DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP
UKRAINE

Black Sea, July 13-19, 1998

Ministry of Environmental Protection and Nuclear Safety

in cooperation with the

Programme Coordination Unit
UNDP/GEF Assistance

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Preface

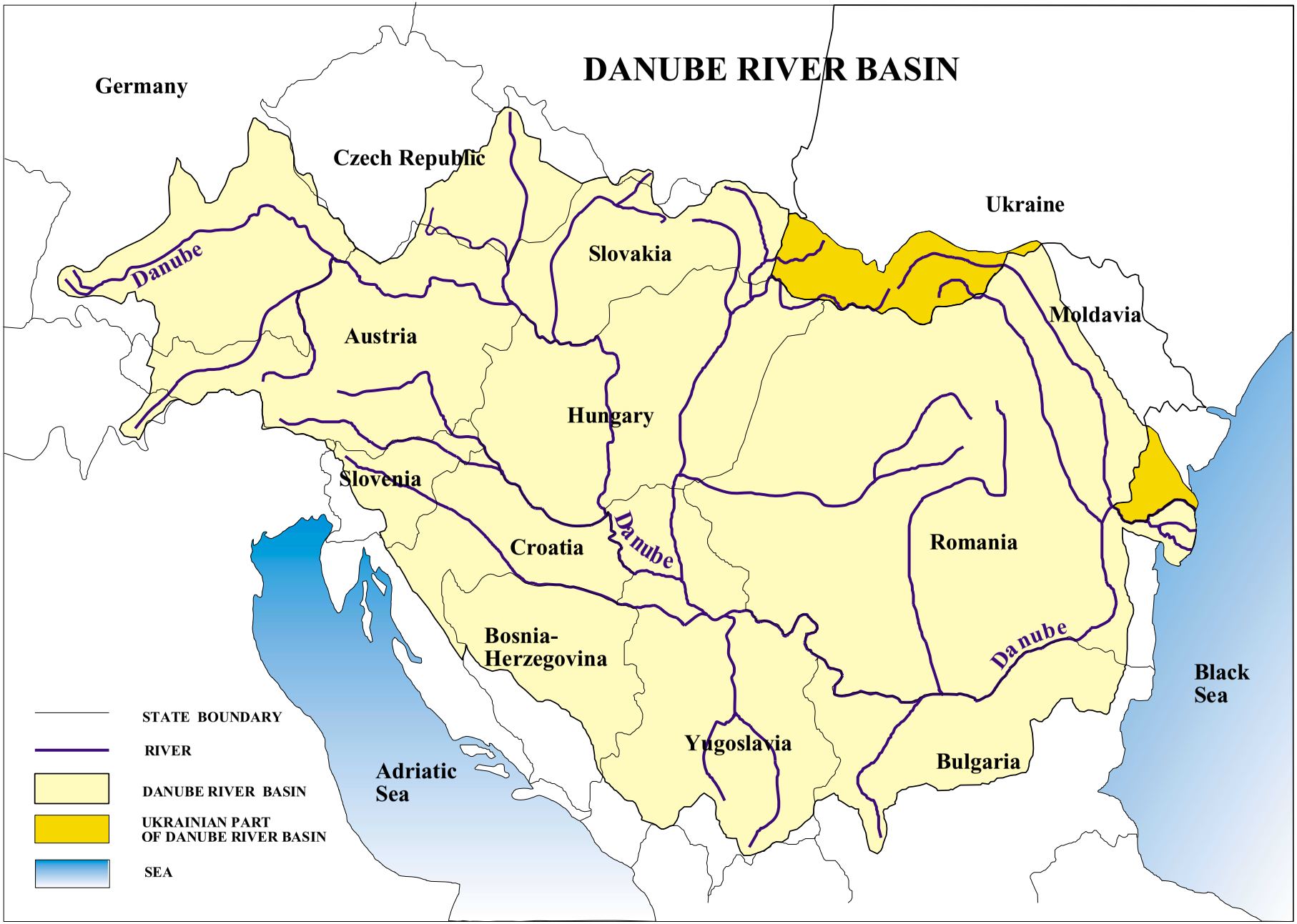
The present report is based on the results of the National Planning Workshop, held on the MEP research boat "Ernst Krenkel" on the Black Sea from 15 to 19 July 1998. The main goal of the workshop and its report is to provide a comprehensive presentation of analysis concerning problems and solutions for reduction, as well as control of water pollution and its effects. The result is a national contribution to the development of the Danube Pollution Reduction Programme and a revision of the Strategic Action Plan (SAP) of the ICPDR.

The Workshop was prepared by the Country Programme Coordinator, Andriy Galyapa, with the assistance of the workshop facilitators Irina Bonya and Tatyana Lysyak. A team of national experts, who elaborated National Review Reports, was present to guide the participants in scientific and technical matters. Veselina Stoyanova supported the national team during the workshop by facilitating one of the working groups.

The National Planning Workshop was attended by participants from various sectors: Representatives of Ministries (the Ministry of Environmental Protection and Nuclear Safety, as well as the Ministry of Economy, the Ministry of Health and the Ministry of Agriculture) State Committees and Inspectorates. Furthermore, representatives of Regional Administrations, State Departments, the US Peace Corp and several NGOs were present at the Workshop. The private sector was also represented. A list of participants is attached to this report in Annex 7.2.

The present report was prepared by the national facilitators with the assistance of the national experts, Victor Karamushka (Agriculture), Zinovy Broide (Industry) and Konstantin Buzadjy (Municipality). It is based on ideas, expert opinions and results of discussions from the Workshop.

A team of international experts from UNDP/GEF, Maxime Belot and Ulrike Meissner, gave assistance and guidance in the methodological approach and report writing. Overall conceptual guidance and technical advice was given by Joachim Bendow, UNDP/GEF Project Manager, to reinforce national initiatives.


DANUBE RIVER BASIN
Germany
Czech Republic
Slovakia
Ukraine
Moldavia
Danube
Austria
Hungary
Slovenia
Croatia
Danube
Romania
Bosnia-
Herzegovina
Danube
Black
Sea
Yugoslavia
Bulgaria
Adriatic
Sea
STATE BOUNDARY
RIVER
DANUBE RIVER BASIN
UKRAINIAN PART
OF DANUBE RIVER BASIN
SEA

The experience of a planning workshop on a ship:
Hard work on a wavy Black Sea, where dolphins were accompanying the workshop

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Executive Summary

In the frame of the Environmental Danube Programme of the ICPDR and with the assistance of UNDP/GEF, a team of Ukrainian experts has elaborated the National Reviews providing information on water quality, analyzing financial mechanisms, describing social and economic framework conditions and developing projects and programs for pollution reduction, improvement on water quality, sustainable management of aquatic ecosystems and the protection of resources. These elements, as well as the results of the National Planning Workshop, shall constitute a national contribution to the development of the Danube Pollution Reduction Programme and shall provide elements for the revision of the Strategic Action Plan (SAP) of the ICPDR.

This present report shows the results of the National Planning Workshop, which took place in Odessa, Ukraine from 13 to 19 July 1998. It is one of 11 national workshops, which have been organized in all participating countries, signatories to the Danube River Protection Convention or adhering to its principles.

The Ukrainian part of the Danube River basin occupies 5.4% of the country of which 44.6% belongs to the Tisa basin, 31% to the Prut River basin, 20% to the Danube River bed and 6% to the Siret basin. The major pollution source is wastewater discharge. The stop of industrial production and the decline in agriculture led to a 30 to 40% decrease in water supply and wastewater discharge in the Danube basin. However, the existing treatment plants are not maintained and fall into decay. The danger arises that if economy returns to the level of 1990/1991, it will not be possible to reach even the stage of treatment, which existed in those years.

The Ukrainian part of the Danube River basin (DRB) covers 4 regions (oblast): Zakarpatska oblast, Ivano-Frankivska oblast, Chernivetska oblast and Odessa. It was divided into three parts: The Transcarpathian Water Management Region (Tisa River basin), the Upper Prut Water Management Region (Prut River basin) and the Danube Southern Water Supply Region (Lower Danube River basin). This division is based on the basin-administrative principle, which takes into account the areas of river departure/entry from/into the Ukrainian territory of the DRB. The report describes the physical aspects, demography and human activities for each of these areas.

The sector approach analyzes particular causes and effects of pollution from point and diffuses sources, as well as transboundary effects of water pollution, considering different economic activities classified, for consistency purposes, into agriculture, industry and municipalities. Based on the sector analysis the core problem was identified as **“Inadequate human activities in the Ukrainian part of the Danube River Basin”**. Direct causes of the core problem are described as “unsustainable resources and land management” from the agricultural sector, “unsustainable technogenic activities” from the industrial sector and “unsustainable waste management” from the municipalities. A number of effects of economic activities leading to a deterioration of water quality in the Danube River basin were identified which include the pollution of ground and surface water, erosion and eutrophication, which consequently result in health risks, biodegradation and an increased risk of technogenic ecological catastrophes.

Based on the results of the problem and objective analysis, the program objective was defined as **“Appropriate human activities in the Ukrainian part of the Danube River Basin”** which should contribute to the achievement of a “Sustainable development in the Danube River basin”.

In order to identify sector strategies, each of the priority sectors was thoroughly examined:

Agricultural Sector

Agriculture and forestry are among the most important kinds of human activity in the region. Due to the specific relief and a relatively high percentage of forested areas (excluding the Odessa Oblast) the area of arable land is comparatively low. Agriculture produces specific waste, in

particular, nitrogen and phosphorous load, which also cause transboundary effects. The major problem is that resource and land management is still unsustainable. Therefore, the sector objective is to “to ensure the sustainable use of land, water and other natural resources”. This objective ought to be achieved through i) the optimal protection of land and water resources; ii) the application of appropriate practices of cattle breading; iii) the implementation of an appropriate system for fish farming; iv) the proper management of forest resources.

Industrial Sector

Industrial pollution is of great importance for our analysis because it is also believed to have transboundary effects. The most important sources of pollution are water and road transport, irrigation, military sites, as well as inadequate waste management and treatment. The causes of pollution were identified as excavation and dredging, inadequate industrial processes, inadequate waste management, transport and military sites. In order to achieve "sustainable technogeneous activities", being the sector objective, it is required to i) implement appropriate hydrotechnical activities; ii) adopt modern technologies for goods production and waste management; iii) optimize transport activities, as well as military objects.

Municipal Sector

This sector is one of the major water pollution sources in the Ukrainian part of the Danube River Basin. However, is has to be noted that the problem is manifold due to the fact that in some settlements industrial waste water is also discharged into municipal sewage networks. Water pollution in the municipal sector is mainly caused by the almost non-existent sewage treatment facilities in small settlements. Unsustainable waste management is the major source of pollution caused by inappropriate domestic waste management and the inadequate functioning of sewage treatment system. In order to reach the sector objective, “Achievement of sustainable waste management”, it is necessary to i) reduce significantly pollution from domestic waste; ii) achieve an adequate functioning of sewage treatment systems; iii) reinforce institutional capacities in waste management.

The report proposes and outlines a number of activities to achieve these results.

The results of the workshop indicated the clear need for projects to implement the strategies for pollution reduction in the Danube River basin. The following priority projects have been identified:

In the **agricultural sector:**

Establishment of a network of training consulting centers for land users.

- Reconstruction of irrigation systems taking into account their impact on the environment.
- Rehabilitation of deteriorated pastureland.
- Development of a methodology and legislative basis for restructuring cattle breeding farms.

In the **industry sector:**

- Further development and implementation of standards and norms regarding waste management and corresponding software to ensure their active use.
- Switch from contemporary technology to a technology based on a clean production principles or change of production profile of Izmail pulp and paper plant.”

In the **municipality sector:**

- Reconstruction and capacity upgrade of Chernivtsy WWTP.
- Reconstruction and capacity upgrade of Uzhgorod WWTP.
- Reconstruction and capacity upgrade of Kolomyia WWTP.
- Sludge processing and reduction of environmental hazards pertaining to wastewater sludge in Chernivtsy water utility.

1. Introduction

1.1. Background

The main source of fresh water in the territory of Ukraine comes from the rivers Dnipro, Dnistro, Southern Boug, Siversky Donets and Danube with its tributaries, as well as from the small rivers of the northern shores of the Black and Azov Sea.

The total volume of the discharge of these rivers, excluding Danube, in an average water year is 87.1 billion cubic meters, dropping in low water years to 55.9 billion cubic meters. Directly in the Ukrainian territory correspondingly 52.4 and 29.7 billion cubic meters are formed, the remaining part comes from adjacent areas. The Danube water resources are on average 123 billion cubic meters annually. Taking into account the population of 53 million, this level of water supply can be estimated as insufficient.

The full provision of water supply services to the population is complicated due to the poor water quality in water bodies. In most of them water quality is classified by chemical and bacterial parameters as polluted (4^{th}-5^{th} class). The most acute ecological condition is observed in the basins of Dnipro, Siversky Donets, Azov shore rivers and in some of the tributaries of Dnistro and Western Boug, where water quality is classified as very polluted (6^{th} class). Ecosystems of most Ukrainian water bodies are characterized by elements of ecological and metabolic regress.

In response to the decreased quality of water resources, the national objectives and purposes in the sphere of protection of the hydrosphere have been formulated in an action plan for the first time in Ukraine. According to the "Basic Guidelines of State Strategy of Ukraine in Environmental Protection, Use of Nature Resources and Ensurance of Environmental Safety", approved by Verkhovna Rada on 5 April 1998 #188/98, the long-term goals of the strategy for sustainable use and reproduction of water resources and ecosystems are specified as follows:

- Reduction in the anthropogenic load in water bodies;
- Achievement of environmentally safe use of water bodies and water resources in order to meet the economic needs of the society;
- Ensurance of environmentally steady functioning of water body as an element of environment maintaining ability of water ecosystems to restore water quality;
- Creation of an effective management structure and mechanisms of economic regulation for protection and use of water resources.

In order to improve the condition of water resources, Ukraine participates in a number of international agreements on the protection of watercourses. The Bucharest Declaration, aimed at information exchange on water quality, had been signed by the Danube countries in 1985 and served as a basis for international cooperation in the region until 1994, when the Convention on Cooperation for Protection and Sustainable Use of Danube Basin (Sofia) was elaborated. Ukraine signed but still did not ratify the Convention. It is expected that the process will be completed soon and Ukraine will be the Party to the Convention. In the meantime, Ukraine is an active participant of the activities related to the implementation of the provisions of the Convention, particularly, international Danube environmental programs.

Another international agreement of great importance is the Convention on the Protection and Use of Transboundary Water Courses and International Lakes (Helsinki, 1992). In 1997, necessary internal procedures have been completed and relevant materials submitted to the Parliament of Ukraine for ratification. In the meantime, Ukraine concluded bilateral intergovernmental agreements on the protection and practical use of transboundary waters with Hungary (1993), Moldova (1994), Slovak Republic (1994) and Romania (1997).

Except this, during last few years intergovernmental and interministerial agreements on cooperation in the field of environmental protection have been signed with the Danube basin countries Hungary (1992), Moldova (1993), Germany (1993) Slovak Republic (1994) and Austria (1996). Currently, similar agreements with Romania and Bulgaria are under elaboration.

In 1996, the Black Sea countries (the Danube countries Ukraine, Romania and Bulgaria are among them) signed the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (BSAP), stipulating the implementation of important measures on the prevention of pollution, first of all, nutrients, coming to the Black Sea from the Danube River.

Due to the difficult economic situation and steady reduction of budgetary funds to be allocated for environmental measures, the participation of Ukraine cannot be considered adequate to the problems it faces in the sphere of water resources protection.

The main legislative act in the sphere of water resource management - the Water Code of Ukraine of 6 June 1995 - specifies in its Chapter 24 the priorities of provisions of international agreements, to which Ukraine is a party, as regards the national legislation. It requires from authorities to be careful about decision-making on participation in international agreements on water resource protection, taking into account the real economic condition of the state and the ability to meet requirements of these agreements.

A positive momentum to stimulate activities in the sphere of water resources protection can be seen in the statement of the country's political management on its intention to join the EU. This will require both the harmonization of environmental legislation of the country and more active specific actions on the improvement of water bodies condition. The first step in harmonization of environmental legislation should be made through the implementation of the Institutional Development Fund, extended to Ukraine by the World Bank.

1.2. Planning approach

The organization of the National Planning Workshop in Ukraine is part of the planning process to develop the Danube Pollution Reduction Programme in line with the policies of the Danube River Protection Convention. UNDP/GEF gives its technical and financial support to organize a country-driven planning process and to assure involvement of all stakeholders at national, as well as regional level.

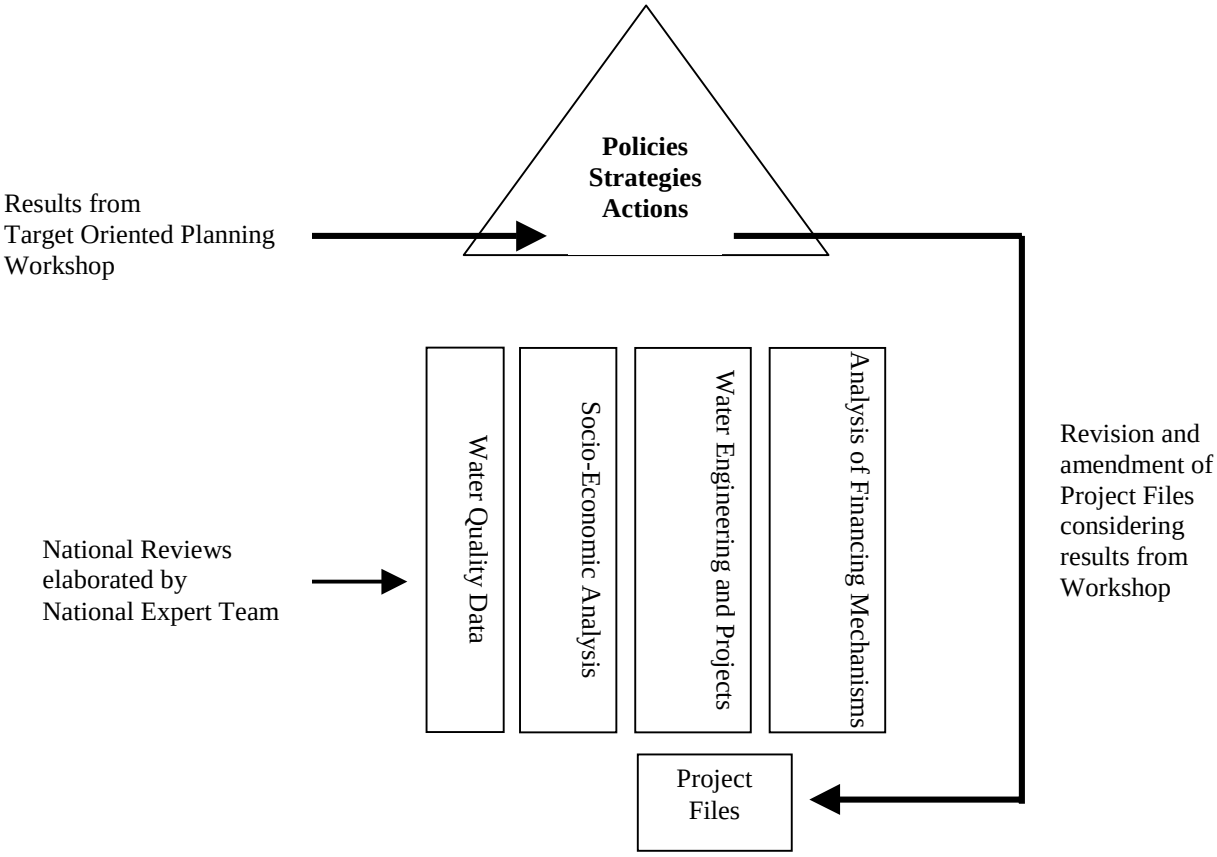
The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects for pollution reduction. For this purpose, a team of national experts for water quality data, water engineering, socio-economic analysis and financing mechanisms has been established within the Ministry of Environmental Protection and Nuclear Safety, and under the guidance of the Country Programme Coordinator. The results of these studies represent the baseline information for participants of the National Planning Workshop. Moreover, they constitute the national contribution, in technical, economic and financial terms, for the elaboration of the Danube Pollution Reduction Programme with particular attention to transboundary issues and the development of an investment portfolio.

To assure wider participation in the planning process, prior initiatives have been taken to organize an NGO-Consultation Meeting, which took place in L'viv from 25 to 26 May 1998**.** At this occasion, the Non-Governmental Organizations have discussed common strategies and priority measures for pollution reduction and designated their participants for the National Planning Workshop, as well as for the forthcoming regional meeting of the Danube Environmental Forum (regional NGO with the participation of all Danube countries).

Within the frame of the National Planning Workshop a multi-disciplinary team, including participants from various ministerial departments, from municipalities and regional organizations, from universities and scientific institutions and from the civil society (NGOs) has analyzed the causes and effects of water pollution and developed strategies and actions for pollution reduction and improved management of aquatic ecosystems and resources.

The workshop has been organized in utilizing target oriented planning methodology (TOPP) and applying logical framework approach. The results constitute a comprehensive and integrated presentation of policies, strategies and actions in three main sectors: Agriculture, Industry and Transport and Municipal Waste Management. The achievements of the Workshop will contribute to national planning, with particular attention to the development of sector-related strategies and actions for pollution reduction and protection of aquatic ecosystems and resources. On the regional level, the results of the Workshop will help to define transboundary issues and to develop regional strategies and actions for the revision of Strategic Action Plan of the ICPDR. Identified projects will be taken into account in the elaboration of the Danube Pollution Reduction Programme and in particular in the Investment Portfolio.

The following chart designs the functional links of the planning process at the national level:



The main characteristics of the methodological approach for the conduct of the Workshop include:

- **Target oriented planning methodology,** which allows defining problems and objectives in a logical frame while taking constraints and limits into consideration. It promotes a systematic, step-by-step approach based on well-focused, task-oriented discussions. This facilitates the description of expected results and actions, the finding of innovative solutions, the definition of assumptions and of impact indicators to support, at later stage, monitoring of programme implementation;

- **Team approach**, which draws on the knowledge, ideas, experience, and judgments of the participants. The collective effort of decision-makers, planners, implementing agents, and beneficiaries is likely to lead to better results than unilateral decision making. The method builds on group interaction aimed at consensus building; it promotes communication and collaboration between participants in all stages of analysis;
- **Visualization of results** in form of colored cards, which are integrated into formal structures, presenting the various aspects of group discussion so that each stage of the analysis is clearly visible to all participants. Cards also serve as the basis for the documentation of the deliberations and the preparation of the final report;
- **Elaboration of Workshop Report,** presenting in written form the results of the Workshop and strictly the charts and planning tables elaborated in consensus by the participants and taking into account the arguments and reasons developed during the discussions.

The Target Oriented Programme Planning (TOPP) methodology includes the following stages:

- Definition of River Basin Areas
- Situation/Stakeholders Analysis (with identification of assets, resources and favorable conditions)
- Problem Analysis (causes and effects of pollution)
- Analysis of Objectives (measures to reduce and control pollution)
- Definition of Actions and Important Elements (detailed description of actions to facilitate report writing)
- Identification of Existing, Ongoing and Proposed Projects (in relation to identified actions)
- Definition of Assumptions and of Impact Indicators (to monitor programme and project implementation).

2. General Frame of Analysis

2.1. Identification and Description of River Basin Areas Considering Physical, Demographic and Economic Situations

Physical, Geographical and Water Management Characteristics of the Danube River Basin

Layout

Ukraine is located in the Southeast of Eastern Europe and covers an area of 603.7 millions km². The Danube River basin on the territory of Ukraine has an area of 32,35 thousand km², that makes 5,4% of the total area. The basins of Lower Danube (from Reni-city to the delta) and Prut and Tisa occupies 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 the Prut basin - 31%, the Danube river-bed - 20% and the Siret basin- 6,7%.

Ukraine has a population of about 53 million inhabitants of which 68% (34,8 million) is urban. The average population density is 92 inhabitants/km². In 1997, 3,08 million were living in the Danube River basin, which is higher then 1991 numbers. The 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%).

Geological Structure and Geomorphological Conditions:

The main part of Ukraine belongs to the Eastern European Plain, which consists of the Volinskiy, Podolskiy, Pridniprovskiy, Priazovskiy hills. There are Crimea and Carpaty Mountains (the Danube basin regions) in the South and West of Ukraine accordingly.

Climate, landscape and geological structure of the Tisa, Prut and Siret basins cause rich and diverse vegetation. Forests cover 37% of the territory. Vegetation is represented mostly in the meadows - flood plains and highlands meadows. There are also marshes in the basins. Flora consists of 1300 species of plants, that is more then one third of the 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 the geographical situation and specific natural and historic conditions, the Tisa basin region (Zakarpatska oblast), the Prut and Siret basins (Ivano-Frankivsk and Chernivtsy oblast) have a unique fauna. The quantity of species is much bigger then in other regions of Ukraine.

Climatic Conditions

The climate of Ukraine is temperate, mainly continental; with average temperatures of -7°-8°C in January, and of 18° -19°C in June. The mean annual precipitation rate is about 600-700 mm on the Northwest where the Danube basin regions situated. In regions of the Carpaty Mountains annual precipitations rate increases to 1200-1600 mm.

Hydrographical Stream System

The main water bodies of the basin are the Danube River and the adjoining lakes (Kahul, Yalpuh, Katlabuh, Kytai); the Tisa River and its tributaries (Tersva, Tereblya, Rika, Borzhava); the Latoritsa, Uzh and the Prut River with its tributary Cheremosh, as well as the Siret River. The Danube River basin on the territory of Ukraine is characterized by a large amount of small rivers – 17612 in total. The rivers Latoritsa and Uzh belong to the Tisa River basin. To the Tisa basin 9425 small rivers also belong to. The Siret basin includes 1461 small rivers and the Prut basin 6289. There are, at present, 602 lakes in the Ukrainian part of the DRB with a total volume of 56,5 mln m^3 and 33 water storages with a total volume of 1308,0 mln m^3.

Water Resources and Water management

Water resource management in Ukraine is regulated by the Law of Ukraine for Environmental Protection (1992), the Water Code of Ukraine (1995) and other legislative and normative acts. The Water Code was only adopted in June 1995. Its legal and normative provisions are not yet completed. The latest changes in the Ukrainian economic and political life have resulted in the necessity to make some alterations in the Law of Ukraine for Environmental Protection, which is undertaken by the Ministry for Environmental Protection and Nuclear Safety of Ukraine with the assistance of other departments. According to the Water Code of Ukraine there are five authorities, which determine water resources management in Ukraine: the Cabinet of Ministers, the Ministry for Environmental Protection and Nuclear Safety, the State Water Committee, the State Geological Committee and the State Hydrometeorological Committee.

Water Quality Control and Management

According to the Water Code of Ukraine water quality management is been carried out by means of ecological water quality standards as a long-term objective, and of categories of water quality as short or medium-term objective. While, ecological water quality standards, as well as categories of water quality, are elaborated by Ukrainian scientists, the limit of allowable concentrations has been worked out for fishing and sanitary safety. However, superfluous strictness of fishing and sanitary limits result in an unreal water quality management at present.

The River Basin Area Approach in Ukraine

The Ukrainian part of the Danube River basin covers 4 regions (oblast): Zakarpatska oblast, Ivano-Frankivska oblast, Chernovitska oblast and Odessa oblast. According to the basin-administrative principle, which takes into account areas (countries) of the rivers inflow (outflow) from (into) Ukrainian borders, the Danube basin can be divided into three main regions:

- **Transcarpathian Water Management Region ("Tisa River basin")** - The Tisa basin region (Zakarpatska oblast) includes the Uzh and Latoritsa River, which flow through the territory of Slovakia and the Tisa River, which flows through Hungary.
- **Upper-Prut Water Management Region ("Prut River basin")** This region (Ivano-Frankivsk and Chernivtsy oblast) covers the Prut River, which passes Moldova and Romania, as well as the Siret River, which flows through the territory of Romania.
- **The Danube Southern Water-Supply Region ("Lower Danube River basin")** This region belongs to the Odessa oblast and includes the following sub regions:
  - Basin of the river-bed of the Danube River, which comes from the territory of Romania
  - Basin of the Danube lakes with water intake from the territory of Moldova.

(i) Transcarpathian Water Management Region (Tisa River basin)

Physical-Geographical aspects

The Transcarpathian Water-Management Region occupies an area of 12,800 km^2 (42 % of the Ukrainian part of the DRB, or 2 % of the country's area) and encompasses all the territory of the Zakarpatska oblast. In the northwest, it has a common border with Poland, in the west with Slovakia, in the southwest with Hungary and in the south with Romania.

The mild climate, mountainous landscapes and the availability of a large amount of mineral springs and other natural resources favor the development of its multisided economic complex, a considerable part of which is occupied by recreation. Climate-soil conditions in the Transcarpathian lowland favor a development of agriculture.

The forests of the region have high water regulating and protecting, climate regulating and sanitation properties. Forests of the second and higher quality occupy 92% of the wood area. More than 400 kinds of wood and bush species grow here, which indicates a wide biological variety.

The territory of the Transcarpathian Water-Management Region is criss-crossed by 9429 rivers. Nearly all of them take a beginning in the mountains and flow mainly from east towards southwest. The south slope of the Ukrainian Carpathians is characterized by strong erosion. All rivers of the Transcarpathian Water-Management region are characterized by floods (8-l0 floods over a year, including 1-4 floods with water discharge upon floodland). There are 137 lakes in the territory of the region.

Demography/Social background

The total population of the Tisa River basin is 0,79 mln, of which 0,48 mln is rural. The average population density is 98.3 persons /km^2, in the Vinogradovskiy region 162/km^2 and in the Rustskiy region 127/km^2. The largest towns are Uzhgorod (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 the production sphere, and among them 36.8 % in industry, 10 % in agriculture, 6.5 % in construction, and 8 % in transport.

A considerable demographic problem is the high mortality rate (particularly at the ages from 36 to 65) in comparison with other, even adjacent, regions. The rate exceeds the Ukrainian one by 13 %. However, due to the high birth-rate and young age-group of the population a natural increase over the region amount to 3.4 persons per 1000 habitants (Ukraine - 6.1).

Transboundary effects

Transboundary impacts of the region are insufficiently treated water entering Hungary and Slovakia and the discharge of water with high oil pollution due to accidents.

