernogora, at the foot of the mountain Goveräa, at the height of 1600 m, and flows across the Ukrainian territory for a distance of about 230 km. Its basin has a form of an irregular elongated oval, being curved and slightly widened in its upper section. An average gradient of a water catchment area in the riverhead reaches 255% while in the lower river it is considerably smaller.

In the Carpathians, the river has a nature of a mountain stream.

The width of the river up to the village Delatino is 20-50 m, while lower it gradually widens and reaches 100-200 m. The bottom of the river down to Chernovtsy is rocky and pebbly, lower is sandy.

The most sizable Prut tributary in the Carpathians is Cheremosh with its consisting rivers Bely Cheremosh (White Cheremosh) and Chorny Cheremosh (Black Cheremosh).

The river Siret takes its beginning on the north-east slopes of the Bukovinian Carpathians by the double riverhead (Bolshoy Siret and Maly Siret). On the Ukrainian's territory, the upper section of the river is as long as 100 km. Its basin is of a pear-type, asymmetrical form. Its maximum width in the right-side part is 12 km. The valley in the upper reaches has an aspect of it chasm with a narrow bottom and steep, nearly sheer grades. Farther down, the valley gradually widens up to 1-5 km. Its flood plain abounds in old beds and channels.

In the Ivano-Frankovskaya oblast (Prut with its right tributaries: Cheremosh, Rubnitsa, Pristynka, Luchka, and left tributaries: Turka, Chernyava, Beleluya), the climate is temperate-continental. The average January temperature is -6 C, and that of July is +16 C.

The main quantity of precipitation falls within a warm season. The rainiest are the summer months (near 44 % of total precipitation), when the rains fall as downpours, which involve catastrophic floods.

Among soils of the mountain part, the brown, burosem-podzolic and mountain meadow-burozem soils are extended. In the Forecarpathins the soddy podzolic and soddy, in the river valleys - the swampy-meadow and marshy soils are common.

On the territory of the Chernovitskaya oblast, the Prut and Siret basins are located within the Carpathian Mountains, their hilly forelandtand high plains.

The climate is temperately continental with the warm, damp summer and cold winter. The soil-continuum, the soddy-pozolic (forelands), mountain burozem and soddy burozem (mountain part) soils prevail. In the Prut and Siret valleys, the soddy-meadow, gleyic and gley-sandy loamy and loamy soil are common.

The Danube Southern Water Supply Region (DWSR)

Length of Danube in this region makes 174 km. The basin proper of Danube occupies here the area of 6,3 thous. km^2. The territory, on which the water resources of this river are used, occupies 9.9 thous. km. Within the DWSR are located 7 towns, including the town of the region subordination Izmail, 6 settlements of the urban type and 213 villages.

DWSR is located within the limits of the Danube-Dniester valley, which is the South-Western part of the Black Sea lowland. It is an accumulative seaside low-lying plain, divided by gorges and valleys of the Danube tributaries (occupied by the lakes Kagul, Jalpug, etc.) and small rivers. The depth of division varies from 5-10 to 60-90 m. It is mainly composed of limestone, sand, clay and loess. Common are steep, seaside and flood-land landscapes, which are almost completely occupied by the agricultural crops, orchards and vineyards.

The South-Western part of the Odessa region, adjacent to the basin of Danube, relates to the steep climate. Its characteristic features are prevalence of the summer precipitation, sufficiently warm winter and hot summer.

2.2. Biological Resources and Ecosystems

Environmental situation in Ukraine is greatly dependent on the quality of land resources. The land fund of Ukraine is characterized by a substantial plowing up. Farming lands make up 72% of the total area, and arable land accounts for 79,5% of the farming lands.

Due to technogenic effect, physical and chemical properties of soils are deteriorating, eroded areas are expanding. Through 1970-1995, the content of humus dropped from 3,5% to 3,2%.

Forest resources are limited in Ukraine. This adversely affects economics and environment. The ratio of forests to the total area is only 14,3% instead of the optimum of 20-22%, the area of forest funds is 10 million hectares, of which covered with forests are 8,6 million hectares. Due to the lack of funds and resources, the trend has been shaped toward reduction of recovery of forest resources.

2.2.1. Vegetation

Climate, landscape and geological structure of Tisa, Prut and Siret basins cause rich and diverse vegetation. Forests cover 37% of the territory. Plants are represented mostly in the meadows - flood plains, highlands meadows, there are also marshes.

Flora consists of 1300 species of plants, that is more then one third of Ukrainian flora. In the mountains areas there are boreal and nemoral species of plants. In the plains there are forest as well as steppe types of plants.

Transcarpathian region

The forests of the region have the high water regulating, water protecting, climate regulating and sanitation properties.

The forests of the second and higher quality of location occupy 92% of the wood area. Three quarters of the wood are presented by the high dense (0,8-1,0) forests.

In the forests and other ecosystems of the Transcarpathian oblast, more than 400 kinds of trees and bush species grow. That indicates a wide biological variety.

Among current natural and natural-antropogenetic processes in the mountain part of the region are: earthquakes (force up to 8-9), intensive weathering, including frost-weathering, eboulements, cavings, avalanches, intensive erosive and cumulative activity of the rivers, and particularly in the periods of the catastrophic floods. On Tissa and its tributaries often the lahars are formed. Between Borchava and Teresva the karst is spread, in environs of Soltvin - salt karst. In the mountains snow avalanches occurred often. Strong winds involve wind blows and windfalls. Upon the deforested slopes, the sheet floods and linear erosion are common.

2.2.2. Animal life

Due to its geographical situation and specific natural and historic conditions Tisa basin region (Zakarpatska oblast), Prut and Siret basins (Ivano-Frankivsk and Chernivtsi oblast) have a unique fauna. Quantity of species is much bigger then in other regions of Ukraine. Carpathian forests are inhabited by valuable hunting species: brown bear, red deer, European roe, wild boar, lynx, otter, badger, forest marten, fox, wolf, hare, squirrel.

Establishing reserves is one of the ways of the fauna protection. Restriction of the hunting started the process of animal recreation.

Table 2.4. Dynamic of hunting in Chernivtsi oblast

Hunting areas users	Animal species	1995		1996	
		Quantity prior to hunting period start	Plan/Fact of hunting	Quantity prior to hunting period start	Plan/ fact of hunting
"Zkbrovytsa" State hunting farm of Starozhynetsk forestry	Aurochs	82	-/4	125	-/1
	deer	147	20/17	380	15/3
	boar	130	40/30	180	30/6
	roe	495	15/14	270	-/-
"Turyatka " hunting farm of Chernivtsi forestry	Deer	44	-/-	52	6/3
	Boar	75	-/-	50	-/-
	Roe	234	-/-	95	-/-
	Hare	375	20/11	260	20/10
"Karpatske" hunting farm of Putylsk forestry	Deer	125	-/-	120	6/-
	Boar	58	-/-		

Information for the year of 1997 is being specified.

Table 2.5. Dynamics of the quantity of the main hunting species in 1992-1997 in Chernivtsi Region

Hunting areas users	Animal species	Quantity per year				
		1992	1993	1994	1995	1996
"Zkbrovytsa" State hunting farm of Starozhynetsk forestry	aurochs	72	78	82	79	69
	deer	260	130	254	215	165
	boar	140	210	136	110	100
	roe	500	510	510	460	300
	hare	240	220	254	200	190
"Turyatka" hunting farm of Chernivtsi forestry	deer	45	45	40	40	52
	boar	80	90	85	65	50
	roe	210	190	180	180	95
	hare	250	250	260	250	2600
	elk	1	-	-	-	-
"Karpatske" hunting farm of Putylsk forestry	deer	122	123	120	120	120
	boar	169	165	50	60	60

Information for the year of 1997 is being specified.

2.2.3. Fishing resources

The Danube lakes

Danube lakes are fresh-water basins with the salinity 2-3 g/l. They have potentially big fish productivity but during the late 5 years average fish productivity has decreased 2-2,5 times.

Outfall part of the Danube River within the boundaries of Ukraine (and Romania) is from ecological point of view a transient zone between fresh water and sea ecosystems, especially its avant-delta section.

For that reason the most significant features of quantitative distribution of aquatic biological resources in the area are:

1. Predominance of heterotrops over pelagic autotrophs in fresh waters and their inverse correlation in the sea water;
2. "Condensation of life" phenomenon in savant-delta as a result of freshwater and sea water interaction "marginal effect".

The following data confirm the existence of the first factor: number of the savant-delta bacterioplankton was 2-10 times less than in the river itself; the other heterotrophs biomass (zooplankton and meiobenthos) was 8,8 and 3,0 times less accordingly.

At the same time the distribution of autotrophs (phytoplankton) was of a reverse character, which is connected with the decrease of the suspensions concentration. This factor in its turn influences the lighting conditions while the transformation of river waters into the sea takes place. Tenfold dominance of ammonificators bacteria is an indicator of the corresponding prevalence in the intensity of processes of destruction of organic matters in the delta ecosystem as compared with savant-delta and coastal waters area.

The illustration of the second factor in the distribution of biological resources is the detected accumulation in the narrow edgewater sea zone (savant-delta area) of pontogammarus macoticus at numbers up to 100.000 specimen/m^3, which equals the biomass to 1,5-2,0 kg/m^3.

It was determined that pontogammarus is the most important component in the nutrition of water and near-water fowl forming mass migratory and winter quarters in the area.

In particular the numbers of shallow background dwellers among water fowl Anas platyrhynchos at the height of seasonal accumulations reach dozens of thousands of specimens, and Apas and Sterna form in this area the largest colonies in the Black Sea region.

The Danube River has considerable influence upon the condition of biological resources in the coastal waters area. High intensity of primary output connected with the removal of biogenes favored the 17 times increase in the phytoplankton biomass during the last 15 years. This phenomenon together with the enrichment of waters in the area with suspended organic matter resulted in extremely high concentrations (557 kg/m^3) of Noctiluca miliaris and medusa Aurelia aurita.

The lower reaches and delta

In the studied part of the main river-bed the elevated aquatic vegetation is practically absent. The response of ecosystem to the pollution by biogenous and organic compounds is accomplished through the plankton sub-system.

Ichthyofauna and fish productivity

The Ukrainian section of the Danube River is one of the major fishery districts of Ukraine. In the Danube river-bed, including the Kilijski branch in its delta and savant-delta water-flows, as well as in tightly connected with Danube large and small salt lake estuaries and flood lands lakes large quantities of different species of fish rather varied according to ecological peculiarities, marketable and gastronomic values have been and are being caught.

The most detailed list of fish includes 98 species, among them 40 are valuable marketable species, 40 are marketable species of little value, and 44 are non-marketable species.

According to the environment and life-cycle the populations of fish in Danube and its savant-delta are divided into the following categories:

1. fresh-water - 50 (4);
2. saline-water - 10 (3);
3. different water - 9;
4. semi-meatus 2 (6);
5. meatus - 91;
6. sea - 18.

It should also be underlined that 4 species of fish, namely Abramis brama L., Silurus glanis L., Lucioperca lucioperca and Lucioperca volgensis (Gm.) have both fresh-water and semi-meatus populations.

In saline waters 3 species can be indicated, namely Neogobius ratan (Nord), Zosterisesor ophiocephalus (Pall) and Platichthys flesus luscas (Pall). They are attracted by the saline waters with heightened salinity and for that reason can be ascribed to the intermediate category of saline-water-sea fish.

According to the way of reproduction the fish of river-bed and avant-delta area falls into the following categories:

1. Viviparous (Chondrichthyes) - 2;
2. Phytophilous - 23 (3);
3. Lithophilous - 31 (4);
4. Psammophilous - 9 (2);
5. pelagophilous - 21;
6. other 11(6) and 1.

2.3. Human Impact

2.3.1. Industrial Activities

Transcarpathian Water Management Region

The TWR is related to the industrial-agrarian regions with a high developing level of recreation management. In a total gross output of industry and agriculture, the industrial part is 84% and the agricultural one - 16%. In a state division of labor, the region is distinguished by a production of metal-cutting machine tools, devices and automatization facilities, wood (24,9%), board (10%), table salt (11%), canned fruits and vegetables and others.

The region is not sufficiently provided with energetic resources. There are no large brown coal deposits (the Ilnitsk, Uchgorod and other deposits). The reserve of ground thermal water is considerably high (the Uchgorodskiy region). There are various ore mineral resources: quicksilver, alunites, polymetallic ores (the Biganskoy complex-ore deposit, Beregovskoye polymetallic ore deposit). Also present are large rock-salt resources (Soltvinskoye deposit). Of an industrial importance are tuft beds, deposits of dolomites, pearlites, mineral paints, bentonite clays, color marbling limestones (the Velikokamenetskoye, Dolgorunskoye, Prybuyskoye deposits), baryte. There are deposits of zeolites. The 335 springs of mineral water have been found. The region is provided with mineral resources for the chemical industry and industry of building materials.

There are deposits form several territorial groups: the Uchgorod group (andesites, thermal water), Mukachevo-Svalava group (andesites, clay, mineral water), Beregovo group (alunites, baryte, pearlites, gold), lrshava-Rust group (andesites, brown coal, mineral paints, bentonite clay), Terebia-Teresva group (lime-stone, tuft, diorite, mineral water, quicksilver), Rahov- Solotvino group (rock-salt, marble, lime-stone, dolomite, mineral water etc.).

In the industry branch structure of the region, the leading is machine manufacturing and metal-working branch (31 % of marketable products; the Uchgorod production union "Elektrodvigatel", the Kalchino machine-toll manufacturing plant "Mukachevpribor", the Kobyletskaya Polyana reinforcement plant). Its main products are: devices, metal-cutting machine-tools, hydropresses, gas-transport turbine plants for gas-lines, gas staves, rainforcement, abrasives. The branches of the Lvov large machine manufacturing enterprises are functioning in many urban settlements.

The timber-industry complex is presented by the enterprises located in all the regions of the TWR (lumbering mainly in the east); it specializes in production of sown timber, furniture felling, scale board and planed veneer, wood plates. The largest enterprises are: Svalava, Rust, Rahov wood plants, Uchgorod board-furniture, Teresva woodworking, Mukachevo and Beregovo furniture groups of enterprises, Rahov board manufacturing plant. The production of a wood-chemical industry is varied: acetic acid, charcoal, formalin, solvents, urea resins a.o. (Svalava, Perechin, Bolshoy Bychkov). Complex wood management is carried out: wood cultivation, gathering and processing of the wild-growing fruits, berries, mushrooms, drug plants breeding of hunting fauna, beekeeping, mountain fish breeding, recreative forest utilization etc.

Chemical industry is presented by the hausechemistry plant in Uchgorod.

Food-industry (about 20 % of marketable products) is based on a processing of the local agriculture row materials and, in particular, of wine (Beregovo, Irshava, Uchgorod, Sredneye); canning (Tyachev, Teresva, Bolshoy Beresniy, Vinigradov, Mukachevo), beef (Ughgorod, Vinigradov, Hust, Beregovo, Kukachevo), butter and cheese making: (Ucbgorod, Hukachevo, Rahov, Vinogradov, Beregovo, Hust), berry-juice, flour milling, butter-fat, salt (Kolotvin) branches. Settling of the mineral water in Ploskoye, Svalava, Dragov, Golubinoye (the Luchanskaya Water) is carried out.

Light industry (18,2%) is presented by tailoring and knitting (Uchgorod, Mukachevo, Vinogradov, Beregovo), cotton-weaving (irshava), leather and footwear (Uchgorod, Hust, Vinogradov, Vilok) branches, by production of artificial fur (Yasinya), hats (Bust).

The industrial-construction complex of the region includes a production of building materials. Marble and dolomite (Rahovskiy region), tuff (the Terebia river basin), pearlites, (Beregovakiy region), and caite, sandy rocks, lime-stones (Irshavskiy, Perechimkiy, Svalavskiy regions) are quarried.

Near Irshava, brown coal is mined. With electricity the region is supplied from the "Lvovenergo"-system, which includes also the Terebla-Rika hydro-power plant and Uchgorod hydrosystem power plant.

The peculiarities of the territorial positioning of the industrial production have conditioned a formation of several multibranch complexes (Uchgorod, Mukachevo, Beregovo, Vinogradov, Hust) and specialized complexes (Svalava, Rahov), which are being developed on the basis of local agricultural and forest row materials as well as improved materials: metals, textile, plastic materials.

Upper-Prut Water Management Region

The national economy complex in the considered river-basins of the Ivano-Frankovskaya oblast is characterized by a development of the industrial branches which are based mainly on the local mineral and wood resources together with a multi-branch agriculture.

In this region the oil-extracting industry (Nadvornyanskiy region), machine manufacturing for the cattle-breeding and fodder production (the plant "Kolomyyaselmash") are developed. There are plants: "Elektroosnashchsheniye" (Electro- equipment), Metalunion "Prikarpatye" in Kolomyya.

A considerable part of the national economy complex is formed by the wood-industry complex. It is presented by the groups of saw mills in the urban settlement Delatin, furniture plant group in the urban settlements Snyatin and Pechenech, wood-pulp plant in Kolomyya.

On this territory, there are enterprises of the light and food industry.

Agriculture specializes in cattle-breeding (beef, dairy) and plant growing (production of grain, sugar, beet, fibre flax).

In the Prut basin, a main part of the economy is formed by the Kolomyya economic assembly, which specializes in machine manufacturing, electro-engineering and light industry, production of the flesh, sugar, fruit and vegetable, hoticulture as well as in tourism (the Gutsulshchshyna tourist region with the centers in Kosov, Kolomyya, Kuta, Shashora a.o.).

The Chernovitay part of Upper-Prut Management Region territory is related to the industry-agricultural regions as well. In the branch structure of the industry the leading are food industry followed by light industry. Of great importance are machine manufacturing and metal-working, wood, woodworking and wood-pulp, chemical and oil-chemical branches. Energy resources of the region are restricted.

The food industry branches (sugar, alcohol, beef, butter-fat, dairy, butter and cheese making, fruit and vegetable drying and canning) are extended everywhere. Enterprises of the light industry, machine manufacturing and metal-working are mainly concentrated in Chernovtsy (the plants “F.E. Dzerchyaskiy”, “Elektronmach” for production of the computer-engineering facilities and spare parts; the production union “Leg-mach” for producing the processing equipment for light industry, machines for cattle-breeding and fodder production; the stocking production union; the cotton production union “Voshod”, the glove-knitting, knitting, footwear, tailoring production union “Trembita”).

Here, an intensive development has been given to the traditional lumbering and woodworking industry (production of sawn wood, splint boards, furniture). Enterprises of the chemical and oil-chemical industry produce the rubber footwear, paint work materials, goods of hausechemistry. The construction industry is presented by a production of wall-materials, built-up ferroconcrete constructions, soft roof, brick, lime, gypsum. In the region, the domestic industry-carve-working, carpet weaving, fine needle-working a.o. are widely developed.

Considerable industrial development in the Prut river-head region and, in particular, of ecologically deleterious production, involves an increase of the influence into natural objects and became one of the main causes of a sharp aggravation of the ecological situation.

2.3.2. Water-Treatment Facilities

Zakarpatska Region

In Zakarpatska region of Danube basin water treatment facilities are found only in the towns - Beregovo, Irshava and Dubove. Water protection issues of the woodworking and chemical enterprises in Velykiy Bychkiv and Slovyansk and also big hog production farms of Vilkovtsi and Chonivtsi have not been resolved.

Municipal water treatment facilities of Uzhgorod and Mukachevo are overloaded by the wastewater (in Mukachevo - 2 times) and don't provide designed level of purification.

Ivano-Frankivsk Region

In the towns of Verkhovyna and Zabolotovo municipal water treatment facilities are in the process of construction. There are plans to build water treatment facilities in Yaremcha and Vorokhta. Problems of utilization of the galvanic industry waste products and solid waste products need urgent solutions.

Current water treatment facilities in Kolomyia and Snyatyn are twice overloaded. Portion of the wastewater of Kolomyia (7 m^3 per day) is discharged into Prut without any purification.

Chernivtsi Region

Water treatment facilities of Kytsman, Zastavnya, Putill are not effective enough. Preparation work and planning for the construction of local preliminary water cleaning facilities in Chernivtsi and water treatment facilities in Kelmentsy, Kytsman, Vyzhnytsi started.

Communal water treatment stations in Chernivtsi with the capacity of 128 thousands m^3 per day are overloaded, especially in the peak hours. Level of the purification is lower then it was rated. Issues of neutralization of the galvanic waste products, heavy industry waste products and industrial areas surface emissions need urgent solution.

Odessa Region

Water treatment facilities of Vilcovo are represented by obsolete sediment basins; some of those are damaged. Filters parts are full of grass. Municipal water treatment facilities of Kilia get wastewater from 27 enterprises. Mechanical and biological treatment is not used.

The other part of the wastewater can be accepted as normatively clean. But in some cases rice fields' irrigation systems wastewater have become a source of the water bodies pollution.

Water treatment facilities of Izmail receive approximately equal portions of the sewage both from the city and paper factory. Their work is not effective because of the high concentration of the contamination and overloading.

Water treatment facilities of all cities purify both city and industrial wastewater.

Analysis of the wastewater after its purification shows that big number of the water treatment facilities discharge unpurified water into water bodies.

2.3.3. Municipal Wastes

Ivano-Frankovskiy region

The existing municipal wastewater treatment facilities in Kolomyia and Snyatin towns are overloaded nearly two times. A part of wastewater from Kolomyia town (7 thous. m^3/day) is discharged into the Prut River practically without any treatment. It is planned to increase the capacity of these wastewater treatment facilities, and for Kolomyia town it is necessary to construct

an advanced wastewater treatment facilities. Carried out in the townships of Verkhovina and Zabolotov and planned in the towns of Yaremtcha, Vorokhta and Kuty townships construction of the municipal sewerage system and wastewater treatment facilities is restrained due to the financial and other reasons.

Zakarpatska region

The municipal wastewater treatment facilities of Uzhgorod and Mukachevo towns are overloaded with wastewater (for Mukachevo town two times) and do not provide the design levels of treatment. The construction of the second stage of the treatment facilities in Mukachevo is being carried out with violation of the fixed terms and the third stage of the treatment facilities in Uzhgorod practically has not started yet. The main reasons are financial, material and technical. The construction of the advanced wastewater treatment and sediment treatment facilities, solving of the problems of neutralization of the galvanic industry wastes, hard wastes (domestic wastes especially), surface runoff from the industrial sites and urban territories is actual for both towns.

Chernovitskiy region

The municipal wastewater treatment facilities of the town of Chernovtsy with the capacity of 128 thous. m^3/day are overloaded during "peak" periods and the efficiency of wastewater treatment is lower then the designed one. Putting into operation new stage of the wastewater treatment facilities with the advanced treatment facilities (100 thous.m^3/day) is postponed to later terms.

Solving problems of neutralization of the galvanic industry wastes, hard wastes, surface runoff from the industrial sites and urban territories is actual for the town.

Odessky region

The wastewater treatment facilities of Izmail town, belonging to the integrated pulp-and-paper mill, receive in about equal volumes the wastewater from the mill and from the town. Due to the high concentration of the substances in wastewater at the inlet and due to the overloading the wastewater treatment facilities operate inefficiently.

The municipal wastewater treatment facilities of all the towns carry out the treatment of the municipal wastewater as well as wastewater from the industrial enterprises.

The analysis of the wastewater after their treatment proves that the main part of the wastewater treatment facilities discharge wastewater, which does not coincide with the conditions providing the normative water quality in water bodies. Proceeding from that the essential capital investments are required for the reconstruction of the existing and construction of the new wastewater treatment facilities, as a rule the facilities of the tertiary treatment (advanced treatment).