Human activities/economy

The Tisa River basin is an industrial-agrarian region with a high developing level of the recreation industry. In the republican division of labor, the region is distinguished by a production of metal-cutting machine tools, wood (24.9% of the labor force), cardboard (10%), table salt (11%), canned fruit and vegetable, and others.

Of industrial importance in the region are tuff beds, deposits of dolomites, pearliness, mineral paints, bentonite clays, color marbling limestone’s, (the Velikokamenetskoye, Dolgorunskoye, Prybuyskoye deposits), barite. There are deposits of zeolites. The region is provided with mineral resources for the chemical industry and industry of building materials.

In industry, the leading branch is machine constructing and metal processing (31 % of marketable products). Their main production areas are devices, metal-cutting machine tools, hydropresses, gas-transport turbine plants for gas-line, gas staves and abrasives. The branches of the L'viv large machine constructing enterprises are functioning in many urban settlements. The chemical industry is represented in Uzhgorod.

There is also production of construction material. Food-industry (about 20 % of marketable products) is based on the processing of local agricultural products, mainly wine production canning, beef, butter and cheese making, berry-juice, flour milling, butter-fat and salt branches. The textile industry (18.2%) is presented by tailoring and knitting, cotton- weaving, leather and footwear branches, as well as the production of artificial fur and hats.

The peculiarities of the territorial positioning of the industrial production have conditioned a formation of several multi-branch complexes (Uzhgorod, Mukachevo, Beregovo, Vinogradov, Hust) and specialized complexes (Svalava, Rahov) which are being developed on the basis of local agricultural products, as well as: metals, textiles and plastic materials.

ii) The Upper-Prut Water Management Region (Prut River basin)

Physical aspects

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-Frankivska oblast and 3,200 km^2 of the Chernovitska oblast), and the Siret riverhead basin which occupies an area of 2,200 km^2 and is located in the Chernovitska oblast.

The left Danube's tributary - Prut - take its beginning in the north-east slope of the Carpathians - the mountain mass Chernogora, at the foot of the mount 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 river Siret takes its beginning in the north-east slopes of the Bukovinian Carpathians by the double riverhead (Bolshoy Siret and Maly Siret).

In the Ivano-Frankivska oblast, the climate is temperate-continental. The average January temperature is -6 C, and that of July is +16 C. Warm, damp summers and cold winters are also usual in the Chernovitska oblast. The main quantity of precipitation falls within the warm season. The rainiest are the summer months (nearly 44 % of total precipitation). At that time the rain falls so heavily that it often results in catastrophic floods.

Demography/Social background

The total population in this region is 1.3 mln, of which 0.74 mln is rural. Due to the comparatively young age-structure of the population, the region is distinguished by a high index of natural growth, which amounts to an average of 3.5 persons per 1000 habitants. The mortality rate is 13.3, birth rate – 13.8.

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 the total population's composition has decreased. A high unemployment rate is prevailing in the mountain areas. The region is distinguished by the low number of inhabitants engaged in public production while there is a considerable rise of inhabitants who are engaged in individual auxiliary management and housekeeping.

Transboundary effects

Transboundary impacts of the Prut River basin are the insufficiently treated water entering Moldova and Romania, the risks of unsorted silt sites overflow from treatment plants during the flooding periods and the high nutrient load from run off from agricultural areas.

Human activities/economy

The national economy complex in the considered river basins is characterized by the development of industrial branches, which are mainly based on local mineral and wood resources and multi-branch agriculture. In this region the oil extracting industry and machine construction for cattle breeding are developed. A considerable part of the national economy is the wood-industry. Of great importance is also the light and food industry. Agriculture is specialized in cattle breeding (beef, dairy) and plant growing (production of grain, sugar, beet and potatoes).

In the Prut basin, the main part of the economy is formed by the Kolomyia economic assembly which specializes in machine construction, electro-engineering and light industry, meat production, sugar, fruit and vegetable, horticulture as well as in tourism (the Gutsulshchshyna's tourist region, with the centers in Kosov, Kolomyia, Kuta, Shashora).

iii) The Danube Southern Water Supply Region (Lower Danube River basin)

Physical Aspects

The Length of Danube in this region is 174 km. The basin occupies an area of 6.3 thousand km^2. The region is located within the limits of the Danube-Dniester valley, which is the South-Western part of the Black Sea lowlands. It is an accumulative seaside low-lying plain, divided by gorges and valleys of the Danube tributaries and small rivers. It is mainly composed of limestone, sand, clay and loess. Common are steep, seaside and flood-land landscapes, which are almost completely occupied by agricultural crop, orchards and wine yards.

The South-Western part of the Odessa region, adjacent to the basin of Danube, relates to the steep climate. Its characteristic features are the prevalence of summer precipitation, sufficiently warm winter and hot summer. Danube lakes are fresh-water lakes with a salinity of 2-3 g/l. They have potentially big fish productivity but during the last 5 years, average fish productivity has decreased 2-2.5 times.

Demography/Social background

According to data from 1997, the population in Lower Danube basin was estimated at 490,000, including an urban population of 320,000 and rural of 170,000. Within the region there are 7 towns, including the town of the region subordination Izmail, 6 settlements of urban type and 213 villages.

In 1996, in comparison with 1987, the birth rate was reduced by 12%, and the growth rate was reduced more than 2-fold. The total mortality rate index (16.4) exceeds the average national level by 2.5%. The birth rate is low – 8.9 per 1000. The mortality of the population caused by malign tumors has increased by 21 %, and infantile mortality caused by inborn deformity has increased by 40%. In the general structure of the disease rate, leading positions occupy diseases of the respiratory organs, blood circulation system, nervous and osseous-muscular system, sensory and digestive organs. Their portion in the total decease rate makes 70%.

Transboundary effects

Oil pollution from ports and accidents are affecting Romania and the Black Sea.

Human activities/economy

Industry in Lower Danube is presented by the paper and food industry. There are several big sea and river ports on the territory of the region.

Out of the 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 waste is also delivered. The existing refuse tips are hotbeds of intensive pollution of the environment. 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 its compounds (0.1 %).


UKRAINE
BELORUS
POLAND
RUSSIAN FEDERATION
SLOVAKIA
ROMANIA
MOLDOVA
AZOV SEA
BLACK SEA
KYIV
Chernihiv
Sumy
Lutsk
Rivne
Zhytomyr
Lviv
Ternopil
Berdychiv
Bila Tserkva
Poltava
Kharkiv
Ivano-Frankivsk
Khmelnytsk
Vinnytsia
Cherkasy
Kremenchuk
Uzhhorod
Chernivtsi
Kamenets-Podol'skyi
Uman'
Kirovohrad
Dnipropetrovsk
Zhovti Vody
Kryvyi Rig
Zaporizhzhia
Mariupol
Mykolayiv
Melitopol
Nova Kakhovka
Kherson
Odesa
Simferopol
Sevastopol
Feodosiya
LEGEND:
RIVER BASIN AREAS:
Tisa River Basin - Transcarpatian Water Management Region
Prut River Basin - Upper Prut Water Management Region
Lower Danube River Basin - Danube Southern Water Supply Region

2.2. Problem Analysis

The problem analysis is of major importance for planning the measures to be undertaken in the national context. It allows establishing cause-effect relationships between the negative aspects of the situation in the Ukrainian part of the DRB.

2.2.1. Core Problem

Based on reviewing major problems from the situation analysis of each of the three main sectors, the core problem was defined as follows:

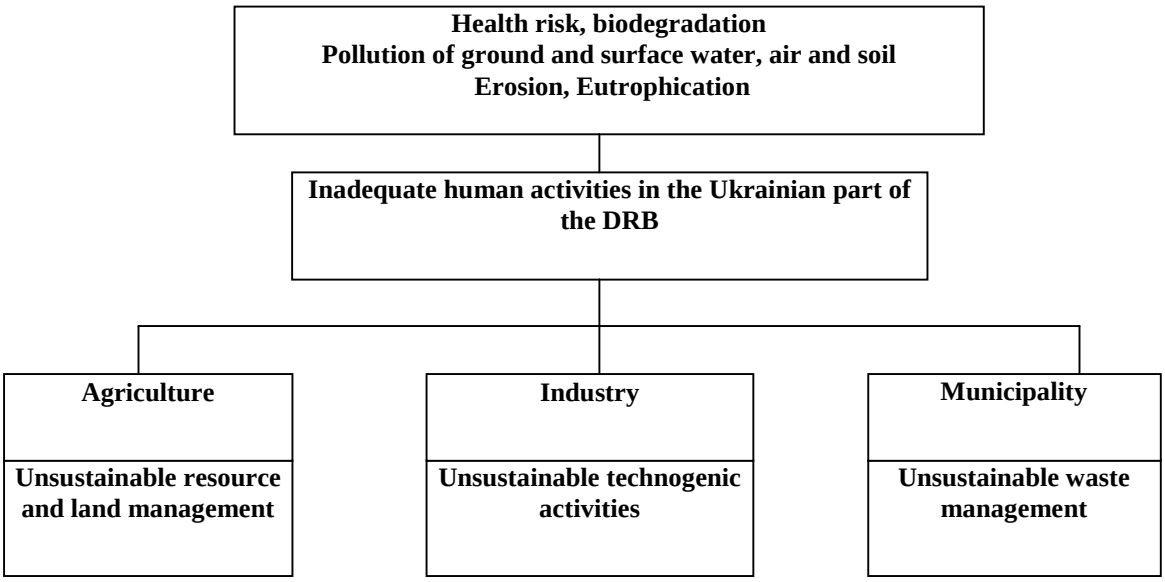
"INADEQUATE HUMAN ACTIVITIES IN THE UKRAINIAN PART OF THE DANUBE RIVER BASIN"

2.2.2. Direct Causes of the Core Problem

For each of the sectors a corresponding direct cause of the general core problem was defined:

- **Unsustainable resource and land management,** caused by unfavorable framework conditions, inadequate agricultural systems and practices, as well as unsustainable animal husbandry, fish farming and forestry practices
- **Unsustainable technogenic activities**, derived from pollution related to excavation and dredging, inadequate industrial processes, inappropriate waste management and pollution due to transport and due to the military sites.
- **Unsustainable waste management** is a result of inappropriate domestic waste management and the inadequate functioning of sewage systems.

Scheme of the Problem



2.2.3. Effects of the Core Problem

Inadequate human activities lead to certain direct effects, which can be defined as follows:

- **Pollution of ground and surface water**
- **Air and soil pollution**

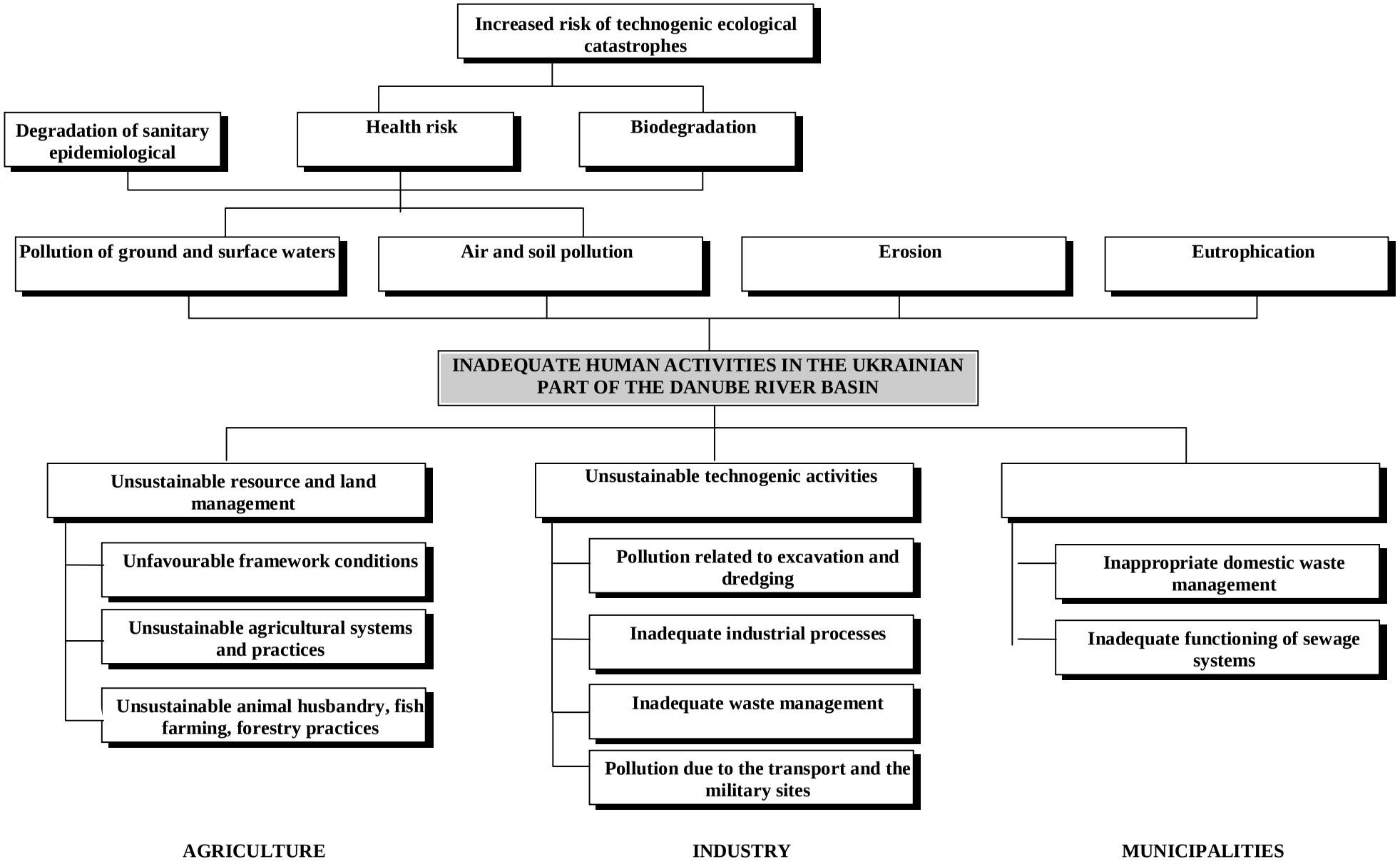
  These two effects can be found in all three sectors and are due to pollution with pesticide residuals, nutrient loads and bacteriological contamination from agriculture and pollution of watercourses with hazardous industrial waste water and oil, as well as bacteriological contamination from municipalities. Another typical effect for the sector of Agriculture is diffuse pollution with organic matters released from animal farms.
- **Erosion**

  Erosion of cultivated lands results in soil degradation and a decline of water quality of streams and rivers. During the past 20-30 years in the Ukrainian part of the Danube basin land erosion increased by 10-25% of highlands and 3-10% of valleys. Annual average losses can reach as much as 24.9-31.8 kg/ha for humus, 1.8 thousand tons for phosphorus, 1.9 thousand tons for nitrogen and 2.0 thousand tons for potassium.
- **Eutrophication**

  Eutrophication is manifested in slow flowing surface waters and caused by an excessive load of nutrients generated by agriculture and municipalities. The cost of treatment of waters polluted with nutrients (P, N, NH_4, NO_2, NO_3) adversely increases depending on their concentration.

  Pollution of environment, in particular of ground and surface water, adversely affects sanitary epidemiological situation. At the same time it raises risk of diseases within the population in the Danube River basin and destroys its biodiversity which, in its turn, leads to an increased risk of technogenic ecological catastrophes.

General Problem Hierarchy



2.3. Analysis of Objectives and Identification of Priority Sectors

2.3.1. Description of Objectives

The program objective was defined by the participants as:

"APPROPRIATE HUMAN ACTIVITIES IN THE UKRAINIAN PART OF THE DANUBE RIVER BASIN"

This program objective contributes to the overall objective of the Danube Pollution Reduction Programme, which was identified as follows:

"ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN"

In order to assure appropriate human activities and, thus, make a sustainable development in the DRB feasible, specific sector objectives have been determined:

- **Agriculture:** Sustainable use of land and water resources
- **Industry:** Optimization of technogenic activities optimized
- **Municipalities:** Decrease of negative impact on water quality from municipal waste

By implementing specific projects in all three sectors the situation in the Ukrainian DRB will be significantly improved – pollution of ground and surface water, as well as soil and air pollution will be reduced. Eutrophication will decrease and erosion processes will be limited. This will lead to a reduced health risk and recovered biodiversity which in its turn results in a reduced risk of technogenic ecological catastrophes.

Scheme of Objective

2.3.2. Identification of Priority Sectors

In order to obtain sustainable development in the Danube River basin, the following measures have to be undertaken in each of the priority sectors:

a. Agriculture

Agriculture is an important source of pollution, which leads to negative consequences in the environment. These consequences can be at least mitigated through the promotion of sustainable use of land and water.

To obtain the objective of sustainable use of land and water resources, it is necessary to:

- protect optimally the land and water resources;
- apply appropriate practices for cattle breeding;
- implement an appropriate system for fish farming;
- manage adequately forest resources.

b. Industry

Some of the industries are especially polluting the Danube environment, for example food-processing, paper and like. These are mainly point sources, therefore technological optimization could be a suitable way to act. It should be also mentioned here that the industry sector also includes transport. Another big polluter is represented by a number of former military sites, quite difficult to regulate.

To obtain the objective of optimized technogenic activities, it is required to:

- implement appropriate hydrotechnical activities;
- adopt modern technologies for goods production and waste management;
- optimize transport activities and military objects.

These measures will allow to improve technological processes and to upgrade existing wastewater treatment facilities, as well as to construct new industrial wastewater treatment facilities if required.

c. Municipalities

In the municipalities the problem is caused by inadequate municipal wastewater treatment, especially in smaller towns and villages where wastewater treatment plants do not exist or their capacity is too small.

To obtain the objective of a reduced negative impact on water quality from municipal waste, it is needed to:

- reduce significantly pollution from domestic waste;
- achieve an adequate functioning of sewage treatment systems;
- reinforce the institutional capacity in waste management.

These steps will allow improving performance of municipal wastewater treatment plants through upgrading the existing and construction of new treatment facilities. It will further allow expanding capacity, extending range of pollutants to be eliminated and increasing number of treatment stages which will result in reduced pollution of ground and surface water and decreased eutrophication.

2.3.3. Important Assumptions for Program and Sector Objectives

Assumptions are factors that are important for the success of the program but lie outside its scope and out of the direct control of the program. The assumptions below are conditions to be satisfied. They are external factors that can affect the implementation and long-term sustainability of the program.

For the **agricultural sector**, in order to achieve the program objective, these assumptions are as follows:

- **Legislation is improved and enforced**
  The transition to the market economy requires steady improvements of the legislative basis and regulations and their harmonization with internationally recognized standards. At the same time, the weakness of the enforcement system at the national level is a cause of inefficiency of well-developed legislative acts. For achieving the sector objective, both parts of this problem have to be resolved.
- **Economic stability achieved**
  Economic uncertainties cause obstacles for business development and prevent attraction of investment required for sector rehabilitation and environmental protection measures. Thus, this assumption has been considered as the most important condition for sustainable sector development.

For the **industry sector**, only one assumption has been identified:

- **Economic stability of the country is growing**
  Program activities in technogenic optimization are only possible under the condition of a growing economic stability to support it.

For the **municipalities,** it is important that:

- **Privatization in general, and land privatization in particular, is in process**
  It is very important that privatization, in particular land privatization, has started to be the basis for the program activities in order to reduce the negative impact on water quality from municipal waste.

2.3.4. Impact Indicators for Program and Sector Objectives

Impact indicators were developed for the sector objectives. They define the contents of the objectives in operationally measurable terms (quantity, quality, target groups, partner institutions, time period and place). They should give an adequate picture of the situation. Furthermore, they should be measurable in a consistent way at an acceptable cost.

The following impact indicators have to be used to assess progress towards attaining the targets.

The impact indicator for **agriculture** was determined as follows:

- **By the year 2010, diffuse pollution is reduced by 20% (versus 1998) in the Ukrainian part of the Danube basin.**
  Diffuse pollution sources as major sources of microbiological contamination are very important and very difficult to assess. A reduction in diffuse pollution in the Ukrainian part of the Danube basin will facilitate the evaluation of the success of activities towards the promotion of sustainable use of land and water resources.

For **industry**, the indicator was defined as follows:

- **Through optimizing technogenic activities in the Danube River basin water quality increases from category 5 to category 2 by 2010 versus 1998.**

  The optimization of technogenic activities in the Danube basin will ensure a minimum of pollutants in wastewater and an effective and reliable protection of the environment, thus, increasing the water quality. Increase in water quality up to category 2 will facilitate to check and adjust the direction of technogenic optimization. The water quality category is the major parameter, which allows to assess the changes. However, it is necessary to note, that the improvement of the category from 5th to 2nd class does not stipulate complete or partial shut-down of industrial capacity comparatively to 1998, i.e. the changes will be caused only by the successful implementation of the Program.

The impact indicator for **municipalities** is:

- **By the year 2010, the concentration of BOD in the Ukrainian part of the Danube River basin decreases by 25% while the same volume of municipal wastewater, in comparison to 1998, is discharged.**

  Low BOD in water might often be used as an integral parameter of water bodies' purity. A reduction of BOD by 25% while producing the same amount of municipal wastewater, demonstrates reaching the sector objective.

Program Planning Matrix

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Overall Objective:** Sustainable Development in the Danube River Basin achieved		
➢ **Program Objective:** Appropriate human activities in the Ukrainian part of the Danube River Basin		
➢ **Sector Objectives:** **1. Agriculture:** Sustainable use of land and water resources ensured **2. Industry:** Technogenic activities optimized **3. Municipality:** Negative impact on water quality from municipal wastes decreased	➢ By the year 2010, diffuse pollution is reduced by 20% (versus 1998) in the Ukrainian part of the Danube basin. (SO-A) ➢ Trough optimizing technogenic activities in the Danube river basin, water quality increases from category 5 to category 2 in 2010 if compared with year 1998 (SO-I) ➢ By the year 2010, the concentration of BODs in the Ukrainian part of the Danube river decreases by 25% while the same volume of municipal waste water , in comparison to 1998, is discharged. (SO-M).	➢ Legislation is improved and enforced (SO-A) ➢ Economic stability achieved.(SO-A) ➢ Economic stability of the country is growing (SO-I) ➢ The process of privatization in general and land privatization in particular is in process (SO-M)
➢ **Sector Results/Outputs** **1. Agriculture** 1.1. Land and water resources optimally protected 1.2. Appropriate practices for cattle breeding applied 1.3. Appropriate system for fish farming implemented 1.4. Forest resources adequately managed **2. Industry** 2.1. Appropriate hydrotechnical activities implemented 2.2. Modern technologies for goods production and waste management adopted 2.3. Transport activities and military objects optimized **3. Municipality** 3.1. .Pollution from domestic waste significantly reduced 3.2. Adequate functioning of sewage treatment systems hieved 3.3. Institutional capacities in waste management reinforced		➢ Appropriate scientific and technical basis available (SR-A) ➢ Investment in required amounts (SR-A) ➢ Privatization program is implemented before 2010 (SR-A) ➢ Structural Changes in economy are taking place (SR-I) ➢ Market mechanism in economic sphere is working (SR-I) ➢ Legal and economic mechanism of full Cl phase-out from drinking water preparation and waste water disinfection are developed and enforced (SR-M)

PO - Program Objective SO-AF - Sector Objective Agriculture and Forestry SO-I - Sector Objective Industry SO-M - Sector Objective Municipality

3. Sector Strategies

3.1. Agriculture

Analyzing the role of the agricultural sector regarding the pollution of the Danube River and its tributaries, it was decided by the participants of the Workshop to include the following sub-sectors: crop production, animal husbandry, fish farming and forestry. These four areas of activity lead to water pollution due to their inadequate practices. All of them are aimed at food and wood production and are based on the use of land and water resources. It should also be noted that we are speaking of both state and private forms of ownership.

3.1.1. Situation Analysis

3.1.1.1. Importance of the sector and activities leading to water pollution and environmental degradation

Ukraine, a state with powerful industrial and agricultural potential, is now in transition to a market economy. Agriculture is very important for the country: 40% of productive forces are land resources; 38-39% of employees is involved in the agricultural sector. 72.2 % of the territory of Ukraine also belongs to this sector; 57.5% of the territory is arable land that considerably exceeds ecologically based standards (in comparison, arable land in the United States covers 15.8 % of the territory). The latter is evidence for the irrational and uncontrolled use of land resources and considerable anthropogenic pressure that requires an essential improvement of the land management system.

Since the beginning of the 90s, as a result of the economic transition, a significant reduction in total agricultural production has been observed. For example, today, in some regions, cattle livestock is only about 20% of the total livestock in 1990 in spite of a general increase of pasture areas. In 1998, the decline in total cattle livestock is 16% in comparison with the same period of 1997. Economic relations between producers, on the one hand, and state bodies and consumers of agricultural products on the other hand have been destroyed. Barter operations dominate between agricultural producers and other stakeholders of the economic system. The former ineffective collective farm system (kolkhoz) still prevails but value of its production is steadily declining. Most of the cooperatives are close to bankruptcy or are already bankrupt.

The private sector in agriculture is still very weak and faces serious obstacles due to unfavorable legislative, financial and organizational conditions. In spite of the lack of experiences and relevant financial support, the output of private farms is becoming steadily more important. Unlike cooperatives, private farms do not require investment. In the first half of 1998, positive trends become visible in the sector. Production increased as far as 100.6% in comparison to 1997. For some products (for example, milk) the private sector amounts to about 60% of the total outcome in agriculture.

With regards to the Ukrainian part of the DRB, it is relevant to emphasize that agriculture and forestry are among the most important kinds of human activity in the region. As any other activity, it requires natural resources and produces specific waste. 57%, 61%, and 35% of population in Prut River basin, Tisa River basin and Low Danube respectively are rural and involved in agricultural activity. Due to the specific relief of the territory and a relatively high percentage of forest areas in the region (excluding the Odessa Oblast), the area of arable land is comparatively low. At the same time, the quality of land is quite high. Western regions (oblast) can be considered as more oriented towards individual activity, i.e. towards the development of the private sector. Up to 100% of state

cooperatives in western regions (oblast) have already been privatized (whereas in the Odessa Oblast it is only about 70 %).

The average salary of employees in agriculture is the lowest in the country. Even at such conditions, a relatively high level of unemployment in the region, especially in mountain areas, is observed.

Among other things, key types of human activity targeted at land and other natural resource use must be considered from the point of view of prevention and control of water bodies pollution.

Land use/farming systems and agricultural practices still have an extensive character and are oriented mostly towards the increase of total output without ecological consideration. Negative consequences of these activities are soil degradation and water bodies pollution. A common practice is the direct discharge of untreated water from agricultural farms located near water bodies. In 1997, the State Ecological Inspection registered a discharge of 74,000 m^3 water (73,400 m^3 - untreated water) to Danube by cooperatives of the Odessa Oblast. However, in general, the discharge of wastewater from the agricultural sector has steadily decreased in the region, unfortunately, due to a decrease of production activity.

Uncontrolled pesticide management leads to serious pollution of surface and ground water. Due to the significant rise in price of agrochemicals and the disorganization of economic relations, the amount of pesticides used decreased considerably. At the same time, cooperatives still storage a considerable amount of agrochemicals prohibited for usage (68.3 tons in Ivano-Frankivsk Oblast, 1997). Thus, it is still potentially dangerous for the environment.

Animal husbandry practices basically lead to land degradation due to the over-exploitation of pasture areas and water pollution by organic wastes. The giant cattle-breading and pig-breading complexes have a considerable impact on the environment, usually constructed without or with very modest water treatment facilities.

Irrigation management can be assessed as inadequate and causes changes in soil and water quality. Outdated constructions and technologies require serious investments for improvement and updating.

Fish farm management can be considered as inappropriate in terms of cost-effectiveness and environmental impact. Fish farming without environmental consideration causes hydrological regime changes, deterioration of water ecosystems and water pollution.

Another activity leading to water pollution is **forest management.** Orientation towards fast outcome has usually as a consequence the violation of technologies to cut trees and of wood processing. Insufficient forest reproduction leads to land degradation by washing off surface unprotected soil layer and losses in biodiversity.

Participants of the Workshop came to the conclusion that agricultural and forestry practices in the Ukrainian part of Danube basin are still unsustainable which leads to the exhaustion of natural resources, the deterioration of the environment and pollution of air, land and water with transboundary effects. Recognizing that water and land are key natural resources for future prosperity, unsustainable resource and land management requires immediate improvement and rationalization.

3.1.1.2. Current strengths/assets

Agriculture and forestry in the region have a potential for improvement and sustainable development. Different aspects of the most important assets for the future to rely when overcoming negative consequences have been discussed in the Workshop.

- **Natural and human resources**

  The Ukrainian part of the region could be characterized as a region with potentially valuable natural and human resources of proper qualification. Regarding water resources, it is to mention that only 4% of total area of the Danube basin is located on the territory of Ukraine, but, at the same time, 20% of total water resources of the country are localized on this territory. In this respect, only the Odessa Oblast has very limited possibilities to use fresh water.

  In western Ukraine, there is not enough arable land for agricultural practices but soils are of high quality. In contrast to this, extensive arable area with valuable soil resources in the Odessa Oblast requires relevant irrigation for high crop production.

  In spite of some negative trends due to general degradation of the environment, Danube lakes still can be characterized by high fish productivity.

  The region has also a well-developed agricultural infrastructure and a qualified population with traditional agricultural activity.

- **National laws and legislative acts**

  Ukraine has a well developed legislative basis for the regulation of activities in the agricultural sector and its environmental impact. The most important elements of legislation and policy, in respect to the activity in the Danube River basin, are described below.

  Laws of Ukraine "On Environmental Protection" (1991, amendments 1997), "On ecological expertise" (1995), "Main Law on Health Protection" (1992), "On provision of the Sanitary and Epidemiological Human Wellbeing" (1994) provide general provisions for balanced and safe development and activity of the population and relations to the environment. General environmental policy (including in the agricultural sector) and key priorities have been formulated in the framework legislative act "Main directions of state policy in the field of environmental protection, rational use of natural resources and environmental safety" (approved by Parliament of Ukraine in 1998). "Main Directions" stipulate an integrated approach of intersectoral partnership in environmental management; strengthening of the institutional frameworks, legal and economic instruments; participation of governmental, local, business and public stakeholders in cooperative management program with priority of environmental issues.

  Laws of Ukraine "On Properties" (1991), "On enterprising" (1991), "On collective agricultural enterprise" (1992), "On farm enterprise" (1993), "On privatization of land areas" (1992), "On land reform" (1990), "On pesticides and agro-chemicals" (1995) are the basis for development of the human relations in the field of agricultural production and practices.

  Regulation of natural resource use, rehabilitation and protection are based on the Land Code**,** Water Code, Forest Code, as well as the Laws of Ukraine "On Fauna" (1993), "On the Protection of Atmosphere Air" (1992), "On nature-preserve stock of Ukraine" (1992), "On Waste" (1997) and relative legislative acts, norms and standards.

  Nevertheless, existing legislation must be amended in order to harmonize it with provisions of EU norms and regulations in the field. But the key problem remains the enforcement of the legislative acts.

- **International agreements**

  Ukraine has signed a number of international agreements in relation to water management and management of transboundary water courses, e.g. the Convention on Cooperation for Protection and Sustainable Use of the Danube Basin (1994). Ukraine has also concluded bilateral agreements with Hungary, Moldova, Slovakia and Romania. These have already been described in greater detail in the background information of this report.

- **National and regional programs**

  A range of state programs, which are of relevant importance for sustainable development and rational agricultural practice in the region, can be mentioned as existing assets:

  - *Concept of Development of Land Use in Ukraine for period up to 2005 and its implementation (1990)*
  - *Program of prospective development of the reserve matters (PRM, approved by Parliament in 1994)*
  - *National Concept on the Protection and Rehabilitation of the Azov and Black Seas (BSAP, has been approved in July, 1998, by the Cabinet of Ministers of Ukraine and can be considered now as a basic strategy for sustainable development of the Black Sea region including low Danube area)*
  - *State flood prevention program (SFPP)*
  - *Annual Action Plan of Government on Land Protection (GAAP)*
  - *State Privatization Program (SPP)*
  - *National Program of Land Protection for 1997-2010 (NPLP, did not approved yet, draft of the program is under consideration among governmental bodies)*
  - *Program of Development of Subsidiary Private Enterprises of Citizens for 1998-2000, PPE (1998)*

  However, implementation of all these programs and action plans is weak and problematic, particularly, in the Ukrainian DRB, due to the absence of effective economic-financial mechanisms and legislative constraints and restrictions.

- **Educational and informational aspects**

  In general, the educational potential in the region and in the country as a whole is maintained at a level ready to introduce new techniques and open for innovation and appropriate improvements. The education structure and a well developed mass media in the region can be used for the introduction of a modern vision and cleaner agricultural practices.

- **New technology**

  New technologies for waste minimization and cleaner agriculture production are available from abroad and from relevant national institutions.

- **Financial resources**

  In spite of general budgetary problems in the country, some financial resources are available for the implementation of advanced technologies and prospective projects in the sector. In this respect, International Financial Institutions can be mentioned as a possible source of activity aimed at sustainable development of the sector and commercial banks as a possible source for financing commercial projects.

3.1.1.3. Analysis of transboundary effects

As a result of the inappropriate management systems in agriculture and forestry, pollution of the environment in general and water bodies in particularly is still uncontrolled and causes transboundary effects (Romania and Moldova are subject to the influence of Ukraine and vice versa). In this respect, the participants have identified two issues. One is the high level of

suspended solid load as a consequence of considerable soil erosion. The other problem is the transport of agricultural chemicals and nutrients and the danger of eutrophication due to **inappropriate agrochemical application and pollution from animal husbandry**. Potentially, inadequate agricultural management has a negative impact on the status of biodiversity and may cause its degradation.

3.1.2. Sector Problem Analysis

3.1.2.1. Core problem

The core problem of agriculture has been identified as:

"UNSUSTAINABLE RESOURCE AND LAND MANAGEMENT"

3.1.2.2. Causes leading to environmental problems

It looks relevant that critical factors of environmental problems are considered at two levels. First of all we should take into account factors of social policy connected with social and economic relations in the society. In this respect, consequences of former kolkhoz system of land use and uncertainties of transition to private land and enterprises ownership are important for all analyzed sub-sectors - agricultural practices, animal husbandry, fish farming and forestry. On the other hand, we have to recognize that, independently from ownership relations, management in the relevant fields of activity is rather poor and inappropriate.

In general, agricultural systems and practices are unsustainable due to a range of causes, which are:

- Unfavorable framework condition
- Unsustainable agricultural systems and practices
- Unsustainable animal husbandry, fish farming and forestry practices.

These causes are described in greater detail below:

(i) Unfavorable framework condition

Except for causes which are specific for each analyzed sector, there are a range of more general causes which are of great importance and which are to be taken into account considering the current situation and elaborating measures to improve policies and practices within the sector. The unfavorable framework conditions are caused by:

a. Inefficient framework condition for investments and financial support

The current economic situation in the country does not allow to rely upon financial support from the state budget. During the last decade, the **state budget has a sufficient deficit** which becomes more at the end of the year. At the same time, **conditions for investments**, first of all from foreign sources, **can not be assessed as attractive** due to specific **regulation**, essential **restrictions** and many **uncertainties**. As a result, agricultural producers must rely upon own resources.

b. Insufficient legal and normative framework

c. The lack of a control system for environmental friendly agricultural practices

These two causes are general features of the transitional period and are caused by **changes of ownership**, the fast development of **legislation** and the **still weak capacity for its enforcement**.

d. Inadequate and outdated technologies for resource utilization

It is caused **by financial restrictions**, the **lack of education and relevant skills**. In general, agricultural technologies and practices in the region need to be changed and improved on the basis of modern approaches. An essential problem lies in the consequences of former agricultural practices based **on extensive land resource use** and aimed at final results without environmental consideration and economic analysis. Most problematic in terms of cost- and resource effectiveness are former animal complexes, which require urgent restructuring.

e. Inefficient dissemination of information and education

The **lack of means and background capacities** is one of the main reasons. The situation in this field does not look so complicated. Due to the establishment of new educational structures in the country aimed at providing management skills in different sectors and the development of new educational advanced programs, which are practically oriented, the situation is changing but still cannot be considered as satisfied. However, there are also efforts in this field of foreign and national firms and producers, which are interested in the implementation of their modern know-how, techniques and technologies.

(ii) Unsustainable agricultural systems and practices

Irrational use of arable land, poor conditions of the irrigation systems and pollution from pesticides and agricultural chemicals are the main causes of the unsustainable agricultural system and practices.

a. Irrational use of arable land

The irrational use of arable land is due to the extensive use of arable and pastureland, as well as forests with an **ecological imbalance, the lack of necessary preventative erosion measures** and the pre-dominance of **outdated agricultural technologies**. At present, the situation can be considered as even more difficult in comparison with the former kolkhoz system because the previous system of agricultural provisions (techniques, fuel, agrochemicals supply system) collapsed totally. In spite of this, the sector still must produce food and raw materials for other sectors (e.g. industry). The intensive development of private agricultural practices leads to an enormous imbalance in land use.

b. Poor conditions of the irrigation systems

The reason for the poor conditions of the irrigation systems is the lack of funds to maintain and update systems and violations of irrigation technologies. The existing irrigation systems require modernization by improving techniques, introducing know-how and advancing the stages of water preparation.

c. Pollution from pesticides and agricultural chemicals

This pollution is caused by the **inappropriate transport, storage and stock location of agrochemical**, as well as the **improper use of pesticides and mineral fertilizers**. Both are the result of insufficient information and violations of agrochemical technologies. During the last few years, the amount of agrochemical used dropped down considerably due to the lack of funds available that, in general, resulted in a decrease of water pollution. At the same time, large volumes of useless pesticides are still in stock and violations of storage regulations cause significant local pollution of water and soils.

(iii) Unsustainable animal husbandry, fish farming and forestry practices

a. Unsustainable animal husbandry

Unsustainable animal husbandry results from the **inappropriate management of sewage from animal farms** and the **inappropriate location of stationary and temporary animal farms and cattle cemeteries**, which in its turn is due to the **lack of farm management systems for private and collective farmers**. As it has been mentioned earlier, animal farm complexes remain one of the biggest problems for the environment due to the irrational land use, outdated wastewater treatment technologies (or their absence), as well as the negligible relation to water resources and their pollution.

b. Unsustainable fish farming

Fish farms operate **without environmental impact assessment and without considering ecological safety**. This is often due to the **violation of fish farm technologies**. In terms of environmental impact and measures for improvement, fish farming can be evaluated as less important than others can.

c. Unsustainable forestry practices

Unsustainable forestry practices are caused by **violation of technologies for felling** (including illegal felling in order to use the wood as an energy source) and **insufficient forestry reproduction**. The export of wood, instead of wood processing in the region, leads to essential financial losses and social problems caused by unemployment.

3.1.2.3. Environmental effects

Despite the general decrease of wastewater discharge from agriculture (the amount of water, discharged in 1997, is equal to 54% of the water volume discharged in 1991), the influence of agricultural activities on water quality in the Danube River basin is still considerable. As negative environmental consequences affecting water quality the following were mentioned:

- **Chemical pollution of water**

  Chemical pollution is a consequence of unregulated overexploitation of agrochemicals. However, due to financial constraints the use of agrochemicals has been decreased substantially during the last years and, consequently, led to an improvement of pollution patterns. Further, chemical pollution results from the violation of the technologies for the use of agrochemicals (inappropriate transport and storage), and from oil products used for agricultural techniques.

- **Eutrophication**

  Eutrophication is a consequence of water pollution by nutrients, above all from diffuse agricultural sources (animal farms and pastures) by washing off animal waste and organic fertilizers.

- **Increase in sedimentation and**
- **Increase in solid discharge and accumulation of polluted sediments**

  The increase in sedimentation and in the solid discharge and accumulation of polluted sediments result from the washed off surface level of soil from arable land due to the enormous extension of arable areas.

With regards to soil quality, negative effects are:

- **Erosion**

  Erosion is a consequence of inadequate agricultural and technical practices and the lack of anti-erosion measures.

- **Chemical pollution and salination of soil**

  Chemical pollution and salination of soil are the consequences of inadequate irrigation methods, crop production, use of mineral fertilizers and pesticides, uncontrolled private animal breeding etc.

- **Increase in background mineralization**

  Increase in background mineralization is a consequence of inadequate practices in irrigation (violation of watering technologies, uncontrolled leakage from irrigation systems, use of untreated waters etc.).

- **Rise of ground water table**

  The rise of the ground water table results from the uncontrolled construction and exploitation of pisciculture ponds, deficiencies of irrigation system constructions and violation of the irrigation technologies.

There are at least two groups of effects from the direct environmental consequences of sectoral activity on natural resources: (i) degradation of soil quality, as well as the loss of soil fertility and the breakdown of structure and (ii) degradation of surface and ground water quality.

- **Degradation of soil quality, loss of soil fertility and the breakdown of structure**

  Degradation of soil quality, loss of soil fertility and the breakdown of structure are due to erosion processes, the worsening of chemical composition (salination, mineralization and chemical pollution) and the rise of ground water table. With the exception of wind erosion, the influence of water is not to be neglected as a factor for soil pollution and its degradation.

- **Degradation of surface and ground water quality**

  Degradation of surface and ground water quality is a consequence of water pollution by agrochemicals, organic compounds (nutrients) as well as by mineral soil salts and particles.

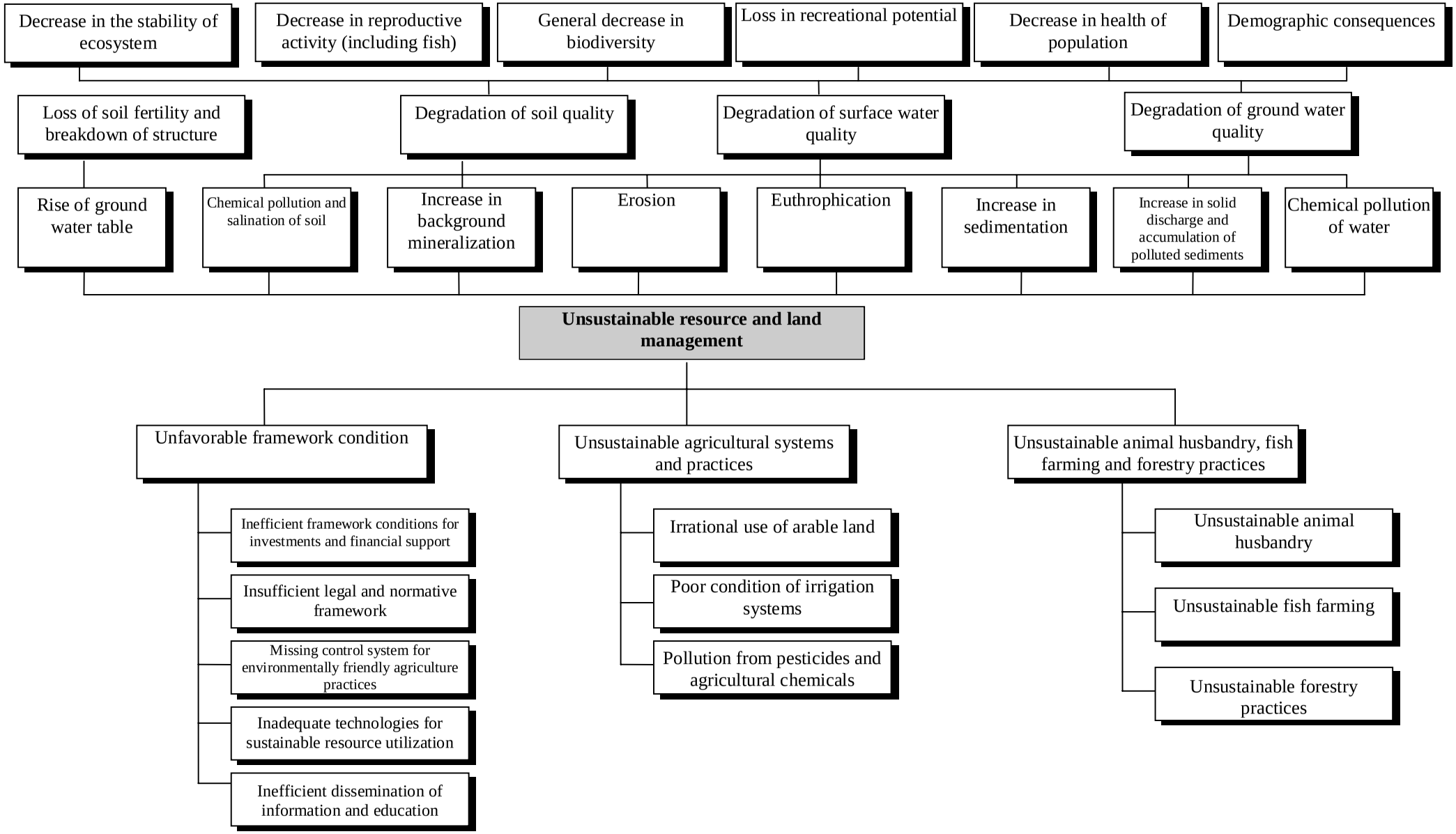
At the level of ecosystems negative consequences are:

- Decrease in the stability of ecosystems
- Decrease in reproductive activity of ecosystems (including fish)
- General decrease in biodiversity
- Loss in recreational potential of ecosystems.

For the human society, negative effects are:

- General decrease in health of population
- Demographic consequences.

Problem Hierarchy - Agriculture



3.1.3. Objectives, Expected Results, Actions and Related Projects

On the basis of the problem analysis the core objective was determined as:

"SUSTAINABLE USE OF LAND AND WATER RESOURCES"

To achieve of the core objective for the sector the following important results have been identified:

- Optimal protection of land and water resources;
- Application of appropriate cattle breading practices;
- Implementation of an appropriate system for fish farming;
- Adequate management of forest resources.

Each of these results can be achieved by undertaking specific activities, which were identified by the participants. Following, existing and planned projects were marked down for each activity. However, there is an obvious lack of projects, therefore, additional projects to implement strategies for pollution reduction in the Ukrainian part of the DRB are clearly needed and a number of projects were proposed.

(i) Optimal protection of land and water resources

To attain this result it is foreseen to undertake activities in the following areas:

- Land use
- Farming systems and technologies
- Irrigation and draining

It is necessary to:

- **optimize land use for agriculture, forestry and pastures.** This activity will be achieved by means of informing the population about restrictions on economic activity in water protection zones and coastal protection areas in terms of Water Code Requirements. It is also necessary to develop a plan for reducing the area of cultivated lands, to organize projects for regulation encouragement in order to establish coastal protection areas in terms of legislation requirements. It is also necessary to implement demonstration projects on cultivated lands reduction, to introduce a river basin management approach, to develop projects and introduce water protection zones and coastal protection areas, to organize public campaigns for recreation of small rivers and to implement sustainable erosion protection measures.

  For this activity, the following projects have been identified:

  Existing/ongoing Projects:

  - *Restructuring of Agriculture and Land Privatization (World Bank)*

    This project provides technical assistance for institution strengthening and capacity building of the sector; for the improvement of legislation, as well as information and training systems and gives input to the land privatization process.
  - *Implementation of the Strategic Action Plan for Black Sea, 1997-98 (GEF).*

    The project supports the development and implementation of policies and measures for the reduction of pollution coming to the Black Sea from point and diffuse (including agriculture) sources and for sustainable use of natural resources (including land) of the coastal zone.

- *TACIS Fund for the Black Sea Environmental Program, 1997-99*

  The main objective is the improvement of the control system for water pollution and the development of methodology of an integrated coastal zone management.
- *Accident emergency warning system, monitoring, laboratory and information management for the Ukrainian and Moldavian part of the Danube Basin, TACIS*

  The project gives assistance to Ukraine and Moldova to develop and participate in the implementation of Monitoring Programs.
- *State Inventory and Monitoring of land (National)*

  This project aims at the development and implementation of the state system of land monitoring, inventory and assessment of land.
- *Rationalization of Land Use (National)*

  Development and implementation of projects aimed at rational land use.
- *Anti-erosion agro-technical measures (National)*

  Implementation of complex of measures aimed at erosion minimization.
- *Improvement of soil fertility (National)*

  Implementation of complex approach for soil rehabilitation.

Proposed Projects:

- *Establishment of the network of training and consulting centers for land users*
- *Pilot projects on relief-ameliorative system of agriculture management*
- *Pilot projects on ecological (organic) agriculture*

- **implement sustainable farming system and technologies.** The most important components of this activity are identifying sites for safe storage and utilization of waste pesticides, assuring appropriate use of chemical fertilizers and pesticides, reinforcing legislation related to utilization and management of agricultural chemicals and developing a system to promote organic (local) fertilizer utilization.

  There are no existing or planned projects. The participants have proposed the following projects:

  Proposed Projects:

  - *Establishment of training system for modern agrochemicals management*
  - *Production and use organic fertilizers.*
  - *Strengthening the control system for agricultural practices*

- **improve functioning of irrigation and drainage schemes.** For this activity, it is necessary to perform analysis of impacts from hydro-melioration on environment, performing ecological expertise of the projects for reconstruction and building of new hydro-melioration installations, meeting rational ecologically based irrigation models. At the same time, audit and analysis of technical conditions of hydro-technical facilities and protection installations of Ukrainian bodies in the DRB have to be carried out.

  Furthermore, this activity includes the treatment of irrigation waters to improve its quality. Standards for return drainage water have to be developed and technologies for the rehabilitation of riverbeds developed and implemented.

  System of economic incentives for water consumers irrigating land has to be developed and implemented as well.

For this activity, following projects have been identified:

Existing/ongoing Projects:

- *Erection of anti-erosion hydro-technical construction and recultivation of land destroyed (National)*

  The objective of this project is to improve irrigation systems and assist in land rehabilitation.

Proposed Projects:

- *Reconstruction of irrigation systems taking into account their impact on the environment*
- *Privatization of irrigation system*

(ii) Application of appropriate cattle breading practices

This important result can be achieved through the implementation of specific activities in the following areas:

- Cattle breeding
- Waste processing and utilization
- Auditing and restructuring of cattle breeding farms

It is required to:

- **regulate cattle breeding activities including private farming.** For this activity it is important to analyze the state of cattle breeding, including private cattle farms. Individual cattle farmers have to be informed on the rules of farming in the river valley and farms and integrated farms have to be removed from coastal and water protection areas. In parallel, it is foreseen to allocate plots for pastureland to improve legislation and regulations on cattle breeding.

  Neither existing nor planned projects could be identified.

  Proposed Projects:

  - *Demonstration projects on environmentally friendly farms*
  - *Demonstration projects on the restructuring of cattle-breeding farms.*
  - *Rehabilitation of deteriorated pasture land*

- **implement an optimal system for the processing and utilization of wastes.** This activity includes the application of straw to absorb waste in cattle breeding, the elimination of waste removal by washing off, the introduction of technologies for processing and utilization of cattle breeding waste and the use of cattle-breeding waste in crop farming.

  Proposed Projects:

  - *Introduction of updated technologies for processing and utilization of cattle-breeding waste*
  - *Creation of Information and Training Centers for advanced farming technologies*

- **carry out ecological auditing and restructuring in cattle breeding farms.** It is needed to develop a methodology of ecological auditing for cattle farms according to ISO 1400. Ecological state of these farms have to be assessed and measures for its improvement developed together with an economic assessment of their implementation, as well as projects on restructuring cattle-breeding farms should be demonstrated.

  For this activity, the following projects have been proposed:

  Proposed Projects:

  - *Ecological audit of cattle-breeding farms with respect to privatization*
  - *Development of a methodology and legislative basis for restructuring cattle-breading farms*

(iii) Implementation of an appropriate system of fish farming

To reach this result it is necessary to:

- **introduce ecological auditing in privatizing of fishery farms.** For this activity it is key to improve legislation regarding fish farming, create a data bank of fish farms which require ecological audit. It is necessary also to create a data bank of fish farm ponds constructed without design documentation and relevant permissions. Methodology for an ecological audit exercise of fish farms (in accordance with ISO 1400) should be developed.

  Proposed Projects:

  - *Establishment of service centers for education and consultation on fish farming.*
  - *Inventory, assessment and rehabilitation of existing fish farming system*
  - *Development of an integrated approach for fish farming (including biodiversity and land protection measures)*

- **optimize technologies of fish farming.** This includes the development of measures on appropriate fish farming, taking into account necessity to reduce negative impact of fish farms on the quality of ground and underground water. Furthermore, ecologically balanced technologies should be promoted. The analysis of causes and development of technologies to eliminate the rise of the ground water table should be carried out.

  The following projects have been identified:

  Proposed Projects:

  - *Demonstration projects on ecologically balanced technologies of fish farming*
  - *Development of aquaculture technologies in fresh water bodies*

(iv) Adequate management of forest resources

In order to attain this result, several activities have to be undertaken in the following areas:

- Use of forest resources
- Restoration and conservation of forest area
- Protected areas

It is needed to:

- **optimize technologies of forest resources use.** This activity can be successful by means of improving control to prevent unauthorized felling. It is also foreseen to develop and introduce a system of economic incentives for no-waste felling technologies use and implementing a complex of measures for informing the people about the consequences of disposal of wastes from felling into the water bodies.

  Existing/ongoing Projects:

  - *Regulated forest-planting for land protection (National)*

  Proposed Projects:

  - *Introduce no-waste technologies for felling*
  - *Public awareness and public information on sustainable forest management*
  - *Alternative energy sources exploitation*

- **introduce measures for restoration and sustainable conservation of forest area.** This includes carrying out ecological expertise of forest restoration and forests recultivation projects. Public forests-planting campaigns will be organized; and financing forest planting in the river banks protection bands.

  Proposed Projects:

  - *Forestation projects for the Odessa Oblast*
  - *Support of public forest-planting activity*

- **expand protected areas.** For this purpose it is necessary to analyze the state of possible protected area. An inventory of territories in the Danube basin, which could be turned into protected areas, will be established and legislation for organizing new protected areas drafted.

  For this activity, the following projects have been identified:

  Existing/ongoing Projects:

  - *Biodiversity Protection in the Danube Delta (GEF), 1994 -1998.*

    The objectives of this project are strengthening of the capacity of the Danube Delta Preserve; strategic planning of biodiversity protection in the Low Danube, as well as research and assessment of new protected area.
  - *Elaboration of the National Strategy for Biodiversity Protection (GEF), 1996 – 1998.*

    This project assists with the formulation and implementation of national policy for the protection and sustainable use of biological resources
  - *Biodiversity conservation in the North Black Sea region (GEF).*

    Through this project, GEF provides research and technical assistance for the establishment of an ecological network and biodiversity conservation in the North Black Sea region.
  - *Conservation of Biological and Landscape Diversity of Bukovyna Carpathians and the establishment of transfrontier ecological network of the borders of Ukraine and Romania (TACIS), 1998 - 1999*

    This project supports agriculture, forestry and the development of eco-tourism in the region.

Proposed Projects:

- *Feasibility study and projects for organizing new protected areas*

In order to achieve sustainable use of land and water resources the ***proposed projects of top priority*** are as follows:

- Establishment of a network of training consulting centers for land users.
- Reconstruction of irrigation systems taking into account their impact on the environment.
- Rehabilitation of deteriorated pastureland.
- Development of a methodology and legislative basis for restructuring cattle breeding farms.

3.1.4. Important Assumptions for the Sector

Important assumptions are factors that are significant for the success of the program but they lie outside of scope of the programme and not under its direct control. Therefore, they could also be described as external factors. However, they are necessary to ensure the success of the program and the sustainability of its results.

Assumptions at the activity level have not been identified. On the result/output level, the following important assumptions to attain the sector objective have been mentioned:

- **Investment in required amounts is at hand**

  This is a universal pre-condition for the proper development and functioning of all sub-sectors discussed above. Yet, to use investment adequately, special regulations and legislation are necessary.
- **Appropriate scientific and technological basis is available**

  The participants considered the current scientific and technological basis in the agricultural sector in the DRB as outdated but potentially available for fast improvement. For this purpose, financial resources and foreign experiences are necessary.
- **Privatization program is implemented before 2010**

  The implementation of this Program will stimulate the development of private initiative and will be an impetus for agricultural production. Thus, the sector will have sufficient resources available for green technologies and environmental protection measures.

These preconditions, however, depend, first of all, on governmental policy as well as on many other circumstances in the sphere of social-economic relation. In this respect, the implementation of the Privatization Program and the realization of measures targeted at strengthening the legislative basis can be fully provided by the Government and local authorities.

3.1.5. Impact Indicators for Sector Results

Objectively verifiable indicators were developed for the sector objectives and sector results. They define the contents of the objectives and result in operationally measurable terms (quality, quantity, target group, partner institution, time period and place). They should give and adequate and precise picture of the situation. Furthermore, they should be measurable in consistent way at acceptable costs.

Impact indicators for sector objectives have already been presented in chapter 2.3.4. For the particular sector results, the group identified the following indicators:

- **From 1998 to 2010, the surface area of arable land in the Ukrainian part of the Danube River basin is reduced by 15 % and agricultural pollution is reduced by 20 %, in comparison with data from 1998.**

  Implementation of advanced technologies in the field of crop production, animal and fish farming will ensure arable land reduction and a decrease of water pollution. The pollution level will be evaluated by a monitoring system.

- **By the year 2010, waste utilization technologies in cattle breeding will be introduced in 50% of the farms in the Ukrainian part of the DRB.**

  The implementation of advanced technologies for waste utilization in animal farms will reduce the general input of organic pollutants to the surface and ground water in the region and will promote the enhancement of soil quality.

- **By the year 2010, water quality indicators in fishponds in the Ukrainian part of the Danube River basin will be adjusted to EU standards.**

  The implementation of sustainable management, improvement, harmonization and reinforcement of relevant legislation and regulations will promote enhancing bioproductivity of the piscicol ponds and increasing surface and ground water quality. Water quality indicators (BOD, nitrates, etc.) will meet EU standards.

- **By the year 2010, forest planting (expansion) will be according to scientifically justified norms. Moreover, there will be an increase in nature conservation forest areas by 50% and clean production technologies will be introduced in all forest farms.**

  The implementation of appropriate forest management technologies and a decrease of arable land will ensure an expansion of forest areas. Increasing the nature protected territories will promote biodiversity conservation and soil rehabilitation.

3.2. Industry

This Sector unites the analysis of manufacturing enterprises, as well as of all other activities which are not covered by the agricultural and municipal sector but which are important sources of pollution in the Ukrainian part of the Danube River basin. Therefore, it could also, as a wider notion, be denominated as "technogenic sphere".

In addition to the immediate producing sphere, the following sub-sectors were included:

- Transportation (by roads, sea and river shipping, railways and pipe-lines);
- Irrigation and other hydrotechnogenic processes (amelioration, bowel exploitation and mining in the river basins, river bed regulation, dredging, sand/gravel mining on the river banks etc.);
- Military sites (including disarmament sites restoration);
- Waste management and treatment (generation, collection, storage, utilization, disposal, burial etc.).

3.2.1. Situation Analysis

3.2.1.1. Importance of the sector and activities leading to water pollution and environmental degradation

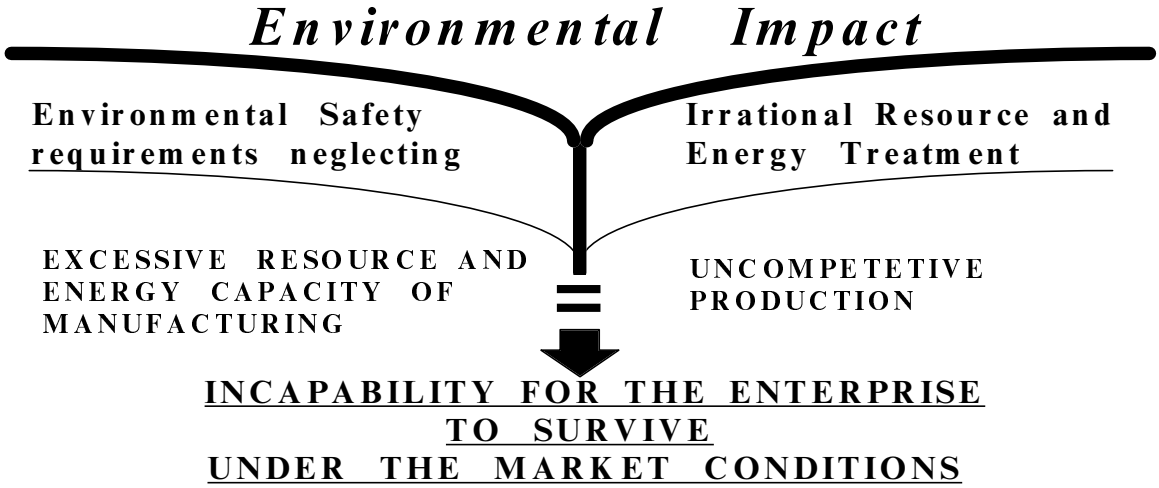
The productive system in the Ukrainian Danube River basin reflects, in miniature, the same features than in the overall Ukrainian economy, as well as in the Romanian, Slovakian, Czech, Hungarian and Moldavian economy. Similar are also the energy and mineral resources, food, construction, machines, electronics and light industries, slate, oil and gas deposits, etc. The particularity of the development in the last 50 years was the rich natural and human resources in the former USSR which were available at low expenses, combined with the absence of market competition conditions under declarative environmental legislation. As a result, the potential of technogenic and environmental disasters is essentially higher than in the western part of Europe.