2.3.4. Solid Waste Removal

From four regions the Odessa and Zakarpatska region are the biggest producers of solid domestic wastes. Storage of domestic wastes is performed on refuse tips, to where a part of industrial wastes is also delivered. The existing refuse tips are hotbeds of intensive pollution of environment. The situation is especially critical in the cities of Odessa and Chernovtsy. Of special danger is the town refuse tip of Novoselitsa town (Chernovtsy region), which is located in flood-lands of the Prut River and during floods is the direct source of pollution of the water.

The biggest sites of toxic waste storage are located in the Odessa region. The greatest specific weight in toxic wastes of this region is for toxic chemicals and pesticides, which became worthless (66,5 %), oil products (3,5 %), cadmium wastes and their compounds (0,1 %). The largest volume of toxic wastes is stored at the enterprises of the Region Agricultural Chemistry Authority (about 800 thous. tons). In Zakarpatska region agricultural sites are also the main sources of toxic wastes.

2.4. Key Issues of Environmental Degradation

Lack of the facilities of sufficient capacities and low effectiveness of the existing facilities are negative factors that influence water quality. Among other key issues are: low capacities of the communal facilities in comparison with the amount of the wastewater, inadequate operating conditions, low technical level; lack of the local facilities for the most toxic wastewater or their low capacity that have negative influence on the central water treatment facilities and condition of the water bodies; small amount of the close cycle enterprises, low coefficient (in many enterprises and in whole branches) of close systems of the water use; lack of the wastewater quality test, testing equipment, automation equipment bring to the overloading of the water treatment facilities. In some areas there are no facilities at all or they are presented by the primitive filtration fields that are also often overloaded.

Besides the point pollution sources, a big portion of pollution comes from the diffuse sources: surface flowing from the fields, livestock production farms, polluted ground waters, from the inhabited territories etc. When the pollution coming to Danube basin from the point sources can be easily controlled, pollution from the diffuse sources is more difficult to control.

All factors mentioned above have brought to the degradation of the Danube basin ecosystem and deterioration of the water quality. According to the level of the chemical and bacteriological pollution water of the most rivers of Danube basin can be classified as polluted.

Water pollution in Danube basin has broken natural processes of water bodies self-cleaning and has made more difficult a problem of good drinking water. Cleaning facilities of the water supply can not preserve drinking water from organic and inorganic contamination. Their combination is dangerous for human health especially in the situation of high radiation level.

As a result in Danube basin area we found critical hydroecological and water management situation.

3. Analysis and Projection of Population and Water Sector Relevant Demographic Characteristics

Transcarpathian Water Management Region

A number of the population depends on the natural increase and migration. The population increase (a difference between birth and death numbers) in 1997 has been reduced nearly by 1233 persons in comparison with 1144 in 1991.

The region is characterized both by outer migration and inner seasonal migration of the population mainly from countryside. In the last years a negative tendency of the migration is evident, i.e. a number of persons having left the region has exceeded a number of persons having come to it.

A distinguishing feature of the demographic situation in villages and in urban side of the Transcarpathian is the tradition of retaining a large family, due to which new generation birthrate intensity here is 15% higher than in the Ukraine. A common feature is that there is a considerable number of families consisting of 5 and more persons (22%).

A considerable demographic problem is a high age-mortality of the region habitants (particularly at the ages of 36-65) in comparison with other, even adjacent, regions. The total death rate here exceeds the Ukrainian one by 13% and the death rates of Lvov and Ivano-Frankovsk oblasts - by 17% and 16% respectively. However, due to the high birth rate and young age group of the population a natural increase over the region amount to 9,6 persons per 1000 habitants (over the Ukraine – 3,4). This index is maximum in the Tyachevskiy region (13,1) and minimum in the Uchgorodskiy region (5,2 persons).

The Transcarpathian oblast differs in the lowest specific weight of employees in a public production and in the highest specific weight of engaged in individual auxiliary management and housekeeping. According to estimation of specialists, the present distribution of the manpower by the kinds of engagement, while accounting for the age structure of the population, is characterized by a presence of some territorial labor reserves for a development of the national economy that in other oblasts has exhausted.

The Upper-Prut Water Management Region

Due to comparatively young age-structure of the population, the region is distinguished by a high index of natural growth gain, which amounts here in average to 6-7 persons per 1000 habitants. The inherent feature of the Upper-Prut Water Management Region demographic situation is keeping of large families in the villages and towns.

A main source of manpower is the population of a workable age, which in the last years has slightly increased, though its specific weight in all population composition has decreased.

The region is distinguished by a low specific weight of the number of the habitants engaged in a public production while a large number of habitants engaged in the individual auxiliary management and housekeeping.

Providing the urban habitants with dwelling amounts here to 15 m^2 and the rural habitants - about 16 m^2. Only 62% of the housing fund is here provided with conveniences. That is the lowest index over the Ukraine, according to the 1996 year estimations.

The system of medical service in countryside needs improvement. Health control in kindergartens, schools and special children institutions is not sufficiently managed. Recently a growth of the sick rate with a temporary disability is observed.

The Danube Southern Water-Supply Region

Historical-geographical peculiarities of the Southern part of the Odessa region population have stipulated formation in DWSR of the settlements with compact residence of a number of the national groups and originality of the demographic situation. According to the data of 01.01.96 general population in DWSR made 621,8 thous. persons, including the urban population of 267,3 thous. (48%).

Analysis of the natural migration of the investigated territory population shows, firstly, more high natural increment of the population during the last 10 years in comparison with the mean regional indices, secondly, cessation beginning from mid-eighties - early nineties of the rural population depopulation processes. Analysis of the migration processes in this region during the last 10 years shows, that in all districts has begun to show the trend of the migration processes transfer from the negative to the positive ones. Intensity of the population migration mobility here is the lowest in the Odessa region.

Peculiarities of the natural and mechanical movement of the population enabled formation here of the geodemographic situation of a peculiar type, which differs from the typical characteristics of the other settlement zones of the Odessa region: ethnic composition of the population, relatively low mobility of the native residents, tradition to have many children in the family, direct dependence of the natural increment upon the portion of the Moldavian, Bulgarian and Gagausian population.

The settling system of the DWSR is represented by 13 towns and settlements of the urban type and 213 villages. In the Danube-adjacent zone these figures make 5 and 46, respectively. Among the urban settlements stands out town Izmail, which relates to the medium town concerning the population and carries out functions of the interdistrict center in the Danube-adjacent settlement system. Other towns (Kilija, Reny, Vilkovo) relate to the category of the small towns. Settlements are mainly located near the fresh water bodies and along the Danube River.

Peculiarity of the rural settlement in the Danube-adjacent areas consists, first of all, of high density of the rural settlements, prevalence of the big and medium settlements and rare network of the rural settlements. In average, the population of the rural settlements almost 3-fold exceeds mean regional indices - 2300 persons, in particular, in the Izmail district - 2293 persons, in the Kilija district - 1699 persons and in the Reny district - 292I persons.

Because of the unsatisfactory housing conditions, natura1 increment of the population in the region is one of the lowest in Ukraine. In the rural area the population has sharply reduced.

3.1. Present situation

3.1.1. Population

According to the information of the State Statistics Committee total population of Ukraine in 1997 was 50,9 million. Today there is a tendency toward decrease of the rural population. In comparison to the 1991 the population reduced by 1 million. In 1997 urban population was 34,8 million (68% of the total population) and rural - 16,1 million. In comparison to 1991 urban population has reduced by 1% (300 thousand) and rural - by 4% (700 thousand).

Situation in Danube basin is little better. Total population, as well as urban and rural has not reduced and even increased. In 1997 population was 3,08 million which is higher then in 1991. Danube basin population today is more then 6% of the total population of Ukraine. Urban population is 1,39 million (45%) and rural - 1,69 million (55%).

The most inhabited area is Tisa basin together with the tributaries Uzh and Latorytsya - 1,27 million, which is 43% of the basin population. The population density of the region is more then 100 people per km^2, compared with average density of the population in Ukraine of 12 people per km^2.

The second largest populated area is Prut basin, where 1,062 million people live (34% of the basin population). Population density is 110 people per km^2. In the lower part of Danube channel in Odessa oblast the population is about 500 thousand (16%), in Siret basin - 240 thousand (8%).

Given figures cannot be accepted as accurate. State Statistics Committee gives information about different oblast. Experts have calculated population taking into account Danube basin total surface, territories covered by separate tributaries in every oblast and information on the population density. The figures were compared with information of 1991 when analysis of National Overview of Danube basin was made as a part of the preparation of International Program for the Protection and Sustainable Use of Danube River Basin. Due to the fact that the population of the total basin and separate tributaries has not considerably changed presented numbers can be accepted for the evaluation of the population in 1997.

Table 3.1. gives information on the population in Ukraine, Danube basin, and separate tributaries.

Table 3.1. Population of Ukraine. Present situation (mln.)

	Total		Urban population		Rural population	
	1991	1996	1991	1996	1991	1996
Ukraine	51,90	50,90	35,100	34,80	16,80	16,40
Danube basin	3,07	3,08	1,380	1,38	1,68	1,69
Danube River-bed	0,50	0,49	0,330	0,32	0,17	0,17
Tisa	0,78	0,79	0,310	0,31	0,48	0,48
Prut	1,06	1,06	0,460	0,46	0,60	0,60
Siret	0,24	0,24	0,100	0,10	0,14	0,14
Latoritsa	0,29	0,29	0,110	0,11	0,18	0,18
Uzh	0,20	0,20	0,078	0,08	0,12	0,12

3.1.2. Area

Ukraine occupies the territory of 603,7 thous. km^2. The Danube square is 32,35 thous. km^2, that makes 5,1% of total area. The basins of Lower Danube (from Reni-city to delta) and Prut and Tisa occupies 1,4%, 1,6% and 2,4% accordingly.

The biggest area in relation to the whole Danube basin area in Ukraine has the Tisa basin - 44,6%. Next is Prut - 31%, the Danube riverbed - 20%, Siret - 6,7%.

For the territory of Ukraine the data of State Committee for Statistics were used. The characteristic for the territories of particular tributaries and the whole Danube basin was taken from the State Water Cadaster materials, the information to which was given by State Committee for Water resources (Derjvodgosp) of Ukraine, and State Committee for Hydrometeorology. That data are official.

Table 3.2. Territory. Present situation (thous. km^2)

	Square	%
Ukraine	603,70	100,00
The Danube basin	32,35	5,40
The Danube riverbed	7,85	1,40
Tisa (with Latoritsa and Uzh)	12,80	2,10
Prut	9,63	1,60
Siret	2,07	0,34
Latoritsa	2,89	0,48
Uzh	2,01	0,33

3.1.3. Per Capita Income

The average per capita income in Ukraine in 1997 was 138 grivna (79 US$). In comparison with year 1991 the per capita income had decreased on 55,6%. The average per capita income in the Danube basin was 98,7 grivna (48,4 US$) in 1997 and decreased from 1991 for 56%.

In the Odessa region (the Danube riverbed) in comparison with 1991 the per capita income decreased from 230 grn to 100 grn (for 56%). In the Tisa basin - from 223 to 91 grn (for 60%), in the Prut and Siret basins - for 50% and makes 110 and 106 grn (around 55 US$).

The official minimum monthly wage in Ukraine is 50 grivna.

All data were taken from the State Committee for Statistics materials for year 1997.

Table 3.3. Per capita income

	1991 (karbovanets)	1997 (grivna)	1997 (US $)
Ukraine	248	138	69,0
The Danube basin	225	99	49,5
The Danube river-bed	230	100	50,0
Tisa	223	91	45,5
Prut	220	110	55,0
Siret	218	106	53,0
Latoritsa	228	89	44,5
Uzh	230	96	48,0

3.1.4. Domestic Water Demand

Information on the intake of fresh water, its utilization, wastewater emissions, water pollution in the branches of economy, types of water utilization (for domestic needs, industrial needs, agricultural water supply, irrigation, etc.) for Ukraine and the regions has been collected and analyzed by the State Committee for Water Management. The information is annually presented in the unified form of the state statistics report. But this report doesn't give information separately for the communal needs of the urban and rural population. That is why general information about Ukraine, Danube basin in general and separate tributaries is an official statistics but information on the urban and rural population has an evaluation character and needs more detailed research and analysis.

According to the Water Code of Ukraine while conducting special water use to satisfy drinking and communal needs of population in a way of centralized water supply, enterprises, institutions, and organizations, which maintain drinking and communal water pipe-lines, extract water directly from water bodies according to properly approved designs of water-intake facilities, water quality standards and permits for special water use.

These enterprises, institutions, and organizations are obliged to carry out regular survey of water quality in water bodies, to maintain a sanitary protection zone of water intake in the proper state, and to inform state bodies on sanitary inspection, environmental protection, water resources, and local radas of people's deputies about deviations from established standards and norms of water quality.

Water users should build local network of observation wells at the centralized water intakes of ground waters, within their deposits and adjacent territories.

While using water for drinking and communal needs of population by a way of non-centralized water supply, legal and natural persons extract water directly from surface or ground water bodies according to the procedure of general and special water use.

Periodic control of water quality, which is used for non-centralized water supply of population, is exercised by state bodies on sanitary inspection at the expenses of water users.

In Ukraine in general 70,2% of population are connected to the central water supply systems. In the cities this number reaches 95,5%; in rural areas - 19,5%. In Danube basin this figure is 82%. Information for each of the tributaries needs detailed research.

In 1997 total water demand for communal needs in Ukraine was 3766 million m^3 including urban communal needs - 2554 million m^3 and rural - 1211 million m^3. Water use in communal branch is 3396 million m^3, including urban - 2304 million m^3 and rural - 1092 million m^3.

In Danube basin total water demand for communal needs is 135,57 million m^3 or 3,6% of the total demand in Ukraine.

The biggest water amount for communal needs is taken in Odessa oblast (lower Danube) and it constitutes 56,58 million m^3 or 42% of the total water intake in the basin. In Tisa basin water demand is 31,18 million m^3 or 23% of the total demand. In Latorytsya basin - 22,25 million m^3 or 16%. In Uzh basin - 8,85 million m^3 (6,5%). In Prut basin - 15,60 million m^3 or 11%, in Siret basin 1,11 million m^3 or approximately 1%.

General water demand for the population of Ukraine is 74,0 m^3 per person per year. In Danube basin this average figure is significantly smaller - 44 m^3 per person per year. But it comes to 116,5 m^3 per person per year in Danube basin. The lowest demand is in Siret basin - 4,6 m^3 per person per year. Information on the water demand per person in Ukraine in general, Danube basin and the tributaries is given in Table 3.4.

Table 3.4. Domestic water demand

	Raw water extraction (demand), mln m^3	Per capita demand of raw water m^3/man/year	Per capita consumption of raw water m^3/man/year	Share of population connected to centralized water supply systems, %
Ukraine	3766,00	74,000	66,73	70,20
The Danube basin	135,57	44,060	36,71	
Danube	56,58	116,510	92,97	
Tisa	31,18	39,200	32,68	
Prut	15,60	14,680	12,23	
Siret	1,11	4,610	3,82	
Latoritsa	22,25	76,470	63,65	
Uzh	8,85	43,774	36,82	

Raw water demand reflects the needs per capita. The raw water consumption is the statistics on real consumption. The water losses are not listed under these figures. They are indirectly included in raw water consumption. For some places the losses may exceed 50%.

3.1.5. Domestic Wastewater Production

According to the information of State Construction Committee and "Water supply and sewerage systems of Ukraine development program", which was approved by the resolution of the Cabinet of Ministers of Ukraine of 17 November, 1997 total number of the population of Ukraine connected to the centralized sewerage system makes 51,2% of the country population, including 75,4% of the urban population and 3,1% of the rural. Total wastewater production from the municipal economy is 3573 million m^3. In Danube basin it is 90,4 million m^3 or 2,5% of the total in Ukraine. The biggest amount of wastewater emission is in lower part of Danube river - 37,7 million m^3 or 42% of the total amount of the municipal sewerage in the basin. In Tisa basin the wastewater emission is 20,8 million m^3 or 23% of the total quantity. In Latorytsya - 14, 8 million m^3 (16%). In Prut basin - 10,4 million m^3 (11%).

Average wastewater production per person in Ukraine is 70,21 m^3./person/year. In Danube basin it is 29,37 m^3 per person per year. The largest water use for the communal needs is in the lower portion of Danube - 77,67 m^3 per person per year. The smallest is in Siret basin - 3,08 m^3 per person per year.

It should be noted that calculation of the wastewater production per person is an approximation.

Table 3.5. Domestic wastewater production

	Waste water production, mln m^3	Per capita production, m^3/man/year	Share of population connected to centralized sewerage systems, %
Ukraine	3573,00	70,21	51,20
Danube basin	90,40	29,37	
The Danube	37,70	77,67	
Tisa	20,80	26,14	
Prut	10,40	9,79	
Latoritsa	14,80	50,93	
Uzh	5,90	29,16	
Siret	0,70	3,08	

3.2. Projection for Planning Horizons 2010 and 2020

3.2.1. Population

Because of the tendency of a population decrease in Ukraine, population of the year 2010 according to the forecasts of the scientists of the Economical Geography department of the Kiev National University will be on the level of the year 1997. This can be explained by the economic and social crisis in Ukraine. They forecast that till 2005 there will be a tendency of the negative demographic balance and the population nearly in all regions of Ukraine will decrease. With the beginning of the stabilization of the state economy insignificant increase of the population is possible and by the year of 2010 it will come to the level of 1997. By 2020 insignificant increase of the population of Ukraine is expected. Total population will increase by 3%. Urban population will increase by 4% and rural by 2%. Today there are no special forecasts of the scientific or official organizations for Danube basin region. That is why for the Danube basin population evaluation of the same tendency as for the whole Ukraine is accepted. The forecast for the number of population in Ukraine in 2010 is 50,9 million, among which urban population will be 34,5 million, rural - 16,4 million. By 2020 total population will increase to 52,36 million and this increase will apply to urban population. Population of the rural areas will not significantly change. Insignificant increase of population is also expected in Danube basin in 2020.

Table 3.6. gives prognosis for population in the basin in 2010 and 2020.

Table 3.6. Prognosis for population in the basin in 2010 and 2020 (thous.)

	year 2010			year 2020		
	Total	Urban	Rural	Total	Urban	Rural
Ukraine	50894	34522	16372	52357	35903	16454
Danube basin	3077	1386	1691	3167	1441	1725
Danube riverbed	486	320	166	502	332	169
Tisa	795	311	485	817	323	494
Prut	1063	461	602	1084	479	605
Siret	240	103	138	247	107	141
Latoritsa	291	114	177	300	118	181
Uzh	202	79	123	208	82	126

3.2.2. Domestic Water Demand

Information on the expected domestic raw water demand and wastewater production has an evaluation character and it was calculated for this paper using information of the population forecast and current water demand for the different regions and Ukraine in general.

Calculations were made with the assumption that significant reduction or increase of the water use per person of the population is not to be expected. Experts based their assumption on the fact that for the last 5 years general water use per person has not significantly changed. Because of the difficult economic situation increase of the water use in the nearest future is not to be expected in the regions where it's low at the current moment (e.g. Prut basin). Significant reduction of the water use in the communal sphere is not going to happen because most water users don't have water meters and their massive introduction is not expected, which doesn't stimulate rational use of the water resources.

Water loss in the centralized water supply systems is estimated by the state statistics in the range of 10-15%. But to our opinion this figure is much bigger and it reaches 20-25%. Taking into consideration current economic situation of the country and prospects for the future we can be sure that increase or reduction of the water loss in the centralized water systems can not influence our calculations. New water supply facilities have been constructed very slowly. Preventive maintenance of the network is very rare. Cost of the water used by the population doesn't depend on the actual use (lack of the water meters). As a result rational use is not stimulated. Due to the lack of finance and imperfection of the legislation current situation will remain in the nearest future (Table 3.7.).

All mentioned above is also applied to the communal wastewater production.

Table 3.7. Projection of domestic raw water demand

	2010			2020		
	Population (thous.)	Water demand mln m^3/year	Per capita demand	Population (thous.)	Water demand mln m^3/year	Per capita demand
Ukraine	50893,50	3766,00	no data available	52356,23	3874,4	no data available
Danube basin	3077,30	135,67	-	3166,53	139,5	-
Danube riverbed	485,64	56,68	-	501,74	58,5	-
Tisa	795,32	31,18	-	817,44	32,0	-
Prut	1062,55	15,60	-	1083,98	15,9	-
Siret	240,47	1,11	-	247,33	1,1	-
Latoritsa	290,97	22,25	-	299,07	22,9	-
Uzh	202,31	8,85	-	207,94	9,1	-

3.2.3. Domestic Wastewater Production

Table 3.8. Domestic wastewater production (mln m^3/year)

	2010			2020		
	Population (thous.)	Wastewater production	Per capita wastewater production	Population (thous.)	Wastewater production	Per capita wastewater production
Ukraine	50893,50	3573,00	no data available	52356,23	3675,9	no data available
Danube basin	3077,26	90,37	-	3166,53	93,0	-
Danube riverbed	485,64	37,72	-	501,74	39,0	-
Tisa	795,32	20,79	-	817,44	21,4	-
Prut	1062,55	10,40	-	1083,98	10,6	-
Siret	240,47	0,74	-	247,33	0,8	-
Latoritsa	290,97	14,82	-	299,07	15,2	-
Uzh	202,31	5,90	-	207,94	6,1	-

4. Actual and Future Population Potentially Affected by Water Pollution

According to the Water Code of Ukraine Article 46 there are two types of water use in Ukraine.

Use of waters is exercised in a way of **general** and **special** water use, and water use for hydropower generation, water and air transportation.

General water use is conducted by citizens for satisfaction of their needs (swimming, boating, amateur and sports fishery, watering of animals, extraction of water from water bodies without application of facilities or technical instruments, and watering from wells) free of charge, without assignment of water bodies to definite persons and without issuing relevant permits.

To protect life and health of citizens, natural habitat, and due to other reasons stipulated by the legislation, city radas of people's deputies, being submitted with application of specially authorized state bodies on environmental protection, water resources, sanitary inspection and other state bodies, establish places where swimming, boating, water extraction for drinking and communal needs, watering of animals are prohibited, and determine, due to certain reasons, other conditions, restricting general water use of water bodies, located within their territory.

The primary water user is obliged to bring water use conditions to the population's notice and inform about prohibition of general water use within water body granted on lease.

If primary water user or relevant rada of people's deputies did not establish such conditions, general water use is considered as permitted without limitations.

Special water use - is extraction of water from the water body with application of facilities or technical instruments, and discharge of reclaimed waters into it.

Special water use is carried out by legal and natural persons, first of all for satisfaction of **drinking needs** of population, as well as communal, health-healing, health-improvement, agricultural, industrial, transport, energy, fishery and other national and public needs.

Water use is not special, if it is connected with conveyance of water through hydrotechnical system, navigation, conveyance of water to the users in low-water regions, elimination of adverse effect of waters (ground water elevation, salinity of land, swamping etc.), use of ground waters for extraction of mineral resources, extraction of water from the earth crust along with mineral resources, accomplishing construction, dredging and exploding work, mining of mineral resources and water plants, running pipe-lines and wires, as well as drilling, geological exploration and other work within water bodies, that is executed without water extraction and wastewater discharge.

The Article 58 of the water Code of Ukraine specifies the requirements for quality of waters used to satisfy of drinking and communal (municipal) needs of population.