With respect to this sector, water pollution in the Ukrainian part of the DRB comes mainly from manufacturing wastewater discharge. In industrial areas, this wastewater is often discharged into the municipal sewage system. This peculiarity (in combination with the absence of economic mechanisms for water supply adjusting) stipulates the principal difference in designing, construction and operation of water supply, sewerage and water cleaning equipment. Nowadays, the management of such systems and their effectiveness as a whole become more and more problematic. Such situation is caused by the radical reconstruction of economy and the collapse of manufacturing.

Therefore, industrial pollution prevention in the Ukrainian part of Danube River basin is very complicated and needs a systematic approach for its complex solution.

The industrial sector can be conditionally devised on two main parts:

- Former enterprises which will not further survive (keep the same activity), for instance large electronics plants, and, therefore, they have to be reconstructed through privatization
- Enterprises, which will survive - for example wood and food (sugar, milk, bread, meat, alcohol etc.) production - and which are looking for investments to modernize their technologies and to make their production more competitive.



The main decisions of this economic sector, which are connected with the environment, are shown on the above scheme. All stakeholders: state and local Government, enterprises themselves, foreign and national investors have to concentrate their efforts for such legal, economic and technical policy which will step-by-step improve the situation for the existent enterprises and will use the privatization and investment mechanisms for its sustainable development, as well as to ensure technogenic and environmental safety.

Negative factors affecting the quality of natural water bodies include the following ones: a negligible number of facilities, equipped with water reuse/recycle systems, low shares of water reuse/recycle by many facilities and industries, the lack of necessary quality control of wastewater, the lack of control instruments and devices, etc. As a result, many wastewater treatment plants operate with heavy overload, in some settlements there are no WWPT at all, or they use sedimentation ponds for the purpose (which often are also overloaded).

The State concept to reduce industrial wastewater discharge incorporates three major directions:

- Modernization and update of technologies at timber, paper and pulp facilities (especially at Tersva chemical plans and Izmail paper and cardboard factory);
- Modernization of wastewater treatment installations at timber plants (the cardboard factory in Rakhuv, the paper plant in Kolomyia, timber plants in Svaliava, Perechin, Kuty, Verkhovina, Vorokhta and Dylatyn). These facilities discharge their wastewater directly into water bodies.
- Modernization and construction of pre-treatment installations at facilities, which discharge their waste, water into municipal sewage systems.

The already operational oil pipeline, which crosses Zakarpatska oblast, poses a direct threat of oil pollution in the Tisza, Latoritsa and Uz Rivers. Its impact may result in transboundary water contamination. In 1997, two major accidents occurred in the Zakarpatska oblast (oil leaks covered an area of 16,773 m^3). These accidents occurred at the pipeline part between Uzhgorod and Brody. According to the State Environmental Inspectorate of Zakarpatska oblast, the “Druzba” oil pipeline has major maintenance problems, consequently, necessary measures are needed to avoid more serious emergencies. The expansion of road vehicles and the resulting air pollution are another rapidly growing problem, which affects the Zakarpatska oblast and neighboring regions. Besides, direct adverse impacts on biodiversity, it might also increase environmental pollution (heavy metals, oil derivatives, etc.).

In the following areas activities leading to water pollution were identified by the participants:

Within the management of industrial discharges a poor pollution prevention policy inside and outside the enterprises can be observed. Furthermore, the production and water cleaning equipment is often outdated and outworn. The environmental impact can be direct - river water pollution - or more complicated, such as acid rain, as a result of gaseous discharge mixing, as well as groundwater pollution by solid waste. Moreover, the inadequate management leads to hazardous and uncontrolled mixes of different discharges, both into the sewage systems of the enterprises and immediately into the river basin.

Water and road transport operations are characterized by the low level of transportation technologies, equipment, rolling-stock and package safety, by an obsolete normative basis, checking system and by the absence of waste treatment systems for all types of transport (for example - collecting and treating ballast water of civic and military vessels). Further, often fuel and lubricants leakage occurs. The danger of pollution is high, both from the constant operation and from accidents (roads, railways, shipping and pipeline breakdowns). Similar to the previous area, its impact can be direct through the immediate discharge into the river and indirect through air pollution transfer.

The impact of irrigation consists of an unbalanced water use, as well as the direct pollution from dredging technologies and from the dumping of dredging products. More specific consequences come from activities such as mining and quarry of mineralized waters, as well as sand and gravel mining at the riverbanks.

The impact of military sites has similar features as the above-mentioned activities (especially in the area of industry and transportation). However, specific for this field, is the high concentration of hazardous substances and their storage, as well as operation or dummy maneuvers. A system for certification and environmental impact assessment is not available. The weapon disarming is disordered and an adequate system for storage, treatment and burial of the poisonous substances is absent.

With regard to waste management, the new adopted Ukrainian Law “On Waste” for the management of all types of liquid, solid and gaseous waste is to mention. Today, though, the system of waste detection, minimization, identification, classification and certification is in an embryonic stage. Also, the development of waste management information technologies and databases for waste treatment technologies has only started (especially for the reduction of waste generation, as well as the maximum utilization or de-contamination of waste inside the enterprises).

A strong regulation system for waste treatment, control and especially clarified tariffs, both for solid waste collection and for wastewater acceptance at municipal WWTPs is absent. Today, the system of dumps, landfills, industrial waste keeping yards and other waste treatment units is disordered, so is the wide usage of eligible waste collection and disposal technologies. The quality of waste treatment facilities (technologies and equipment) is very poor. One of the consequences is that waste decomposition filtrates constantly diffuse into rivers and ground water.

3.2.1.2. Current strengths/assets

The participants mentioned the following current strengths and assets to rely on when measures were to be undertaken to mitigate the negative consequences of industrial activities:

- **Legal framework**

  An important achievement in this area was the adoption of the National Program for Water Supply and Canalization System Development (No. 1269) by the Ukrainian Government on 17.11.1997. Moreover, new mechanisms were developed and implemented under the new Ukrainian Law “On Waste” and in the framework of the National Program for Industrial and Consumption Waste Utilization, adopted by the Ukrainian Governmental order on 26.06.1997 (No.628).

However, national and municipal regulations, standards and normative could be systematized under the existent Ukrainian legislation (especially the chapters in the Laws and Codes which stimulate pollution prevention). Also, the legal system could be further improved towards harmonization with EU Directives and Standards, and the interior normative basis of the enterprises could be enhanced through the process of the ISO 14000 system implementation.

- **Modern wastewater treatment technologies**

  Modern wastewater treatment technologies exist and they may be consequently implemented in all stages of the water use cycle, starting from water supply sources and finishing by the final impacts on natural water resources. There are a lot of opportunities for stimulating their implementation by local authorities, monitoring organizations and by the enterprises themselves.

- **Human resources**

  A lot of Ukrainian professionals, as well as foreign experts can be involved in the framework of international programs and concrete projects in the area of water system monitoring, water supply and protection.

- **Training system**

  The existent training level in the Ukrainian institutions and colleges provide a good basis, both for education and for postgraduates. There are also opportunities for cross-border experience exchange.

- **NGO activity**

  The steady growth of NGO activities ensures their real support in the field of independent expertise, mass-media information and public awareness. Moreover, environmental awarding activities, training and education can be realized by official structures, as well as NGOs.

- **Identification and Standardization System for liquid waste**

  The Identification and Standardization System for liquid waste in all sectors of economic activity can be implemented in all branches of management, production, services and control on the basis of the existent Ukrainian and CIS (former USSR) standards and normative acts. This can be further improved through the harmonization with modern ISO and European (CEN) developments.

- **Reserves to reduce material and energy consumption of enterprises**

  As earlier mentioned, there are large reserves for the minimization of energy and resource capacity of manufacturing and production (including the use of cleaner production approaches etc.).

- **Participation in international agreements**

  The integration of Ukraine into the general European Process as well as the Ukrainian regional initiatives (Black Sea, EcoEuroRegion etc.) give a good opportunity for experience exchange and foreign help. In order to further deepen this cooperation it is very important to use the requirements of privatization and investments procedures. Those procedures are to include high level expertise and audit, as well as modern systems for appraisal and risk assessment.

3.2.1.3. Analysis of transboundary effects

The expert assessment allowed identifying several transboundary effects, which affect adversely the water quality in the Ukrainian part of the DRB. The **failure to meet requirements of international agreements and conventions** signed by Ukraine can lead to a loss of EU support and other kinds of foreign help. **Increasing risks of transboundary technogenic and ecological accidents** are mostly defined by the absence of bilateral and multilateral agreements for joint

planning, prevention and operation for the general safety and concrete disasters. A **disordered mixture of air pollutants from enterprises** can provoke a complex impact in the DRB, which may be exacerbated by a combination of air and water transfers. **Transboundary transition of materials from riverbed excavation (including pollutants)** may generate environmental consequences. Moreover it may even cause territory complications as it was shown in the Ukrainian - Romanian sector of the Prut River near the village of Zeleniy Gaj in the Chernivtsy Region and on the Ukrainian - Moldavian coast in the Estuary of this river on the border of the Odessa Region. If there are no agreed monitoring and border control systems, **materials transition due to emergency situations** may become a major problem.

3.2.2. Sector Problem Analysis

3.2.2.1. Core problem

As a result of the above mentioned situation analysis the core problem of the industrial sector was formulated by the participants as:

"UNSUSTAINABLE TECHNOGENIC ACTIVITIES"

3.2.2.2. Causes leading to environmental problems

The problem can be characterized through the alterable legal, technical and economic basis for these activities that are now in the stage of fierce changes. The influence of the Danube Program in combination with other aspects may play a crucial role in this direction.

The direct causes leading to unsustainable technogenic activities are as follows:

(i) Pollution related to excavation and dredging

This problem is due to water intakes for irrigation and dumping and utilization of dredged materials.

a. Water intake for irrigation

The high level of water intake for irrigation is due to the **lack of modern scientific approaches** in bottom excavation, the **excessive number of dams** (over-regulation) and the **straightening of tributaries** (canalization).

b. Dumping and utilization of dredged materials

The use of obsolete and unsafe technologies for **dumping and soil utilization** after bottom excavation causes substantial environmental consequences. The utilization of **by-products from dredging and mining**, which are disposed in the river basin is closely connected with the waste management problem. Quarries and water discharges from mines into the river basins and especially on the riverbanks also belong to activities, which contaminate water resources. This problem, together with the above is caused by a non-observance of scientific principles for nature which also leads to the inappropriate use of mineral resources.

(ii) Inadequate industrial processes

Unsustainable use of raw materials and energy resources and use of obsolete technologies in industrial processes have main contribution to the inadequate industrial practices.

a. Use of obsolete technologies in industrial processes

Use of obsolete technologies in industrial processes is caused by several factors, the most important of which is the **improper economic and taxation mechanism** interfering with companies who feel responsible for the environment. The lack of economic incentives along with the deep economic crisis does not allow companies introduce modern technologies.

b. Unsustainable use of raw materials and energy resources

According to Ukrainian experts' calculations, Ukrainian companies use 8 to 10 times more electricity per product manufacture than Western ones. This is only possible under conditions of a state regulated economy and an underdeveloped private sector. **Structures are interested in the final product and pay no attention on the harm they cause to the environment.**

(iii) Inadequate waste management

This problem is closely related with inadequate wastewater treatment facilities (i.e.) and insufficient industrial solid waste management

a. Inadequate wastewater treatment facilities

By wastewater treatment the participants understood both, the preliminary sewage processing inside the industrial technological cycles and their further treatment on the municipal wastewater treatment plants. Inadequate wastewater treatment facilities are one of the major components in waste management leading to an increasing load on the environment. Under conditions of a dramatically complex economic situation in industry, the introduction of new technologies and the reconstruction of waste treatment facilities up to required capacity is getting more problematic. **Undeveloped legislation and contradictory regulations play a major role in contributing to this process**.

b. Insufficient industrial solid waste management.

Industrial solid waste management is insufficient due to the **absence of information on technologies for waste treatment**. This leads to the use of hazardous technologies for waste "destruction" such as burning of dangerous waste etc. The other problem is that there are no agreed actions of the various institutions responsible, on the one hand, for the construction of waste treatment facilities and, on the other hand, the construction of industrial facilities. This leads to a **disordered placement of waste treatment units**. Two more reasons for the insufficient industrial solid waste management are closely interconnected. One is the **underdeveloped system of waste disposal** the other is the **poor quality of treatment facilities**. Both of them can be explained either by a lack technologies or funds to develop and introduce them.

(iv) Pollution due to the transport, as well as military sites

It is caused by pollution from to military sites itself and pollution from water and lands transport activities.

a. Pollution related to military sites

Problems connected with military sector activities are of great importance, however, information has been only recently released to the public. There is still a high level of secrecy in this area which is no surprise taking into account the whole preceding

background of the Soviet Union. Causes for the pollution related to military sites are the **overloading of treatment plants with military waste**, as well as **discharges and leakage of fuel and lubricants**. This is due to the **insufficient control** from the part of competent state bodies and the public. Nowadays, certain changes towards improvement are obvious (e.g. special environmental programs for the army) although monitoring of military sites is still inefficient. Moreover, there is a necessity for modern technologies for the safe utilization of old military equipment, as well as for the restoration of former military sites.

b. Pollution from water and land transport activities

One factor of pollution from water and land transport activities is **the pollution from oil pipelines** (accidents at the Druzba pipeline were earlier described in the introduction). Another problem is the **discharge of ballast and washing water from vessels** and the **inappropriate transportation of industrial products**. It should be noted that both transport itself, as well as materials being carried by means of transportation could lead to water pollution. The main environmental impacts of transport and military activity are the losses of oil and lubricants. This impact multiplies if extraordinary disasters happen with the large oil or chemicals railway, lorries, ships or spills by military activities. A similar danger is connected with poisons, pesticides and other hazardous substance transported or used in military activities.

3.2.2.3. Environmental effects

The direct effects of the core problem encountered in the industry sector have been identified in the Workshop as follows:

- **Salination of soils as a result of watering (amelioration)**

  Salination of soils is a result of inadequate irrigation activities, as well as a consequence of the general water pollution, especially by high mineralized mining waters. The water intake for irrigation, as well as amelioration processes cause an aggravation of water pollution, an alteration of the surface and ground water level, salting of soils and a loss of biodiversity.

- **Erosion Process**

  Erosion processes were caused/accelerated by industrial, transportation, military and hydro-technical activities, both direct and in combination with natural processes (winds, floods, native riverbed changes etc.). The deposit exploitation, as well as sand and gravel extraction in the river basins, in combination with mineralizing mining waters discharged into rivers cause powerful erosion processes. These processes can not only aggravate the situation in the Danube River bed, but even lead to processes in watersheds such as karst phenomena.

- **Environmental Pollution**

  There are a lot of specific environmental effects from industrial activities as for instance, the adverse allocation of energy production sites, which can become a cause for acid rain. Direct industrial pollution and the accumulation effects have, as a result, the quantitative and qualitative aggravation of all water resources, the alteration of the surface and ground water level and a reduction of the self-purification ability of the water systems. Practically, all environmental consequences, except for erosion, are due to bad waste management. It is necessary to take into account the latent accumulation of degradation impact factors as a consequence of the combination of local industrial water, air and soil pollution.

- **Disturbed functioning of the ecosystem**

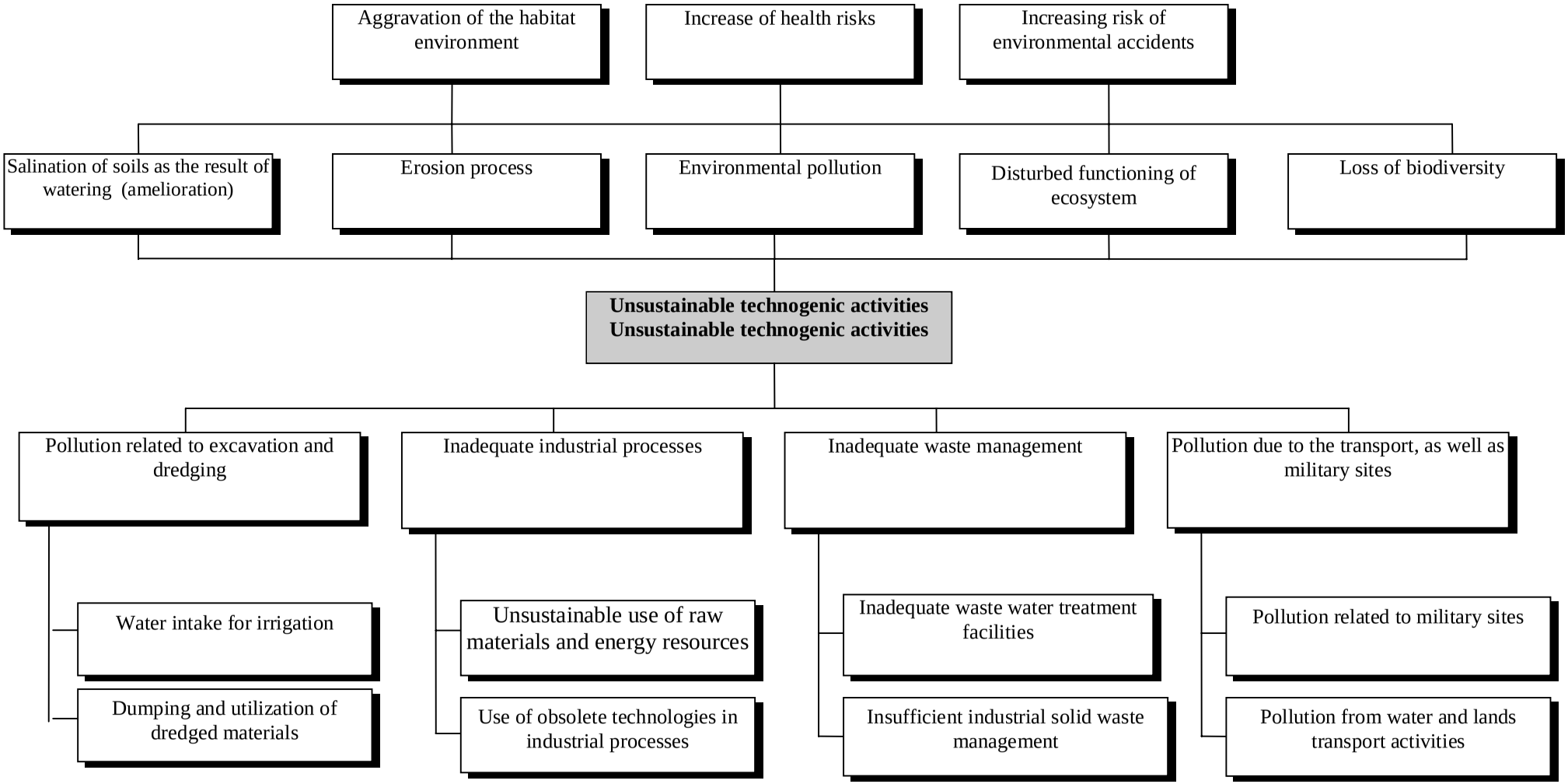
  Simultaneously the technogeneous environmental impacts cause a degradation of bottom biocenoses and a disturbed functioning of ecosystems. One of the results is the reduced Aquatic Systems productivity.

- **Loss of biodiversity**

  The loss of biodiversity is based on the absence of complete scientific principles for the use of nature and the consequence water tariff policy. There are a lot of examples such as the unbalanced forestry, flora oppression and fauna misbalance

All of the above-mentioned environmental impacts lead to the aggravation of the habitat environment, an increase of health risks, as well as an increase of disasters and emergency risks. The latter may be a result of disordered water cleaning silt deposits on river banks under flood threat, taking into account that the hydrological situation in these basins is additionally complicated by precipitation (snow and seasonal rain in the Carpathian Mountains) and that the peaks of floods in 1914, 1969 and 1974 exceeded 6 m.

Problem Hierarchy – Industry



3.2.3 Objectives, Expected Results, Actions and Related Projects

The Sector Objective for the industrial core problem has been defined by the participants as:

"TECHNOGENIC ACTIVITIES OPTIMIZED"

To achieve of the core objective for the industrial sector the following important results have been identified:

- Implementation of appropriate hydro-technical activities
- Adoption of modern technologies for goods production and dealing with wastes
- Optimization of transport and military objects

(i) Implementation of appropriate hydro-technical activities

To obtain this result, several activities have to be undertaken in the following fields:

- Water intakes
- Sustainable technologies
- Use of mineral resources
- Scientific base of technologies development

It is foreseen to:

- **optimize the water intake**. This activity includes introducing regulations and economic measures (tariff system, normative etc.) in order to stimulate industrial enterprises to use a closed water supply. Furthermore, it is important to increase control and metering of water intake on all stages of the complete water usage cycle, both outside and inside of the enterprises and to improve control, metering and economic incentives. These actions are required in order to bring down water losses with simultaneous information and education support of water saving technologies. Also it is necessary to stimulate measures in order to decrease net water consumption in agriculture and to stimulate measures for the introduction of meters in the municipal sphere.

  The experts' analysis has shown that this approach is practically new for the former extensive system of the economy. For the time being there are ***no existing or planned project.***

  Two projects are proposed ***for review:***

  - *Improvement of the Project for Danube water supply South Ukraine for irrigation purposes;*
  - *Development of Danube water treatment technologies to remove suspended pollutants.*

- **apply sustainable technologies**. For this activity, it is key to carry out independent expertise of feasibility studies of projects on the basis of the modern audit and life cycle assessment approaches, as well as the ordered national legal and normative system. Also, it is important to introduce technologies for the rehabilitation of river beds, to develop methodologies for complex cost assessment of ecological consequences of projects, including the environmental impacts and risk evaluation and to inform the population about negative consequences of the unauthorized changing of water bodies configurations through official activity and NGO actions. Lastly, it is necessary to develop technologies for the utilization of hydro-techniques waste technologies as part of the general implementation of waste minimization and a waste management system.

For this activity, the following projects have been identified:

Existing Projects:

- *Danube bank stabilization in emergency sites*
- *Renewal of emergency parts in Danube check dams*
- *Integrated long-term program to prevent flooding in the Ivano-Frankivsk region (1994 to 2000)*
- *Integrated long-term program to prevent flooding in the Zakarpatska oblast)*
- *Integrated long-term program to prevent flooding in the DRB (Odessa oblast)*

Planned projects:

- *Measures on the elimination of flooding consequences on the drinking water facility Knyazdvir for Kolomyia City (riverbank protection).*
- *Riverbank protection of the Prut around the pumping station 2 (Kolomyia City).*

Proposed projects:

- *Development of new technologies for riverbed excavated soil processing.*
- *Develop technologies for riverbed rehabilitation.*
- *Prepare and distribute a set information materials about the role of coastal protection zones*
- *Develop and implement pilot projects for small rivers' beds rehabilitation.*
- *Develop and implement an integrated program for measure on the ecological improvement of water collection of the Prut River.*

- **introduce the sustainable use of mineral resources**. This may be materialized by minimizing mineral resource mining in river beds and riparian lands; stopping discharging of untreated water from mines into open water bodies and stopping the placement of mining waste in the riparian lands. Further, it is needed to stop pumping water from mines, which results in karst processes, as well as to develop and implement technologies for ecologically safe utilization and disposal of mining industry wastes in river basins as a part of the general system of waste management in Ukraine.

  The experts' assessment has shown that there are no ***existing or planned projects*** for the time being.

  Proposed Project:

  - *Prevention of the karst rock formation in the Dnestr-Prut water sections.*

- **undertake measures for development and introduction of technologies on the basis of scientific criteria.** For this activity, it is necessary to organize international basin expert groups to harmonize technologies of hydro-technical activities, which can operate on a constant basis in the framework of the new EcoEuroRegion. A system of unified and local criteria for sustainable water use in the river basins of the Danube system should be developed as well as a common database in hydro-technical technologies and methods to assess their impact to be used in the Danube countries. Furthermore it is important to develop criteria and methodology for international economic and legal assessment to stimulate the implementation of ecologically safe technologies; holding international scientific conferences on water management in all the countries of the Danube basin. In this context stakeholders in the use of technologies should be assisted on the basis of scientific criteria through the existent requirements of the Ukrainian legislation.

The following projects were identified by the participants:

Existing Project:

- *Pilot project for the improvement the Concept of Water Supply in Chernivtsy (TACIS N-1769/69)*

Planned Projects:

- *Program of the enterprise "Danube-Dnipro".*
- *Pilot project for sanitation and reconstruction of the sewage network in Chernivtsy, including the prevention of the bank slippery cases*
- *Approved National program for ecological improvement of the Danube River.*

Proposed Project:

- *Development and implementation of an automatic water quality control system*

(ii) Adoption of modern technologies for goods production and dealing with wastes

In particular, to achieve this result, several activities have to be undertaken in the following areas:

- Production
- Technologies
- Regulations
- Waste management
- Treatment technologies

It is required to:

- **reduce/reuse/recycle in production.** This activity foresees to consequently introduce the assessment of material and power balance in technological industrial processes in accordance with the principles of life cycle assessment (ISO 14040). In this frame it is necessary to stimulate measures to recycle materials and power agents in industry using regulations and economic incentives, to develop a system of databases on power saving technologies for main types of industries and services which are typical for the Danube basin. It is important to conduct researches and develop information technologies on wastes and secondary power agents for use instead of natural materials and power at the typical industries in the Danube basin. Series of scientific and technical workshops of the Danube countries should be held, dedicated to power saving in the main branches of economic activities in the country.

  The following projects have been identified:

  Planned Projects:

  - *Complex use of wood raw materials with green technologies at the Tereasviansky Wood Processing Plant*
  - *Complex use of wood raw materials with green technologies at the Velykobichkovsky Wood Processing Plant*

  Proposed Project:

  - *City Twinning project for Chernovitska region, based on the Life Cycle Assessment tools.*

- **improve technologies.** This means to develop an information base on the typical kinds of economic activities, industries and basic technologies which influence the state of the Danube basin ecosystem, to organize expert groups and e-mail conferences on the types of economic activities to exchange information and contribute to new technologies introduction. This can be done in the framework of the Ukrainian-Romanian-EcoEuroRegion. Moreover it is important to organize training for staff and conditions for experience exchange between sister industries on using economically and ecologically acceptable technologies, to compile in the Danube basin a catalogue of closed water use systems and recommendations on the implementation for the typical kind of economic activities and to hold workshops and e-mail conferences on the experience of modern technologies implementation.

  Planned project:

  - *Assessment of environmental protection measures implemented in the Danube basin regarding the impact on the southwestern part of the Black Sea.*

  Proposed project:

  - *Switch from contemporary technology to a technology based on clean production principles or change of production profile at the Izmail pulp and paper plant.*

- **enforce regulations.** To enforce regulations it is necessary to carry out inventory and revision of regulations on industrial and environmental protection activities in order to harmonize them with EU regulations and on the transboundary level. In this context it is also important to review regulations on water use by international experts in order to harmonize them and decrease the environmental impact.

  In the Danube countries harmonized requirements should be developed for measuring and control of water quality on all stages of water cycle on the basis of the general LCA approach. Technologies for ecological monitoring in the Danube basin have to be harmonized as well on the basis of EU Directives and the revision of the former Council of Economy Mutual Assistance documents. Also, it is key to harmonize regulations and/or develop manuals for emergency situations classification, preventative measures and plans of consequences liquidation in the transboundary regions of the Danube River basin.

  The enforcement of the legal basis and regulations is the only way to provide the realization of the proposed system of projects. It foresees three levels for this activity:

  - *The national legal base in Ukraine and its harmonization with EU Directives and Standards.*
  - *Regional regulations (for example, the Order of the Chernivtsy Regional Council on 19.08.1997 approving Zones for Sanitary Protection of Water Supply Sources is a long term sanitary-technical measure for the Prut River).*
  - *Cross-border agreements (such as the Ukrainian - Romanian - Moldavian EcoEuroRegion proposal agreed on the summits in Izmail in 1997 and in Jalta in 1998), which gives the opportunity to agree the national approaches and to develop joint mechanisms for the realization of international Conventions.*

  Planned Projects:

  - *Pilot implementation of the Austrian ECOPROFIT Programme in the EcoEuroRegion as a facility for ISO 14000 and CIS waste management standards*

  Proposed Projects

  - *National and regional legal basis inventory.*

- **apply an appropriate system for dealing with wastes.** This activity implies to implement a step-by-step classification system and wastes certification according to the types of economic activities to comply with the law of Ukraine "On wastes" and the system of GOST (State Standards) 17.0.005. Further, it is important to develop technical and economic incentives to bring down waste generation in the main types of industries in the Danube basin on the bases of their material and power balances according to ISO 14040, to develop international automated databases on technologies of dealing with wastes according to CIS GOST and national Standards (DSTU), to develop and step by step introduce experimental basis stimulating economic measures which are foreseen in the law of Ukraine "On waste" and to hold workshops and e-mail conferences on technologies for dealing with wastes in the Danube basin.

  For this activity the following project were defined

  Existing projects:

  - *Landfill for communal solid wastes in the town of (second phase)*
  - *Waste management system in accordance with State Standards (GOST):*
    GOST-17.0.0.05.1 (DSTU 21.95.1)
    GOST-17.0.0.05.2 (DSTU 21.95.2)
    GOST-17.0.0.05.3 (DSTU 21.95.3)
    The specified documents, together with the "System of Nature Protection Standards" of the former USSR, make it possible to form a new united system of standards well harmonized with ISO 14000.