Waters, whose quality corresponds to established **national standards, ecological safety standards, and sanitary norms**, are used to satisfy drinking and communal needs of population.

Water users have the right to demand drinking water quality charts from the owner of waters (water supplier).

In case when quality of water does not comply with established standards, ecological safety standards, and sanitary norms, its use is stopped by the decision of state bodies of sanitary inspection.

The ground waters of drinking quality should be used mostly to satisfy needs of drinking and communal water supply of population, as well as needs of food (processing) industry and cattle breeding.

4.1. Actual and Future Population Potentially Affected by Health Hazards through Raw Water Quality Exceeding Defined Quality Standards for Drinking Water

In 1996 in Ukraine about 14% tests of the water in the centralized water supply system did not satisfy the requirements of the State Standards "Drinking Water" on sanitary-chemical indexes, about 10% - on bacteriological indices.

Approximately the same situation is in the Danube basin. For example in Danube part of Odessa region 18% tests did not satisfy the requirements of the sanitary-chemical indexes and about 15% - the bacteriological indexes.

In the Tissa basin 15% of the drinking water tests did not satisfy requirements of the bacteriological indexes. In the Prut basin this figure was 17%.

4.2. Actual and Future Population Potentially Affected by Health Hazards and Other Impacts on Welfare through Unsanitary Conditions in the Danube River System

The stretches, which exceed Ukrainian water quality standards (for fishery and communal economy), are shown in Tables 4.1. and 4.2

Municipal wastewater discharges are adequate to 75% of the COD wastewater load of point-source discharges by treated or non-treated sewage into the Danube River catchment area.

Table 4.1. The stretches, which exceed Ukrainian water quality standards (as result of municipal wastewater discharges)

Stretch	River basin	Length, distance from delta, km	Number of population actually living in communities directly located at both sides of the river stretches, thous.
Chernivtsi	Prut	767-752 km	263,2
Izmail	Danube	89-82 km	94,7
Kolomiya	Prut	861-856 km	69,3
Mukachevo	Latoritsa	109-101 km	91,3
Uzhgorod	Uzh	30-25 km	126,2

Table 4.2. The stretches, which exceed Ukrainian water quality standards (as result of industrial water discharges

Name of the plant/location	River/main catchment area	Length, distance from delta, km	Number of population actually living in communities directly located at both sides of the river stretches
Cardboard factory, Rachiv	Tissa	925-930	16,8
Forest exploration factory, V. Bichkov	Shopurka(Tissa)	7-4	11,2
Forest exploration factory, Teresva	Tissa	892-890	no data
Cardboard – Paper factory, Izmail	Danube	89-82	94,7

In Ukraine we do not have separate standards for bathing water quality. In Ukraine the state standards exist for fishery and sanitary-hygienic indexes.

4.3. Description of Main Health Hazards through Water Pollution in the Danube River and Tributaries

Statistics show us that the state of health of the population deteriorates. Starting from 1995 the birth rate decreased and death rate increased, negative natural growth has become bigger.

Serious sanitary-epidemic situation in Danube basin is an obvious evidence of the ecological destabilization. Lack of the water protection brings great loss not only to the environment but also to the labor potential and economics of the country. According to the information of the sanitary-epidemic service every eighth - tenth sample of the drinking water, which was supplied to the population, didn't meet state bacteriological standards. Bacterial and virus contamination of the water can become the basis of the epidemics of cholera, dysentery, and viral hepatitis. The problem is complicated by the wide use of chlorine in the current technologies of the drinking water preparation. In particular it is used for decontamination of the phyto plankton disintegration products. As a result of this process a big amount of toxic carcinogenic chlorine organic compounds developed. The use of hypo chlorinated water with high concentration of the heavy metals, radio nuclides and compounds containing nitrogen leads to the increase of the endocrine system diseases, metabolism disturbance, nervous system diseases etc.

Comparative analysis of the economic situation of the water supply systems in the areas with the different quality of the surface waters shows us that the expenditures for water treatment are much higher in the polluted areas. The volume of mentioned work is very big, which means big losses for the state economy.

The danger of mass technological and ecological catastrophes and accidents, breakdown of the life-support water supply and water treatment systems has dramatically increased. The reasons for this are pretty obvious - great structural reconstruction, economical disintegration, lack of investment projects and financing. As a result there is no possibility either for the technical re-equipping, or for the maintenance of the objects in the proper order and ensuring of the minimum safety level.

In recent years in DWSR, as in the whole Odessa region, in the public health state a number of the negative trends is noted: low life expectancy, huge rate of the tumor diseases, viral hepatitis, inborn deformity, endocrine pathology, diseases of the direction organs and kidneys.

In 1996 in comparison with 1987 the birth rate has reduced by 12%, and the natural increment has reduced more than 2-fold. The total mortality index exceeds the average republican level by 2,5%. During the last 10 years the mortality of the population caused by the malign tumors has increased by 21%, and infantile mortality caused by the inborn deformity has increased by 40%.

In general structure of the disease rate a leading position is occupied by diseases of the respiratory organs, blood circulation system, nervous and osseous-muscular system, sensory and digestive organs. Their portion in the total disease rate makes 70%.

The reasons of such public health state are not quite clear. On one hand they are stipulated by the unfavorable ecological situation, bad conditions of labor and mode of life and low medical culture of the population, on the other hand by a poor material-technical basis of the establishments, personnel problems, low level and duality of the rendered alstance.

5. Analysis of the Economic Significance of the Danube River System and Impacts of Economic Activities

5.1. Actual Situation

5.1.1. Abstraction of Raw Water from the Danube River System

5.1.1.1. Domestic Raw Water Demand

According to the information of the state statistics report "Main indices of the water use and water protection in Ukraine for the period from 1991 to 1997" abstraction of the water for the domestic purposes in Ukraine in 1991 was 5570 million m^3 a year or 16,5% of the total water abstraction. In 1997 water abstraction for all branches of economy reduced by more then 11000 million m^3 and con was only 21091 million m^3. Water abstraction for the domestic purposes reduced almost by 2000 million m^3. In comparison to 1991 water abstraction from Danube by all branches of economy reduced almost by 0,7 million m^3. Water abstraction for domestic purposes in Danube basin constitutes 0,67% of the general abstraction for domestic purpose in Ukraine. Information on the basins of the each of tributaries and on their part in the general abstraction for domestic purposes in Ukraine is given in Table 5.1.

The Ukrainian Statistics on water consumption include many other areas, e.g. ground water, irrigation of pastures, which is listed separately from irrigation for plant watering, fish farming, maintenance of necessary hydraulic ground water pressure, etc.

Private small businesses are not listed as industrial water users. They consume water from municipal system listed as drinking water. Moreover very often in Ukrainian statistics the industries that require the drinking water quality, for example food industry, are listed under the category of drinking water consumption or demand.

Table 5.1. Abstraction of raw water for domestic needs (mln m^3/year)

	1991			1997		
	Total abstraction	Domestic demand	Share from total abstraction in Ukraine, %	Total abstraction	Domestic demand	Share from total abstraction in Ukraine, %
Ukraine	33813	5570,0	16,500	21091,0	3766	17,90
Danube basin	2676	235,0	0,690	1958,0	136	0,64
Danube	2310	99,0	0,290	1708,0	57	0,28
Prut	109	22,0	0,060	67,0	16	0,07
Siret	7	1,4	0,004	5,3	1,1	0,01
Tisa	141	55,0	0,160	97,0	31	0,15
Latoritsa	78	40,0	0,120	58,0	22	0,10
Uzh	31	18,0	0,050	22,0	9	0,04

5.1.1.2. Industrial/Mining Raw Water Demand

Water intake for industrial needs in Ukraine in 1997 was 9125 million m^3 or 43,3% of the total intake. It reduced almost twice. In Danube basin for the industrial purposes 173,25 million m^3 was taken or 0,82% of the total water intake in Ukraine. It is 40% reduction in comparison with 1991. In lower Danube water intake reduced by half and it was 71,6 million m^3, 1,8 times reduction in Prut basin (17,94 million m^3), minus 20-30% in the basins of Tisa, Latoritsa, Uzh.

Information on water intake for the industrial purposes for Ukraine in general, as well as Danube basin and separate tributaries in comparison with 1991 is shown in Table 5.2.

Table 5.2. Abstraction of raw water for industrial purposes (mln m^3/year)

	1991			1997		
	Total abstraction	For industrial purposes	Share from total abstraction in Ukraine, %	Total abstraction	For industrial purposes	Share from total abstraction in Ukraine, %
Ukraine	33812,74	16687,34	49,35	21091,00	9125,00	43,26
Danube basin	2676,36	248,45	0,73	1957,62	173,25	0,82
Danube	2310,00	137,04	0,40	1708,00	71,60	0,34
Prut	108,50	31,43	0,09	66,79	17,94	0,08
Siret	7,28	1,91	0,01	5,34	1,20	0,01
Tisa	140,70	42,48	0,12	96,91	38,70	0,18
Latoritsa	78,20	27,02	0,08	58,46	32,17	0,15
Uzh	31,46	8,57	0,02	22,11	11,64	0,06

5.1.1.3. Agricultural Raw Water Demand for Irrigation

The raw water abstraction for agricultural purposes in Ukraine in 1997 was 1139 mln m^3 or 5,4% from total abstraction. This amount is lower for 828 mln m^3 in comparison with 1991.

The decreasing trend for total water abstraction and for agricultural sector can be observed all over the whole Danube basin.

Table 5.3. Abstraction of raw water for agriculture (mln m^3/year)

	1991			1997		
	Total abstraction	For agricultural purposes (irrigation)	Share from total abstraction in Ukraine, %	Total abstraction	For agricultural purposes (irrigation)	Share from total abstraction in Ukraine, %
Ukraine	33813,00	1967,00	5,81	21091,00	1139,00	5,40
Danube basin	2676,36	186,17	0,55	1957,61	133,88	0,63
Danube	2310,00	90,50	0,27	1708,00	63,14	0,30
Prut	108,50	23,10	0,07	66,79	16,58	0,07
Siret	7,28	3,14	0,01	5,34	2,44	0,01
Tisa	140,70	45,73	0,14	96,91	35,47	0,70
Latoritsa	78,42	18,84	0,06	58,46	11,82	0,06
Uzh	31,46	4,86	0,01	22,11	4,43	0,02

5.1.2. Wastewater Discharge to the Danube River System

In the whole of Ukraine the wastewater discharge decreased for 427,6 mln m^3 or 17% from the 1991 level and made 3573 mln m^3. Normatively clean waters discharge decreased for 374,3 (22%). Now it makes 1352 mln m^3.

The polluted water discharge did not change a lot and stay on 2159,5 mln m^3 (year 1991 - 2181,7 mln m^3).

Investigations show the decreasing tendency in the whole Danube basin. For example in the Tisa basin the wastewater discharge decreased for 10,35 mln m^3 or 28%.

The discharge of normatively clean waters had decreased almost two times - in 1991 it was 67,63 mln m^3, and now - 34,20 mln m^3. This trend can be observed for all Danube tributaries.

According to the state statistic information (2TP vodgosp) the wastewater discharge in Ukraine in 1997 has decreased for 6575 mln m^3 from year 1991 (36%) and made 11698 mln m^3/year.

Because of ineffective work of the treatment plants the discharge of normatively clean waters also decreased and made 1798 mln m^3/year.

At the same time the discharge of polluted waters also decreased for 15% and made in 1997 4232,3 mln m^3/year.

In the Danube basin the discharge of wastewater also decreased for 841,2 mln m^3/year (17,7%) and become 391,8 mln m^3/year. In the meantime the discharge of normatively treated water increased two times and made 140,9 mln m^3/year. Discharge of polluted waters (not enough treated) raised for 27,32 mln m^3/year with exception of the Latoritsa River basin and Uzh River basin. Small increasing of wastewater discharge for 2,46 (Latoritsa) and 7,39 (Uzh) mln m^3/year can be observed. The discharge of normatively clean waters also increased for 93% in Latoritsa and 58% in the Uzh River basin.

At the same time in Latoritsa the discharge of insufficient treated waters has decreased two times and in the Uzh River basin it stayed on the level of 1991.

Table 5.4. Wastewater discharge (m^3/year)

	1991				1997			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	18273,00	701,10	4291,00	2533,00	11698,00	763,30	3469,00	1798,00
Danube basin	475,92	246,12	150,12	79,61	391,80	73,42	177,42	140,96
Danube	321,60	197,9	83,83	39,81	206,70	43,09	117,80	45,82
Tisa	63,55	9,87	27,77	25,91	57,58	7,27	12,72	37,59
Prut	89,80	37,22	38,04	13,54	53,04	21,10	23,95	7,99
Siret	1,96	1,13	0,48	0,34	1,74	1,10	0,57	0,65
Latoritsa	40,54	0,76	23,84	15,93	43,00	0,84	11,44	30,71
Uzh	22,34	0,23	10,20	11,92	29,73	0,12	10,94	18,78

5.1.2.1. Municipal Discharge

Table 5.5. Municipal wastewater discharge (mln m^3/year)

	1991				1997			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	4000,60	92,60	2182,00	1726,00	3573,00	61,50	2160,00	1352,00
Danube basin	156,03	3,62	85,08	67,33	90,37	1,55	54,64	34,20
Danube	65,76	1,53	35,86	28,37	37,72	0,65	22,80	14,27
Tisa	36,34	0,84	19,82	15,68	20,79	0,36	12,58	7,87
Prut	14,46	0,34	7,88	6,24	1,04	0,18	6,29	3,94
Siret	0,92	0,02	0,50	0,40	0,74	0,01	0,46	0,28
Latoritsa	26,44	0,61	14,42	11,41	14,82	0,25	8,96	5,61
Uzh	12,11	0,28	6,60	5,23	5,90	0,10	3,57	2,23

5.1.2.2. Industrial/Mining/Shipping Discharge

Table 5.6. Industrial discharge (mln m^3/year)

	1991				1997			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	10915,00	8200,0	1944,00	771,00	6260,00	3936,00	1917,00	406,40
Danube basin	165,60	124,40	29,50	11,77	115,13	72,39	35,26	7,47
Danube	91,30	68,60	16,26	6,49	47,74	30,02	14,62	3,10
Tisa	28,32	21,27	5,04	2,01	25,80	16,22	7,90	1,67
Prut	21,00	15,77	3,74	1,49	11,96	7,52	3,66	0,78
Siret	1,27	0,95	0,23	0,09	0,42	0,26	0,13	0,03
Latoritsa	18,02	13,53	3,21	1,28	21,45	13,49	6,57	1,39
Uzh	5,71	4,28	1,02	0,41	7,76	4,88	2,38	0,50

According to state statistics (2TP vodgosp) the total industrial wastewater discharge in 1997 decreased in comparison with the year 1991 for 43% and made 6260 mln m^3/year.

The discharge of untreated water also decreased for 48% and made 3936 mln m^3/year. Almost two times discharge of normatively clean waters decreased (44%). This can be explained by absence of financing of building and reconstruction of the wastewater treatment plants.

The decrease of total discharge of industrial wastewater can be explained by recession in industrial activity.

The same tendency is present in the Danube basin except for rivers Latoritsa and Uzh, where small increase of wastewater (19 and 36%) can be observed. At the same time in the Latoritsa and Uzh River basins the discharge of polluted (insufficient treated) waters is observed (104 and 133% accordingly). This means that the existing treatment plants cannot provide needed treatment level.

The tendency of increasing insufficient treated waters (for 20%) discharge and decrease of normatively clean discharge (for 37%) is typical for the whole Danube basin.

5.1.2.3. Agricultural Discharge

Table 5.7. Agricultural wastewater discharge (mln m^3/year)

	1991				1997			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	3273,00	3129,00	138,60	5,33	1761,00	1646,00	111,70	3,060
Danube basin	124,12	118,70	5,22	0,24	89,40	83,70	5,68	0,150
Danube	60,34	57,69	2,53	0,12	42,10	39,36	2,67	0,070
Tisa	30,48	29,14	1,28	0,06	23,65	22,11	1,50	0,040
Prut	15,40	14,72	0,65	0,03	11,06	10,34	0,70	0,020
Siret	2,10	2,01	0,09	0,004	1,85	1,73	0,12	0,003
Latoritsa	12,56	12,01	0,53	0,02	7,88	7,37	0,50	0,010
Uzh	3,24	3,09	0,14	0,01	2,95	2,76	0,19	0,005

1997 in Ukraine is marked by decreasing of total wastewater discharge from agriculture in comparison with 1991 by two times (46%).

At the same time the decrease of normatively clean waters discharge can be observed (for 43%). This can be explained by ineffective work of treatment plants and their overloading.

The total discharge in the Danube basin also decreased for 38% but at the same time the insignificant increase of insufficient treated waters discharge is found (8%).

The decrease of normatively clean water discharge is typical for the whole Danube basin (from 33 to 42%).

5.1.3. Pollution of Aquatic Systems through Potential Soil and Ground Water Contamination

5.1.3.1. Industrial/Mining/Municipal Solid Waste Disposal

At present time 40 mln m^3 of sludge are produced from wastewater treatment plants. Sludge should be stored in the special mud landfills. After disinfection measures and environmental impact assessment it can be used as fertilizers (in reality only about 5% or 2 mln m^3 are utilized). There is no data, at present time, on dump sites in Danube basin. There are no facilities in the region for preparation of wastewater treatment sludge for utilization. There are no incineration facilities or other facilities for solid waste disposal in the region. This is one of the most serious problems of the region because the landfill and dumpsites are serious source of diffuse pollution in the region.

In many cases it presents severe affect to ground water quality as for example in Bolgrad district of Odessa region as was reported by Odessa State Ecological Inspection. The future activity for pollution reduction from these pollution sources must be directed on the basis of inventory of pollution sources, assessment of the size of diffuse pollution and introduction of ecologically friendly technology for the solid waste processing and disposal.

Ukraine will need external financial support to carry out the needed assessment and introduction of new technology in the field of solid waste disposal.

5.1.4. Hydro Power

According to the Water Code of Ukraine the use of waters for hydropower generation needs is executed for payment without permit. Term of water use for hydropower generation needs is not specified.

Hydro-power enterprises are bound to follow established rules of water reservoirs operation, regimes of accumulation and working off water stock, regimes of water level oscillations in upstream and downstream water reaches, and admission of fish to places of spawning in accordance with designs of fish-admission facilities.

There is only one hydro-power station in the Ukrainian part of the Danube basin - Tereble-Rikska station. Its capacity is 27 MW, the annual electricity production is 133 GWh.

5.1.5. River Fisheries (Danube and Main Tributaries)

Rights of water uses in relation to water bodies (their parts) that are used for industrial fish-breeding and other types of fishery or are significant for restoration of fish reserves could be limited for the sake of fishing.

A list of fishery reaches of water bodies (their parts) is determined by the Cabinet of Ministers of Ukraine.

Water users, whom the rights for use of fishery water bodies (their parts) are given, are obliged to carry out measures that provide improvement of ecological state of water bodies and conditions of restoration of fish reserves, as well as to keep by-water protective stripes within places of fish capture in due sanitary state.

Hydro-amelioration in places, where waterfowls, fur-bearing beasts are located, as well as industrial capture of fish in places, where beavers and desmans are cultivated, is carried out with agreement of the state bodies for hunting and fishery.

Other issues of water usage for needs of fishery and hunting are regulated by the Law of Ukraine "On Animal Kingdom" and other acts of the legislation.

Conditions of fishing farm reservoirs and as a result fish productivity have suffered from the unreasoned utilization of the flood plains for the industrial purposes, excessive water intake, deepening, absence or poor quality of the fish protection facilities.

Table 5.8. Industrial fish stock in Danube lakes (tons)

Lakes	1993	1994	1995	1996
Kahul	230	150	110	296
Kartal	120	65	108	228
Yalpuh	400	155	65	222
Kuhurluy	550	608	458	744

These lakes are separated from the Danube riverbed by dams and their discharges are regulated.

In Zakarpatska region there are no commercial fisheries. The main fish species for fishing sport is the rainbow trout.

The total area of fish farming sector in the Prut River basin is 4 869 thous. ha.

The most important fish catches are performed in Lower Danube area, where it is done on the commercial scale.

The commercial fish stocks are slowly increasing in the Lakes of lower Danube though in 1997 the fish productivity was 6,5 in the Lake Yalpug and 19,2 in the lake Kuhurluy.

Table 5.9. Fish catches in the lower Danube of Ukraine 1993-1997 (t/year)

Years	Danube River	Lake Kagul	Lake Kuhurluy	Lake Yalpug	Lake Katlabukh	Lake Kartal	Lake Kitay
1993	328	491	12,0	222	43	63	383
1994	466	522	11,5	281	394	27	262
1995	448	367	80,0	170	339	32	186
1996	444	483	46,0	108	635	27	169
1997	375	471	105,0	173		60	

5.1.6. River Shipping

According to the Water Code of Ukraine the use of waters for transportation needs is executed for payment without permit. Term of water use for transportation needs is not specified.

Rivers, lakes, water reservoirs, channels, other water bodies, as well as in-land (sea) waters and the territorial sea are in-land water ways of general use except cases, when their use for this purpose is prohibited partially or completely according to the legislation of Ukraine.

A list of in-land waterways, which are regarded as appropriate for navigation, is approved by the Cabinet of Ministers of Ukraine.

All vessels and other floating facilities should be equipped with tanks for collecting slate (schistous) and other contaminated water that has to be transferred to special wastewater treatment facilities for purification and disinfection.

Ships that have not replaced isolated ballast and are not equipped with tanks and special isolated systems for collecting wastewater of any origin or with plants (complying with international standards) for purification or disinfection of these waters, are prohibited from coming into the territorial sea.

Use of water bodies for floating on small capacity vessels (oar, motor boats) is allowed with observation of rules established by the Verkhovna Rada of Ukraine, cities radas of people's deputies with agreement of the state inspection of Register and safety of navigation.

Water Transport

The Ukrainian Danube Steamship Line (UDSL) manages the Reny, Izmail, Kilija and Ust-Danube ports, ensuring the mixed (sea-river), sea and river shipments. According to the data of year 1996 the sea and river fleets of the steamship line number 1001 ships, including 57 sea transport ships having total load-carrying capacity above 250 thous. tons, 431 river non-self-propelled ships having total load-carrying capacity of almost 580 thous. tons, 22 river cargo vessels having total load-carrying capacity of 43 thous. tons. The general freight turnover of the ports makes 2l,4 mln. tons.

It should be mentioned that the Ust-Danube, Izmail and Reny ports, the portion of which makes about 98% of the general freight turnover of the steamship line, to a greater degree are oriented at the foreign trade shipments, the Izmail and the Reny ports being oriented at the export freight traffic, and the Ust-Danube port being oriented at the import freight traffic. All these ports take an active part in the small coasting trade.

The steamship line also performs passenger transportation - there is an international line "from the Alps to the Black Sea".

In accordance with the working plan of the Danube Commission on Observance of the Convention on the navigation conditions, the Danube states for the sake of navigation carry out in their sections using their own means hydrotechnical and dredging works in order to ensure the depth and the width of the fairway in accordance with the recommendations on establishment of the clearances. In the operation activity of the UDSL exists the necessity to develop more intensively and comprehensively the mouth of the Danube. At present, because of the long periods of the required depth non-insurance on the Prorva canal, to a great degree the Kilija arm has reduced its role as of the navigable branch of the Danube, which connects the Ukrainian ports with the sea. UDSL failed to realize the possibilities connected with opening of the Kilija arm for putting in the sea foreign ships. The steamship line has often to use the Sulin canal for the coastal trade shipments and to pay with hard currency for this. The available design of the navigable the Danube-sea canal construction (Zhebrjanovakiy bay), which passes through the Stentsovsko-Zhebrijanovakiy low place, cannot be realized because of the significant negative effects for the ecosystems of the Danube low places and the sea. A special anxiety causes the use of the commissioned in 1964 Tchernavoda-Konstantsa canal, which reduces the way to the sea by 400 km. The danger consists in possibility of switching to it the freights of the Danube-sea communication, which are transported at present by the UDSL, as well as in activation of the international shipments over this canal in connection with the free trade zone in Constantsa.

In 1985 the Danube fleet of Ukraine consisted of 196 different vessels, including 58 cargo ships, and 28 passengers vessels. In 1985 it transported 11,3 mln tons of cargoes and 604 thous. persons. The river transport consisted of 50 % of total. The Danube shipping company has four ports (Reni, Izmail, Kiliya, and one marine port in Ust-Dunaisk). In 1985 the port cargo turnover was 22,6 mln tons. Since dissolving the Soviet Union and embargo imposed on trade with former Yugoslavia, the port turnover and transportation of people and cargo dropped down significantly (approximately by 10-15 times).

5.1.7. Water Related Recreation/Tourism

The Prut and Silet riverheads are the recreational regions of multitype summer and winter mountain-sports and mass cognitive and sanitation complex. Favorable climate as well as high natural-recreation and health-resort potential, define an economy profile of this part of the Danube basin in many aspects.

The chief natural recreation resources of the region are mineral waters as well as climate and relief. There are 50 deposits of medical waters of various species. The most common are carbonaceous mineral springs. There are also hydro-carbonaceous sodium (alkaline), chloride-hydrocarbonaceoue sodium Rod sodium-calcie, chloride-sodium waters. The main part of the springs is located in the mountains (Uchok, Meghgorye, Dragov, Ploskov, Polana, Novopolana, Soymin, Evasova a.o.). They are also present in the plain (Uchgorod, Shayan a.o.).

Within the region 15 sanatoria and holiday hotels with medical treatment (the largest are "Polana", "Solnechnoye Zakarpatye", "Karpaty", "Evitka Polonyny", "Verhovyma", "Shayan", "Gornaya Tissa", "Chemchuchyna Karpat"), 2 holiday homes and hotels, numerous holiday bases, sport-centers are in function. In Solotvia the republican allergological hospital (in the salt mines) acts.

The water bodies that have natural health-healing properties, are regarded as health-healing ones if they are included in a special list.

The list of water bodies related to the category of health-healing ones with indication of stock of waters and their health-healing properties, as well as other conditions favorable for health-treatment and prophylaxis, is approved by the Cabinet of Ministers of Ukraine at the submission of the Ministry of Health Protection of Ukraine, the State Committee on Utilization of Mineral Resources of Ukraine and the State Committee on Water Resources.

Water bodies regarded as health-healing ones according to the established procedure are used in health-healing and health-improving purposes.

According to the Water Code of Ukraine the use of waters for health-improving, recreational and sport purposes is carried out according to the procedure of general and special water use.

Places, where the waters are used for health-improvement, recreational and sport purposes, are set up by relevant radas of people's deputies according to the procedure established by the legislation.

Use of water bodies for health-improvement, recreational and sport purposes, in a way of general water use, could be prohibited or limited according to article 45 of the Water Code of Ukraine.

5.2. Projection of Expected Economic Significance/Impacts

5.2.1. Projection of Abstraction of Raw Water

Projection of total raw water abstraction for planning horizons 2010 and 2020

The estimation is given by expert with the help of Kiev National University staff and based on the projection of population and current amounts of the abstracted raw water.

The estimation does not consider possible changes in economical situation in Ukraine and possible improvements in the technologies.

The only reason that was taken into account is possibility of active growth of water-use in the rural settlements. The National programme for installation the centralized water-supply systems in rural settlements was adopted. Due to this programme it is possible that the raw water abstraction in rural settlements will raise up.

Table 5.10. Projection of water abstraction for Danube basin (mln m^3/year)

	2010		2020	
	Total abstraction, mln m^3	Share from total abstraction in Ukraine, %	Total abstraction, mln m^3	Share from total abstraction in Ukraine, %
Ukraine	25030,40	100,00	32098,50	100,00
Danube basin	2276,40	9,09	2670,12	8,31
Danube	1976,00	7,80	2298,10	7,10
Prut	91,40	0,36	99,10	0,31
Siret	5,99	0,02	77,23	0,02
Tisa	113,80	0,45	160,10	0,49
Latoritsa	62,30	0,24	77,20	0,24
Uzh	25,43	0,10	29,05	0,09

Table 5.11. Projection of abstraction of raw water for domestic demands (mln m^3/year)

	year 2010		year 2020	
	Total abstraction mln m^3	Domestic demand	Total abstraction, mln m^3	Domestic demand
Ukraine	25030,40	4505,40	32098,50	7061,50
Danube basin	2276,40	409,60	2670,12	587,40
Danube	1976,00	355,40	2298,10	505,50
Prut	91,40	17,29	99,10	24,78
Siret	5,99	1,20	7,23	1,50
Tisa	113,80	20,34	160,10	35,20
Latoritsa	62,30	11,16	77,20	19,30
Uzh	25,43	3,50	29,05	4,64

Table 5.12. Projection of abstraction of raw water for industrial purposes (mln m^3/year)

	year 2010		year 2020	
	Total abstraction	Industrial demand	Total abstraction	Industrial demand
Ukraine	25030,40	11013,20	32098,50	15728,02
Danube basin	2276,40	1001,40	2670,12	1308,30
Danube	1976,00	869,40	2298,10	1119,70
Prut	91,40	40,04	99,10	43,50
Siret	5,99	1,19	7,23	3,50
Tisa	113,80	49,72	160,10	78,40
Latoritsa	62,30	27,20	77,20	37,70
Uzh	25,43	13,01	29,05	14,23

Table 5.13. Projection of abstraction of raw water for agricultural purposes (mln m^3/year)

	year 2010		year 2020	
	Total abstraction	Agricultural demand	Total abstraction	Agricultural demand
Ukraine	25030,40	9511,40	32098,50	9308,40
Danube basin	2276,40	864,80	2670,12	772,20
Danube	1976,00	750,80	2298,10	664,00
Prut	91,40	34,58	99,10	31,70
Siret	5,99	3,70	7,23	2,09
Tisa	113,80	42,90	160,10	46,40
Latoritsa	62,30	23,56	77,20	22,30
Uzh	25,43	9,00	29,05	8,41

5.2.2. Projection of Waste water Discharge

Table 5.14. Wastewater discharge (mln m^3/year)

	2010				2020			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	201345,0	700,700	3400,00	2310,00	26123			
Danube basin	682,1	54,420	1565,20	140,96				
Danube	409,7	43,090	117,80	45,82				
Tisa	87,8	7,270	12,72	37,59				
Prut	51,2	21,100	23,95	7,99				
Siret	2,19	1,100	0,57	0,06				
Latoritsa	46,9	0,840	11,44	30,71				
Uzh	21,8	0,012	10,94	18,78				

5.2.2.1. Municipal Discharge

Table 5.15. Municipal wastewater discharge (mln m^3/year)

	2010				2020			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	4000,60	92,60	2182,00	1726,00	3573,00	61,50	2160,00	1352,00
Danube basin	156,03	3,62	85,08	67,33	90,37	1,55	54,64	34,20
Danube	65,76	1,53	35,86	28,37	37,72	0,65	22,80	14,27
Tisa	36,34	0,84	19,82	15,68	20,79	0,36	12,58	7,87
Prut	14,46	0,34	7,88	6,24	1,04	0,18	6,29	3,94
Siret	0,92	0,02	0,50	0,40	0,74	0,01	0,46	0,28
Latoritsa	26,44	0,61	14,42	11,41	14,82	0,25	8,96	5,61
Uzh	12,11	0,28	6,60	5,23	5,90	0,10	3,57	2,23

5.2.2.2. Industrial discharge

Table 5.16. Industrial discharge (mln m^3/year)

	2010				2020			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	10915,00	8200,00	1944,00	771,00	6260,00	3936,00	1917,00	406,40
Danube basin	165,68	124,40	29,50	11,77	115,13	72,39	35,26	7,47
Danube	91,36	68,60	16,26	6,49	47,74	30,02	14,62	3,10
Tisa	28,32	21,27	5,04	2,01	25,80	16,22	7,90	1,67
Prut	21,00	15,77	3,74	1,49	11,96	7,52	3,66	0,78
Siret	1,27	0,95	0,23	0,09	0,42	0,26	0,13	0,03
Latoritsa	18,02	13,53	3,21	1,28	21,45	13,49	6,57	1,39
Uzh	5,71	4,58	1,02	0,41	7,76	4,88	2,38	0,50

5.2.2.3. Agricultural Discharge

Table 5.17. Agricultural wastewater discharge (mln m^3/year)

	2010				2020			
	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated	Total	Normatively clean without treatment	Polluted (without treatment + insufficient treated)	Normatively treated
Ukraine	3273,00	3129,00	138,60	5,330	1761,00	1646,00	111,70	3,060
Danube basin	124,12	118,70	5,22	0,240	89,40	83,70	5,68	0,150
Danube	60,34	57,69	2,53	0,120	42,10	39,36	2,67	0,070
Tisa	30,48	29,14	1,28	0,060	23,65	22,11	1,50	0,040
Prut	15,40	14,72	0,65	0,030	11,06	10,34	0,70	0,020
Siret	2,10	2,01	0,09	0,004	1,85	1,73	0,12	0,003
Latoritsa	12,56	12,01	0,53	0,020	7,88	7,37	0,50	0,010
Uzh	3,24	3,09	0,14	0,010	2,95	2,76	0,19	0,005

6. Analysis of the Relevant Legal and Institutional Framework and its Adequacy for Sound Environmental Management of Water Resources and Eco-systems

6.1. Documentation and Short Analysis of the Relevant Legal Framework

The principal environmental regulation of Ukraine is the Ukrainian Law "On Protection of the Environment" of June 25,1996. This law establishes the basic principles for protection of the environment. It regulates relationship in the field of protection and recovery of natural resources, ensures the environmental security, prevents deleterious effects on the environment by industrial and other activity. Another important regulation is the Water Code of Ukraine. Below are some measures aimed at compliance with the environmental regulations by utilities of no matter which form of property:

- the conduct of environment examination (expertise) pursuant to article 26 of the Law "On Protection of the Environment". The procedures to conduct such an examination are established by the instruction (explanatory note of prescriptive character) that was approved by internal ordinance #15 of February 17, 1994 by the Ministry for Environmental Protection of Ukraine;
- fees for specials use of natural resources (Article 43), fees for causing pollution of the environment, including fees for effluence (Article 44), fees for the worsening of the quality of natural resources (Article 45), amount of which has not been fixed yet;
- state and public monitoring over compliance with environmental legislation (Article 9);
- prevention of environmental infractions through setting constrains or suspending of environmentally hazardous activities or even cession of such activities in case of reiterative violations of environmental security norms and requirements;
- various kinds of legal liability (criminal, administrative, disciplinary).

The regulatory and legal framework of environmental policy in the branch are based on the Laws of Ukraine "On Sanitary and Epidemiological Security of the Population" (1994) and on the Water Code of Ukraine, which was passed by the Ukrainian parliament on June 6, 1995.

The principal regulations in this area are the following Enactment by the Cabinet of Ukraine: "On Enforcing the Order to Define Charges and Collect Payments for Pollution of the Environment" - # 18 of January 13, 1992, "Provisions Describing the Republican Non-budgetary Fund for Protection of the Environment", # 75 of February 8, 1994 and "On Enforcing the Order to Collect Payments for Special Use of Fresh Water Resources and Enforcing Provisional Payment Tariffs for their Special Consumption".

The main regulations to follow for urban water supply and sewerage systems are so called Constructional Norms and Rules 2.0402-84 "Water Supply. External Networks and Constructions" and SNIP 2.04.03-85 "Sewerage. External Networks and Constructions".

For operating water supply and sewerage systems "The Operating Rules for Water Supply and Sewerage Systems in Populated Areas in Ukraine", which were approved by the State Committee of Ukraine for housing and public amenities management in 1995, are to follow. For integrating industrial sewage water into municipal sewerage systems "The Rules for Receipt of Industrial Sewage Water into Municipal and Departmental Sewerage of Ukrainian Towns and Villages" which were approved by the same Agency as above in 1992, are to be complied with.

The utilization of municipal water supply systems and sewerage are regulated by “The Rules to Run the Systems for Municipal Water Supply and Water Drainage in Towns and Villages of Ukraine”, which were approved by the same Agency in 1994.

The principal documents regulating the quality of drinking water and selection of water supply sources are standards of the former Soviet Union, so called GOST:

- GOST 2874-82 "Drinking Water. Hygienic Requirements and Quality Control";
- GOST 2761-84 "Sources of Central Water Supply for Drinking and Commercial Purposes. Hygienic, Technical Requirements and Selection Rules";
- "Radiation Safety Rules. NRB-76/87" approved by the Ministry for Health Protection of the USSR in 1987.

All analytical techniques for determining pollution levels in source water and drinking water regulated by the above-mentioned Standards, have the corresponding State Standards of the Former Soviet Union.

Release of circulating water, including treatment of urban sewage water, are regulated by "The Rules for Protecting Surface Water against Pollution" SanPiN # 4630-88 and "The Generalized List of Maximum Permissible Concentration Levels and of Presumable Safe Levels for Impact of Hazardous Materials for the Water of Bodies of Water Used for Fishery Purposes" (1990).

The settlement for the releases of harmful substances into bodies of water is regulated by "The Procedures for Determining Settlement and Collecting Payments for Pollution of the Environment" and by a number of internal documents by the Ministry for Environmental Protection and Nuclear Safety of Ukraine, among them the most important are: "Basic Payment Tariffs for Pollution of the Environment of Ukraine", "The Order to Calculate Charges and Collect Payments for Pollution of the Environment of Ukraine" (1993); one more regulation - by the State Committee of Ukraine for housing and public amenities - is worth mentioning, namely "Guidelines to Payment for Pollution of the Environment by Municipal and Departmental Water Supply Systems and Sewerage in Populated Areas of Ukraine" (1992).

The amount of damages to be reimbursed, which were caused to the environment, are calculated in accordance with "Guidelines to Calculate Amounts to Be Reimbursed for Damages, Which Have Been Caused through Violating of the Environmental Legislation", which were enforced by the Ministry for Environmental Protection and Nuclear Safety of Ukraine in 1995.

The system for environmental standards currently in force in Ukraine is based on sanitary or sanitary-hygienic norms that are refereed to maximum permissible concentrations, i.e. the concentrations of eventually harmful chemical combinations in air, water and ground which do not cause pathogenic mutation or diseases following a lasting impact on human body on a day-by-day basis. Maximum permissible concentrations are also referred to in the models for pollutant dissolution in an aqueous environment that are used in order to set limits for effluents released by industrial facilities.

Pursuant to “Rules for Surface Water Protection” (standard provisions) that were approved by the Soviet Union Committee for the protection or/of/ nature on February 12, 1991 and currently in force in Ukraine, there are 3 category of water quality; for fishery purposes, for domestic purposes, and for household and drinking purposes.

The “Rules” set forth the general requirements to the quality and composition of water in open bodies of water. The Sanitary Rules and Norms (SanPyN # 463088) “Protection of Surface Water Against Pollution” establish the hygienic requirement to the composition and properties of water in bodies of water in the areas of water is used for domestic, household and drinking purposes and introduce the limitations for maximum permissible content of harmful substances in such water.

The system for water quality standardization inherited from the former Soviet Union encompasses over 4000 performances. Each chemical, physical or biological performance, which defines water quality, is attributed to norms of maximum permissible concentration for man-induced chemical combinations that can differ considerably depending on water body types and water use purposes (household & drinking, domestic, fishery).

There are approximately 1000 sanitary & hygienic and 450 fishery norms of maximum permissible concentrations (hereinafter referred to as MPC). MPC norms to 420 harmful combinations have been fixed for bodies of water serving household & drinking purposes; 68 similar performances have been developed to object of water that serve economic purposes. The monitoring of water resources is regulated by "The Provisions Describing the State Monitoring of the Environment of Ukraine" that were put in force by the enactment of the Cabinet of Ukraine #785 of August 23, 1993. In accordance with these provisions the monitoring of the Danube basin water resources is ensured by several State agencies. The State Committee for Hydrometeorology operates the largest surface water quality monitoring network. That system has been designed mainly to study the country's water resources. It provides the most efficient services to Carpathian and Crimea Mountains but not to the polluted industrial regions of Ukraine.

Sanitary-epidemiological posts reporting to the Ministry for Health Protection of Ukraine ensure constant monitoring of the drinking water quality and domestic water quality on specific sites located along the Danube River and its water reservoirs. A particular attention is paid by the Ministry's monitoring system to assess the impact of various water pollutants on the general public's health. The Ukrainian State Committee for Water Management has in operation above 200 surface water monitoring units and receives various data on sewage water effluents transmitted by approximately 15.000 utilities through forwarding of filled-out forms (water management). Once these data are processed and finalized the State Committee for Water Management submits the corresponding information to the Ministry for Statistics of Ukraine in the form of quantified pollution performance for towns, regions etc.

According to the Water Code of Ukraine the agricultural water consumers are agrarian utilities, organizations, establishments and farmers, which withdraw water from bodies of water, use them or release circulating water, crude and reclaimed sewage water.

Agricultural water use in Ukraine, in particular water intake for irrigation and supply purposes, for cattle-breeding complexes and farms is presently free of charge. There are also no fees for the pollution of bodies of water, i.e. releasing of crude effluents and pollutants; collective agricultural utilities, sovkhozes, and other agrarian producers do not reimburse the cost of water intake from water sources and its conveyance to consumers. The Water Code of Ukraine foresees a stage-by-stage introduction of charges for purposive water use, including the agricultural one.

The tools for an economic mechanism aimed at ensuring conservation and recovery of water resources, that regard specifically agrarian customers, are as follows:

1. issuance of permissions to operate water sources and to consume water resources for specified purposes;
2. establishment of tariffs and amounts of charges for water intake and releases of effluents and pollutants;
3. granting of tax, credit and other preferential conditions (privileges) to water consumers in case of their implementing water-saving technologies, crop watering techniques that require less water, as well as non-waste generating and less-waste generating technological processes, which leads to decreases of the negative impact on bodies of water, river basins etc.

Agrarian water consumers must make arrangements aimed at an economical use of water resources and an operation of bodies of water in compliance with specified purposes and requirements. They also have to implement up-to-date efficient techniques to prevent unreasonable water losses, pollution, littering and exhaustion of bodies of water. It is also incumbent on them to put in place accountability for water intake and consumption, for the quality and volumes of sewage water, drainage water and pollutants to be released in bodies of water. The agrarian water consumers are to cover expenses associated with the use of water resources with the release of effluents and to pay other charges in compliance with the legislation (regulations) in force.

Complying with the provisions of the Water Code of Ukraine, decision making process, exercising the State Control over strict compliance with the relevant regulations by all agricultural producers, accelerating and enforcing the market-oriented economic reforms will foster drastic improvements to the environmental state of the domestic water resources and an environmental rehabilitation of the water basins, will promote the upgrading of satisfaction of the general public needs in high-quality water resources.

6.2. Analysis of Relevant Institutional Framework

Water resources management in Ukraine is provided by the Law of Ukraine for Environmental Protection (1992), the Water Code of Ukraine (1995) and other legislative and normative acts. While Water Code was adopted only on June, 1995 its legal and normative maintenance is not completed. Last changes in Ukrainian economical and political life result in necessity to make some alterations in Law of Ukraine for Environmental Protection, which is carried out by the Ministry for Environmental Protection and Nuclear Safety of Ukraine with assistance of other departments.

According to the Water Code of Ukraine the state management of water resources use, protection, and restoration is carried out according to the river basin principle on the basis of national, international, and regional programmes for water resources use, protection, and restoration.

The state management of water resources use, protection, and restoration is carried out by the Cabinet of Ministers of Ukraine, Government of the Autonomous Republic of Crimea, local radas of people's deputies and their executive committees, bodies of the state executive power, specially authorized bodies, and other state bodies according to the legislation of Ukraine.

Specially authorized bodies of the state executive power in the area of water resources use, protection, and restoration are as follows: the Ministry of Environmental Protection and Nuclear Safety of Ukraine; the State Committee for Water Resources, the State Committee on Geology and Utilization of Mineral Resources of Ukraine, their local bodies and other state bodies according to the legislation:

- **Cabinet of Ministers**
- **Ministry for Environmental Protection and Nuclear Safety of Ukraine**
- **State Water Committee**
- **State Geological Committee**
- **State Hydrometeorological Committee.**

Powers of the **Cabinet of Ministers of Ukraine** in the area of water resources use, protection, and restoration include:

1. implementation of the state policy in the area of water resources use, protection, and restoration;
2. management of water bodies of national significance;

3. conducting state control in the area of water resources use, protection, and restoration;
4. setting up priorities of water usage;
5. providing development of national, international and regional programs for water resources use, protection, and restoration; approving regional programmes;
6. determination of procedure for state executive bodies' action in the area of water resources use, protection, and restoration; coordination of their activities;
7. establishing procedure for issuing permits for special water use, constructing, dredging and blasting, mining sand and grit, laying cables, pipelines and other supply lines within lands of the Water Fund, as well as for development and approval of standards for discharge of polluting substances into water bodies;
8. establishing norms of payments for special water use and procedure for collecting these payments;
9. establishing norms of payments for use of waters for hydro-power generation and water transport needs, and procedure for collecting these payments;
10. making decisions regarding discharge of wastewater from storage tanks into water bodies in case of emergency situations, when it leads to exceeding of admissible concentrations in these water bodies;
11. organization and coordination of work on prevention and mitigation of consequences of accidents, emergency, adverse effect of waters or worsening quality of water resources;
12. making decisions on limiting, temporary prohibiting (terminating) or suspending activity of enterprises, institutions, and organizations in case of violation of water legislation, within its jurisdiction;
13. approving of designs for sanitary protection zones of communal-drinking water intakes that provide water supply for territory of more than one oblast;
14. management of external relations of Ukraine concerning water resources use, protection, and restoration;
15. dealing with other issues of water resources use, protection, and restoration.

Ministry for Environmental Protection and Nuclear Safety provides:

- an over departmental guidance of the water resources management;
- an elaboration of economical mechanisms for decreasing of the water objects pollution and rational use of water;
- an organization of the State ecological monitoring;
- a provision of the State ecological control system.

According to the Water Code of Ukraine powers of **the Ministry of Environmental Protection and Nuclear Safety** in the area of management and control of water resources use, protection, and restoration include:

1. carrying out complex management of water resources protection; conducting unified scientific-technical policy in the area of water resources use, protection, and restoration; coordination of activity of ministries, departments, enterprises, institutions, and organizations in this field;
2. exercising government control of water resources use, protection, and restoration;
3. development and participation in implementation of national, international, and regional programmes on water resources use, protection, and restoration;
4. organizing and conducting state monitoring of water resources;

5. development and approval of standards and rules; participation in development of standards concerning management of water resources use, protection, and restoration, within its jurisdiction;
6. conducting the state environmental impact assessment;
7. issuing permits for special water use, when the water is used from water bodies of national significance;
8. making decisions on limiting, temporary prohibiting (terminating), or suspending activity of enterprises, institutions and organizations, according to the established procedure, in case of violation of water legislation, within its jurisdiction;
9. development and implementation of organizational-economic measures on providing protection and use of waters and water resources restoration, according to the established procedure;
10. carrying out international cooperation regarding issues of water resources use, protection, and restoration;
11. dealing with other issues concerning water resources use, protection, and restoration.