  Planned projects:

  - *Development of the methodological background to establish sectoral classification of waste.*
  - *Development of the methodological background to create a database on waste management technologies.*
  - *Review and improvement of the environmental safety of sludge formation at the Chernivtsy enterprise "Vodokanal"*

  Proposed projects:

  - *Further development and implementation of standards, norms and corresponding software to ensure their active use.*

- **upgrade the quality of treatment technologies to meet the requirements of environmental quality.** To upgrade the quality of treatment technologies and to meet the requirements of environmental quality it is necessary: to carry out an inventory of local treatment and pre-treatment facilities of industries to assess their correspondence to existing and prospective technologies and requirements for ecological safety on the next stages of water cycle, to improve inner systems for liquid wastes collection in industries to prevent them from mixing which will make their qualitative treatment impossible.

  Also, it is needed to improve the system of metering and quality control of industrial wastes discharged to the municipal treatment facilities, to introduce municipal treatment facilities of flexible technologies in order to react to the changes in municipal and industrial wastes composition and to introduce technologies for methane extraction and sludge of treatment facilities for its further utilization and stopping of silt grounds organizing on the river banks.

For this activity, the following project have been identified:

Existing Project:

- *Completion of the discharges' collector from Luzansk industrial area to the Chernogove waste treatment plant*

Planned Projects:

- *Investment project for the Luzhansk alcohol plant reconstruction regarding processing biowaste into fertilizers*
- *Development of the requirements to decrease the antropogene load on the Danube taking into account requirements for Black Sea rehabilitation.*
- *Assessment of nature protection measures in the DRB regarding the impact on the Black Sea*

Proposed Project:

- *Project for the construction of the plant for dehelmitology and sludge from treatment plants and closure of the sludge sites at Chernivtsy treatment plants.*
- *Removal of oil products from water (technology development).*

(iii) Optimization of transport and military objects

To achieve this result several activities have to be undertaken in the following fields:

- State of ports and marine equipment
- Assessment of military sited
- Reliability and safety of transport

It is required to:

- **improve the state of ports and marine equipment (military and merchant vessels) in order to meet MARPOL requirements.** For this activity, it is important to organize an international bank of technologies for dealing with wastes from vessels, both in the sea and in ports, to attract investments from international funds in order to build wastewater reviewing facilities in the Danube ports, to purchase equipment in order to comply with international standards for combating oil spills as a result of accidents, to introduce an additional ecological tax for the ports which do not have receiving facilities for wastewaters, to make bilateral and multilateral agreements on the prevention of pollution from river transport, to develop an international classification catalogue of wastes from navigation including internationally accepted technologies of dealing with these wastes and to modernize the navy.

  For this activity, the following projects have been identified:

  Existing Project:

  - *Program of measures regarding the implementation of the Black Sea Convention*

  Proposed project:

  - *Study of international experience of elimination of oil spills and its implementation in Ukraine*

- **assess the impact of military sites on the state of the environment.** This means to develop a methodology for ecological certification of military sites on the basis of interstate standards, to establish a catalogue of wastes from military activities and

technologies of dealing with those wastes, to elaborate a classification guide for emergency situations in military sites, their potential environmental impact and measures for prevention. Furthermore, it is key to generalize international experience and develop recommendations to decrease the impacts and risks from military activities in the Danube River basin and to make available issues of technogenic-ecological safety of military activities available in the Danube River basin through scientific and technical conferences.

For this activity, the following projects have been identified:

Existing Project:

- *Program of measures regarding the implementation of the Black Sea Convention*

Proposed Projects:

- *Development of an impact assessment from military sites on the environment*
- *Development of a methodology for ecological standardization of military sites*
- *Development of a classification of emergency cases in military sites.*

- **increase reliability of transport means and safety of transportation technologies.** This activity includes the establishment of a system of classifying guides on emergency situations in different kinds of transport in the Danube basin and a program of measures to increase their technogenic ecological safety. Also, it is important to develop a system of classifying catalogues of wastes and technologies dealing with them in different kinds of transport in the Danube basin, to organize an international expert group and develop a common action plan in order to decrease the technogenic load in trans-european transport corridors in the Danube basin. It will be necessary to elaborate recommendation for ecologically safe automobile tourism in the countries of the Danube basin, as well as to introduce automatic radiological transboundary traffic security in the transport corridors.

  In addition to the already ***existing project*** specified in the "Program of measure regarding the implementation of the Black Sea Convention", the ***proposed projects*** are as follows:

  - *Develop a system of classifying catalogues of wastes and technologies dealing with them in different kinds of transport in the Danube basin.*
  - *Creation of the international common action plan to decrease technogenic load in trans-European transport corridors in the Danube basin.*

Besides the already planned projects in the industry sector, out of all proposed projects the following were considered to be of ***high priority:***

- Further development and implementation of standards and norms regarding waste management and corresponding software to ensure their active use.
- Switch from contemporary technology to a technology based on a clean production principles or change of production profile of Izmail pulp and paper plant."

3.2.4 Important Assumptions for the Sector

Important assumptions are factors that are significant for the success of the program but they lie outside of scope of the programme and not under its direct control. Therefore, they could also be described as external factors. However, they are necessary to ensure the success of the program and the sustainability of its results.

Assumptions necessary at the activity level to achieve the expected results/output have been identified as follows:

- **Health protection regulation is observed**

  One of the major problems inherited by the Ukraine from the times of the Soviet Union is the deep contradiction between declared legislation (articles of a law) and the execution of declared legal principles. Unfortunately, when legislative power is adopting new laws (which is positive in itself and builds a legal field for activities), supervision on the enforcement of these regulations has still not been provided. Assertion of violated public rights in the court also seems problematic due to the lack of independence of judicial power from state bodies.

  All the above-mentioned can be completely applied to regulations relevant to health protection. It is a widespread practice that human health and the environment are brought into dependence on the so called "state interests". Thus, giving effect to mechanisms which will change the declarative character of health protection regulation and make it working, will allow implementing health protection principles which have been already put into the Ukrainian legislation and to use them in full to achieve the goals of the Danube Program.

- **Mechanisms of economic stimulation of industries are working efficiently**

  When the market works, the market itself is a mechanism of economic stimulation for the creation of products which lead to less pollution of the environment and, therefore, being granted with more chances to be sold. It proves once more an assumption that only deep structural changes in the economy and reforms following them may build conditions to successfully and completely implement the program.

- **Ecological education of people is growing**

  Often not only the public but also officials in the industry are not informed of the environmental situation in the country, having no idea where to obtain relevant information and about places where to apply for it. Therefore, ecological education is the first step to create public awareness and attract the public to solve the problems of contamination in the Ukrainian part of the DRB.

On the result/output level, the following important assumptions to attain the sector objective have been mentioned:

- **Structural changes in economy are taking place**

  There is no secret that only a good economic basis is the ground for all kinds of reforms in industry, modern technologies development and implementation, which gives a good opportunity to dramatically reduce waste generation, as well as to apply clean production principles. A strictly regulated economy without a private sector cannot manage to deal with the growing human-made pollution load on nature and man. Moreover, it itself leads to this growing load, as its expansion is focused on manufacturing only a certain type of product, regardless of its cost, its harmful effect on the environment and human health.

- **Market mechanism in economic sphere is working**

  Only structural changes in the economy such as the launch and active growth of the private sector and the establishment of a market mechanisms in the economic sphere etc. will allow to reduce the negative influence of industry on the environment and human health. This will lead to the fact that economic stability in the country will be growing.

  Economic stability along with the other mentioned economic factors prove a reconstruction of the economic system in Ukraine. Economic stability is a factor for possible foreign investors to decide on the attractiveness of investment. Moreover, only economic stability in the country will allow to judge the effectiveness of taken measures to improve environmental situation. Further, the economic stability is a criterion to judge whether mechanisms for the economic stimulation of industries are working efficiently. The lack of market mechanism not only provides conditions for ineffective funds utilization and repels possible investors but also directly leads to the fact that state funds are being invested in obsolete production contaminating the environment and prevents the introduction of modern environmentally friendly technologies.

3.2.5. Impact Indicators for Sector Results

Objectively verifiable indicators were developed for the sector objectives and sector results. They define the contents of the objectives and result in operationally measurable terms (quality, quantity, target group, partner institution, time period and place). They should give and adequate and precise picture of the situation. Furthermore, they should be measurable in consistent way at acceptable costs.

Impact indicators for sector objectives have already been presented in chapter 2.3.4. For the particular sector results, the group identified the following indicators:

For the **sector result**, formulated as **implementation of appropriate hydro-technical activities** the following impact indicator was proposed:

- **Trough implementing appropriate hydro-technical activities in 50% of the industries in the Prut River basin, the discharge of solid substances decreases by 25% in 2010, compared with the year 2005**

  Unfortunately, strict economic limitations do not allow to implement these measures in all industries of the Prut River basin. Therefore, the implementation in 50% of industrial enterprises seems to be a realistic target. It is necessary to note, that only the application of necessary hydro-technical activities may ensure a reduction of the discharge of solid substances, contemporary applied ones may even increase these discharges.

For the adoption of modern technologies of goods production and dealing with waste, the following impact indicator was proposed:

- **As a result of changing the profile of the Izmail paper mill, the quantity of phenols in the Kilia Arm of the Danube decreases by 10% before the year 2010, compared with data from 1998**

  It is the Izmail paper mill, which is the major source of pollutants, phenols, in particular into the Kylia arm of Danube. Therefore, reduction of phenols will confirm either a switch to cleaner technologies by the plant, or changes in its production profile.

For the **optimization of transport and military objects,** the following impact indicator was proposed:

- **The concentration of oil products and heavy metals in the ecosystem of Danube is decreasing by 20% before the year 2010, compared with data from 1998**

  Transport and military objects are well known sources of oil and heavy metal contamination in the Danube basin. Only the optimization of their operations may result in a reduction of impact of these pollutants on the ecosystem.

3.3. Municipality

Water pollution associated with the municipal sector is one of the major sources in the Ukrainian part of the Danube River basin. However, is has to be noted that the problem is manifold due to the fact that in several settlements industrial wastewater is discharged into municipal sewage networks. These discharges are often not pre-treated. Therefore, it is almost impossible to solve the problem of municipal wastewater as a separated one, without addressing industrial wastewater discharges. Water pollution in the municipal sector is mainly caused by the almost non-existent wastewater treatment facilities in minor settlements.

3.3.1. Situation Analysis

3.3.1.1. Importance of the sector and activities leading to water pollution and environmental degradation

In the Ukrainian part of the Danube River basin, towns with a population of more than 100,000 inhabitants are the major producers of domestic waste (e.g. Chernivtsy, Izmail and Mukachevo). Here, the capacity of municipal wastewater treatment plants is two times lower than necessary (Kolomyia town with 70,000 inhabitants might be also classified into this category). In the region, 20 small towns with a population of more than 10,000 and 40 minor settlements and villages with a population of less than 10,000 are in need of constructing new WWTPs or reconstructing the existing one.

With respect to the State policy for pollution reduction, it is worth noting both short-term (up to the year 2000) and long-term (up to the year 2015) directions.

The main short-term directions might be defined as follows:

- Development and implementation of environmental standards of water quality;
- Development and implementation of the State system for water monitoring;
- Introduction of adequate user charges for water pollution and water consumption.

The following main long-term directions were adopted:

- Integration of environmental legislation of Ukraine into an Environmental Code and its harmonization with EC legislation;
- Improvement of water use management efficiency by introducing the basin principle.

It would be appropriate to divide the Ukrainian part of the Danube basin area into 3 regions. Every region has some particular features of municipal wastewater discharges.

(i) Tisa River basin (Zakarpatska oblast)

In the region only Beregovo, Irshava and Dubove have adequate wastewater treatment facilities. The municipal WWTPs in Uzhgorod and Mukachevo are overloaded (in Mukachevo more than twice their capacity). These treatment facilities cannot ensure due level of wastewater treatment and discharge more than 117 million m^3 of untreated wastewater annually into the Tisa and Latorytsya Rivers. In the Zakarpatska oblast, only 13 small towns have wastewater treatment plants (46 per cent). From overall 561 villages only 3 have these facilities (1 per cent).

(ii) Prut River basin (Ivano-Frankivska and Chernivetska oblasts)

The Ivano-Frankivska oblast has a rather low number of wastewater treatment systems. In the towns of Verkhovyna and Zabolotov, these facilities are under construction, in Yaremcha and Vorohta these facilities are only at design stage. Overall oblast-wide discharges of contaminated water reach 68,000 m^3 per day. Recreation sites, located in Vorohta town make a major contribution into wastewater discharges. Already operational WWTPs in the towns of Kolomyia and Sniatyn are overloaded twice their capacity. In Kolomyia town a part of wastewater is discharged into the Prut River, practically untreated (7,000 m^3 per day). Demand for additional capacity for wastewater treatment in Kolomyia reaches 30,000 m^3 per day.

In the Chernivetska oblast, municipal wastewater treatment facilities in Chernivtsy City (with a capacity of 128,000 m^3 per day) are overloaded in peak load times. Moreover, their efficiency is lower than projected.

(iii) Danube River mainstream region (Odessa oblast)

Vilkovo has outdated and inefficient wastewater treatment plants. In the town of Kilia, the municipal WWTPs are overloaded by industrial discharges of 27 plants. In the town of Izmail municipal WWTPs receive equal shares of municipal wastewater and industrial wastewater from the pulp and cardboard plant.

Demographic factors substantially influence the production of municipal wastewater. The population of the Danube River basin reaches a little over 6% of the total population of Ukraine. The highest share of the population lives in the Tisa River basin (1.27 million people or 43%) with a population density of 100 people/km^2 (the average population density in Ukraine is 12 people/km^2). Some increase of population is expected in the Danube River basin (3.07 million in 1996, 3.077 in 2010, 3.167 in 2020).

The municipal wastewater discharge into the Danube basin reaches 80% of all hot spots sources of pollution. BOD, nitrogen, phosphorus and microbiological contamination as well as toxic substances (heavy metals) originating from industry are the main pollutants for the lower part of the Danube River. The municipal treatment plants in small settlements of the Danube River basin are mainly overloaded or do not exist at all. Due to this fact, constructing and modernizing municipal treatment facilities would allow to downsize hot spots wastewater discharges into the Danube River basin at least of easily oxidized organic and microbiological contamination. Nitrogen and phosphorus inflow into the Danube basin would lessen despite a lack of the third stage of treatment.

3.3.1.2. Current strengths/assets

The analysis by the participants allowed identifying following assets, characteristic to the municipal sector:

- **Existing environment-protecting legislation**

  Constitutional regulation of environmental legal relations secures the most important principles and forms of natural resource utilization, declares a range of environmental rights of citizens and ensures environmental safety within the process of the implementation of functions by various state legal institutions. Environmental legal regulation is based on the Law of Ukraine «On Environmental Protection» of June 25, 1991, a kind of «environmental constitution», which presupposes a goal, a task, principles and mechanisms to ensure effective environmental use, environmental protection and environmental safety in Ukraine. Ensurance of these rights of citizens, their associations and legal environmental interests of the state, legal bodies, is presupposed by laws and legislative acts adopted to develop it: the Law of Ukraine «On Environmental Expertise» (1995), Land (1992 revision), Water (1995), Forest (1994) Codes, the Code of Ukraine on Underground Resources (1994), laws of Ukraine «On World of Animals» (1993), «On Atmospheric Air Protection» (1992), «On Nature Reserves Stock» (1992), etc.

  Existing normative documents regulate the water use and water contamination from municipal sources, as well as rules of payment for water use and contamination. It is defined by 1100 documents and 18 resolutions of the Cabinet of Ministers of Ukraine being worked out to further develop provisions of the Water Code.

- **Technological standards and economic incentives**

  Most parts of technological standards, developed as far back as Soviet Union times, are a strict system of requirements set up to improve water quality. The newly developed "Technological standards of municipal wastewater treatment" are agreed in the Ministry of Environmental Protection, the State Building Department (Gosstroy) and the Ministry of Health Protection and are submitted for approval by the Ukrainian Cabinet of Ministries. A limit value for pollutants released by municipalities is being agreed. The municipalities pay a certain amount for every substance set off against its volume. For exceeding the limit value they pay a 5 times higher rate. Violations of technology, laws and regulations are punished by penalties and law suits. Methods of their calculation are approved by the Cabinet of Ministers of Ukraine. The economic incentives specified in the above-mentioned Law «On Waste» deal mostly with the bodies involved into waste management and require further development to quickly implement clean production technologies.

- **State programs**

  It is necessary to mention already existing programs such as the "State Program for Development of Drinking Water Supply and Sewer Systems of the Settlements of Ukraine" (approved in 1997), and the "Integrated Program of Flood Prevention".

- **Wastewater treatment plants**

  Despite their outdated facilities, they can play an important role in water treatment in case existing technological standards are strictly met. However, these standards are often not met due to the low skills of personnel and lack of funds to introduce modern control systems.

- **NGOs acting in the region**

  As positive factors one may include the following existing and actively working NGOs: Greenpeace Ukraine, Ukrainian Youth Environmental League, Zeleny Svit etc. Despite the missing legislative mechanism which takes into account the public opinion while making decisions by state bodies, NGOs play a major role in the creation of public awareness and attraction of wide sections of public to solve environmental problems.

- **International programs**
  The Convention of Sustainable Use and Protection of the Danube River **is** one of the most important examples of international cooperation in which Ukraine takes part. UNDP, GEF, TACIS, USAID and other international organizations provide Ukraine with grants devoted to environmental protection.
- **State and municipal funding**
  Despite the poor economic situation in Ukraine, state and municipal funding still exists and make it possible to implement some of the projects concerning waste management in the Ukrainian part of the Danube River basin.

3.3.1.3. Analysis of transboundary effects

After discussions, the experts identified the following transboundary effects **– transition of pollutants,** a characteristic feature in the whole Trans-Carpathian region of the Danube basin**, eutrophication** characteristic to the whole Danube basin, as well as **bad smell in transboundary areas** appearing when border-area settlements are located in close proximity to contaminated sites, e.g. landfills, etc. **The violation of international conventions** does not directly belong to transboundary effects but might be defined as having secondary consequences. As for the conventions, it is necessary to note the Convention on Co-operation for Sustainable Use and Protection of the Danube River signed in Sofia on the 29th of June 1994 (unfortunately still not ratified by Ukraine) and the Convention on Protection and Use of Trans-Boundary Waterways and International Lakes (Helsinki, 1994) which Ukraine is expected to join soon.

3.3.2. Sector Problem Analysis

3.3.2.1. Core problem

In the municipal sector of the Ukrainian part of the Danube River basin, the core problem was defined as

"UNSUSTAINABLE WASTE MANAGEMENT"

3.3.2.2. Causes leading to environmental problems

There are two direct causes for the core environmental problem in the municipal sector

- Inappropriate domestic waste management
- Inadequate functioning of sewage treatment system

These direct causes will be described in greater detail below.

(i) Inappropriate domestic waste management

Improper collection and separation of domestic wastes, absence of biogas collection and recovered territories and inadequate treatment of domestic discharges are the main factors contributing to the inappropriate domestic waste management.

a. Improper collection and separation of domestic wastes
Waste collection is exercised on a regular basis in big cities and is usually managed by one company. In rural areas, waste collection is irregular. Moreover, many landfills all over the country are overloaded and many of them do not meet environmental standards

and sanitary norms. The state of existing landfills is not clear. Most modern waste treatment and recycling technologies are not yet introduced in Ukraine. This is caused by the **lack or improper use of financial resources, poor technical equipment, the low sanitary culture** within the population which might be attributed to the almost complete absence of information, poor social/economic condition and non-existent economic incentives.

b. Absence of bio-gas collection and recovered territories

Due to the **inappropriate landfill policy** their state is not known and there is no system for collecting filtrate from landfills. Nowadays, there is not even one square meter of recovered territory, **neither technologies** granting the opportunity to create them, **nor economic mechanisms**, which would allow to attract sufficient funding for this.

c. Inadequate treatment of domestic discharges

This results from the **non-existing pre-treatment of industrial discharges**. Further, Ukrainian enterprises, connected to municipal wastewater treatment plants, do not pre-treat wastewater at their own facilities although it would be essential. Industrial pre-treatment facilities have been constructed, but they do not work due to economic reasons, a **low capacity of treatment plants and no systems for sludge utilization from treatment plants**. Each of these three factors is determined by common elements: the misbalance of territory development and construction plans, the weakness of staff qualification and the lack of modern technologies.

(ii) Inadequate functioning of sewage treatment system

The inadequate functioning of sewage treatment system covers in its meaning both, discharges of plants connected to municipal wastewater treatment plants (considered above), obsolete and worn-out sewage systems which are very often overloaded and lead, consequently, to uncontrolled discharges of wastewater, as well as the absolute lack of sewage systems in small settlements. It derives from insufficient sewage systems and discharge of industrial wastewater into municipal sewer.

a. Insufficient sewage systems

Insufficient sewage systems might be divided into the following categories. Firstly, there are **no sewers in small towns and villages**, which is the result of cumulative action of three component-factors: low or no funding at all, low management efficiency caused by the fact that functions and rights of governmental, regional and municipal authorities are not agreed due to insufficient institutional capacity and insufficient public participation due to the low sanitary culture and the lack of economic incentives. The second reason for the insufficient sewage systems is the **critical state of sewage systems and facilities** which is due to the deficit of treatment capacity and obsolete technologies, which, in their turn are caused by a lack of finance. The non-adjusted control system is another underlying factor for the critical state of sewage systems and facilities.

b. Discharge of industrial wastewater into municipal sewer

It is caused by **improper control and metering of industrial waste at treatment facilities** and by the fact **that industrial waste pre-treatment is inefficient or absent** (due to the critical state of treatment facilities and collection of industrial waste). Both these categories are based on the **underdeveloped system of penalties**.

3.3.2.3. Environmental effects

Unsustainable waste management negatively affects both human health and the environment, causing the following adverse consequences in the Ukrainian part of the Danube River basin:

- **Degradation of the sanitary – epidemiological situation**

  As statistical data confirm, the population health is getting worse. Since the beginning of 1995, birth rates have been decreasing, mortality rates have been growing and the negative population growth continues to increase. The acute sanitary-epidemiological situation in the Danube basin is a clear manifestation of environmental destabilization.

- **Pollution of ground and surface waters and local sources of drinking water**

  According to information of the sanitary-epidemiological service, in 1994, every eighth-ninth sample of drinking water supply did not meet bacteriological requirements of the State standard. Bacterial and viral contamination of water sources might result in epidemic outbreaks of cholera, dysentery, and viral hepatitis. According to the State of Environment Report data, water quality in the Tisa River basin corresponds to the 3rd class (contaminated water). The same is true to the downstream part of the Danube.

- **Eutrophication**

  Supply of nutrients to the Danube basin (N and P) due to wastewater discharges and agricultural washout causes eutrophication of water bodies. This is of special importance for the downstream Danube part, because this area incorporates especially protected wetland areas (protected according to the RAMSAR convention). All these factors cause also adverse impacts on the Black Sea. In the Danube inflow area, eutrophication of the Black Sea has already reached critical levels.

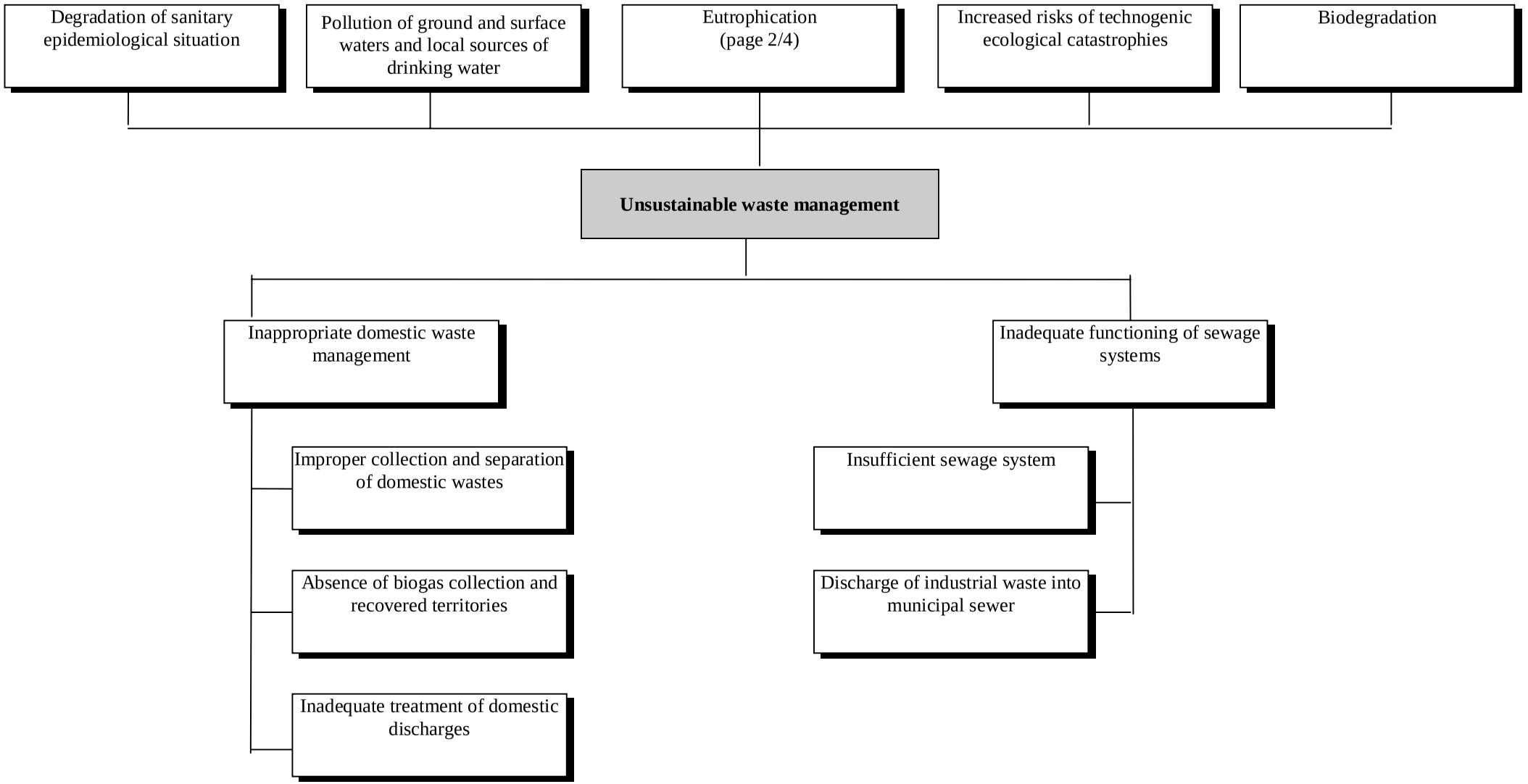
- **Increased risks of technogenic catastrophes**

  Risks of large-scale technological and environmental accidents and disasters, failures of major water management and treatment facilities have grown sharply. The reasons are fairly clear: large-scale restructuring, disintegration of economic links, limited investment capacity and finance resources. As a result, it is virtually impossible to implement technological modernization policies. Moreover, it is hard to maintain these sites in operation, to ensure compliance with necessary safety requirements.

- **Biodegradation**

  All the above mentioned factors, which lead to the contamination of water resources and soil cause a reduction of habitats of animal species, disruption of natural migration routes and problems pertaining to adequate food-chain supplies for animal species of the Ukrainian part of the Danube River, resulting in both decreasing populations of fauna and flora species and even in the extermination of some species.

Problem Hierarchy – Municipalities



3.3.3. Objectives, Expected Results, Actions and Related Projects

The group of experts, who worked in the Workshop, having studied all the problems, pertaining to the municipal sector, has defined as sector objective:

«NEGATIVE IMPACT ON WATER QUALITY FROM MUNICIPAL WASTES DECREASED »

In order to reach the objective, three results have been identified:

- Significant reduction of pollution from domestic waste
- Achievement of the adequate functioning of sewage treatment systems
- Reinforcement of institutional capacities in waste management

(i) Significant reduction of pollution from domestic waste

To attain the expected result, necessary actions have to be undertaken in the following fields:

- Collection and separation of domestic waste
- Use of landfills territories
- Treatment of domestic discharges

It is foreseen to:

- **implement a system for the proper collection and separation of domestic waste.** In this context, it would be necessary to develop technologies for the proper domestic waste collection, separation and utilization. Facilities for proper domestic waste collection, separation and utilization will be installed. Furthermore, other facilities have to be developed for hospital non-plastic waste burning. This will contribute to perform the system for the proper collection and separation of domestic waste. Measures have to be undertaken to make funds available.

  There are no ***existing/on-going*** projects for the time being, which are pertaining to the proper collection and separation of domestic waste. Moreover, even a development of such projects is not stipulated.

  Proposed projects:

  - *Study international experience in the sphere of proper collection and separation of domestic waste, with a further development of national technologies to address the problem or an introduction of foreign ones*
  - *Set up a pilot project for the proper collection, separation and utilization of household solid waste*

- **undertake measures for the appropriate use of landfill territories.** This activity includes developing an adequate landfill policy, ensuring measures for an inventory of landfills (old and functioning), assessing the impact of landfills on the environment. Appropriate measures for sanitation of landfills will be applied and technologies for biogas collecting introduced. It is also foreseen to implement technologies for the re-cultivation of closed landfills. Furthermore, measures will be undertaken to make funds available and to reinforce the system of quality control.

  As the analysis shows, for the time being, there are no ***existing projects*** on collection of biogas and recovery of territories. Moreover, as the discussion has shown, the development of such project is impossible without an inventory of landfills (both old and functioning).

The only example of a ***planned project*** might be the following one:

- *Site for collection of solid domestic waste in Chernivtsy City.*

Proposed Project:

- *Inventory of landfills (both old and functioning).*

- **upgrade the treatment of domestic discharges.** It is key to build new treatment facilities and increase the capacity of existing ones. It is foreseen to introduce technologies for biogas collecting in the sludge cites as well. Sludge from treatment facilities has to be utilized. Furthermore, appropriate waste pre-treatment systems in industry, together with proper control and metering for industrial waste have to be introduced and ensured. Moreover, measures have to be undertaken to make funds available and perform an inventory of domestic discharge facilities**.**

  Existing Projects:

  - *Construction of waste water treatment facilities in Vorohta and Kuty.*
  - *Construction of sewage collector for the discharge of contaminated waste water of industrial sites in Luzhany settlement with a simultaneous implementation of technologies for waste water treatment in the Luzhansky experimental distillery*

  At the same time far more projects are being planned. The overall number of these projects reaches 4 projects in Odessa oblast, 5 projects in Ivano-Frankivska oblast, 9 projects in Chernivetska oblast and 20 projects in Zakarpatska oblast.