Ecological control is carried out by the State Ecological Inspection of the Ministry for Environmental Protection and Nuclear Safety of Ukraine. Methodological maintenance of the water quality and wastewater quality control is provided by the Main Ecological Inspection of the Ministry for Environmental Protection and Nuclear Safety. Exceeding of permissions' limits results in fines or another punishments.

However volume of charges and fines is very low. This is the main reason why punishments as well as economical mechanisms of water resources management are ineffective.

The Ministry for Environmental Protection and Nuclear Safety of Ukraine is not able to ensure regular monitoring of the quality of water in the Danube basin and uses mainly the information provided by the State Committee for Hydrometeorology and by Ministry of Health Protection of Ukraine. Local representative of the Ministry for Environmental Protection and Nuclear Safety of Ukraine performs only random effluent sampling to check out the compliance with environmental regulations. Such a verification envisages sampling 500 meters downstream the point where effluents are released. This enables to determine "possible dissolution" of effluents, which is necessary to calculate contain limitations. The inspection departments of the Ministry for Environmental Protection and Nuclear Safety of Ukraine perform analyses of water samples downstream releasing points to identify eventual infractions and to apply civil penalties.

1. The balanced macroeconomics policy along with privatization of the majority of industrial enterprises will gradually change economic incentives and the structure of economy itself, which will provide for the healthy environment in Ukraine. Changes to pricing policies and more strict liability for each particular utility will have to encourage a drastic reduction of industrial waste volumes and enhancements of the effluence of water, energy consumption and the use of other resources. The awareness of environmental values will help surmounting past attitudes and refusing a dominating orientation towards mining & milling and metallurgical complexes. Eventual structural changes within the national economy can bring to life certain mutations in the industrial sector, namely:

   A transition from centralized planning to market-based relations will inevitably bring on considerable changes to individual and social consumption structures. Less income will be spent for durable commodities, more income will be spent for light and food industry goods, transport and other services. Thus, industrial upgrowth rates will considerably fall behind general upgrowth rates.

A part of national revenue, which used to be spent for investments, has abruptly shrunk over the last 3-5 years and will follow this trend. Even when the economic stabilization begins, this investing part (in the heavy industry and key economic branches), will be of less amount as opposed to the past years. The reason for that is a decreasing demand for heavy industry production as well as the changes in the national revenue structure. All these factors will inevitably cause the shrinking of manufacturing of the majority of outdated plants, where the cost of electricity, raw materials consumption and transportation of goods is too high. Strict budgetary restrictions along with the cessation of subsidies to extract natural resources and to consume water will gradually lead to "environmental friendly" technologies and utilities.

2. The present system of environmental standards in the area of protection of water resources has a number of substantial drawbacks. Firstly, the quantity of norms themselves and, in some cases, their unreasonable strictness make them inapplicable by the monitoring system of the State Committee for Hydrometeorology that is able to exert efficient control over only 50 hazardous substances. Secondary, particular norms are poorly interrelated and often contradict each other, like certain sanitary-hygienic and fishery norms since they have been determined in various bases. Thirdly, the compliance by utilities with effluent regulations that have been developed keeping in mind the corresponding standards, does not by itself guarantee the preservation of river basin water resources and of the most important water systems.

   That is why there is a vital need in a fast development and implementation of "technological standards for effluents" (similar to RACT, BATNEEC or BACT principles) to particular categories of industrial installations proceeding from the capacities of technologies that are available at these installations.

3. The system for pollution charges is the simplest tool that, at least presumably, will force polluters to reduce effluent volumes down to maximum permissible concentration. At the moment of introduction additional expenditures paid by utilities-payments in damages for pollution, fines etc. - seemed to promote additional investments into "environmentally clean technologies" with a view to curtail the expenditures above. However, for some (mainly social & economic) reasons this system has not been operational at rated power - in this respect there are presently doubts whether it will be applicable in Ukraine at all. Firstly, the above mentioned expenditures are much lower than the upgrading cost and therefor they do not encourage utilities to reduce their effluents. Secondary, the majority of industrial enterprises still belongs to the State and often is provided with explicit or implicit subsidies. Thirdly, civil penalties can be curtailed and even canceled for sake of "the highest national interests".

It is possible that this system will become in the future a significant part to the more flexible regulatory system that is based on market relationships, which is the case in the majority of industrialized countries.

State Committee for Water Management carries out :

- a distribution of water resources between water users;
- an assessment of water resources use;
- a radiological and hydrological/hydrochemical monitoring of surface water objects;
- a conducting of the Annual Water Register.

According to the Water Code of Ukraine powers of the State Committee on Water Resources in the area of management and control of water resources use, protection, and restoration include:

1. state management of the water infrastructure; carrying out the unified technical policy; introduction of achievements of science, technique, new technologies, and advance experience into this field;
2. development and establishment of operational regimes for reservoirs of complex use, water-supplying systems, and channels; approval of rules for their operation;
3. development and participation in implementation of national, international, and regional programs for water resources use, protection, and restoration;
4. provision of needs of population and economic industries in water resources, and exercising their inter-basin redistribution;
5. conducting radiological and hydro-chemical monitoring of water bodies of complex use, water-supplying systems of interbranch and agricultural water supply;
6. designing, constructing and maintaining water-supplying systems and water bodies of complex use;
7. conducting measures concerning environmental restoration and control of surface waters;
8. carrying out the state accounting of water use and the State Water Cadaster;
9. giving approval on permits for special water use;
10. conducting international cooperation in the area of trans-boundary water resources use, protection, and restoration;
11. undertaking measures connected with prevention of adverse effect of waters and elimination of its consequences, including anti-flood protection of settlements and lands (flood control);
12. conducting control on compliance of reservoirs' and water-supplying systems' operation with established operational regime;
13. dealing with other issues concerning management and control of water resources use, protection, and restoration.

State Geological Committee carries out:

- an assessment of underground water use;
- a monitoring of underground waters;
- a conducting of the Annual Underground Water Register.

According to the Water Code of Ukraine powers of the **State Committee of Geology and Utilization of Mineral Resources of Ukraine** in the area of management and control of water resources use, protection, and restoration include:

1. issuing special permits (licenses) for mineral resources usage when developing deposits of ground waters, with the approval of the state executive bodies on environmental protection, health protection, and supervision of labor protection;
2. carrying out the state accounting of ground waters, and water cadaster;
3. conducting the state monitoring of ground waters;
4. giving approval on criteria of special water use, when ground waters are used;
5. giving approval on permits, which give a right to execute design and construction work related to ground water extraction;
6. revealing unused wells and taking measures on their elimination, or renovation and further utilization;

7. carrying out the state geological control on investigation and other activities regarding geological study of ground waters;
8. dealing with other issues concerning management and control for water resources use, protection, and restoration.

For provision the implementation of above mentioned tasks over all territory of Ukraine, State geological enterprises, which are subordinated to State Committee on Geology and Use of Underground Resources, are established.

State Hydrometeorological Committee provides:

- hydrological and hydrochemical monitoring of surface water objects;
- conducting together with the State Water Committee of the Annual Water Register.

The **Ukrainian Ministry for Agricultural Production** operates about 100 monitoring units that measure the content of pesticide and nitric combinations in surface water.

The main parts of the domestic water supply system of settlements are water and sewerage enterprises - Water channels. In accordance with the Law of Ukraine "On Local Councils and Local and Regional Self-governing" productive activities of water channels are totally subordinate to local and regional self-governing.

According to the mentioned laws and the Law "About Sanitary and Epidemiological Well-being of Population" local self-governing authorities have to carry on responsibilities for supply of population with drinking water with the standard quality and in enough volume, but practically they do not provide fulfillment of this Law.

The drinking water supply systems (approximately 70 %) are oriented on the surface water, that by the quality has to belong to grade 1, but in fact it belongs mostly to grades 4-6 and does not meet the modern requirements. Less and less money are directed by the local authorities for construction and reconstruction of water supply objects that are oriented on the investments from state budget, which possibility is allocated.

State Committee of Ukraine on Housing and Public Utilities Management (Derdzdzytlocomungosp) according to its statute is in charge of realization of the State policy in combined development of the dwelling-domestic economic. The issues of water supply are under jurisdiction of its structural dwelling-domestic economic divisions. But after the adoption of the Law on Self-governing the connections between local authorities and Committee were violated. Decentralizing tendencies and requirements to save money lead to the liquidation in some regions of regional dwelling-domestic economic departments or regional water channels.

Management structure of agricultural water supply includes the central authority (Dergvodgosp, Minsilgospprod) regional administration, collective municipal and village water supply systems.

All above mentioned authorities and their enterprises have financial support mainly from budget and partly from the revenue from these activities.

7. Description and Analysis of Actual Policies and Strategies

7.1. Actual Policies and Strategies

Pursuant to the Ukrainian environmental legislation (regulations) branch economic policy tries to implement with no deviations the “polluter pays” principle, which foresees payments for purposive use of natural resources, for pollution caused to the environment, including fees for effluence, as well as for the worsening of natural resources’ quality. This policy is based on a system of water quality environmental standards, which define sanitary norms similar to maximum permissible concentration, according to which utilities-polluters are given limitations for effluents. It is generally accepted, at least theoretically, that such a policy has to encourage industrial installations to save water resources and reduce volumes of effluents pursuant to fixed maximum permissible levels. This policy does not envisage establishing of “technological standards for effluents” to certain industrial facilities taking into account the capacities of available techniques since the environmental regulations of Ukraine have no provisions similar to RACT, BATNEEC or BACT principles. There are only particular branch norms for operating of clean-up facilities to be approved by the highest officials dealing with the corresponding branch. However, these norms are not prescriptive.

All regulatory requirements regarding the operation of clean-up facilities are laid down by the Ministry for Environmental Protection and Nuclear Safety of Ukraine (MEPNS of Ukraine) in design documents and authorizations (licenses) for special use of water.

There are some differences between Ukrainian and EC practice of regulation of water objects’ pollution. EC practice uses emission standards - limit allowable concentration of contaminants in wastewater. Ukrainian practice uses limit allowable discharges of contaminants in order to avoid limit allowable concentrations’ exceeding in calculated station (point) of water object. However, since 1996, according to the Water Code of Ukraine, all special water users have to present for adoption by the Ministry for Environmental Protection and Nuclear Safety the technological normative for water use and for contamination production. Technological normative for contaminant production will be an analogue of EC emission standards and will be estimated according to the Best Available technologies. For a normative and legal maintenance of new direction of environmental policy, Ukraine needs some help of EC and another countries, which have an experience in that branch.

The world's conventional principle "polluter pays", water resources polluting included, has been enforced in Ukraine since Verhhovna Rada of Ukraine adopted the Law "On Natural Environment Protection" in 1991. Penalties for water resources polluting are a major economic lever of implementing this principle.

Penalties for discharging pollutants into surface, territorial and inland sea water as well as underground waterlines shall be enforced for economic stimulating water protection efforts, regulating their financial resources, creating and repaying losses in national economy effected by polluting water.

Penalties for discharging pollutants into surface, territorial and inland sea water as well as underground waterlines shall compensate for economic losses from the polluted water negative effect on people's health, municipal services and facilities, agricultural lands, forest, fishing and recreational resources.

Developing the aforesaid Law the Cabinet of Ministers of Ukraine approved "The Procedure of Determining and Charging Penalties for Polluting Natural Environment" and "Statute of the Republican Non-budget Natural Environment Protection (NEP) Fund" in its No18 Decree as of January 13,1992. It is since then that penalties for water resources polluting have been charged in

Ukraine. In compliance with this Decree the Ministry of Natural Environment Protection and Nuclear Safety of Ukraine in coordination with the Ministry of Economy of Ukraine, and Ministry of Finance of Ukraine tailored and sent "Methods of Determining Provisional Penalty Standards and Charging Penalties for Polluting Natural Resources" to the government of the Crimean Autonomous Republic, regional executive committees, Kiev and Sevastopol city executive committees, local natural protection agencies in 1992. The Ministry of Natural Environment Protection and Nuclear Safety supplemented these methods with and approved provisional Guidelines "On the Procedure of Developing, Introducing, Revising and Enforcing Pollutants' Maximum Emissions and Charges and Disposing Water" as of March 23, 1992.

In order to explain the procedure of introducing penalties for polluting water and enforcing the No 18 Decree of the Cabinet of Ministers of Ukraine as of January 13, 1992, Methods of determining provisional penalty standards and charging penalties, the Ministry of Natural Environment Protection and Nuclear Safety of Ukraine tailored and sent the "Instructive Letter" No 8-2/2-3-114 as of March 31, 1992 to the local executive authorities.

Due to the avalanche inflation in 1992 penalty standards for polluting water resources were practically devaluated and lost their stimulating role in making production environmentally friendlier. That is why the Ministry of Natural Environment Protection and Nuclear Safety of Ukraine started developing basic penalty quotas for polluting natural environment due to inflation rate in order to impose the current system of determining penalty amounts and raising its efficiency. The index of rising fees for construction and assembly operations was assumed as a basis, since the funds raised due to natural environment pollution are mostly allocated into construction and assembly operations accompanying construction of water treatment and gas purification facilities. A coefficient of indication (92 times) was determined and provisional penalty quotas for pollution were respectively augmented by way of calculating, consulting with the Ministry of Construction and Architecture of Ukraine, coordinating with the Ministries of Economy and Finance of Ukraine, on the basis of official statistic data. The Ministry of Natural Environment Protection and Nuclear Safety of Ukraine replaced the Provisional quotas with Basic penalty quotas for polluting natural environment of Ukraine and Methods of determining penalty amounts and charging penalties for polluting natural environment of Ukraine, registered by the Ministry of Justice of Ukraine as of May 14, 1993, No.46.

In view of the durable inflation rise in Ukraine the Ministry of Natural Environment Protection and Nuclear Safety of Ukraine, in coordination with the Ministry of Economy and Finance of Ukraine revised penalty quotas for discharging pollutants into water resources and raised them by 50,2 times assuming as a basis weighted means of inflation index for major branches of national economy. These quotas were enacted as of February 1996.

Environmental reform

Along with the economic reform, an environmental reform is taking place in Ukraine. During last years, despite inertia of the existing system, something has been achieved. Specifically, tariffs for the use of nature resources have been established, economic liability for environmental pollution, including water, has been introduced.

Targeted resources allocation from the budget has been arranged to support environmental protection, as provided by on-the-purpose formed section of the State Budget of Ukraine "Environmental Protection". Draft documents on introduction of environmental audit and insurance have been prepared where ecological considerations are taken into account in the course of privatization of state-owned enterprises, as well as promotion of nature-preserving investments and introduction of new technologies with an integrated ecological effect is considered.

Measures have been developed and are gradually implemented to effectively use natural resources used in economic activities, to balance nature resources potential and economic development of the country.

To solve the highest priority problem of ecologically clean water supplies to the community and gene pool preservation, the Fund of the Dnipro Recovery has been founded. At the same time, it should be noted that growing of the economic potential of Ukraine is possible only when natural resources involved into economic turnover are used rationally. To do this, nontraditional approaches and world outlook should be shaped in the matters of economics of environment and rational use of natural resources. Alienation from nature has been shaped for years, therefore for the cardinal changes to improve the situation some time, considerable amounts of material and financial resources, thoroughly balanced approaches are necessary.

Achievement of this goal should be preceded by scientifically validated approach to environmental protection and social and economic development of Ukraine. The core of this approach is to elaborate far-reaching priorities taking into account of health of the current and future generations, increase in life expectancy, recovery of landscapes, flora and fauna, preservation of ecological, genetic, and material bases, natural heritage and ecological culture. Ecological imperatives, if one proceeds from universal principles of survival and humanism, should make the basis of reconstruction of the economy, determine rates and proportions of production.

All this will facilitate gradual transition towards new ecological policy, which should provide for:

- thorough economic analysis of functioning of economic structures in branch and territorial aspects;
- determination of the specific impact of environmental pollution on health, flora and fauna, landscapes, ambient air, water resources and soils; determination of ecological capacities of territories and development of corresponding ecological quotas and limits, taking into account medical aspects of pollution and development of regional ecological programs;
- material and technical, resource and financial support of the planned volumes of production, calculated based on ecological possibilities and ecological demands.

Ecological reform may be carried out only where appropriate mechanism is available, providing for: real economic independence, ecological regulation of operating production, new projects and potentially environmentally hazardous enterprises; effective means of ecological monitoring, planning, exports, standards development, financing, crediting and control, comprehensive ecological education system. Without such a mechanism, environmental protection activities of legislative, governmental and executive agencies will be inefficient and will be limited predominantly to controlling functions. Therefore the reform allows for principally new forms and methods of environmental management and rational use of natural resources.

Building up of Ukrainian economic potential is possible only when ecological situation is stable, along with maximally rational use of nature resources. Essentially, environmental protection becomes a prerequisite of economic progress of the nation, i.e. solving problems of economic growth through ecologization of productive forces will become an undeniable factor of the further radical legislative and executive agencies.

This provides for

- rethinking of research and technical environmental policies;
- reorientation of ecology-consuming industries and regions;
- accounting of the environmental unit in the course of the assessment of environmental effect of economic activities ;

- creation of a ramified ecological and social infrastructures, including formation of environmental protection logistics as an independent ecological sub-industry in machine-building and instrument-making, monitoring tools, computers and special equipment;
- ecological regulation on all management levels, including economics and legislation, rating, statistics, analysis, standard setting, and follow up of the environment, state expert programs, research innovations and inventions;
- ecological forecasting and productive forces allocation in order to regulate ecological-economical relations and ecological safety;
- ecological community services, etc.

The new ecological policy places special emphasis on financial regulation of ecological relations in the community. As far as the principle "contaminator pays" is not effective, a synthetic approach should be looked for providing for compromises dividing the burden of environmental costs and levying a fixed economic tax as a basis for state promotional ecofunds.

When drawing the ecological budget of Ukraine, apart from a fixed ecological tax, issuance of interest-free ecological bonds, soft long loans, ecological insurance, systems of fees and benefits, payments for land, mineral deposits use, etc. shall be applied.

In so doing one should proceed form ecological and economical losses due to environmental contamination, accounting to 3-5 GDP per cent.

Thus, the essence of principal trends in environmental problems solution is that environmental quality is considered a community order to the government for production of ecological and social goods. The task can be fulfilled provided ecological priorities are considered the most favorable ones.

Enjoying the world ecological rating expertise, in the near future there should be created a rigid system of environmental quality standards and rates. To do so, one has to develop a legible system of screening, storage and processing of environmental information, the functioning thereof should be aimed at:

- creation of an environmental database;
- treatment of ecological cadasters for industries and introduction of ecological passports;
- scientific and technological information exchange with the neighboring states, regional and branch information agencies, etc.

To provide managerial agencies with an unbiased and prompt ecological information, a singe computer-assisted system for follow-up and control should be introduced in Ukraine.

New conditions demand that radically new relations between government ecological bodies and nature users, which should rest on a legal basis, proprietary and ecological interests, shall be established.

Economical reorientation of ecological activities envisages development and introduction of new regional limits, financing and payments systems for the use of nature and contamination of the environment. In so doing, ecological limitations of the environmental effects should be developed for every region as phase-in limits with bringing them in the final analysis to the standard level.

The dominating form of relations between regional agencies and nature users should be nature exploitation licenser on a contractual basis.

From this standpoint, it is necessary to develop a package of laws in the near future, which would be supported by economical norms and standards based on the use of economical levers and incentives used in the world practice, such as tax benefits, subsidies, ecological funds, etc.

Review of branch industries investments for nature protection is of great importance. It demands reconstruction of material and technical basis of environmental protection and harmonious exploitation of nature resources on the one hand and extension of fundamental and applied ecological research on the other hand.

To focus scientific efforts on ecologically biased economic development it is worth creating a single structure of specialized scientific research institutions, united in Ukrainian Center of ecological safety, prognosis and development. Activities of the Center are to be carried out at the expense of state order on colonization of social and economic ecological development of regions.

Under these conditions the stabilization of ecological situation is possible within next 10-15 years, which should expediently be considered as background ones when applying criteria in force for environmental quality assessment in Ukraine.

7.2. Sector Policies

Elaboration of the state policy in field of ecological education and public awareness in Ukraine is a problem with insufficient attention. However, during last period some ecological or nature protection subdivisions in institutes and universities of Ukraine ware established. Since 1992, Annual National Ecological Report is worked out by the Ministry for Environmental Protection and Nuclear Safety with assistance of another departments.

An activity of Ukrainian no governmental organizations for environmental protection such as Green World, National Ecological Center, Ukrainian Ecological Academy etc. begins to acquire some international sounding and involves more different spheres of human life.

In the Water Code of Ukraine the main rules of water use for all kinds of economy are specified Particular Features of Special Water Use and Use of Water Bodies for Needs of Agriculture and Forestry.

Use of waters for needs of agriculture and forestry is carried out in a way of both general and special water use.

While using water for irrigation of agricultural lands, water users are bound to carry out measures for prevention of elevation of ground water level, swamping, salinity and pollution of these lands. Quality of water used for irrigation of agricultural lands should comply with established standards.

Irrigation of agricultural lands and discharge of drainage waters into water bodies are carried out on the basis of the permit for special water use given to the owner of irrigated lands according to the procedure established by this Code.

Measures to prevent land degradation and wind erosion, as well as worsening of the state of water bodies, should be undertaken when draining agricultural lands.

Provisions envisaged by this article also cover irrigated and drained lands of the forest fund.

Particular Features of Water Use and Use of Water Bodies for Industrial Needs

While using water bodies for industrial purposes, users are bound to comply with established conditions of special water use, ecological requirements, as well as to take measures for reduction of water consumption (especially drinking water) and cease of discharge of polluted reclaimed waters through improvement of technologies, schemes of water supply, and purification of waste waters.

Limits of drinking water consumption for industrial purposes from communal water pipelines are established by local radas of people's deputies with the agreement of state bodies on environmental protection.

Local radas of people's deputies have the right to reduce or prohibit consumption of drinking water for industrial needs from communal water pipe-lines and to limit its consumption from departmental economic-drinking water pipe-lines temporary in case of disaster, emergencies and other extreme situations, as well as in case of extra-consumption by water user, in order to provide immediate satisfaction of drinking and communal needs of population.

Particular Features of Use of Water Bodies for Fire-Fighting Needs

Extraction of water for fire-fighting needs is done from any water body without permit for special water use, by volume that is necessary for liquidation of fire.

It is prohibited to use water from water bodies that are specially designated for fire fighting needs, for other purposes.

Local radas of people's deputies and fire-fighting bodies exercise control on compliance with the procedure for using water bodies for fire fighting needs.

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Part B

Financing Mechanisms

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List of Abbreviations on Financial Mechanism

AR	Autonomic Republic (Crimea in the Ukraine)
CIDA	Canadian Agency of International Development
CMU	Cabinet of Ministers of Ukraine
EPA	Environmental Protection Agency
GEF	Global Environmental Fund
IDRC	International Development Research Center
MEP	Ministry for Environmental Protection and Nuclear Safety of Ukraine
MPD	Maximum permissible discharges or
OECD	Organization of Economic Cooperation and Development
TACIS	Technical Assistance for CIS (EU Programme)
TAD	Temporary agreed discharges
UAH	National currency (Hryvnya)
USD	the USA National currency

1. Summary

Provision of sustainable social-economic development of Ukraine should be accompanied with creation of safe environmental conditions for vital activity of society and every person. The present state of social-economic development in this country is characterized by sharp worsening of environmental situation at local, regional and national levels. The major part of environmental legislation norms of Ukraine is directed to prevent and avoid environmental pollution and to improve finance-economic mechanism of nature use.

The basic law in branch of environmental legislation of Ukraine is the Law of Ukraine **"On Environmental Protection"** (Vidomosti Verkhovna Rada of Ukraine. 1991. # 41. Article 546). The separate clause of this Law "Economic Mechanism of Environment Protection Provision" is devoted to finance-economical aspects of environment protection. The articles of the above clause disclose:

- economic measures for environment protection provision;
- financing of measures concerning environment protection;
- payment for special use of natural resources;
- payment for environment pollution;
- payment for worsening of natural resources quality;
- distribution of payments for natural resources usage, pollution of environment;
- funds of environment protection;
- stimulation in environment protection system;
- environmental insurance.

Economic mechanism of natural resources use, finance basis for achievement of object and tasks in the branch of natural environment protection presented in the basic Law, has been developed and corrected in **"The Main Directions of the State Policy of Ukraine in Branch of Environment Protection, Natural Resources Usage and Environmental Safety Provision"** that was approved by Resolution of Verkhovna Rada of Ukraine dated 5 March 1998 (#188/98-VR). The main idea of the state environmental policy in conditions of transfer to market economy is stimulation of protection and reproduction of natural-resources potential of the country by the way of creation of corresponding economic conditions (investment, taxation, credit ones) and integration of environmental and economic basis of nature usage in management system and economy regulation.

One of the main conditions is formation of stable sources of nature protection measures financing.

System of nature protection measures financing in condition of the country transfer to market economy is formed on the basis of the following sources:

- State budget of Ukraine and local budgets;
- Budget of Autonomous Republic of Crimea;
- Funds of natural environment protection of all levels;
- own funds of enterprises;
- foreign earnings and investments;
- other non-budget assets.

It is necessary to add that financing at the expense of the State Budget is foreseen to fulfill the environmental programmes of priority and urgent nature protection measures that have high national significance exclusively. Non-budget financing, own funds of enterprises, voluntary contributions of national and foreign donors are the basis for expenses settlement for nature protection measures fulfillment and regional environmental policy realization.

Questions connected with finance-economic mechanism improvement of nature usage are specified and further developed in 4 Codes, 8 Laws and over 30 Resolutions of the Cabinet of Ministers of Ukraine as well as in a number of other instructions and norm-methodical documents.

As for water aspects of the state environmental policy it should be stressed that the most important elements of the economic-legal normative mechanism of water usage and water protection in Ukraine are the following:

- mechanism of payment for water bodies (resources) pollution;
- payments for special use of water resources;
- mechanism of compensation for losses incurred due to violation of the water law;
- system of state (from the state and regional budgets) financing of water protection measures;
- non-budget sources of financing;
- system of target-oriented State and regional (including the base level) environmental funds.

2. Legislative Basis

2.1. Compilation of Relevant Laws and Regulations with Financial Relevance to Water Quality and Water Management Programs and Projects

(They are presented in order of their approval by Verkhovna Rada of Ukraine, the Government of Ukraine, Ministry of Environmental Safety of Ukraine)

2.1.1. The Law of Ukraine "On Taxation System" (dated 25 June 1991)

The state taxes and fees (obligatory payments) are determined in this Law for nature resources usage:

- payment (tax) for the land;
- fee for geologic survey works that has been fulfilled at the expense of the State Budget;
- fee for special usage of natural resources;
- fee for pollution of natural environment.

"On the Approval of Order of Determination and Fulfillment of Payments for Pollution of Natural Environment" and "Regulation on Republican Non-budget Fund Natural Environment Protection" (Resolution of the Cabinet of Ministers of Ukraine (further - CMU) dated 13 January 1992, #18).

Direct payment for pollution was implemented in dependence on quantity and composition of pollutants (payment for emissions, payment for water pollution, payment for wastes disposal). It was underlined that payment for pollution of environment does not set free enterprises and facilities from repay of loss to the State in consequence of nature protection legislation violation. This Resolution defines also the Statute of republican non-budget fund of natural environment protection.

In order to develop this Resolution the Ministry of Environment Protection of Ukraine with agreement of the Ministry of Economy of Ukraine and the Ministry of Finance of Ukraine in 1992 has elaborated **"Method of Determination of Temporary Norms of Payment and Fees for Pollution of Natural Environment"**, where payments for pollution were defined.

2.1.2. Regulation on the State Environmental Inspection of the Ministry of Natural Environment Protection of Ukraine (Resolution of the CMU dated 12 November 1993, # 925)

In this Regulation rights and responsibilities of the State Environmental Inspection Service are highlighted and among them the following:

- participates in formation and distribution of corresponding non-budget funds of natural environment protection;
- has a right to prosecute for compensation for losses and damages made as a result of natural environment protection legislation violation.

2.1.3. Order of Payment for Special Usage of Water Resources (Resolution of CMU dated 8 February 1994, # 75).

Amendments and changes were inset in this Order in 1995-1996.

It determines common rules of payments for special water resources usage.

2.1.4. Water Code of Ukraine (Resolution of Verkhovna Rada of Ukraine, dated 6 June 1995, # 214/94 - VR. Visnyk Verkhovnoi Rady 1995, # 24. Article 190)

Chapter 7 of the Water Code deals with the questions of economical regulation of rational water usage and protection as well as reproduction of water resources:

- payment for special water usage;
- payment for water use for hydroelectric stations and water transport;
- distribution of payments for special water usage and use of waters for hydroelectric stations and water transport.

2.1.5. Method of Amounts Calculation of Payments for Damage to the State as a Result of Legislation on Protection and Rational Usage of Water Resources Violation (Order of the Ministry of Environmental Safety of Ukraine, dated 18 May 1995, # 37, registered by the Ministry of Justice of Ukraine on the 1st of June 1995, #162/698)

It deals with approval of rates for calculation of payments for damage as a result of pollution from ships, vessels and other floating facilities in territorial and inner sea waters of Ukraine (Resolution of CMU, dated 3 July 1995, # 484).

2.1.6. Regulation Concerning Order of Calculation of Payments for Damage as a Result of Pollution from Ships, Vessels and Other Floating Facilities in Territorial and Inner Sea Waters of Ukraine (Order of the Ministry of Environmental Safety of Ukraine, dated 26 October 1995, # 116)

2.1.7. Procedure of Payments for Water Users Losses as a Result of the Right Ceasing or Conditions Changing of Special Water Usage (Resolution of CMU, dated 14 August 1996, # 966)

2.1.8. National Program of Environmental Sanitation of Dnipro Basin and Drinking Water Quality Improvement (Approved by the Resolution of Verkhovna Rada of Ukraine, dated 27 February 1997)

Economic and finance mechanism is highlighted for the first time in this Programme for realization of nature protection measures planned. Calculations of value of this realization, sources of financing are presented.

2.1.9. Procedure of Measures Financing for Protection and Rational Usage of Water Resources from the State and Local Budgets (Resolution of CMU, dated 9 July 1997, # 732)

Regulation on the state fund of natural environment protection (Resolution of CMU, dated 7 May 1998, # 634).

The Procedure of payments for pollution of natural environment was put in force by this Resolution and changes were inserted in the Regulation on republican non-budget fund of environment protection in accordance with **the Law of Ukraine "On Making Changes to the Law of Ukraine "On Natural Environment Protection",** dated 5 March 1998, #186/98 - VR).

2.2. Assessment of Main Deficiencies and Needs for Improvement

The main shortcomings in provision of programmes and projects on water quality and water management financing is insufficient volume of funds and sources of financing of these programmes and projects determined by the legislation.

First of all one of the main provisions of the Law of Ukraine "On Natural Environment Protection" is not executed. Payment for natural resources usage should be returned for reproduction of these resources. There is in the state budget expense item "Natural Environment Protection" but similar clauses are absent in the local budgets and in the majority of oblast of Ukraine the funds for reproduction of natural resources are not foreseeing. So, for example, in 1997 payments for natural resources usage in amount of 1247,1 million UAH came into consolidated budget. Only 39 million UAH were used for natural environment protection from the state budget, i.e. 3,1 per cent of the total earnings. In this way environmental payments go almost completely for cover of the state and local budgets' deficit.

Payments for water resources pollution are made to the corresponding environmental funds (of the State and regional) not in full volume. The main reasons for incomplete collection of these funds are the following: general setback in production, payment crisis, insolvent payers, inefficient current mechanism of control over pollution payments collection and lack of a single motivated supervisory body responsible for properly calculated, full and prompt payments.

Payments for environment pollution are made to the natural environmental protection funds not in full volume.

The following payments were calculated in 1996 in accordance with the data of the State Committee on Statistics of Ukraine:

- for pollution of environment to 9725 enterprises. Payments were carried out partially or completely in the frames of limits set by 71,6 per cent and for pollution over limits by 49,5 per cent of the payers;
- for emissions into atmosphere by moving sources to 3907 enterprises. Payments were carried out (completely or partially) by 55,4 per cent of the payers.

Accounting of payers for pollution of natural environment is carried out by the Ministry of Environmental Safety.

Calculation of payments is executed by the payers themselves, agreed by the organs of the Ministry of Environmental Safety and approved by the local State Administrations. Control for payments in time is carried out by the organs of Ministry of Environmental Safety.

Possibilities are limited to control the state of payments earning to the special accounts of the Local Councils by the organs of the Ministry of Environmental Safety.

In situation of absence of strict control form the side of tax bodies also, payers evade from the payments for environment pollution. Indebtedness of payments for pollution in 1996 was: for Donetsk oblast – 32,6 mill UAH, for Dnipropetrovsk oblast – 23,7, for Lugansk oblast – 11,9, for Lviv oblast – 68,5 thousand UAH (data for main debtors). Indebtedness for these oblasts is 2,1 times higher than volume of environmental payments practically paid in Ukraine.

Shortcomings take place in system of the state account and records concerning payments earnings.

In 1996 payers had to pay 353,2 mill UAH for natural environment pollution and nature protection legislation violation. In fact they have paid 64,5 mill UAH.

Only 26,5 mill UAH was received by the funds of the natural environment protection.

In 1997 approximately 40 mill UAH was received and 35 mill UAH was spend.

In addition to the above, the main reasons for incomplete collection of these funds include inefficient state system of water metering subject to improvement in 1998.

3. National Policy and Strategy for Funding of Water Sector Programmes and Projects

The general policy and strategy of financing programmes and projects concerning environmental rehabilitation of water basins and water management is based on general principles of basic guidelines of state policy of Ukraine in the sphere of environment protection.

In the State budget the main clause "Natural Environment Protection and Nuclear Safety" from 1994 was separated to finance nature protection expenses linked with reproduction and support of the natural resources in due conditions. Resolution of the Cabinet of Ministers, dated 9 July 1997 # 732 determined Order of this clause formation and financing of expenses as well as List of nature protection measures. In addition to this, Regulation on the state fund of natural environment protection came into force by Resolution of the Cabinet of Ministers of Ukraine, dated 7 May 1998, # 634. This Regulation inserts changes in Statute of republican non-budget fund of environment protection and in Order of amount determination and payment for pollution of natural environment as well as distribution of funds between the State Fund and local funds.

The main integral parts of mechanism of realization of the state environmental policy are the following:

- State institutional infrastructure of nature protection policy execution;
- Legislative-juridical mechanism of production activities regulation of legal and physical persons as for protection, usage of natural (water) resources and wastes;
- Economic mechanism of nature usage (water usage) and nature protection activities;
- Mechanism of realization of interstate, national, regional, branch and local nature protection programs.

At present mechanism is working out in the frames of international technical assistance via the line of TACIS as well as assistance from the Government of Canada to attract foreign investors for solving tasks determined by the National Programme of Environmental Sanitation of Dnipro Basin and Drinking Water Quality Improvement, regional programmes of environmental sanitation of Siversky Donets and Dniester River basins and other basins. Preparation of investment projects is carried out via the line of TACIS concerning realization of nature protection measures of the National and State environmental Programmes. The Government of Canada from 1994 began Programme of Ukrainian-Canadian cooperation "Development of Environment Management in Ukraine (river Dnipro basin)". One of the most important questions of this Programme realization is improvement of economic mechanism and conditions creation for attraction of foreign and national non-state capital for solving of nature protection tasks.

Principal structures of water protection measures financing are presented on Figures 3.1. and 3.2. with main components of natural environment.

Figure 3.1. Principal structure of budget funds formation owing to water usage

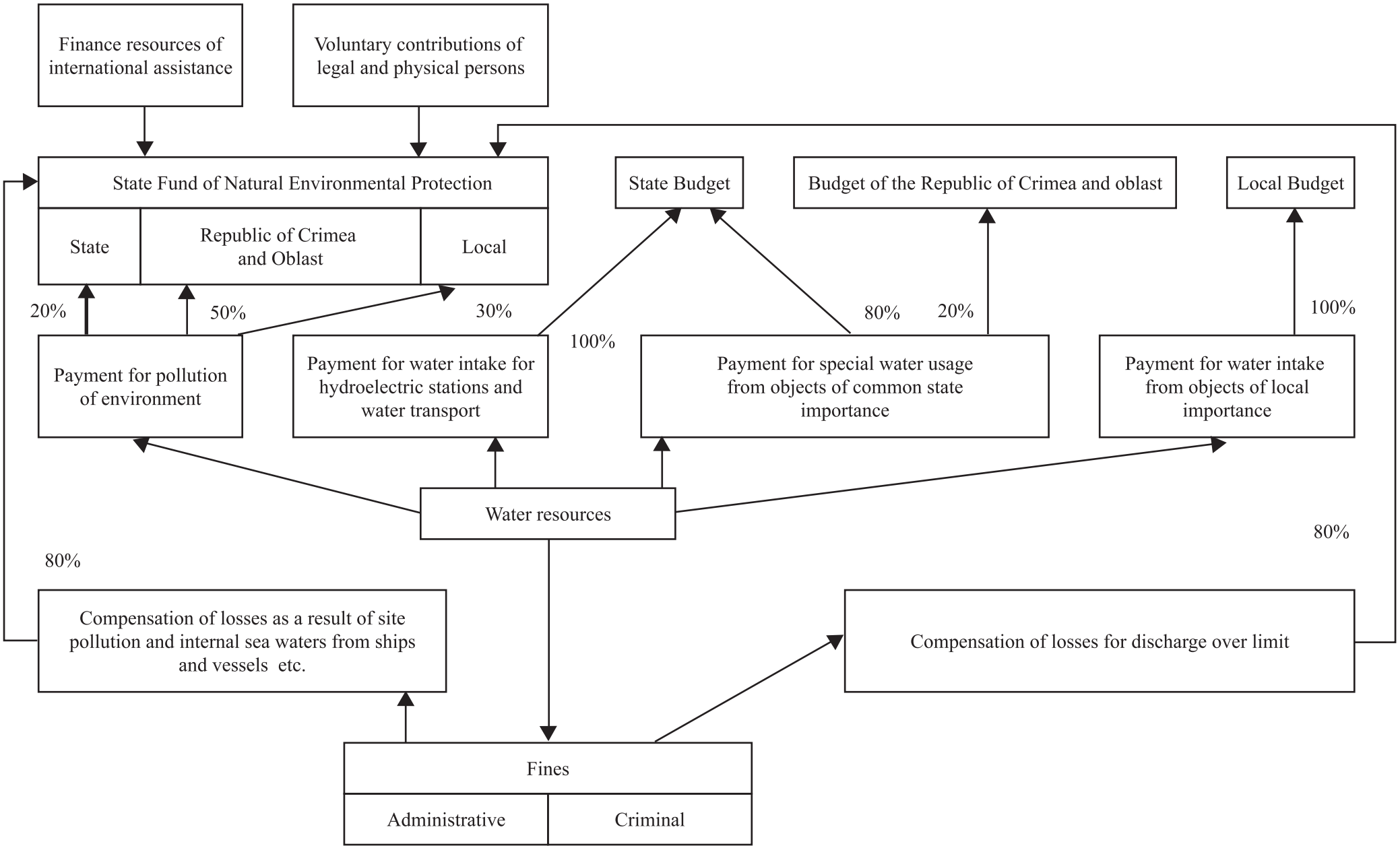
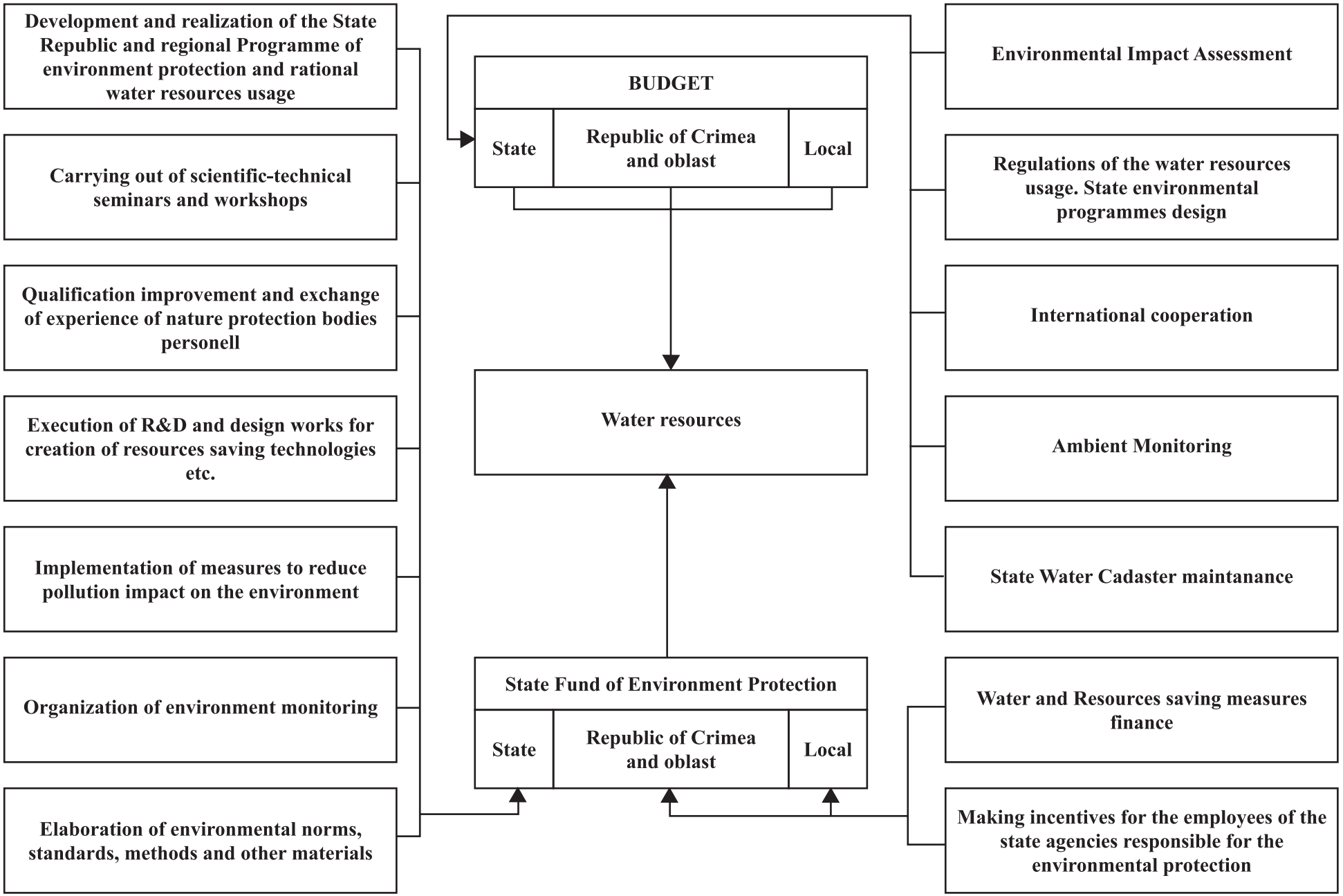


Figure 3.2. Principal structure of expenditures for water protection from the budget funds



4. National Sources, Instrument and Mechanisms for Funding of Water Quality and Water Management Programmes and Projects

4.1. Relevant State Funding Sources and Instruments in Use

1. Resolution of the Government # 634 dated 7 May 1998 approved Regulations on the State environmental fund. It is created as an earmarked fund in the state budget of Ukraine. The purpose of its creation is to ensure, on the basis of stable sources of revenues, financing of environmental programmes, from projects and measures of general state and regional importance.

   The property of the Fund is the revenues transferred from the sources and in the amounts specified by the current legislation. Taking into account the draft adjustments to the 1998 State budget of Ukraine, the Fund shall account for 8,3 million Hryvnya (estimated 4 million USD). By estimations, taking into account the actual revenues, the total amount of the fund from 1999 shall account for 12 million Hryvnya (about 6 million USD).

   The Fund is envisaged to finance the costs related to the following:

   - development and implementation of general state and regional environmental programmes and rational use of natural resources;
   - holding research conferences and seminars, organization of exhibitions, festivals and other environmental measures, propaganda of environmental knowledge, issuing printing environmental product, creation of libraries, video libraries, stills libraries, etc.;
   - professional development and exchange of professional experience for the personnel of environmental bodies;
   - scientific, research and design works (including licensing) related to creation of resource and nature conservation technologies, hardware for control over environment and sources of pollutants emissions and discharges;
   - development and introduction of economic nature use mechanism;
   - implementation of measures aimed at reduction in environmental pollution impact on the health of population;
   - involvement of experts into performance of the state environmental examination;
   - organization of environmental monitoring, creation of general state systems and banks of environmental information;
   - development of environmental norms and standards, techniques and economic norms of nature use regulation, legal documents on environmental issues;
   - equipment of environmental organizations with devices, instrumentation and special transport facilities, improvement of working and living conditions for the specialists and their equipment;
   - implementation of environmental and resource conservation measures;
   - works to protect territories of the nature conservation fund;
   - implementation of measures in extreme environmental situations;
   - development of international cooperation in the sphere of environmental protection, ecological safety and nature use.

   The main source of the Fund replenishment is 30% of payments (charges) for pollution of environment (including water bodies) in the territory of Ukraine.

2. The fund is formed simultaneously with formation of the draft of State budget for the following year. The estimated amount of the Fund is submitted by the MEP to the Ministry of Finance in the terms specified by the Cabinet of Ministers of Ukraine. The basic criteria to define the amount of the Fund are statistical state reporting on transfer and use of funds from both the State environmental funds and regional ones (including the base level).

   The amounts of the Fund are concentrated on a separate account and those not used in the current year are transferred to the following year. Decisions on the use of the Fund are taken according to the order established by the MEP. The Regulation on the Fund envisages direct financing (without repayment) of environmental measures and works. The maximum amount of financing from the Fund depends on its total amount and real transfers.

   Financial control over use of the Fund is performed according to the current legislation.

3. MEP is appointed as the main administrator of the Fund.

   Programs and measures are financed from the Fund on submission (request) of ministries, other central bodies of state administration according to the Regulation specified by the Government.

4. Application for financing specific environmental measures and works is performed according to the form established by MEP.

5. The application form for financing is currently elaborated by MEP.

6. Creation of the State environmental fund is considered as the first stage of the National Environmental Fund. Its peculiarity shall be the circumstance that the source of its replenishment, in addition to 30% share of payments for pollution, will be certain shares of payments for special use of natural resources, other transfers.