  Proposed Projects:

  - *Reconstruction and capacity upgrade of Chernivtsy WWTP,*
  - *Reconstruction and capacity upgrade of Uzhgorod WWTP,*
  - *Reconstruction and capacity upgrade of Kolomyia WWTP,*
  - *Sludge processing and reduction of environmental hazards pertaining to waste water sludge in the Chernivtsy water utility.*

(ii) Achievement of the adequate functioning of sewage systems

In order to achieve this result, several activities have to be undertaken in the following areas:

- Sewage system in towns and villages
- Sewage systems and treatment plants in towns
- Industrial waters connected to municipal systems

It is required to:

- **develop sewage systems in towns and villages.** For this activity, after analyzing existing western practices for towns and villages it is necessary to perform an inventory of the existing sewage systems in towns and villages in order to strengthen the system of quality control. On the basis of the above mentioned activities, environmentally friendly technologies will be developed and introduced. In this context it is foreseen to construct sewage systems in towns and villages where they do not exist, establish cluster pipelines and sewage systems for small villages and individual farms, as well as rehabilitation and covering the deficit of capacity in existing sewage systems of towns and villages.

- **ensure appropriate sewage systems and treatment plants for cities.** After the analysis of western and inventory of sewage treatment system in cities, technologies for wastewater treatment systems will be developed and introduced. To ensure appropriate sewage system and treatment plant for cities, it will be necessary to rehabilitate and cover the deficit of capacity in existing sewage systems of cities and to strengthen the system of quality control, and make funds available.

  As it was already mentioned earlier, ***existing projects*** in both cases might include the construction of wastewater treatment facilities in Vorohta and Kuty. The situation with ***project planning*** is far more promising and, besides reconstruction of sewage systems, (see above) it is necessary to note two projects, which deal with the construction of sewage facilities in rural areas of Zakarpatska oblast and the construction of local sewage networks in villages of Zakarpatska oblast (with an overall length of 46.3 km) which belong to the development of sewage system in towns and villages activities.

  Proposed Projects:

  - *Inventory of existing sewage system in towns and villages*
  - *Strengthening of the system of quality control through branch standards updating and new technologies introduction*
  - *Existing Western practices for towns and villages analysis*

- **apply methods for the adequate treatment of industrial waste into the municipal system.** This necessitates the following important elements: carrying out an inventory of pre-treatment facilities, developing pre-treatment facilities, introducing proper control and metering of industrial waste at the treatment facilities, introduce practices of water re-use and recycling in technological processes, as well as applying appropriate waste pre-treatment system in industry.

  Besides the above-mentioned ***existing project*** for wastewater treatment in the Luzhansky distillery, which is being implemented now, it is worth noting two ***planned projects*** for the implementation of environmentally friendly technologies in Teresviansky and Velykobychkivsky timber pants.

  Proposed projects

  - *Inventory of pre-treatment existing facilities*
  - *Introduction of proper control and metering of industrial waste at the treatment facilities of Izmail and Trans-Carpathian timber processing factories*
  - *Introduction of practice of water re-use and recycling in technological processes as a pilot project*

(iii) Reinforcement of institutional capacities in waste management

To obtain this result, several activities have to be undertaken in the following fields:

- Efficient waste management
- Financial mechanisms in waste management
- Public participation
- Public awareness

It is foreseen to:

- **create a basis for efficient waste management.** This activity necessitates to carry out inventory of all waste facilities in the Danube basin, develop registration and regulations for management waste, share responsibilities between the bodies, eliminate disproportion between the capacities for drinking water supply and sewage systems, undertake measures for stakeholders involvement in decision-making process, optimize the existing structure of the territory of the basin and plan its balanced (sustainable) development, unify rules for industrial wastewater discharge to the municipal sewage, introduce clean production principles into technological processes, establish river basin councils.

  For the time being there are no ***existing projects*** connected to the above mentioned activities.

  Proposed projects

  - *Inventory of all waste facilities in the Danube basin*
  - *Develop the regulation to share responsibilities between the bodies*
  - *Eliminate the disproportion between the capacities for drinking water supply and sewage systems through the implementation of the State program*
  - *Update rules for industrial waste water discharge to the municipal sewage system*

- **introduce financial mechanisms of friendly technologies in waste management.** This activity implies the creation of favorable investment conditions, the introduction of economic mechanism for the establishment of private enterprises for domestic waste collection, separation and utilization. It is necessary to develop economic incentives and develop and introduce mechanisms for using the money collected as «environmental income». Further it is important to develop a system of penalties and tariffs.

  Existing and Planned Projects do not exist at all.

  Project Proposed

  - *To upgrade the Ukrainian Civil Code and develop a Penalty Code.*

- **ensure public participation in the process of decision making and control.** For this activity, it is key to ensure the obligatory procedure for the public participation process, increase the role of public environmental expertise. The right to come out with legislative initiatives will be given to NGOs. Furthermore, measures have to be undertaken to ensure public participation in municipal waste management budget planning and develop economic incentives and procedure for direct public control of funds using and develop human resources has to be approved. For the latter, it is required to develop and assess the level of human resources, through introduction of a human resource service system for the expertise, in particular training for improving qualification

  Proposed Projects:

  - *Develop a new NGO Legislation that could grant the public an equal part in the dialogue with governmental bodies.*
  - *Introduce human resources service system for the expertise and proper system of staff training for improving its qualification.*

- **raise public awareness.** This means to develop a mechanism in order to provide the public with information from the state sources through making available free access to the information for the public. System for taking into consideration public opinion has to be

established. Furthermore, it is necessary to ensure big-boarding broadcasting and publication of public awareness advertising from NGOs for free, ensure legislation protection for «whistlers» both from governmental organizations and NGOs, adopt the law «Free access to environmental information», and promote sanitary culture.

Proposed Project:

- *Set up an info/coordinating NGO Center.*

Among all the above-mentioned projects, the expert group reached consensus to recommend four proposed ***projects of high priority*** for further consideration:

- **Reconstruction and capacity upgrade of Chernivtsy WWTP**
  To justify the project, one could mention the insufficient capacity of wastewater treatment facilities and the transboundary impact on water users in Moldova and Romania.
- **Reconstruction and capacity upgrade of Uzhgorod WWTP**
  The justification for the project is the large waste water discharges into rivers with a small discharge, especially in seasons with a low water level, outdated technological equipment leading to bacteriological pollution and the possible transboundary impacts on water users in Slovakia, may be a source of bacteriological pollution.
- **Reconstruction and capacity upgrade of Kolomyia WWTP**
  In order to justify this proposal, one has to consider the large wastewater discharges into rivers with a small discharge especially in seasons with low water level, as well as the poor conditions of the sewage system.
- **Sludge processing and reduction of environmental hazards pertaining to wastewater sludge in the Chernivtsy water utility**
  The project stipulates design, construction and installation of equipment in the facility unit for dewatering and destruction of worms eggs in sludge and sludge storage. Dewatered sludge is expected to be applied at land in agriculture or forestry.

It is necessary to stress, that in order to upgrade and modernize the sewage and wastewater treatment system in the Danube River basin an allocation of 182,226 million HRV would be required, including 34.8 million HRV for the Odessa oblast, 19.86 million for Ivano-Frankivska oblast, 18.1 million for Chernivetska oblast and 109.47 million for Zakarpatska oblast.

3.3.4. Important Assumptions for the Sector

Important assumptions are the factors that are significant for the success of the program but they lie outside the scope of the programme and not under its direct control. They are external factors, however, necessary to ensure the success of the program and the sustainability of its results.

The following assumptions for sector activities have been defined by the participants of the Workshop to obtain the sector results:

- **Integrated computerized environmental data bank is established**
  Concentration of all information pertaining to water management and ensuring the direct access for all stakeholders would substantially improve cooperation and information exchange, as well as strengthen water management and common activities of all parties involved.

- **Disposal of non-domestic waste at municipal landfills is eliminated**

  For the time being there is a major problem associated with disposal of industrial waste at dumps for domestic waste which cannot ensure due safety. Because, by default, industrial waste is not fit for domestic waste dumps, there are no technologies for its safe handling and utilization. Moreover, even if some technologies for collection, separation and utilization of domestic waste are implemented, industrial waste input will hamper their proper operations.
- **New legislation related to non-governmental organizations is adopted**
- **Mechanism of budget financing for public participation process is established**

  Both NGO-related legislation and mechanisms of partial budget financing for public participation process would allow the general public to play a more and more prominent role in pollution prevention in the Ukrainian part of the Danube basin.
- **Adherence to technological mode of operation of treatment plants is ensured**

  The assumption is necessary because some treatment facilities discharge contaminated wastewater due to the often occurring violation of necessary technological parameters.
- **Information and coordination center for uniting and coordinating NGO activities is established**

  This center would allow to exchange information and coordinate efforts of NGOs, which tackle Danube problems. Moreover, the center would allow the Ministry of Environmental Protection to use actively and fully the high capacity of non-governmental organizations.

The following assumptions for sector results have been identified to achieve the sector objective:

- **Legal and economic mechanism of full Cl phase-out from drinking water preparation and wastewater disinfecting is developed and enforced**

  The problem of bacterial and viral contamination of drinking water is getting further aggravated by the wide-scale application of chlorine for water treatment in contemporary technologies. When applied to destroy products of phyto-planctone degradation, chlorine forms large amounts of carcinogenic chlorinated organic compounds, which produce cumulative health effects. Synergetic effect of hyper chlorinated water with increased levels of heavy metals, radio-nuclides and nitrogen compounds results in growing incidence with endocrine system malfunction and other major disorders.

3.3.5. Impact Indicators for Sector Results

Impact Indicators were developed for sector objectives and sector results. They define the contents of the objectives and results in operationally measurable terms (quantity, quality, target groups, partner institutions, time period and place). They should give an adequate picture of the situation. Furthermore, they should be measurable in a consistent way at an acceptable cost.

Impact Indicators for sector objectives have already been presented in Chapter 2.3.4. Indicators for sector results are as follows:

For the sector result **significant reduction of pollution from domestic waste,** the indicator was defined as:

- **By the year 2010, the concentration of BODs in groundwater of the towns of Uzhgorod, Kolomyia, Izmail, Reny and Vilkovo decreased by 35% and, at the same time, the domestic waste has not been disposed to the other municipal landfills.**

  In case of underground water with high BOD contents, it might cause also a contamination of surface water. As it was already mentioned above, low BOD in water (in this particular case in groundwater resources of Uzhgorod, Kolomyia, Izmail, Reny and Vilkovo) would confirm the improvement of water quality. BOD reduction by 35% would show a reduction of pollution from domestic waste (due to both utilization and proper treatment). At the same time the indicator would show that in these cities, domestic waste is not re-channeled to other sites.

For the **achievement of the adequate functioning of sewage systems**, the following indicator was proposed:

- **By the year 2010, microbial contamination and coli-titer in surface water in the downstream Danube towns of Vilkovo, Kiliya, Reny and Izmail decrease to standard values and, at the same time, health risks are reduced.**

  High microbial counts are the major warning of a hazardous health situation. Microbial contamination and coli-titer are integral parameters, which allow to monitor adequate operations of sewage treatment systems. The reduction of parameters to standard levels would confirm the adequate operation of sewage treatment systems but only if this reduction does not endanger public health, e.g. hyper-chlorinating, etc.

For the **reinforcement of institutional capacities in waste management**, the impact indicator defined is:

- **By the year 2010, the amount of 35 million UAH is obtained as an ear-marked investment into treatment facilities in the towns of Reny, Izmail, Kiliya and Vilkovo without taking funds from other environmental and social budget items**

  The investments proposed might be reached only provided that economic preconditions (privatization and introduction of finance mechanisms for environmentally friendly technologies) are in place, efficient management capacity developed, wide public participation and the enhancement of NGO role ensured in the sphere of waste management. At the same time, it is necessary to avoid a simple reallocation of budget funds between different budget sections, especially when social sections are concerned.

Annexes

1. **Identification of River Basin Areas**
2. **Situation Analysis**
3. **Problem Analysis**
4. **Objective Analysis**
5. **Sector Planning Matrix**
6. **Description of Activities, Important Elements and Projects**
7. **Workshop Organization**

Annex 1.
Identification of River Basin Areas

1.1. Tisa River Basin

1.2. Prut River Basin

1.3. Lower Danube

Identification of River Basin Areas **1. Tisa River Basin** **Annex 1.1.**

Physical-Geographical Characteristics	Social and Demographic Characteristics	Transboundary Impacts	Human Economic Activities in the Basin
Terrain ➢ Mountainous **Characteristics of the river basin** ➢ Nature reservation areas ➢ Forests 35% ➢ 137 lakes ➢ Pastures: 120,600. Hectares ➢ Soil erosion ➢ Marsh formation ➢ Rain flooding **Numerical Parameters** ➢ Area: 12,800km2 **Climate** ➢ Evaporation: 380-400 mm/year ➢ Rain falls: 800-1400 mm/year ➢ Average annual temperature: 4.5° C	**Population** ➢ 0,79 million Urban: 0,31 million Rural: 0,48 million ➢ Population density: 98,3 person/km^2 ➢ Growth rate: 3,4 ‰ (for Ukraine- -6,1‰) ➢ Mortality rate: 17,7‰ ➢ Birth rate: 9,1‰ **Economic characteristics:** ➢ Employment of the population: - wood processing - 24,9% - card board production - 10% - salt (NaCl) production - 11% - agriculture - 11% ➢ Income per capita: UAH 91 (USD 45)	➢ Insufficiently treated waste water entering Hungary and Slovakia ➢ Discharge of water with high oil pollution due to accidents ➢ Bacteriological pollution	**Agriculture** ➢ Main agricultural plants: - grain - sunflower - potato - vegetables - wine yards - fruits ➢ Forestry **Industry** ➢ Cellulose paper industry ➢ Paper industry ➢ Food industry ➢ Machine construction ➢ Construction materials ➢ Metal processing industry ➢ Chemical industry ➢ Textile industry ➢ Military activity **Municipality** ➢ Individual economic activity of population ➢ Waste water treatment and toxic ➢ Removal of toxic elements

Identification of River Basin Areas **2. Prut River Basin** **Annex 1.2.**

Physical-Geographical Characteristics	Social and Demographic Characteristics	Transboundary Impacts	Human Economic Activities in the Basin
Terrain ➢ Mountainous ➢ High plains **Characteristics of the river basin** ➢ Nature reservation areas ➢ Forests 35% ➢ Pastures:303,800. Hectares ➢ Soil erosion ➢ Marsh formation ➢ Water collection area **Numerical Parameters** ➢ Area: 11,600km^2 **Climate** ➢ Evaporation: 380-400 mm/year ➢ Rain falls: 900-1600 mm/year ➢ Average annual temperature: 4.5° C - January: -6° C - July: 16° C	**Population** ➢ 1,3 million Urban: 0,562 million Rural: 0,74 million ➢ Growth rate: 3,5 ‰ (for Ukraine- -6,1‰) ➢ Mortality rate: 13,3‰ ➢ Birth rate: 13,8‰ **Economic characteristics:** ➢ Income per capita: UAH 110 (USD 55) ➢ High unemployment level in the mountain areas	➢ Moldova, Romania (Water quality) ➢ Risks of unsorted silt sites overflow from treatment plants during flooding periods ➢ High nutrient load form agricultural run off ➢ From Romania: River bed deformation in Romania which leads through undermining the Ukrainian river banks to the destruction	**Agriculture** ➢ Main agricultural plants: - grain - fibers - sugar beet - vegetables - potatoes - fruits ➢ Cattle breeding ➢ Forestry **Industry** ➢ Wood processing ➢ Consumer goods industry ➢ Food industry ➢ Machine construction ➢ Metal processing industry ➢ Petro-chemical and chemical industry ➢ Electro engineering ➢ Production of sand and crash rock minerals ➢ Military activity **Municipality** ➢ Individual economic activity of population ➢ Waste water treatment ➢ Removal of toxic elements ➢ Tourism and recreation

Identification of River Basin Areas **3. Lower Danube** **Annex 1.3.**

Physical-Geographical Characteristics	Social and Demographic Characteristics	Transboundary Impacts	Human Economic Activities in the Basin
Terrain ➢ Plains divided by gorges and valleys **Characteristics of the river basin** ➢ Nature reservation areas ➢ Forests 20% ➢ Pastures:60,000. Hectares ➢ 7 big lakes, small lakes and rivers ➢ Soil erosion ➢ Soil and rock salination ➢ Degradation of wetlands (reed beds) ➢ Flooding ➢ Overregulation of the basin **Numerical Parameters** ➢ Area: 6,300km^2 ➢ Length of the Danube River in this region: 174 km **Climate** ➢ Evaporation: 600-1000 mm/year ➢ Rain falls: 370-465 mm/year	**Population** ➢ 490,000 Urban: 320,000 Rural: 170,000 ➢ Mortality rate: 16,4‰ ➢ Birth rate: 8,9‰ ➢ High disease rate **Economic characteristics:** ➢ Income per capita: UAH 100 (USD 50)	➢ Oil pollution from ports and accidents affecting Romania and the Black Sea)	**Agriculture** ➢ Water Management ➢ Fish industry ➢ Forestry **Industry** ➢ Paper industry ➢ Food industry ➢ Ports ➢ Ship repairing ➢ Water transport ➢ Waste management ➢ Military activity **Municipality** ➢ Individual economic activity ➢ Waste water treatment ➢ Removal of toxic elements ➢ Tourism and recreation

Annex 2.
Situation Analysis

2.1. Agriculture

2.2. Industry

2.3. Municipality

Activities leading to water pollution	Current strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
1. Inappropriate land use/farming systems	➢ Land, water, forest codes ➢ Other regulatory acts ➢ State program on the development of natural reserves ➢ Environmental audit based on ISO 14 000 standards ➢ Annual action plan of the Government on land protection ➢ Intergovernmental agreements on use and protection of transboundary rivers ➢ State flood prevention program until 2000 ➢ Concept on protection and recovery of environment of the Azov and Black Seas ➢ Black Sea Strategic Action Plan ➢ Law on ecological expertise (environmental impact assessment) ➢ Valuable soil resources ➢ State privatization program	➢ Impact on ecosystems	➢ High level of suspended solid load ➢ Nutrient transport and danger of eutrophication	➢ Consequences of kolkhoz system of land use ➢ Transition to private land ownership ➢ Changes in land use during transition period ➢ Break of the interrelation between cultivated lands, forests, pasture areas	➢ Economic activity control within the territory of the water fund ➢ Introduction of rural group water supply and sewage systems ➢ Production of agricultural products based on market demand ➢ Reduction of share of arable lands ➢ Building hydrotechnical constructions to protect from erosion (1-2) ➢ Development and implementation of impact assessment method for rivers on diffuse agricultural production (1-2) ➢ Improvement of current ecological legislation (1-6) ➢ Improvement of monitoring, assessment and control practices (1-6) ➢ Introduction of modern technologies and equipment (1-6) ➢ Capital investment (1-6) ➢ Development and implementation of regional ecological programs (1-6) ➢ Economic mechanism and tools for use of natural resources (1-6) ➢ Improvement of current ecological rules/regulations (1-6) ➢ Designing projects to establish water and river bank protection zones (1-6)
2. Inappropriate agricultural practices	➢ Draft national program on land protection; draft laws on land ➢ Excess on human resources of proper qualification	➢ Pollution of ground water ➢ Decrease in quality of water for drinking and recreational use ➢ Loss of fish stocks ➢ Eutrophication ➢ Degradation of soil structure (2,4) ➢ Soil erosion and flooding (2,4) ➢ Increased soil salinity (2,4)		➢ Overcultivation ➢ Collapse of the land management system in transition period ➢ Outdated technology ➢ Unbalanced use and storage of fertilizers	➢ Erosion protection measures ➢ Increase in ratio of forests to meadows in agricultural land use

Activities leading to water pollution	Current strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
3. Inappropriate animal husbandry practices				➢ Overcapacity and improper allocation of cattle breeding farms ➢ Non-solved issues of cattle-breeding waste utilization ➢ Chaotic management of individual cattle breeding	➢ Construction and renovation of irrigation systems ➢ Environmental impact assessment for animal farms
4. Inappropriate irrigation management		➢ Raise of ground water table ➢ Increased sedimentation ➢ Worsening of water quality due to water drainage and discharge from rice fields		➢ Poor condition of irrigation systems ➢ Lack of funds to maintain the system ➢ Violation of irrigation technology	➢ Reconstruction of irrigation systems ➢ Compliance with irrigation methods ➢ Development of ecological river profiles ➢ Water treatment for irrigation purposes
5. Inappropriate fish farm management		➢ Worsening of hydrological and hydrochemical regimes		➢ Fish farming without consideration of ecological safety ➢ Fish farming without environmental impact assessment ➢ Violation of fish farming technology	➢ Environmental audit of fish farms
6. Inappropriate forest management				➢ Inappropriate forestry practices ➢ Violation of technologies to cut trees ➢ Insufficient forest reproduction	➢ Control of forest management

Activities leading to water pollution	Current strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
1. Management of industrial discharges	➢ Legislation ➢ Modern waste water treatment technologies ➢ Availability of professionals (1-6) ➢ Training system (1-6) ➢ Privatization and investment processes ➢ NGO activity ➢ Environmental awarning activity, training and education of population ➢ Identification and standardization system for liquid wastes in all sectors of economic activity ➢ Reserves to reduce material and energy consumption of enterprises ➢ Participation in international agreements	➢ Increasing pollution of water and bottom sediments (1-3) ➢ Malfunctioning of ecosystems (1-3) ➢ Worsening of human health ➢ Loss of quantity and quality of bioresources ➢ Loss of biodiversity ➢ Disbalanced forest management ➢ Unidentified impacts ➢ Latent accumulation of degradation impact factors ➢ Acid rains ➢ Potential danger of technogenic catastrophes ➢ Reduced aquatic ecosystems productivity ➢ Reduced self-purification ability of water bodies ➢ Degradation of bottom biocenoses ➢ Expansion of polluted areas	➢ Failure to meet requirements of international agreements and conventions ➢ Increasing risks of transboundary technogenic and ecological accidents ➢ Disourdesred mixture of air pollutants from enterprises ➢ Transboundary transition of materials from river bed excavation, (including pollutants) ➢ Material transition due to emergency situations ➢ Transition of pollutants from unequipped sites for waste into atmosphere and run off waters	➢ Use of obsolete technologies in industrial processes ➢ Uncoordinated legislation and regulations ➢ Poor economic condition of industrial enterprises ➢ Inadequate treatment plants ➢ Pre-mix of liquid waste from different technological processes	➢ Environmental audit ➢ Harmonization of standards and regulations (internal) with international standards ➢ Automatization and classification of influencing factors system ➢ Upgrading of industrial processes ➢ „Green“ taxation policy 1-3 ➢ Switch of production to other profile activities ➢ Improvement of financial mechanism ➢ Upgrading of existing water treatment plants ➢ Construction of new water treatment plants ➢ Monitoring improvement
2. Pollution due to water and road transport operation				➢ Poor economic condition of industrial enterprises ➢ Uncoordinated legislation and regulations ➢ Undeveloped tariff policy of water consumption	➢ Legislation harmonization for the Danube basin countries ➢ Construction of waste collectors in ports

Activities leading to water pollution	Current strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
3. Irrigation				➢ Contamination with oil products ➢ Direct (water transport) and indirect (road vehicles) pollution with oil products	
4. Military sites				➢ Violation of nature protection legislation ➢ Bottom excavation ➢ Excessive number of dams (overregulation) ➢ Straightening of tributaries (channeling) ➢ Water intake for irrigation purposes ➢ Damping and soil utilization after bottom excavation ➢ Excessive production (quarries, water discharges from mines)	➢ Upgrading of river bed excavation technology ➢ Design and implementation of the technologies for river bed excavated soil processing ➢ Erosion protection works ➢ Optimization of hydrotechnical installations ➢ Restoration of natural conditions for the tributaries ➢ Ratification of convention on access to information ➢ Restoration and inventory of coastal protection facilities ➢ Inventory of the military sites in the area ➢ Introduction of military sites into the state reporting system (environmental) ➢ Enforcement of effective legislation ➢ Inventory of irrigation standards
5. Waste management				➢ Pollutants emission into atmosphere ➢ Overloading of treatment plants ➢ Discharge and losses of fuel and lubricate materials ➢ Weapons disarming ➢ Burial of poisonous substances ➢ Inappropriate allocation of waste management sites ➢ Lack of information on waste management technologies	➢ Introduction of technologies for waste utilization ➢ Construction of waste treatment plants ➢ Rational location of waste management sites ➢ Inventory of old landfills

Activities leading to water pollution	Current Strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
1. Industrial discharges into municipal sewage system	➢ Environment protecting legislation ➢ State programs ➢ Technological standards ➢ Economic incentives ➢ Existing waste water treatment plants ➢ NGOs operating in the region ➢ International cooperation ➢ State and municipal funding	➢ Decrease in water quality ➢ Decrease in general city treatment plants performance ➢ Degradation of biodiversity ➢ Worsening of water consumption conditions ➢ Negative impact on human health ➢ Decreased ability of self-purification ➢ Environmental pollution ➢ Epidemiology worsening	➢ Transition of pollutants (1-4) ➢ Indirect transboundary effect ➢ Eutrophication ➢ Violation of international conventions	➢ Outdated technologies (1-6) ➢ Insufficient local treatment at industrial enterprises ➢ Lack of initial industrial discharge treatment ➢ Lack of NGO encouragement to decision making and control	➢ Technologies improvement and implementation of new process 1-4 ➢ Construction of reliable facilities for initial treatment ➢ Public participation in decision making process ➢ Upgrading of existing water treatment plants ➢ Construction of new treatment facilities ➢ Control improvements
2. Domestic waste treatment		➢ Decreased ability of self-purification ➢ Environment pollution ➢ Decrease in water quality ➢ Degradation of biodiversity ➢ Worsening of water consumption conditions ➢ Negative impact on human health ➢ Worsening of epidemiological situation	➢ Smell in transboundary areas ➢ Eutrophication ➢ Violation of international conventions	➢ Insufficient capacity of treatment plants (2-4) ➢ Poor financing (1-6) ➢ Poor training system for technical staff (1-6) ➢ Undeveloped legislation (1-6)	➢ Expansion of existing treatment plants to the required level ➢ Investment encouragement ➢ Target oriented utilization of nature protection funds ➢ Development of training programs for technical staff (1-6) ➢ Use of budgetary funds ➢ Legislation improvement

Activities leading to water pollution	Current Strengths/Assets	Environmental consequences of economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
3. Management of solid waste		➢ Decrease in water quality ➢ Degradation of biodiversity ➢ Pollution of ground water ➢ Environmental pollution ➢ Worsening of water consumption conditions ➢ Negative impact on human health ➢ Worsening of epidemiological situation	➢ Eutrophication ➢ Violation of international conventions ➢ Pollution with plastic materials	➢ Import of waste ➢ Lack of processing facilities ➢ Lack of economic incentives to utilization	➢ Prohibition of toxic waste import ➢ Construction of processing facilities ➢ Management improvement ➢ Efficient technology for waste processing ➢ Economic incentives for utilization
4. Management wastes from recreation areas		➢ Local atmospheric pollution ➢ Negative impact on human health ➢ Decrease in water quality ➢ Worsening of water consumption conditions ➢ Decrease in ability of self-purification ➢ Degradation of biodiversity	➢ Violation of international conventions ➢ Pollution with plastic materials ➢ Eutrophication ➢ Indirect transport effect	➢ Lack of small sewage system ➢ Law management efficiency (1-6) ➢ Poor technical equipment	➢ Meeting municipal legislation ➢ Technical conditions improvement
5. Military activity (impact)		➢ Environmental pollution ➢ Worsening of epidemiological situation ➢ Ground water pollution		➢ Lack of waste utilization systems in small towns ➢ Low sanitary culture ➢ Low life standard	➢ Construction of small sewage systems ➢ Equipment of services
6. Wastes management		➢ Contamination of vast areas by sediments after treatment ➢ Ground water pollution		➢ Insufficient technologies (1-6) ➢ N,P biogenic elements ➢ Sediments (1,2,6)	➢ Construction of utilization systems in cities/villages ➢ Ecological education ➢ Creation of favorable investment climate