   The administrator of the National fund shall be the Supervisory Board.

   There is no general National water quality fund in Ukraine. There is a separately created Dnipro Fund.

   On the central (state) level within the real opportunities of the State budget, the water protection measures are financed from centralized investment and budgetary funds envisaged in the environmental section of the State budget (formed from the share of payments for natural resources).

   On municipal level the investment is added with the funds of enterprises and organizations concerned.

   State financing on the central, regional and municipal levels is performed on the grant basis.

   The difficult economic situation of the state rules out any additional loans and subsidies.

Other sources of financing include the following:

- regional and municipal budgets;
- system of regional and municipal (basic level) of environmental funds.

Regional environmental funds are based on oblast environmental funds in corresponding budgets. The main source of replenishment for these funds is legally specified 50% payment for environmental pollution.

Municipal environmental funds in corresponding budgets are mainly formed from 20% payments for environmental pollution. Regulations on use of regional and municipal environmental funds, their administration are performed by corresponding local organs of self-administration.

4.2. Standard Mechanism of Financing for Investment in Regulation of Water Pollution

The standard mechanisms of financing for investment in water protection activities are:

- mechanism of payment for pollution of water objects;
- payments for special usage of water resources;
- compensation mechanism of losses in consequence of water legislation violations;
- system of the state and regional (in composition of corresponding budgets) financing of water protection measures;
- system of target-oriented State, regional and municipal environmental funds.

The Resolution of Verkhovna Rada of Ukraine, dated 16 February 1996 determined new order of financing of state centralized capital investments for the Government of Autonomous Republic of Crimea, oblast (cities) State Administrations-customers. According to the Laws of Ukraine on the State budgets for 1996, 1997, 1998 the funds for capital investments are foreseeing in normative of deductions from the common state taxes and fees to corresponding local budgets.

It is foreseeing (at the expense of limited volumes of state centralized investment that are financed from the State budget) to construct only objects of the state significance (production and non-production) for solving tasks of renaissance of economic and social development of the state. It is proposed to realize construction of treatment facilities system for sewage treatment of cities and settlements at the expenses of the local budgets and construction of treatment facilities of industrial enterprises at the expenses of the own funds.

4.2.1. Typical Sources of Capital Investment for Municipal Wastewater Treatment Plants

The sources to finance construction (updating, expansion) of urban wastewater treatment plants include the following:

- local budgets, including their environmental items, formed from the share of payments for special use of nature, in particular, water resources;
- target-oriented environmental funds in local budgets, formed from the share of payments (charges) for pollution of environment, including water resources;
- own funds of enterprises and organizations concerned (share participation);
- State environmental fund in the state budget formed from the share of payments for environmental pollution;
- limited funds of the Cabinet of Ministers reserve fund in case of emergency.

4.2.2. Typical Sources of Investment for Industrial and Commercial Wastewater Treatment/Pre-treatment

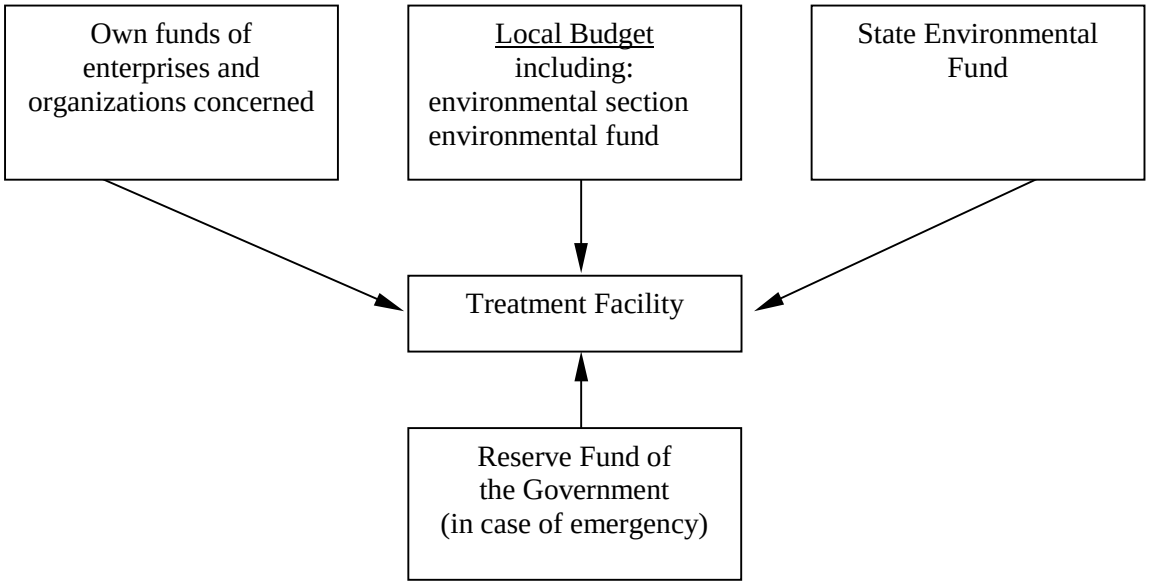
The sources of investment for treatment (preliminary treatment) of wastewater at industrial enterprises can be the following:

- state centralized investment provisioned for development of the corresponding industry;
- own costs of enterprises and organizations;
- funds of the Government reserve fund (in case of emergency).

In the situation of slow process of privatization, there are practically no large industrial private enterprises in the country requiring wastewater treatment.

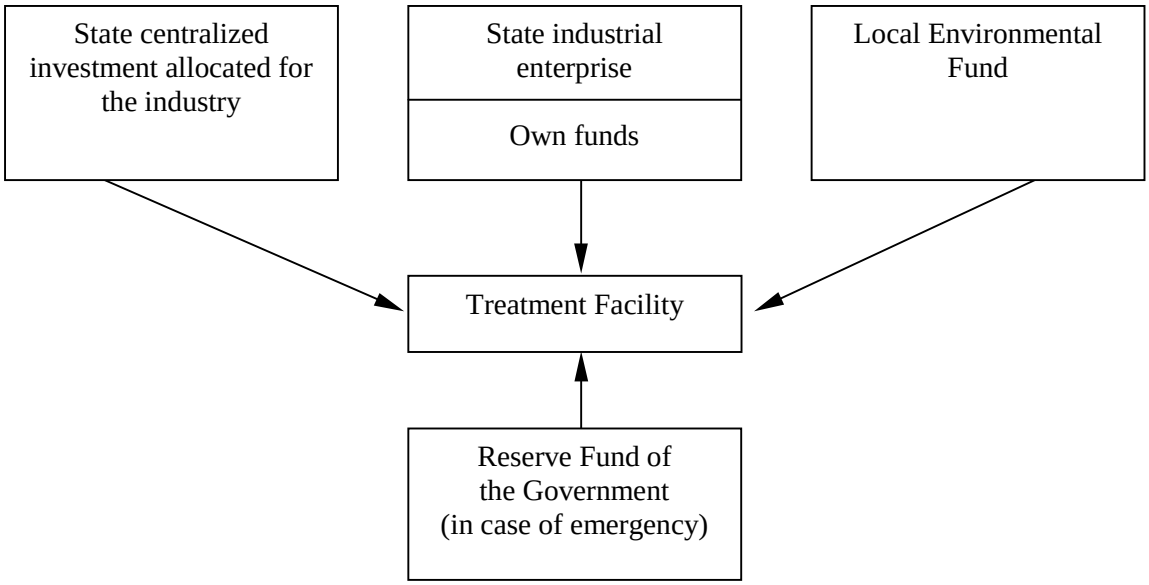
4.2.3. Patterns and Procedures for Municipal and Industrial Wastewater Treatment

Figure 4.1. Standard model of financing construction (updating) of urban (municipal) treatment plants in public ownership



Financing of water protection measures at municipal treatment facilities is carried out through local State Administration

Figure 4.2. Standard model of financing construction of water protection facilities at an industrial enterprise



Involvement of financing sources to undertake water protection measures at an industrial enterprise is performed through the corresponding branch ministry and local State Administration.

4.2.4. Agricultural Pollution of Soil (Ground Water) and Surface Water

There are no special funds, credit institutions to finance measures on regulation of pollution in the agricultural sector.

Treatment of hazardous waste is regulated with the special current legislation.

Disposal of waste, including hazardous one, is charged with corresponding payment (according to the rates approved by the Government).

Pollution of surface reservoirs is also charged with corresponding payment according to the rates approved by the Government.

Sources of finance, standard model and procedure of funds involvement to perform water protection measures at state agricultural (processing) enterprises are similar to industrial enterprises.

4.3. Private Financing Models in Use in Ukraine

Models for private financing of water protection measures in Ukraine are not widely common.

The main share of industrial potential remains in the state ownership.

4.3.1. BOT (build - operate - transfer)

On proposal of the Government of Ukraine and the Government of Japan the projects are being considered to jointly finance reconstruction of treatment plants in the cities of Kryvyi Rig, Zaporizhzhya and pollution with demineralization of Krivbas mine water.

4.3.2. Private Management of Services

As was stated before, development of projects is foreseen concerning implementation of environmental business in water objects sanitation of Dnipro basin in the frames of realization of the 2nd stage of Ukrainian-Canadian Program of cooperation "Development of Environment Management (Region of Dnipro Basin)"- II: cleaning of river-beds, reservoirs from silt, production of bio-fertilizers, dissemination of environmental leasing etc.

4.3.3. Models with Lease

There is not such experience in Ukraine up to now.

4.3.4. Other Finance Models

They are worked out in the frames of TACIS projects.

4.3.5. Licensing and Monitoring of Private Financing or Exploitation Services

It is not carried out on the state level.

4.4. Actual Water and Wastewater Tariffs/Charges

4.4.1. Actual Tariff Policies and Systems

Norms of payments for special water usage have started to develop in system of water supply for all water users from 1992 in Ukraine. These norms are developing on the basis of new methodological approaches to economic evaluation in system of water provision (rental conception) and distribution of expenditures between all participants of water supply complex.

Temporary norms of payment for special water usage of water resources were implemented by the Resolution of the Cabinet of Ministers of Ukraine # 0 275, dated 8 February 1994 by submission of the Ministry of Environmental Safety of Ukraine.

Full-scale economic mechanism was created for regulation of water usage.

Instruction on order of calculation and payment for special water usage of water resources was elaborated and approved on the 14 April 1994 in accordance with the above mentioned Resolution.

Methodological evaluation for determination of norms mentioned is rent conception of economic evaluation of water resources. In accordance with the latter this evaluation consists of two parts:

- for compensation (expenses for maintenance of these resources in due conditions);
- economic evaluation of water as natural resource with determination of its level of deficiency of water resources. Economic evaluation of deficiency of water is equal to the increase of available for usage water resources.

Such approach gives possibility of concrete determination of economic evaluation of water in system of water supply during a time period from water supply point of view as well as from economic one, that is with taking into account complexity of water supply system levels.

The whole economic evaluation of water usage is equal to the sum of two payment rates:

- for usage of water as a natural resource and formation of available water resources for use in the system of water supply;
- for water intake, treatment and distribution among water users in system of water feed (water supply).

During 1994-1996 corrections of volume of payment and some changes of order of payment were carried out by the Resolutions of the Cabinet of Ministers of Ukraine.

New “Permanent Norms of Payment” were introduced by the Resolution of CMU, dated 8 February 1997, # 164. They are in force up to now. Some improvements were made also in Order of payment execution.

4.4.2. Level and Cost Structure

Four categories of payments’ normative are foreseen for usage of water resources:

- from surface water objects (they are equal in general 3,4 – 3,6 copecks per cubic meter (cop/m^3), changing from 1,44 cop/m^3 for Danube up to 8,64 cop/m^3 for rivers of Pryazov’ya);
- from subterranean sources (they are equal in general at level of 5 - 6 cop/m^3 , with deviations from 2,88 cop/m^3 to 9,0 cop/m^3);
- for needs of hydroelectric stations (0,7 cop/ 100 m^3);
- for needs of water transport (0,14 copecks per 1 place-day of operation for passenger fleet and 1,25 copecks per 1 ton-day for cargo fleet).

Payment is not carried out for water that is used for drinking and for domestic-household needs of population and in some other concrete cases.

The following lowering coefficients to the normative payment are set taking into account economic conditions of water users and necessity of the state subsidy to some separate sectors of national economy for the period till 1999:

- for agricultural producers (irrigation inclusive) – 0,2;
- for ponds and lakes farms (fish-breeding) – 0,1;
- for thermoelectric and nuclear plants – 0,5;
- for housing and communal services – 0,1;

Ministry of Environmental Safety of Ukraine has initiated in 1997 revision of lowering coefficients to the water payment norms keeping in mind determination of more adequate value of payment to the real cost of water and increase of returns to the budget. In particular, it is foreseeing advisability of the following change of coefficients:

- for agricultural producers from 0,2 to 0,3 (0,5);
- for ponds and lakes farms from 0,1 to 0,5;
- for housing and communal services from 0,1 to 0,2 – 0,3;

The corresponding proposals are now in the Cabinet of Ministers of Ukraine.

4.4.3. Level of Actual Cost Coverage

The amount of actual payment for special use of water resources is below the planned one. In addition, the main bulk of revenues are allocated to meet other urgent social needs of the state in the transition period.

Due to the difficult financial situation of the enterprises, transfers of payment for pollution of environment (reservoirs) are substantially below the planned level (about 50%).

Thus, the actual payment and real budget expenditures do not cover the total cost of necessary works.

The lowest level of payments for both water consumption and reservoir pollution is in the industrial sector.

Ability of the population to pay for public utilities is registered on level of 50-60%. The population with low life standard is provided by the state with certain compensation for their public utilities costs.

The rates of payment for pollution and special use of water resources, established at transition stage of economy, cannot substantially affect the cost of the product, therefore recovering of their insignificant cost does not affect the economic condition of enterprises.

4.5. Actual System and Practice of Pollution Charges, Fees, Penalties

4.5.1. Charges/Fees for Water Intake (Municipal, Industrial, Irrigation)

For agricultural producers, including those operating irrigation and drainage systems (manufacture of agricultural produce and irrigation) an adjustment coefficient 0,2 is introduced to reduce payment.

For household and public utilities the coefficient is 0,1.

The main share of payments falls on industrial enterprises.

The total payment for water intake shall account for about 184 million UAH (about 90 million USD).

In Ukraine the total payments for special use of water resources in 1998 are to account for approximately 184 million UAH (estimated about 90 million USD).

Taking into account the current reducing indices for agricultural producers, including those operating irrigation and drainage systems (manufacturing of agricultural product and irrigation) and municipal and public utilities (0,2 and 0,1 correspondingly), the largest share of payments falls on industrial enterprises.

4.5.2. Charges/Fees for Waste Water Discharge

One of the first environment-economic instruments has become the mechanism of payment for pollution of environment. It was implemented by the Resolution of the Cabinet of Ministers of Ukraine of 13 January 1992 “On Approval of Order of Determination of Payments and Payments Realization for Pollution of Environment and Regulation on Republican Non-budget Fund Natural Environment Protection”.

According to this Resolution direct payment was introduced for pollution in dependence of quantity and “quality” of pollutants. This payment includes: payment for emissions into atmosphere, payment for water pollution and payment for wastes disposal.

In accordance to this Resolution Ministry of Environment Protection of Ukraine in agreement with Ministry of Economy of Ukraine and Ministry of Finance of Ukraine in 1992 developed and directed to the Government of Crimea AR, State Administrations of oblasts, Kiev and Sevastopol city State Administrations, local nature protection bodies “Method of Determination of Temporary Payment Norms and Payments Fulfillment for Pollution of Environment”.

In the basis of methodology of norms determination, which defines volume of payment for pollution, was put value of environmental-economic loss, amount of money that is necessary to “obtain” from each ton of emissions, discharge of disposed wastes for creation of source for environmental activities financing, which should be independent from the state budget and economic condition of enterprises that pollute environment.

For the purpose of improvement of the existing system of determination of payments volume, increase of their effectiveness and in connection with land-slide inflation in 1992 the norms of payments for pollution lost practically their value and role for stimulation of environmentally sound production. That is why Ministry of Environment Protection of Ukraine has begun elaboration of Basic norms of payments for environment pollution with provision for inflation processes. Index of prices increase of construction-mounting works was selected as a base value because assets received for pollution of environment in the main are directed to construction-mounting works for erection of water treatment facilities and gas cleaning plants.

The coefficient of price index was determined (equal to 92) by means of calculations, consultations with Ministry of Construction and Architecture of Ukraine and agreement with Ministry of Economy and Ministry of Finance of Ukraine and on the basis of official statistic data. The Temporary payment norms for pollution of environment were increased according to this coefficient. "Base Norms of Payment for Pollution of Environment of Ukraine" and "Method of Determination of Payment Value and Fulfillment of Payments for Pollution of Environment of Ukraine" were implemented by the Ministry of Environment Protection of Ukraine. They were registered in the Ministry of Justice of Ukraine on 14 May 1993, # 46.

In connection with permanent growth of inflation in Ukraine Ministry of Environmental Safety of Ukraine in agreement with Ministry of Economy, Ministry of Finance of Ukraine has revised norms of payments for pollution of environment and increased them in 50,2 times. Average weighted inflation index was taken as a basic value (Order of Ministry of Environmental Safety of Ukraine of 29 December 1995, # 153, registered in Ministry of Justice of Ukraine on the 12 January 1996, # 21/1046).

Method of norms payment index determination for pollution of environment was elaborated and approved by Ministry of Environment Protection of Ukraine (Order of Ministry of Environment Protection of 27 May 1996, # 46, registered in Ministry of Justice of Ukraine on 11 June 1996, # 289/1314) in agreement with the Ministry of Finance, Ministry of Economy of Ukraine. It was done for the purpose of carrying out from now on of payment norms index determination in time corresponding to the growth of inflation.

Improved and enlarged corresponding form of statistical reports was implemented (form # 1 - Environmental funds and form #1 - Environmental expenses).

Implementation of mechanism of payment for pollution of environment has brought positive results. An important nature protection principle "one, who pollutes, pays" is realized. It was approved by the Organization of Economic Cooperation and Development (OECD) in 1972 as economic principle of loss compensation that is connected with pollution elimination. Now one, who pollutes, has to indemnify for all expenses connected with environment pollution prevention and carrying out of pollution control measures.

Stimulation function of these payments consists of prevention of natural resources exhaustion and ceasing of environment usage without payment for receiving of pollution by it.

Economic essence of payment for pollution consists of the following:

- one, who pollutes and product consumer, has to pay (compensate) economical losses from negative environmental impact to people health, objects of municipal and public utilities (housing fund, city transport, green plantations etc.), agricultural lands, water, forest, fish and recreation resources, industry fixed assets etc.;
- payments for pollution became a basis for creation of non-budget local and republican environment protection funds (90 and 10 per cent correspondingly), that gave possibility to create source of financing of environment protection measures and works independent from the state and local budgets.

Payment for pollution that is fulfilled within the limits of maximum permissible discharges or temporary agreed discharges (MPD, TAD) applies to the cost of production and is executed by the consumer (in such a manner "consumer pays" principle is realized). Fine sanctions are applied in cases of pollution over norms (over MPD, TAD), over limits set at the price of profit of the enterprise that pollutes environment.

This payment stimulates producer to reduce level of pollution, decreasing price of the products and raising their competitiveness in conditions of market relations and competition improving financial conditions of these enterprises.

Payments for environment pollution are carried out by enterprises quarterly before the 15th day of the first month of the next quarter in a form of advance payment in equal shares from calculated amount of payment per year.

The final settlement on payments corresponding to actual quantity of pollutant discharged and disposal of wastes is carried out during 10 days after presentation of the year report of an enterprise concerning quantity of emissions and discharges of pollutant and wastes disposal according to the forms of statistical reports. It is executed for the enterprises that should not present such reports on the basis of information to the bodies of the Ministry of Environmental Safety as well as to the Government of Crimea AR, oblast, Kiev and Sevastopol State Administrations on actual quantity of emissions and discharges of pollutant and wastes disposal.

Limitation of the value of payments for discharge of pollutant is set by the Cabinet of Ministers of Ukraine by proposals of the Ministry of Economy, Ministry of Finance and Ministry of Environment Protection and Nuclear Safety of Ukraine.

By the decisions of Councils of People's Deputies of the base level enterprises with losses and of low profitability may be released from payment for pollution of environment completely or partially.

For situated on the territory of Ukraine joint and other ventures that used foreign investment and sell all their products for foreign currency, payment for discharge of pollutant within and over limits is paid in foreign currency proportionally to the volume of sales of products for currency.

Actual volumes of pollutant discharges are stated by enterprises in statistical forms of reports and information.

Calculation of loss volumes due to violation of environment protection legislation is carried out in accordance with the Methods of calculation of loss volumes compensation to the state (due to violation of environment protection legislation). They are elaborated and are in force for fish and water resources and atmosphere air.

4.5.3. Other Relevant Charges, Fees, Penalties

It is foreseen by the actual legislation that payments for pollution of environment do not release enterprises from compensation of losses occurred as a result of environment protection legislation violations.

Losses due to violation of environment protection legislation are determined by the following regulations:

1. "Method of Calculation of Volume of Losses Recovery to the State in Consequence of Emissions of Pollutant in over Norms Quantities in Atmosphere" is approved by the Order of the Ministry of Environment Protection and Nuclear Safety of Ukraine on 18 May 1995, # 38.
2. "Method of Calculation of Volume of Losses Recovery to the State in Consequence of Violation of Legislation on Protection and Rational Usage of Water Resources" is approved by the Order of the Ministry of Environment Protection and Nuclear Safety of Ukraine on 18 May 1995, # 37, registered in the Ministry of Justice of Ukraine on 1 June 1995, # 162/698. Changes and amendments to this Method were registered in the Ministry of Justice of Ukraine on 1 February 1995, # 43/1068.

These Methods determine conditions when responsibility of juridical and physical persons comes into force for violation of environment protection legislation concerning emissions of pollutant into air from the stationary sources and discharge of pollutant in the environment.

In particular, responsibility for environment protection legislation violation by emissions of pollutant into air comes into force in the following cases:

- emission of pollutant is higher than maximum permissible level or temporary agreed one, which is determined in permissions for emission, published in a due order;
- there is no permission for emission of pollutant, for separate ingredients inclusive;
- emissions of pollutant are higher than permissible norms of their formation and content in released gases from some types of technological equipment and other equipment.

For discharge of pollutant during:

- unwarranted discharge of recycling waters from enterprises, ships and objects that have not permissions for special water usage or norms of maximum permissible levels or temporary agreed discharges of hazardous substances;
- exceeding of norms and levels approved of pollutant discharge (gr./cubic meter);
- discharge of pollutant that is not in permissions for special water usage or norms of maximum permissible discharges (MPD) or temporary agreed discharges (TAD) in cases when its concentration is higher than permissible level;
- unwarranted discharge of recycling waters or raw materials from sea or river ships, vessels, above- or sub-water facilities;
- entering of recycling waters or pollutant in surface, subterranean and sea waters due to failure at pumping stations, collectors and other facilities, violation of safety engineering, discharge of raw material as a result of emergency at oil pipe lines, oil terminals etc.;
- forced permitted emergency discharges that are not foreseeing by the design but are carried out for the purpose of preventing emergency situations;
- discharge of hazardous substances that resulted in pollution of subterranean waters directly as well as a consequence of pollution of soil surface and land aeration zone.

4.5.4. Assessment of Efficiency of Actual Practice

Introduction of integrated environmental and economical instruments in Ukraine resulted in formation of economic basis for rational water use and protection of water resources.

At the same time, the system of payments for environmental pollution needs to be changed both conceptually and methodologically.

Compared to the western systems, the current system of environmental payments in Ukraine tries to cover with payments practically all polluters. From the one hand, it requires significant administrative costs, from the other hand, the basic principle of taxation system is maintained - “parity and equal approach to business entities”.

The main direction of work in the prospect is simplification of the system and improvement of its efficiency.

One of the methods to reach the goal is to identify, using established criteria and taking into account the international liabilities of major enterprises-polluters and basic pollutants, assessing impact on both health of population and on water bodies, and use only these pollutants for corresponding regulation (rates, permits, quotas) and monitoring.

The rest of enterprises, which adhere to certain pollution criteria and have small pollution payments, shall calculate and make payments by themselves, according to their own calculations without corresponding regulation.

It is feasible to establish the pollution payment for discharge of polluters within permissible rates, quotas. Exceeding the established parameters shall be penalized and the damage incurred shall be compensated.

Certain improvement is needed for the rates of payment for special use of water resources, taking into account restructuring of the economy and certain change of major water users' structure.

4.6. Economic and Financial Incentives For Pollution Reduction Measures

Reform of economic system and transition to market relations should not just raise efficiency of the national economy but also encourage elimination of subsidies for use of such natural resources as energy, mineral resources, in particular water, and improvement of environment through austerities on responsibility for the mass irrational use of natural resources.

In order to take into account environmental requirements in the course of privatization processes developing, environmental audit shall gain more and more importance. Introduction of environmental audit into practice will help in obtaining basic data on the enterprises unfavorable in environmental terms, in particular, in terms of water bodies pollution, for privatization activities, identification of short-term objectives on stabilization and liquidation of environmental pollution.

Improvement of the current economic mechanism of nature use and nature protection and formation of stable sources to finance environmental measures in terms of transition to market relations shall become an integral component of the management and regulation system of economy, shall promote protection and reproduction of the whole nature and resource potential of the country through creation of adequate economic conditions (investment, taxation, credit conditions, etc.).

Unfortunately, there are no practical examples of financing stimulation concerning return of fine sanctions of enterprise for the environmental measures of the same enterprise. The reason for this is absence of a mechanism of such self-offset.

4.7. Quality and Capacity of the National Banking System for Funding of Larger Infrastructure Projects (especially water sector projects)

In the current economic situation and complicated financial situation of the enterprises, the National banking system is not fully able to finance projects with large infrastructure (including projects in the water sector).

5. International Assistance in Funding of Environmental/ Water Sector Programmes and Projects

5.1. Documentation of National Policies and Decision Making Mechanisms for International Co-funding of Environmental and Especially Water Sector Programmes and Projects

Considering that environment protection has extraordinary importance for Ukraine and that the Government of Ukraine recognizes as the highest priority rehabilitation of extremely polluted system of river Dnipro, the Governments of Ukraine and Canada have proclaimed, for the purpose of practical support of political and economic reforms process and establishing of long-term business relations between Ukraine and Canada, creation of significant technical assistance program that is directed to enforcement of possibilities of environment management in Ukraine and to realization of demonstration projects that help to decrease pollution levels of Dnipro.

Declaration on cooperation between the Government of Ukraine and the Government of Canada concerning realization of environment management program in river Dnipro basin was signed in Kiev on the 31 March 1994. The Government of Canada gave a grant to Ukraine in amount of 5 million Canadian Dollars for fulfillment of the Program of Ukrainian-Canadian cooperation "Development of Environment Management in Ukraine (in River Dnipro Basin)".

The concrete purposes of this Program are the following:

- assistance in creation of Ukrainian management institutions of river Dnipro system and use of results of their activities;
- promotion of decrease of water pollution in Dnipro South basin, especially in Zaporizhzhya oblast;
- form a long-term business relations between Ukrainian and Canadian public and nature protection organizations of private sector and promotion of information and experience exchange.

Successful and effective run of the Programs' Projects realization during 1994 -1997, positive practical results and adjustment of long-term contacts between Governmental and scientific structures of Canada and Ukraine became a reasonable background and justification for continuation of Ukrainian-Canadian cooperation. That is why the Government of Canada and Canadian Agency of International Development (CIDA) via International Development Research Center (IDRC) in Canada have come to a decision to give to the Ministry of Economy and Ministry of Environmental Safety of non-repayable finance aid in amount of 2.6 mill. Canadian Dollars for continuation in 1997-2000 the second phase of the Program of Ukrainian-Canadian cooperation: "Development of Environment Management in Ukraine (in River Dnipro Basin) - II" (further - Program - II).

Memorandum on conditions of making available and use of target-oriented financial aid for fulfillment of the second phase of the Program was signed on the 27 November 1997 in Kiev between representatives of the Ministry of Economy of Ukraine, Ministry of Environmental Safety of Ukraine, Dnipro Renaissance Fund and International Development Research Center.

The Program - II is aimed to make the next contribution in improvement of water resources quality of river Dnipro, to assist in realization of the National Program of Environmental Sanitation of River Dnipro Basin and Drinking Water Quality Improvement and to start International Program of environmental sanitation of Dnipro (Republic of Belorussia, Russian Federation and Ukraine).

5.2. Actual Financial Assistance from Bilateral and/or Multilateral Institutions

5.2.1. Projects Concluded and Continuing

Cooperation with Canada

Memorandum on conditions of making available and use of target-oriented non-repayable finance aid for fulfillment of the second phase of the Ukrainian-Canadian cooperation Program: "Development of Environment Management in Ukraine (in River Dnipro Basin) - II" was signed on the 27 November 1997 in Kiev by the authorized representatives of the Ministry of Economy of Ukraine, Ministry of Environmental Safety of Ukraine, Dnipro Renaissance Fund and International Development Research Center.

Ten activity directions are planned that are united in three groups:

1. Ability to systemize programme management of environment in conditions of transfer to the market economy in Ukraine (approximately 1.320.000 Canadian Dollars):
   - management of Ukrainian-Canadian cooperation program;
   - management of drinking water quality;
   - involvement of public with the help of television programs;
   - development of information technologies of environment management.
2. Plan of action on assessment and decrease of surface and subterranean waters pollution (approximately 960.000 Canadian Dollars):
   - assistance of scientific-technical provision of the National Program of Environmental Sanitation of River Dnipro Basin and Drinking Water Quality Improvement;
   - development of bio-testing system;
   - problems of environment and economy of solid wastes and by-products;
   - environmental audit and environmentally clean production.
3. Environmental-investment activities (approximately 320.000 Canadian Dollars):
   - elaboration of investment policy for realization of the program and projects of environmental sanitation of Dnipro basin and support of environmental production development;
   - support of environmental consultative firms.

The amount of a grant is 4,2 mill. Canadian Dollars. From this amount 2.6 mill. Canadian Dollars is under management of the Ukrainian Management Committee that has been created by the joint Order of the Ministry of Economy of Ukraine and Ministry of Environmental Safety of Ukraine. Head of the Committee is Minister of Environment Protection and Nuclear Safety of Ukraine Mr. Shevchuk V.Ya. Members of the Committee are authorized representatives of the Ministry of Environmental Safety, Ministry of Economy, State Committee of Water Economy, State Committee of Hydrometeorology, State Committee of Construction, State Committee of Geology, Dnipro Renaissance Fund, Research and Development Institutes of Ukraine.

Realization of the intentions stated is carried out through a number of separate projects each of the latter should have small expenditures and high efficiency due to development and realization of short-term measures. This permits to obtain certain positive result already in the nearest future.

More than 150 proposals have come to the Ukrainian Management Committee during 1998 concerning fulfillment of projects. They were examined by the Committee at its meetings according to planned directions of activities. 20 projects were approved for financing (state: 31 October 1998), some projects (mainly as for provision of participation of members of Ukrainian and Canadian Management Committees of the Programme in congresses, conferences etc.) are carrying out by the Canadian part.

The total cost of projects that have been decided to finance is equal to 1.414.433 Canadian Dollars. It is equal to 54,3 per cent of the Programme total budget including:

- 12 projects for the total amount of 544.333 thousand Canadian Dollars are in stage of fulfillment and approved for financing by the Ukrainian Management Committee and IDRC with signing of corresponding contracts with executors;
- 8 projects for the total amount of 870,1 thousand Canadian Dollars are now at different stages of examination and are approved for financing by the Ukrainian Management Committee;

Besides that, 6 proposals for the total amount of 369,6 thousand or 14,2 per cent of the budget are at the stage of working out after examination by the Ukrainian Management Committee.

The rest of funds of the Programme that is not divided between projects is equal to 819,0 thousand Canadian Dollars or 31,5 per sent of the Programme budget.

Cooperation with the USA

According to the Protocol of joint activities between Environmental Protection Agency (EPA) of USA and the Ministry of Environmental Safety of Ukraine (signed in November 1997) activities are planned in the frames of Project "Management of Water Quality of Dnipro Estuary" concerning carrying out of a set of expedition researches of water quality in Dnipro-Bug estuary, provision with instruments and chemicals of laboratories of State Administrations of Environmental Safety in Mykolaiv and Kherson oblasts, development and calibration of mathematical models of water quality with approximate expenditures of 300 thousand US Dollars. At present all tasks of the Project are fulfilled but continuation of the Project in 1999 is anticipated.

5.2.2. Planned Projects

At present preparation of project proposals is carried out for financing by the Global Environmental Fund (GEF) of the International (Republic of Belorussia, Russian Federation and Ukraine) Programme of Environmental Sanitation of Dnipro Basin (Trans-border diagnostic analysis of water quality, Strategic Plan of Actions) with a total amount of 7 million US Dollars.

5.3. Centralized National Institution/Development or Promotion Bank for Handling International Funds

At present National Agency for Reconstruction and Development acts in Ukraine. This Agency realizes on behalf and on a commission from the Government contacts with international finance institutions, foreign investors.

5.4. Assessment of the Main Weak Aspects and Necessities for Improvement

The following aspects may be pointed out as the main weakness of the international assistance:

- the international assistance mostly oriented on the pre- and feasibility studies and less on the investments;
- the share of the capital investments (as an equipment leaving in the Ukraine) is rather small and not enough to cover the needs;
- very often the assistance provided by the different institutions is poorly coordinated between them;
- the donor is not interested in the results of the implementation after the completion of the research stage.

The main way for the improvement of the international assistance is the shift of the activities from the studies to the real implementation and investments.

6. Actual and Planned Public and Private Investment Portfolio for Water Quality and Water Management Programmes and Projects

6.1. Compilation of Actual and Planned Investment Portfolio

Verkhovna Rada of Ukraine approved on the 27 February the National Programme of Environmental Sanitation of Dnipro Basin and Drinking Water Quality Improvement.

It is foreseen to develop and realize complex of projects and measures in order to gain this Programme main aim (rehabilitation and provision of environmentally safe living conditions of population and economic activities and protection of water resources from pollution and exhaustion) in such priority directions:

- protection of surface and subterranean waters from pollution;
- environmentally safe use of natural resources;
- renaissance and support of favorable hydrological condition of rivers and execution of measures as for prevention of harmful action of waters;
- improvement of management system of protection and usage of water resources.

Primary tasks in realization of the priority directions of the National Programme are the following:

- limitation of harmful impact of the most dangerous polluters of water sources of Dnipro basin, ceasing of discharge of polluted municipal wastewater, assurance of wastewater treatment in accordance with the design parameters of treatment facilities;
- diminishing of water consumption on the basis of rational water usage with accounting of structural reconstruction of economy, technological modernization and reconstruction of industrial and agricultural production, municipal economy;
- completion of creation of water protection zones and shore lines of all water reservoirs of the basin;
- elaboration and implementation of environmentally sound Rules of Dnipro reservoirs exploitation and water usage;
- further improvement of norm-legislative and environmental-economic basis of safe use of water objects and protection from pollution;
- improvement of water usage management system, water protection and recreation of water resources according to directions of environmental sanitation of Dnipro basin and drinking water quality improvement;
- improvement of economic mechanism of water protecting activities realization;
- implementation of basin principle of water usage management, water protection and reproduction of water resources;
- improvement of monitoring system of environmental conditions of Dnipro basin by the way of development of departmental nets and services, creation of center for analysis of database of environmental conditions of Dnipro basin under auspices of the Ministry of Environmental Safety;
- elaboration and adoption together with Russian Federation and Republic of Belorussia of inter-state agreement on usage and protection of waters in Dnipro basin, provision of fruitful international cooperation;
- elaboration and implementation of environmental training and education programs for population.

The listing of the most important directions of the National Programme tasks of priority of its' realization are the basis for formation of each year nature protection measures in composition of: the State budget, clause "Environment Protection", line "National Programme "Dnipro"; local budgets in corresponding clauses; plans of usage of the State and local "Funds of environment protection"; other sources of financing. According to preliminary data, it is foreseeing, at the cost of state and local sources of financing for realization of the first order measures of the National Programme "Dnipro" for the year 1998 approximately 116 mill. UAH. In addition to this, the Ministry of Economy of Ukraine has provided in 1998 1 mill. UAH for development scientific-technical measures of the National programme tasks realization.

6.2. Inventory of Actual and Planned Investment Portfolio

In fact, financing of measures on the Programme implementation is quite limited.

The research part of the Programme implementation is provisioned in 1998 State budget with target-oriented financing.

6.3. Assessment of Main Weaknesses, Problems, Delay in Project Implementation

The main reason for non-fulfillment of the National Programme measures, in particular construction of capital-intensive measures (treatment facilities), is quite complicated economic situation in Ukraine.

Annexes

Table 1. Compilation of actual investment portfolio (Million US$)

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
TRANSCARPATHIAN REGION																			
1.	Complex longterm programme of antiflood measures in Ukraine (Zakarpatya region)	23,8	11,9	1998 1999 2000							2,9 9,5 11,4								
2.	Erection of the embankment on the Tysa River (Tyachiv)	1,74	0,87	1997-1999		0,36 0,2													
3.	Automatically controlled information measuring system for flood forecasting and Tysa River water resources management - 1st stage (ACIM - Tysa)	2,9	1,45	1997-1999		0,7 0,8												0,5	
	a) erection of center for information acquisition and processing with technological support in Uzhgorod																		
	b)equipment for information exchange																		
ODESSA REGION																			
1.	Complex longterm programme of antiflood measures in Ukraine (Odessa region)			1994-1998															
1.1.	Danube bank stabilization in emergency sites	0,094	0,047					0,094											
1.2.	Renewal of emergency parts of Danube check dams	0,121	0,06					0,121											

Table 1 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
1.3.	Regulation of river and channel beds	0,146	0,073					0,146											
1.4.	Estimation of Danube river side flood areas	0,02	0,01					0,02											
1.5.	Cataloguing of water resource of the region	0,06	0,03					0,06											
CHERNIVTSI REGION																			
1.	Implementation of the extended project of sewer erection designated for Luzhany industrial area waste water discharge and implementation of waste water purification technology at Luzhany Pilot Distillery Plant.	2,7	1,35	1992-1999	1,27 0,08														
2.	Creation of the range for storage of solid waste products in Chernivtsi (2nd phase)	3,3	1,65	1996-2000									0,9					2,4	
IVANO-FRANKIVSK REGION																			
1	Complex longterm programme of antiflood measures in Ukraine (Ivano-Frankyvsk region) 1994-2000 p.																		
2.	Including Prut river	44,9	22,45	1998-2000															
				1998 1999 2000		0,62 3,10 5,18											- 4,0 6,0	- 3,0 5,0	

Table 1 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
3.	Prut's tributaries	22,0	11,0	1998-2000															
				1998 1999 2000		0,20 1,40 2,40											- 2,0 3,0	- 1,0 1,0	
4.	WWT facilities with the daily capacity of 100 m^3 (Vorokhta)	0.04	0.02	1998					0,03			0,01							
5.	WWT facilities with the daily capacity of 700 m^3 (Kuty)	1.6	0.8	1998-2000				0,06 1,0	0,01										

Table 2. Compilation of planned investment portfolio (Million US$)

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
TRANSCARPATHIAN REGION																			
1	Extension and reconstruction of Waste Water Treatment Facilities of Uzhgorod (3 turn)	50,0	25,0	1998-2005														25,0 $US	
2.	Reconstruction and repair of WWTP (Mukachevo)	0,297	0,148	1998-2000						0,05									
3.	Sewage channel on the Pryashivska Str., Mukachevo city	0,691	0,34	1998 1999 2000 2001 2002-2005						- 0,3 0,391									
4.	Second stage of the WWTP Mukachevo city	2,418	1,2	1998 1999 2000 2001 2002-2005						0,1 1,2 1,3 1,4 1,418									
5.	Reconstruction of the sewage system of the Khust city	0,091	0,045	1998 1999 2000						0,055 0,036									
6.	Pumping station of the industrial zone of the Khust city	0,141	0,07	1998						0,141									
7.	Second stage of the WWTP with 15000 cub.m/day capacity in the Khust city	8,343	4,17	1998 1999 2000 2001 2002-2005						- 0,21 0,3 0,62 7,213									

Table 2 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
8.	Re construction and repair of WWTP (Svalyava)	0,051	0,025	1998-2000															
9.	Reconstruction and repair of WWTP (Beregovo)	0,058	0,029	1998-2000															
10.	Reconstruction and repair of WWTP (Vynogradiv)	0,120	0,06	1999						0,120									
11.	Reconstruction and repair of WWTP (Chop)	0,014	0,007	1998						0,014									
12.	Reconstruction and repair of WWTP (Tyachiv)	0,147	0,073	1999						0,147									
13.	Reconstruction and repair of WWTP (Irshava)	0,066	0,033	2000						0,066									
14.	Reconstruction and repair of WWTP (Berezny)	0,016	0,008	1999						0,016									
15.	Reconstruction and repair of WWTP (Mizhgir'ya)	0,006	0,003	1998-						0,002									
16.	Reconstruction and repair of WWTP (Volovets)	0,038	0,019	1999						0,038									
17.	The collecting channel in Olbrachta St.	0,713	0,356	1998- 1999 2000 2001 2001-2005						- 0,2 0,22 0,293									
18.	Canalization pumping station (Svalyava)	0,59	0,3	1998-2005						0,05 0,32 0,22									
19.	The 2nd phase of treatment facilities with daily capacity of 7,000 m^3	3,893	1,95	1998-						0,21 0,66 3,023									

Table 2 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
20.	Construction of the sewage system in the rural area of the region with total length 46,3 km	4,44	2,22	1998 1999 2000 2001 2002-2005						0,384 0,672 1,373 2,016									
21.	Automatically controlled information measuring system for flood forecasting and Tysa River water resources management - 2nd stage (ACIM - Tysa).	1,8	-	1998 1999 2000															
22.	Complex utilization of timber with introduction of environmentally friendly technologies in Teresva Woodprocessing Enterprise.	10,0	5,0	1998-2000															
23.	Complex utilization of timber with introduction of environmentally friendly technologies in Velykobychkiv Wood Chemistry Enterprise	10,0	5,0	1998-2000															
24.	Construction of local area canalization networks in the villages of the region (the total length is 46.3 km	4,44	2,22	1998-2005						- 0,384 0,672 1,373 2,016									

Table 2 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
ODESSA REGION																			
1.	Construction of Vilkovo Wastewater Treatment Facilities.	13,0	6,5	1999-2003				12,2				0,8							
2.	Extension of the Wastewater Treatment Facilities in Kiliya	9,0	4,5	1999-2002				8,4				0,6							
3.	Extension of the Wastewater Treatment Facilities in the Izmail Paper Factory (city WWTP)	7,2	3,6	1999-2003	3,0			3,2	0,8	0,2									
4.	Creation of the Wastewater Treatment Facilities in Reni.	5,6	2,8	1999 - 2003	1,5			3,0	0,9	0,2									
5.	Priority measures on protection against flooding and improvement of sanitary and epidemic situation in Vilkovo.	1,7	0,85	1998 2000				1,5	0,2										
6.	Kiliya protection against flooding (emergency measures).	3,8	1,9	1999-2005				3,0	0,6	0,2		3,4							
7.	Vilkovo city-channels erek reconstruction	4,8	2,4					4,0	0,4	0,4									
IVANO-FRANKIVSK REGION																			
1.	Extension and reconstruction of the Kolomiya city WWTP up to 45000cub.m/day capacity	16,6	8,8	1999-2003					5,0		6,6	3,3						2,0	
2.	Construction of the silt treatment facilities of the WWTP Kolomiya city	13,4	6,7	1999-2000				5,0			7,0	0,4						1,0	

Table 2 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
3.	Additional engineering networks and facilities for the processing for the Kolomiya WWTP	9,3	4,6	1999 - 2000				5,0 4,3											
4.	Reconstruction of WWTP (Otynia)	0,4	0,2	1998-2000				0,4											
5.	Reconstruction of WWTP (Pechenizhyn)	0,2	0,1	2005-2008				0,18		0,02									
6.	Erection of WWTP(Hvizdtsi)	0,2	0,1	2004-2007				0,15		0,05									
7.	WWTP (Kovalivka), shareholder- Kovalivka	0,16	0,08	2005-2007				0,06		0,1									
8.	Measures on the elimination of the consequences of the flood on the drinking water facilities Knyazhdvir for Kolomiya city(river bank protection)	4,8	2,4	1999 2000				2,8 2,0											
9.	River bank protection on the Prut around the pumping station 2 Kolomiya city	0,9 0,4		1999 2000				0,4 0,5											
CHERNIVTSI REGION																			
1.	Sanation, design and demo reconstruction of water and canalization system of the old building- up part of Chernivtsi aimed at improvement of water supply and reduction of soil displacement risk	0,7	0,35	1999							0,23						0,25		

Table 2 continued

No	Type/name of Project or Programme	Total Capital Requirements		Funding Period	National Funding Sources											International Funding			Remarks
					Equity	Envir. Fund	Water Manag Fund	Public Loans			Public Grants			Comm. Bank Loans	Others	Organisation	Grant	Loan	
								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
2.	Erection of the 2nd branch of pressure collecting channel between main pumping station and city canalization treatment facilities (Magala)	7,6	3,8	1999-2001															
3.	Erection of sewage collecting channel between Storozhynetska Str. and the gallery situated in Chernyakhovskogo Str.	2,8	1,4	2000-2008									2,8						
4.	Erection of the gallery division between Gastello St. and active bore situated in Chernyakhovskogo St.	0,9	0,45	2000-2001									0,9						
5.	Expansion and reconstruction of Chernivtsi sewage system including increase of daily capacity up to 200,000 m^3	3,2	1,6	1998-2004							1,0	1,2	1,0						
6.	Design and erection of the 2nd branch of sewage pipe canal across the Prut River near main canalization pumping station	0,4	0,2	1998-2000									0,4						
7.	Reconstruction and repair of WWTP (Vyzhnytsya)	0,2	0,1	1998-2000	0,05	0,005					0,05	0,05							
8.	Reconstruction and repair of WWTP (Putyla)	0,1	0,05	1999-2001								0,1							
9.	Reconstruction and repair of WWTP (“Cheremsh” Sanatorium)	0,2	0,1	1999-2000								0,2							

Table 2 continued

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								Central Budget	Reg. Budget	Local Budget	Central Budget	Reg Budget	Local Budget						
		(MNC)	(MUS$)		(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)	(MNC)		(MUS$)	(MUS$)	
10.	Construction of the polygon for storage of solid waste in Chernivtsi (2nd stage).																		
11.	Processing and raise of environmental safety of mud formations in “Vodokanal” enterprise (Chernivtsi)	2,0	1,0	1993-2000							1,1							0,5	