Annex 3.
Problem Analysis

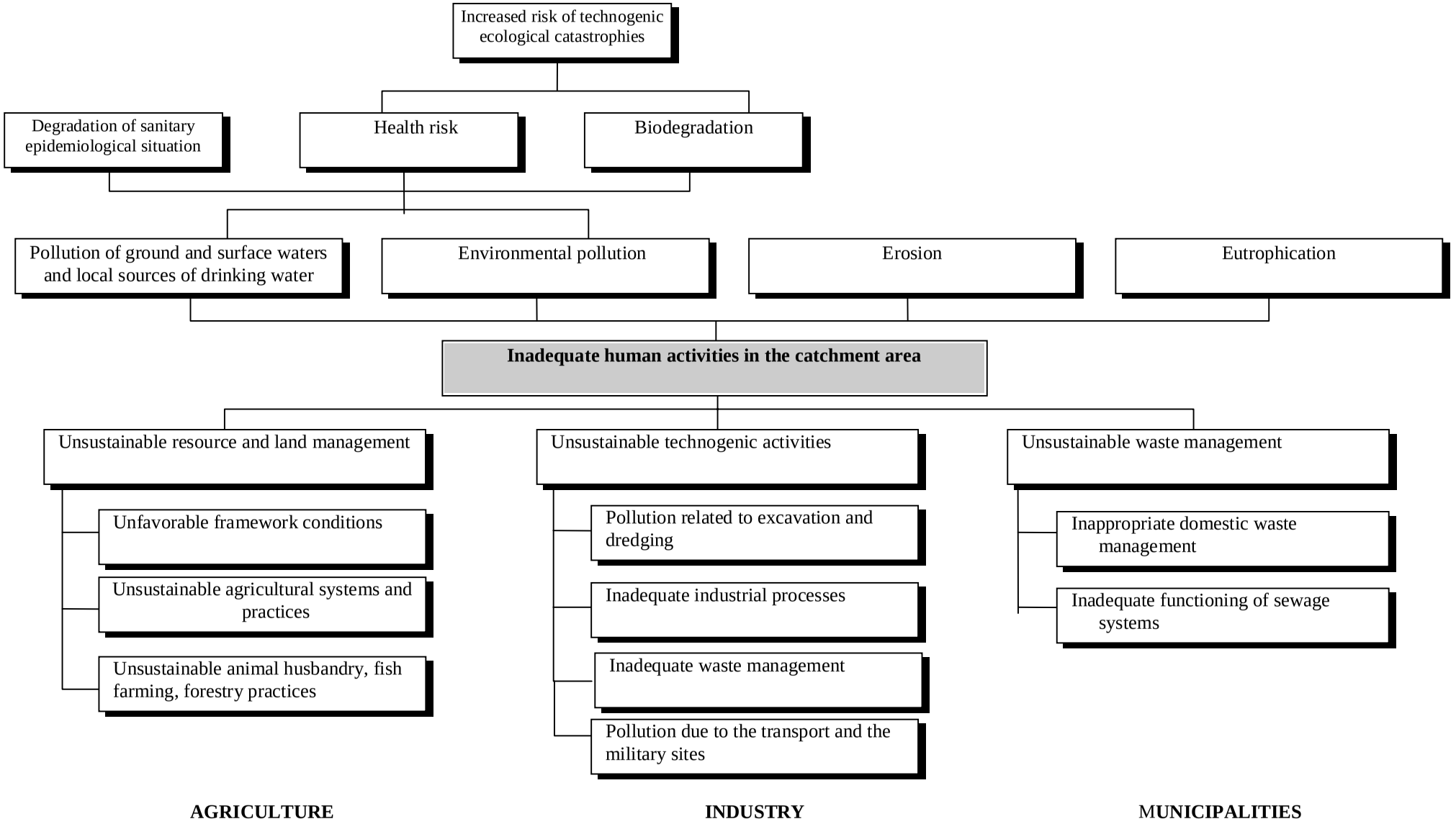
3.0. Global

3.1. Agriculture

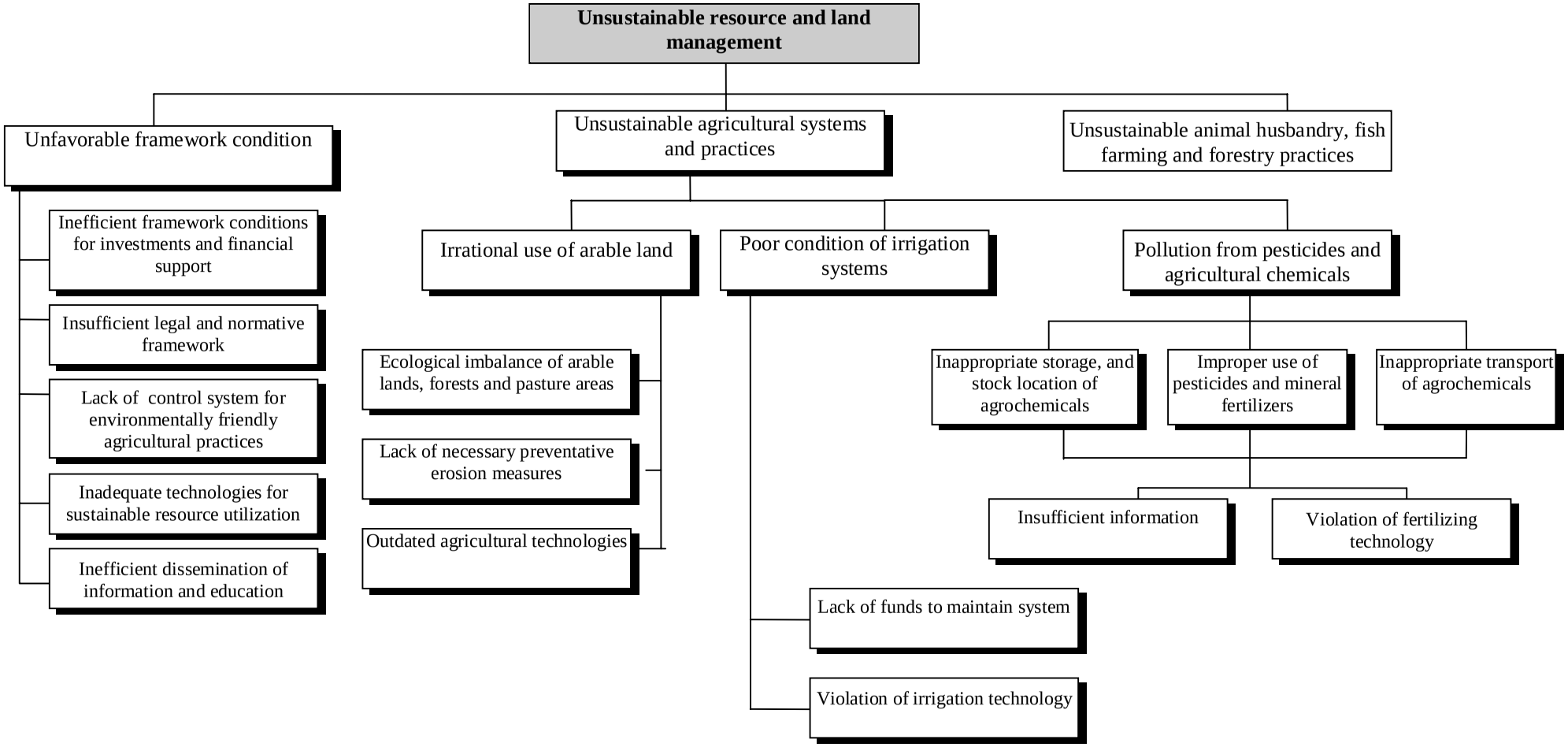
3.2. Industry

3.3. Municipalities

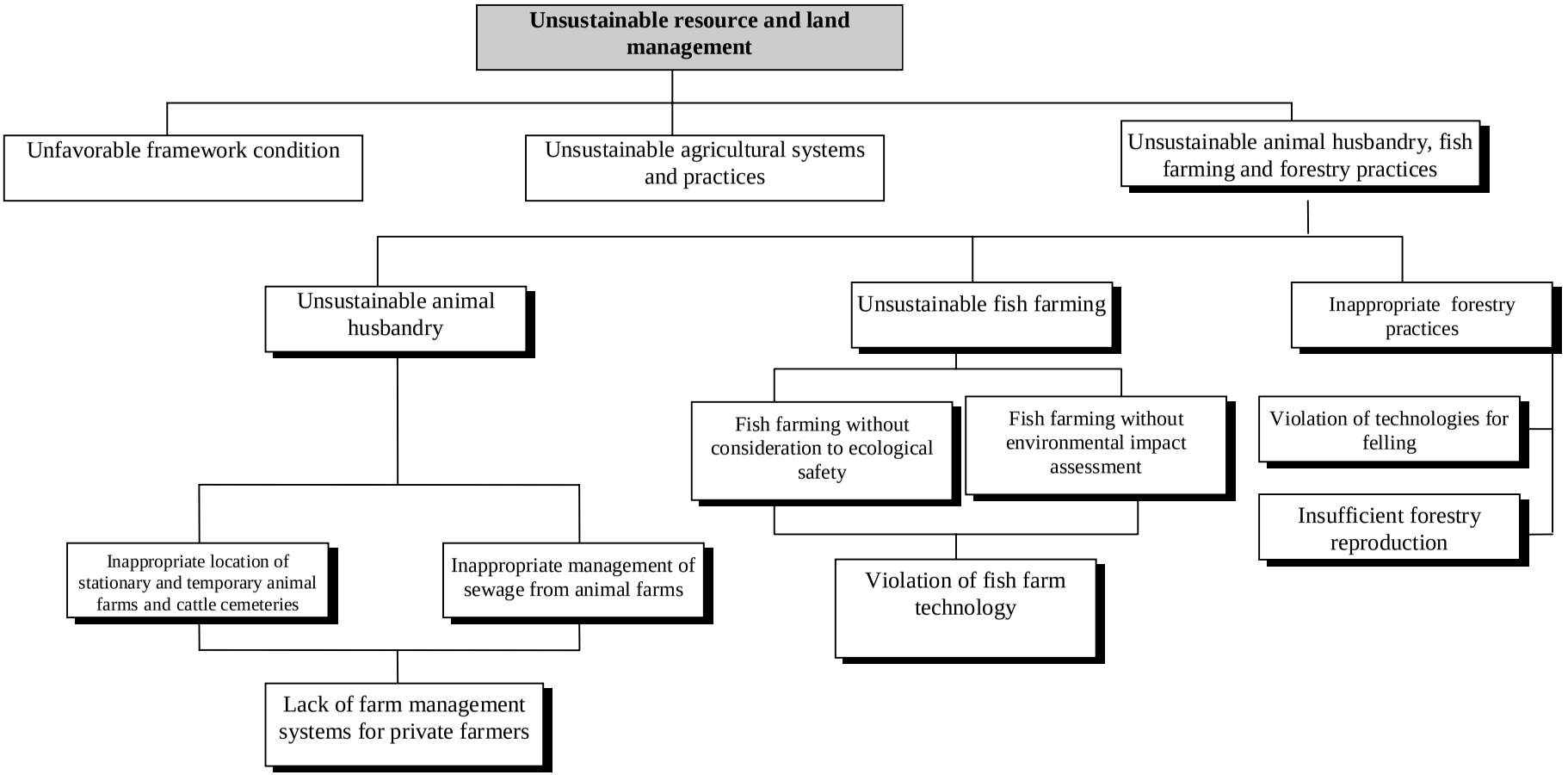
Global Problem Hierarchy **Annex 3.0.**



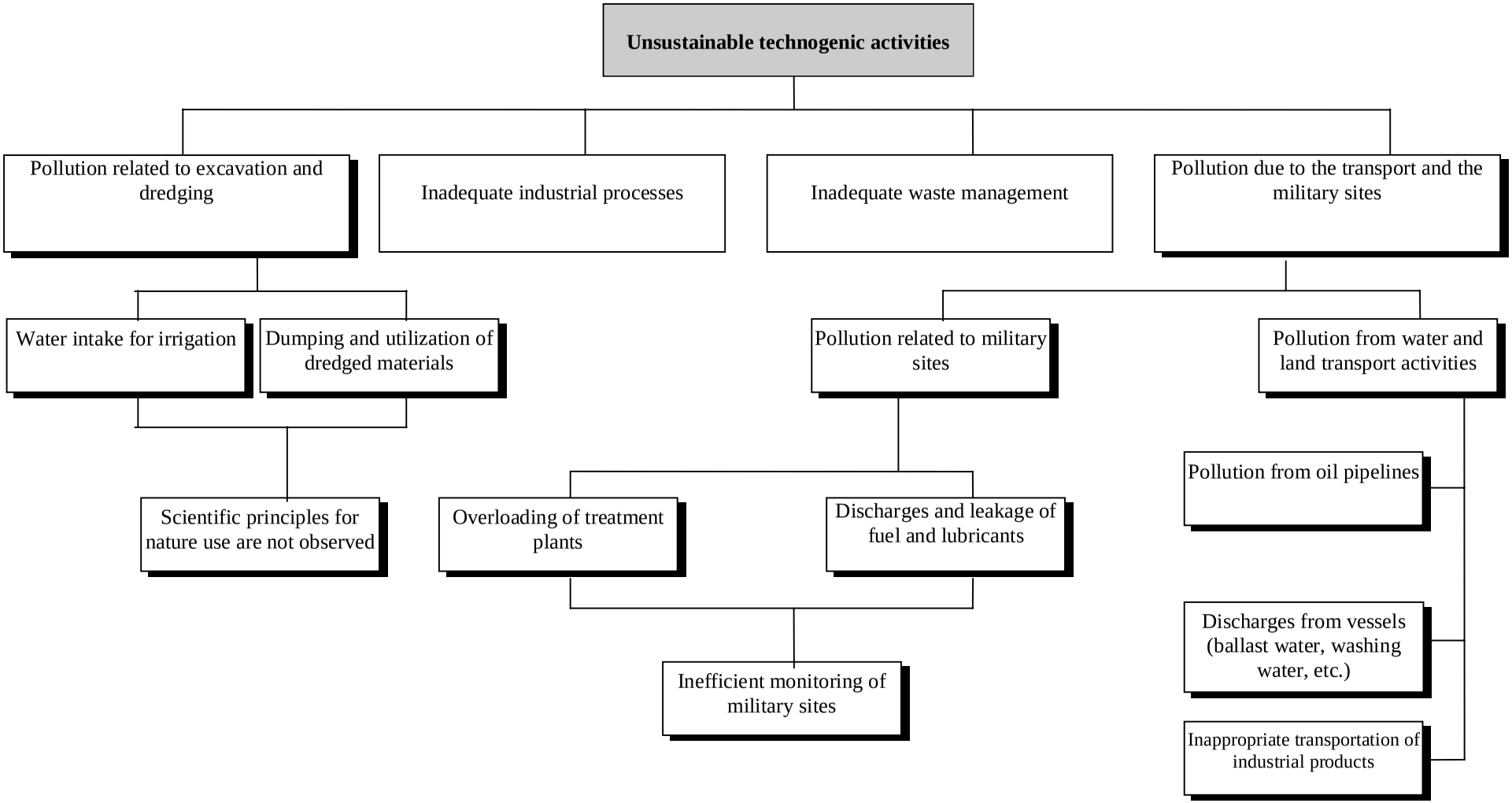
1. Framework conditions
2. Agricultural practices



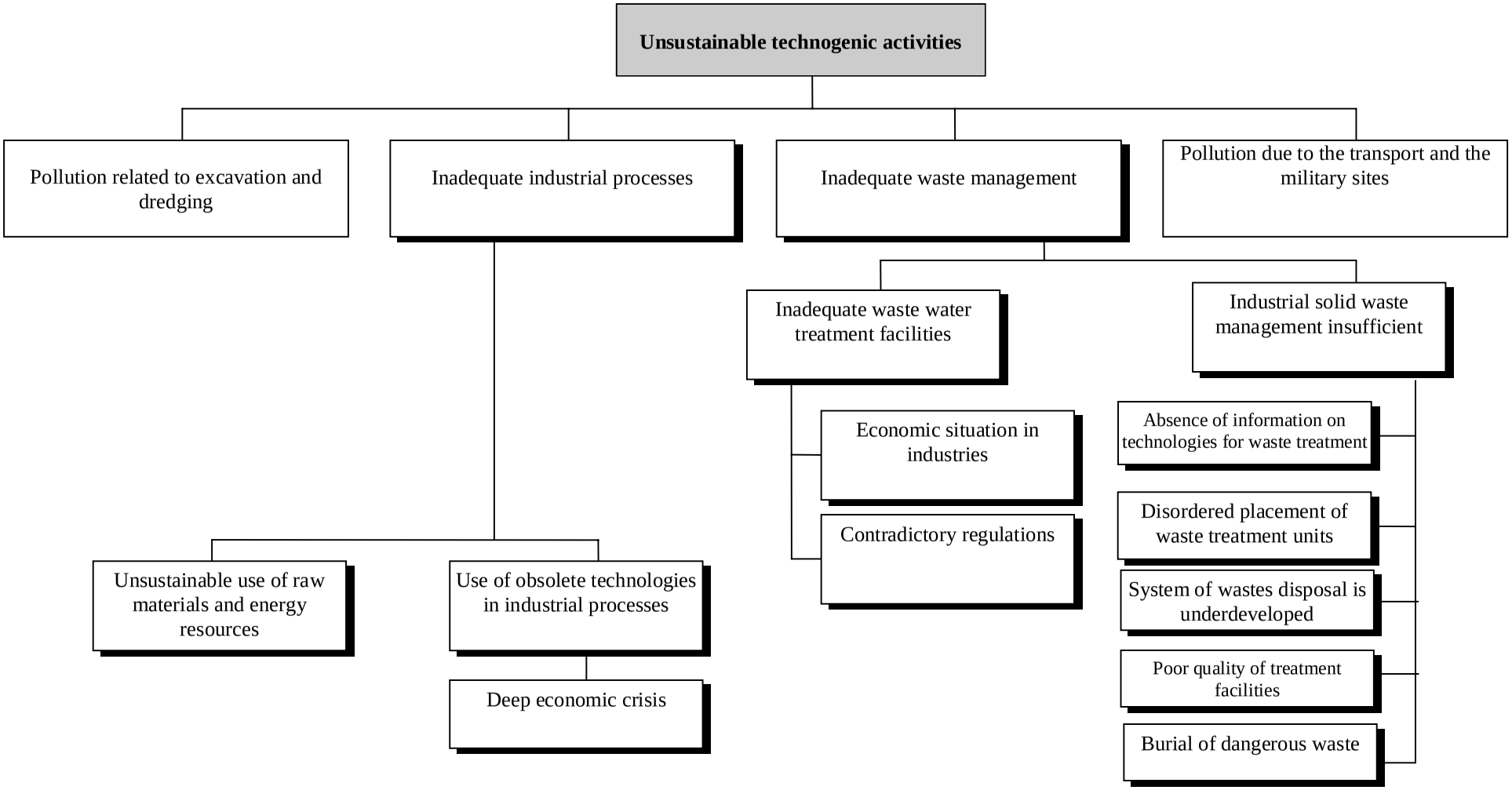
3. Animal husbandry, fish farming and forestry practices



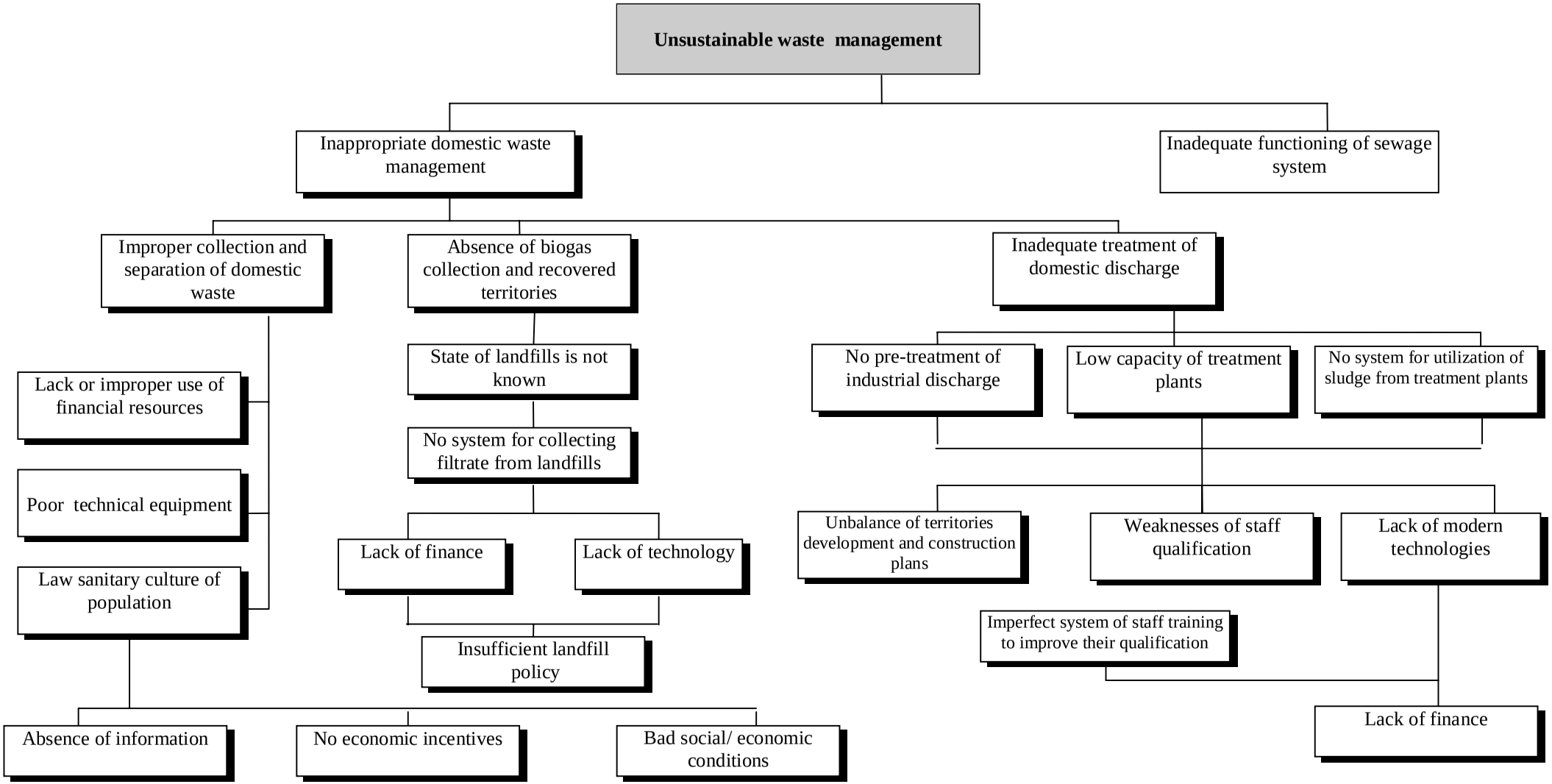
1. Excavation and dredging
2. Transport and military sites



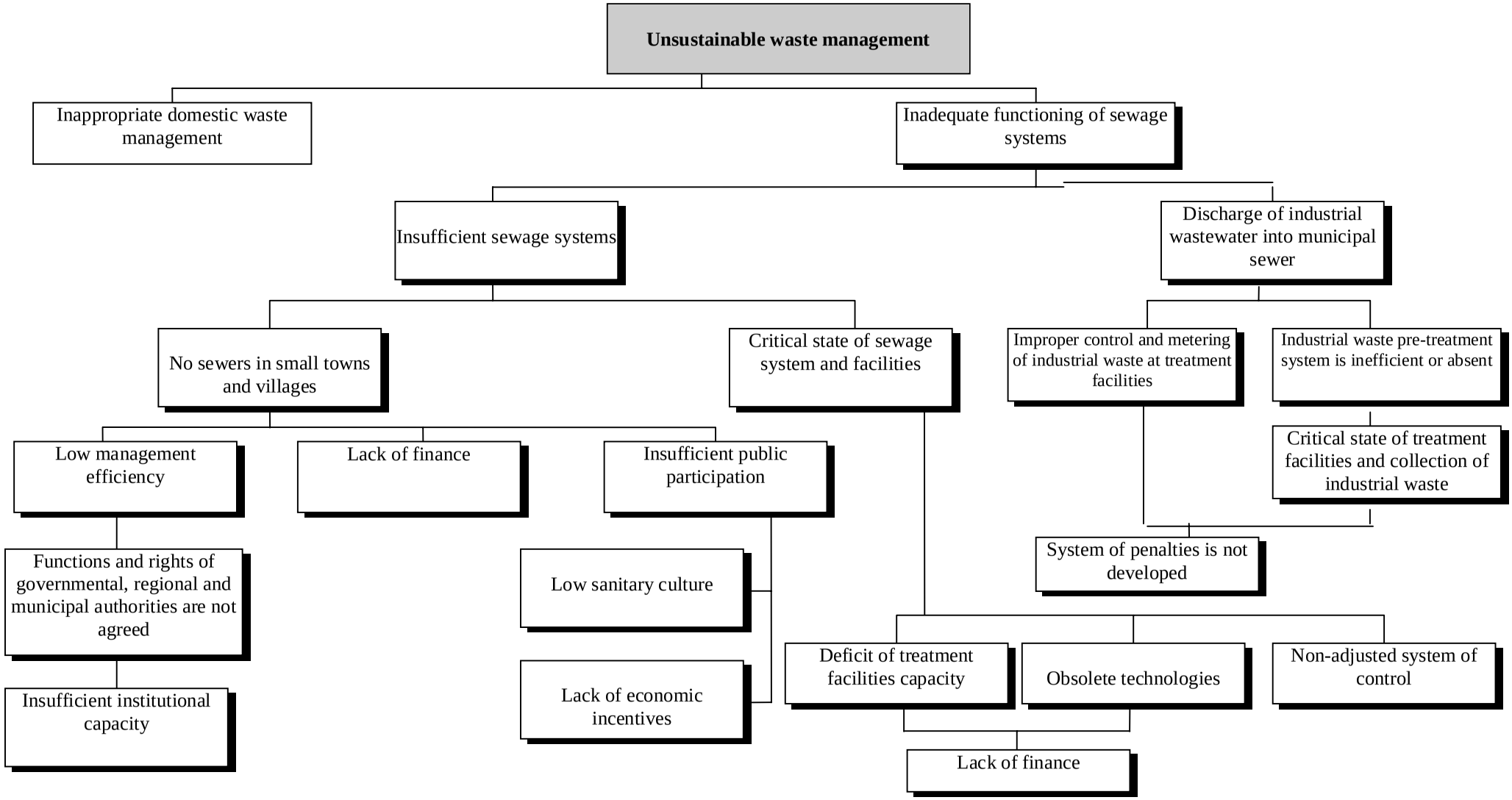
3. Industrial processes
4. Waste management



1. Domestic waste management



2. Sewage systems



Annex 4.
Objective Analysis

4.0. Global

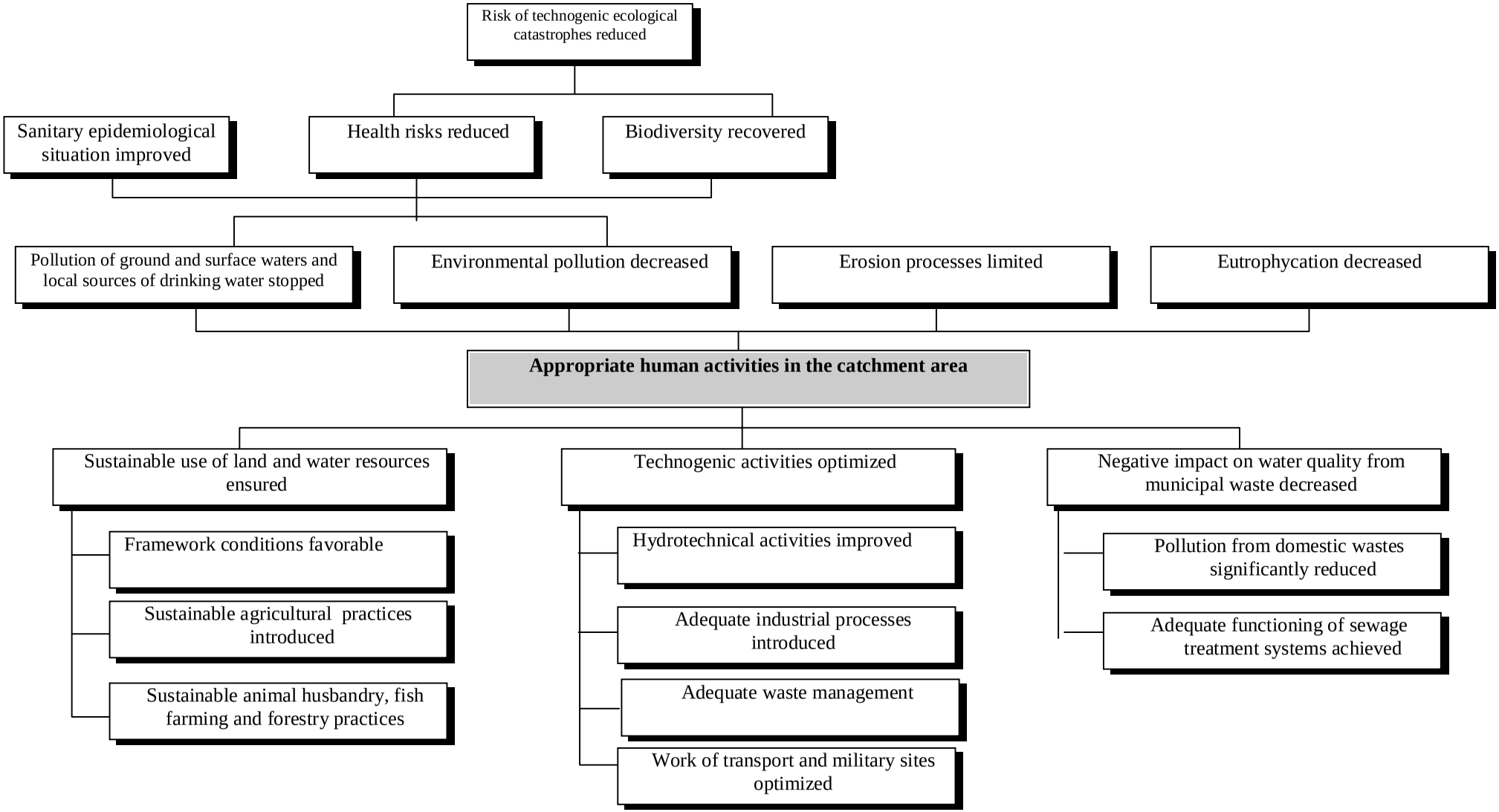
4.1. Agriculture

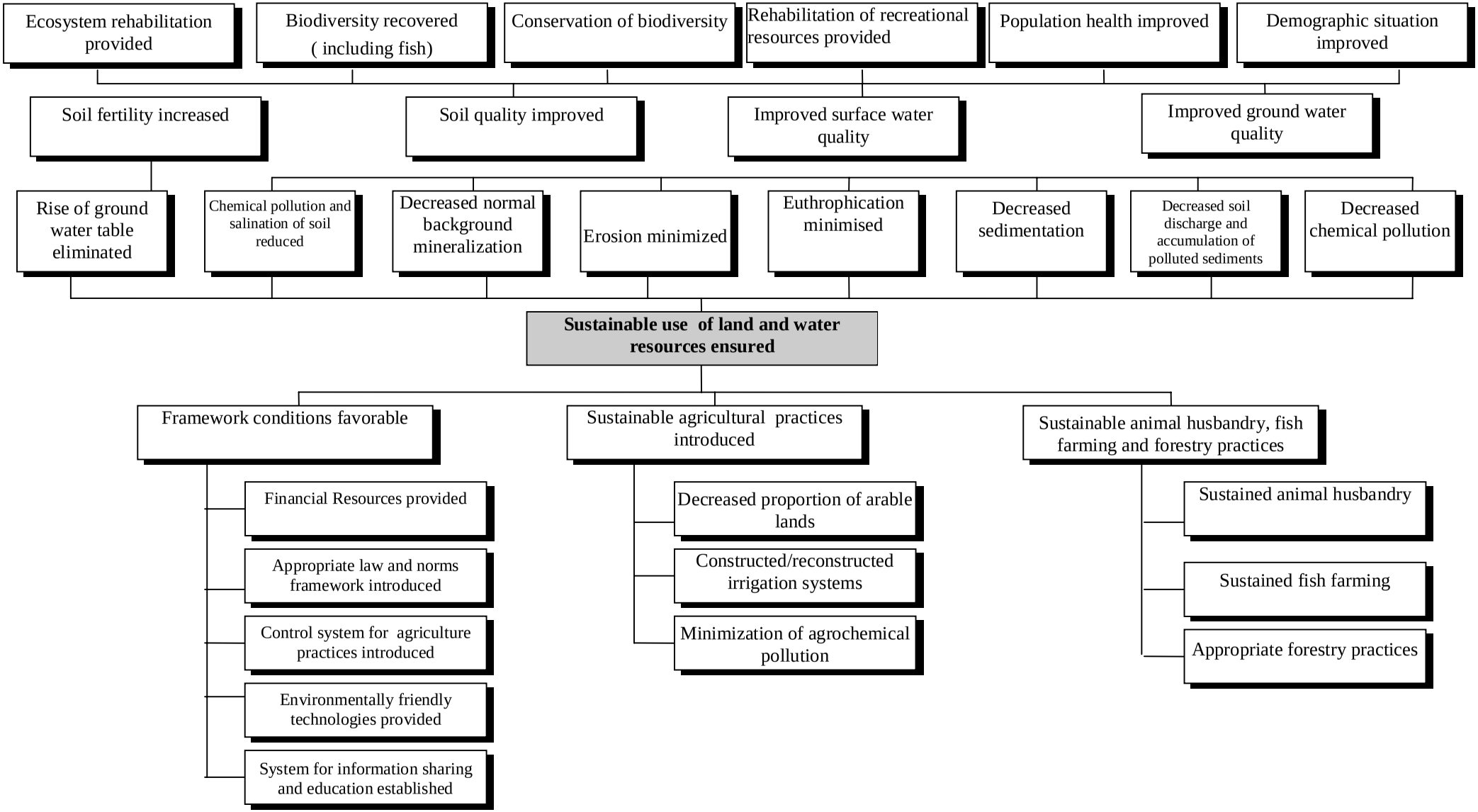
4.2. Industry

4.3. Municipalities

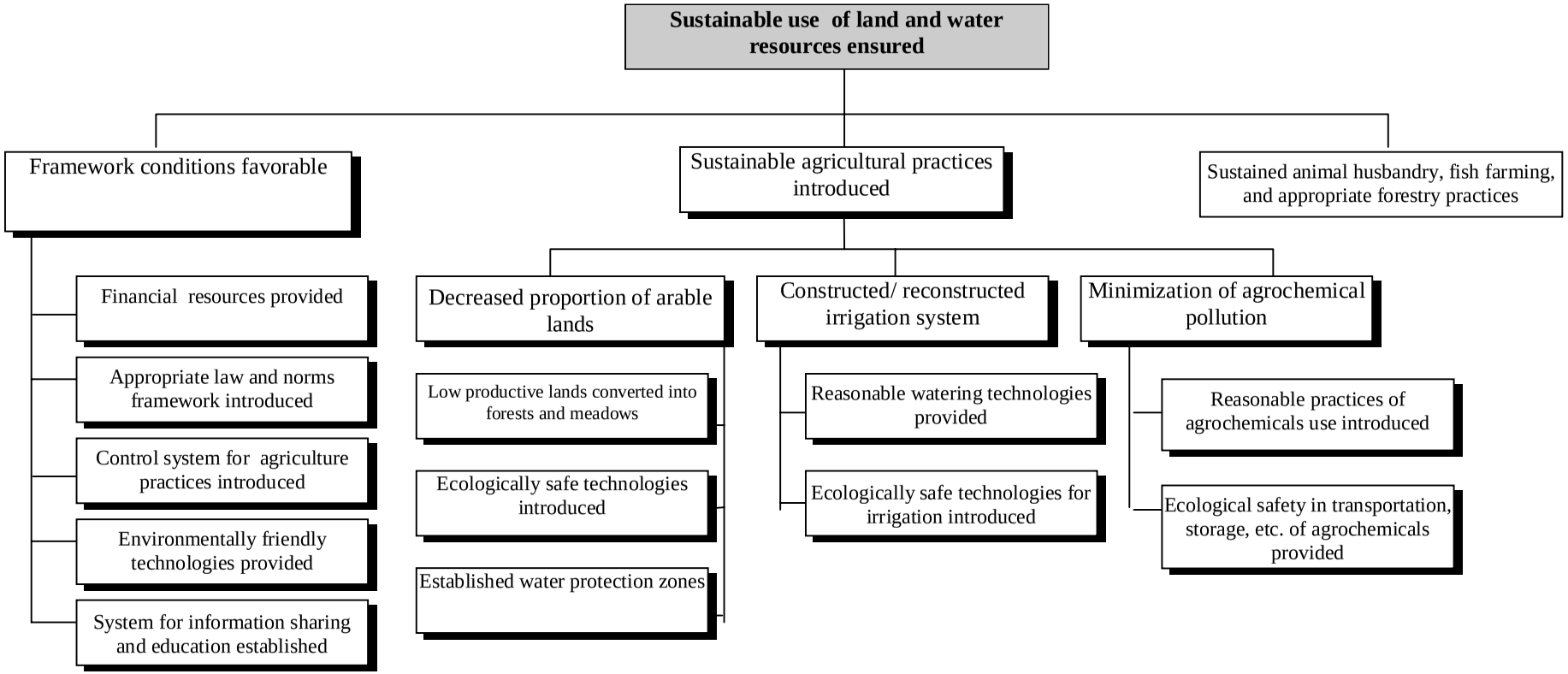
Global Objective Hierarchy

Annex 4.0.

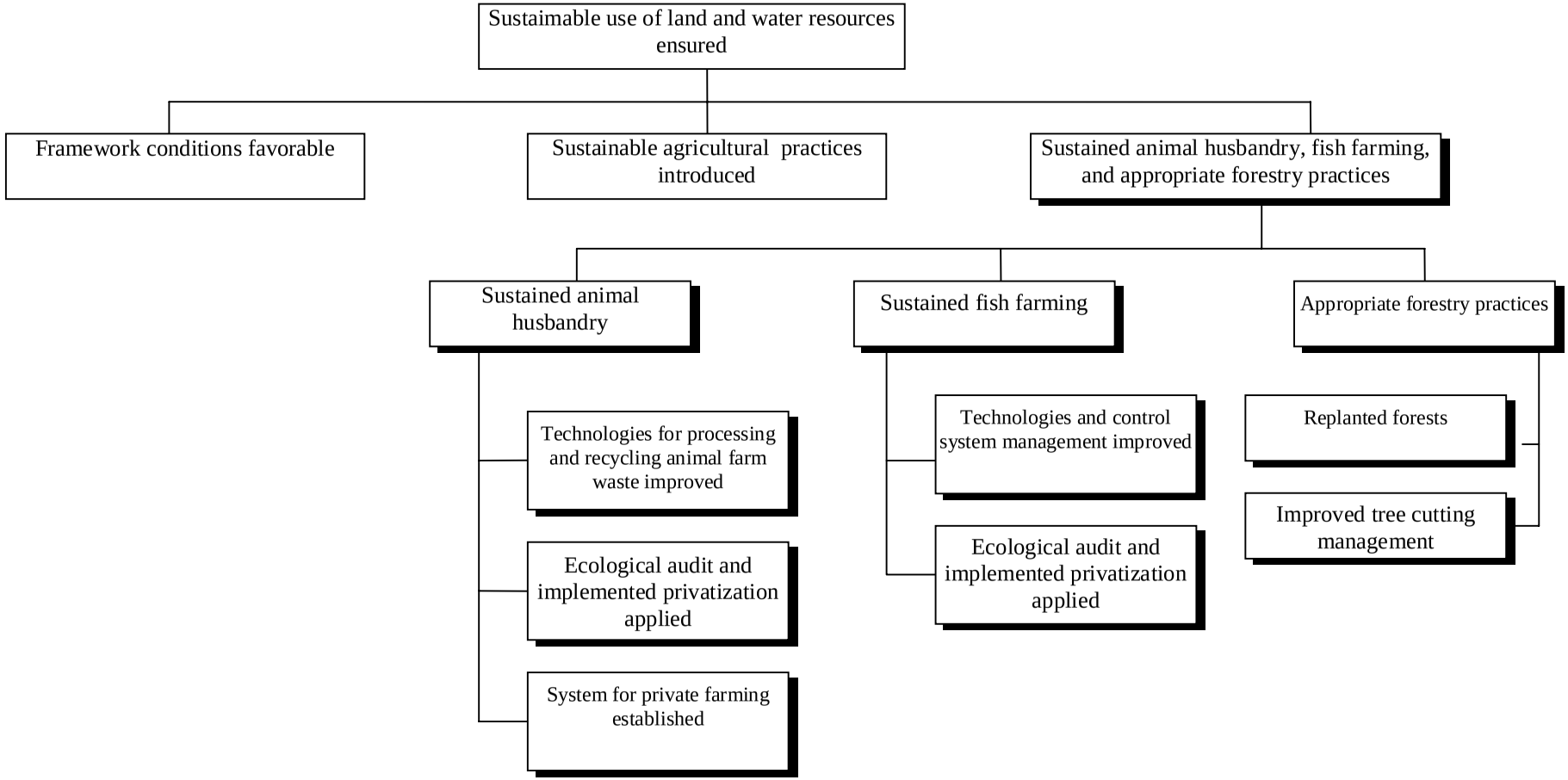


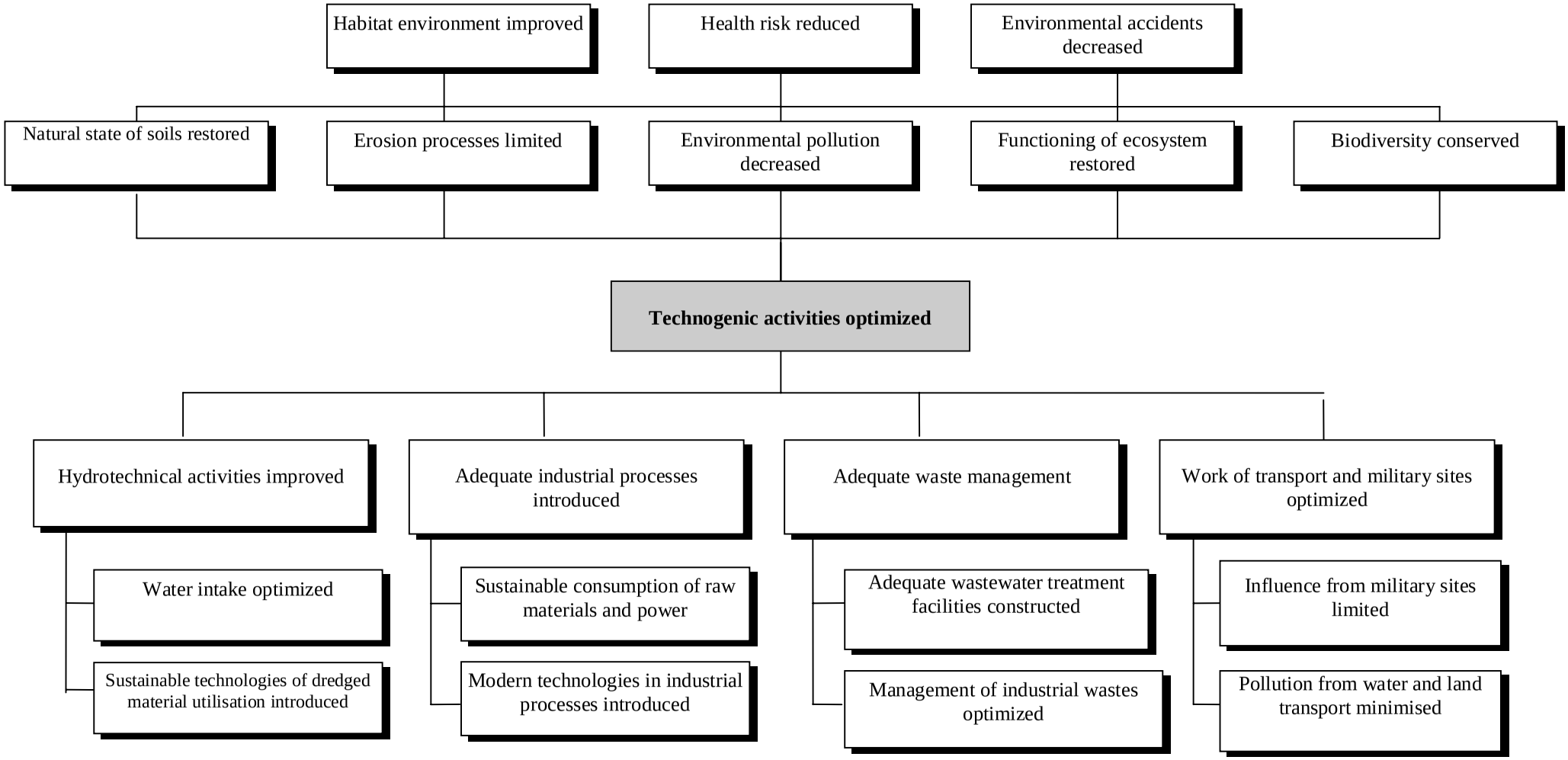

Ecosystem rehabilitation provided
Biodiversity recovered (including fish)
Conservation of biodiversity
Rehabilitation of recreational resources provided
Population health improved
Demographic situation improved
Soil fertility increased
Soil quality improved
Improved surface water quality
Improved ground water quality
Rise of ground water table eliminated
Chemical pollution and salination of soil reduced
Decreased normal background mineralization
Erosion minimized
Euthrophication minimised
Decreased sedimentation
Decreased soil discharge and accumulation of polluted sediments
Decreased chemical pollution
Sustainable use of land and water resources ensured
Framework conditions favorable
Sustainable agricultural practices introduced
Sustainable animal husbandry, fish farming and forestry practices
Financial Resources provided
Appropriate law and norms framework introduced
Control system for agriculture practices introduced
Environmentally friendly technologies provided
System for information sharing and education established
Decreased proportion of arable lands
Constructed/reconstructed irrigation systems
Minimization of agrochemical pollution
Sustained animal husbandry
Sustained fish farming
Appropriate forestry practices

1.Framework conditions
2. Agricultural practices

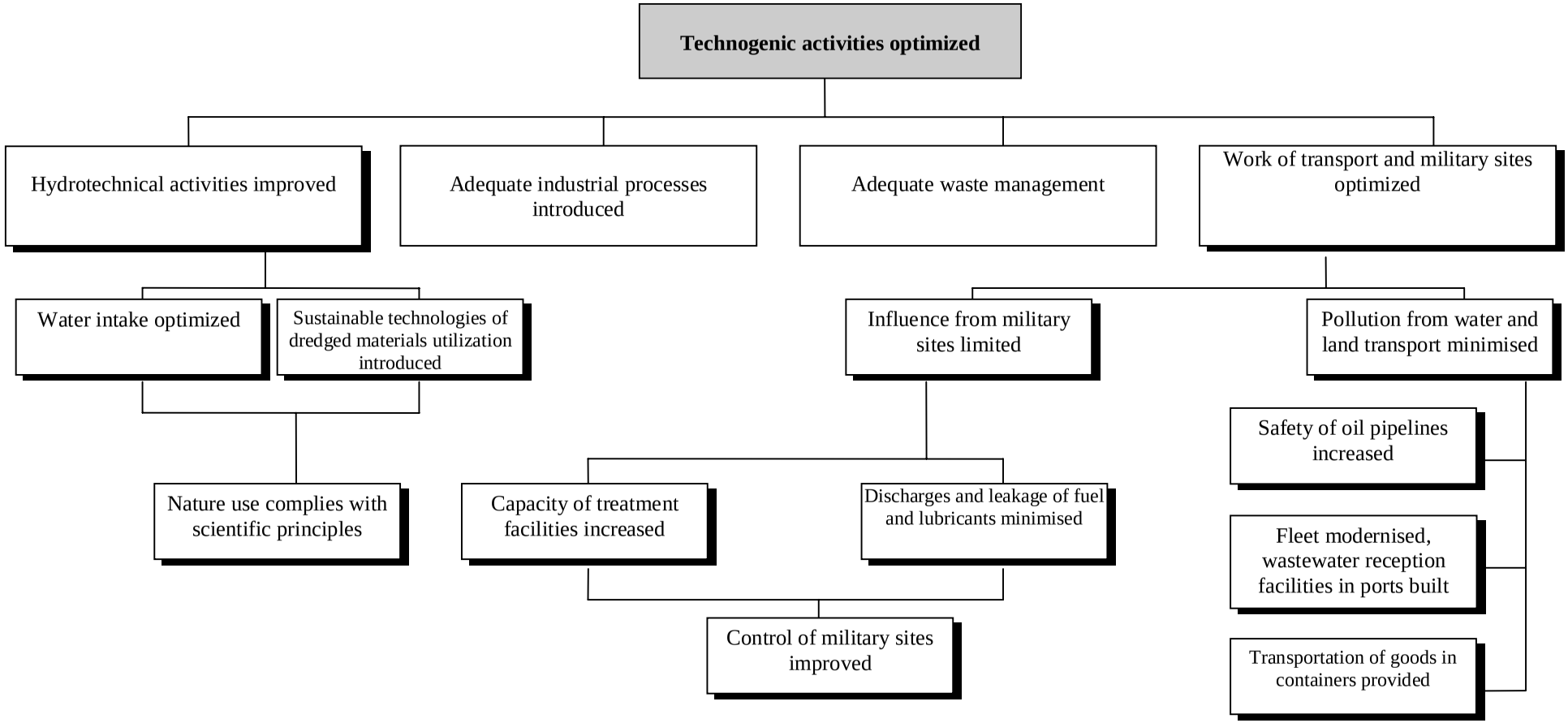


3. Animal husbandry, fish farming and forestry practices

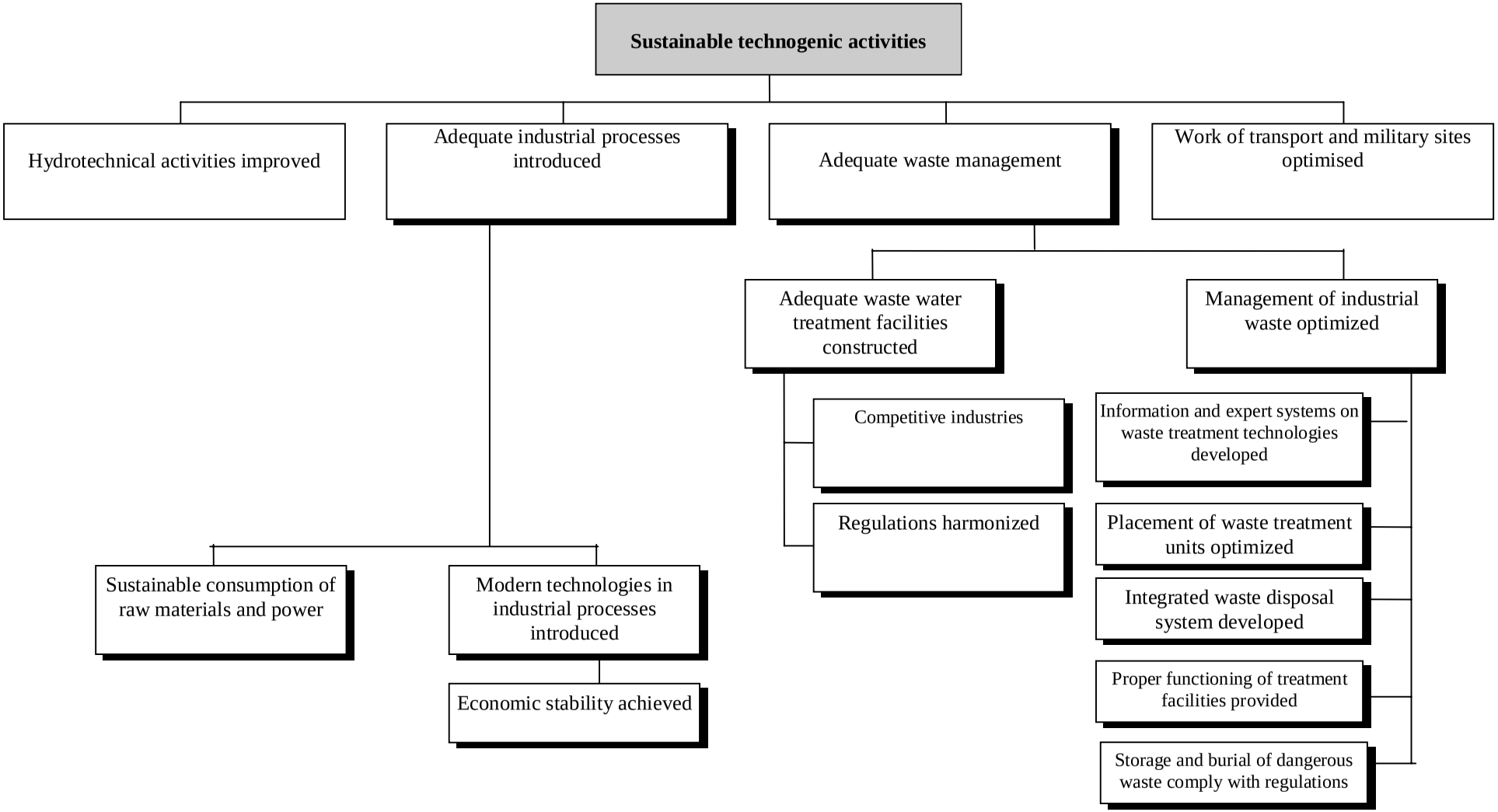



Habitat environment improved
Health risk reduced
Environmental accidents decreased
Natural state of soils restored
Erosion processes limited
Environmental pollution decreased
Functioning of ecosystem restored
Biodiversity conserved
Technogenic activities optimized
Hydrotechnical activities improved
Adequate industrial processes introduced
Adequate waste management
Work of transport and military sites optimized
Water intake optimized
Sustainable technologies of dredged material utilisation introduced
Sustainable consumption of raw materials and power
Modern technologies in industrial processes introduced
Adequate wastewater treatment facilities constructed
Management of industrial wastes optimized
Influence from military sites limited
Pollution from water and land transport minimised

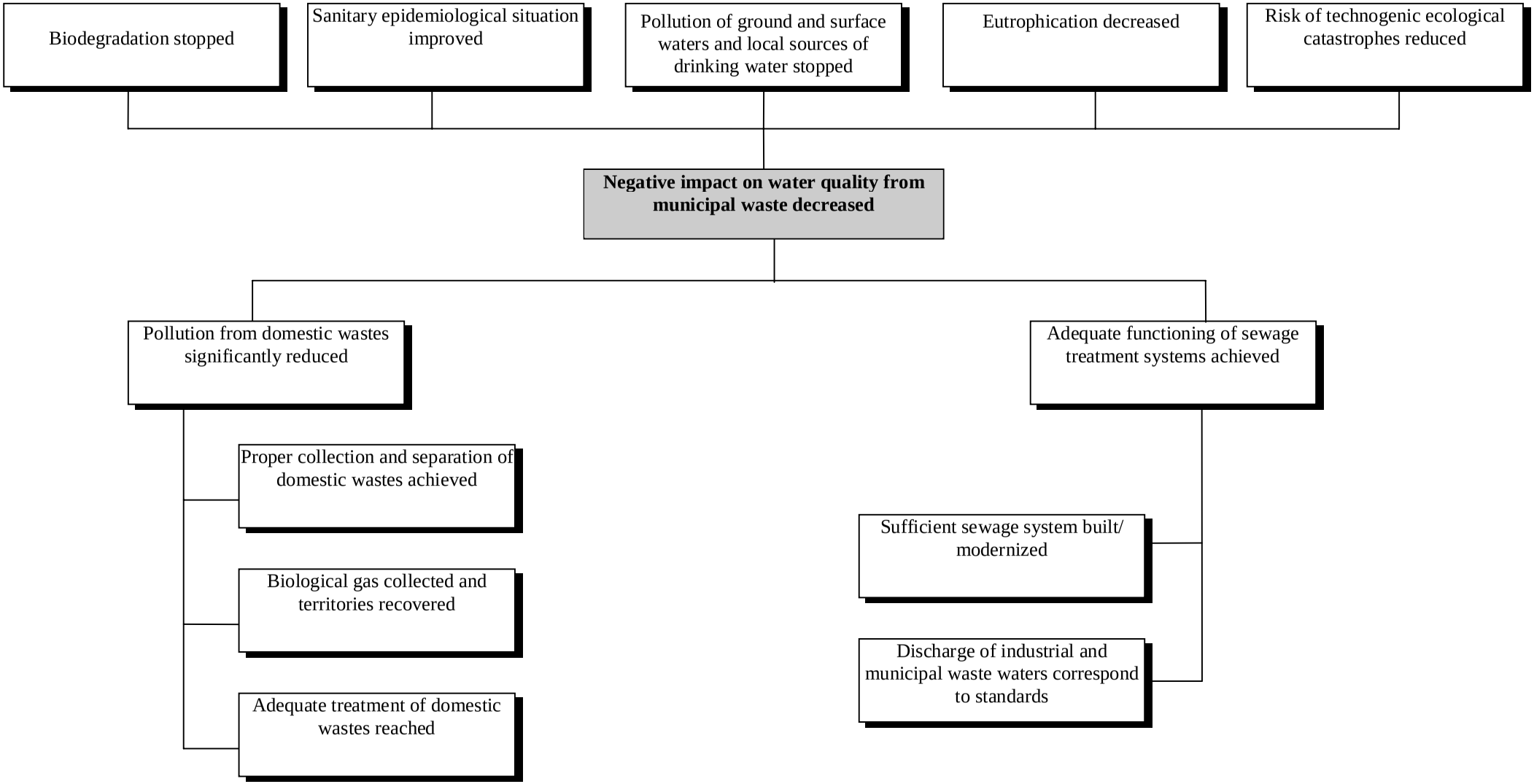
1. Excavation and dredging
2. Transport and military sites



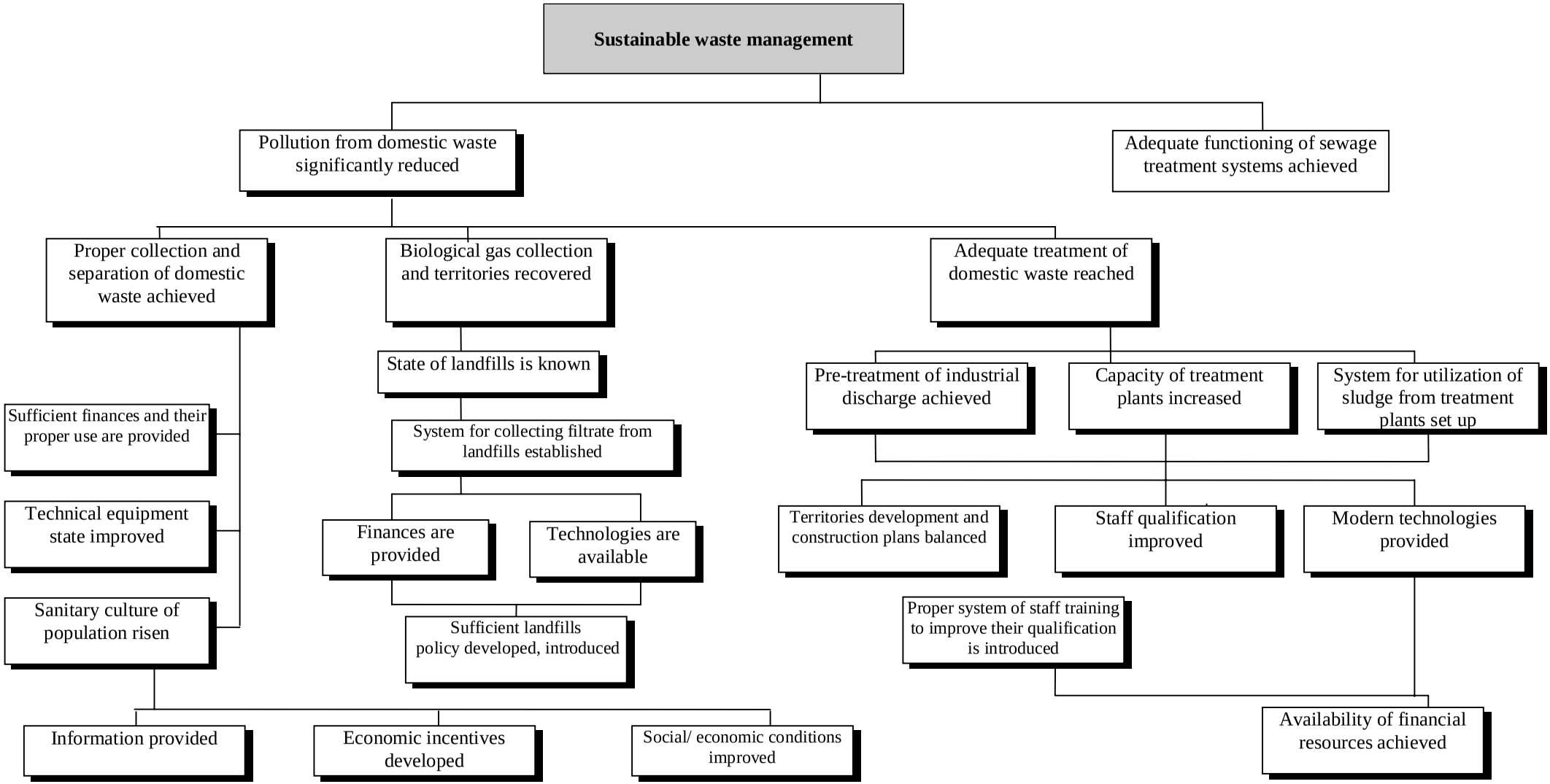
3.Industrial processes
4.Waste management



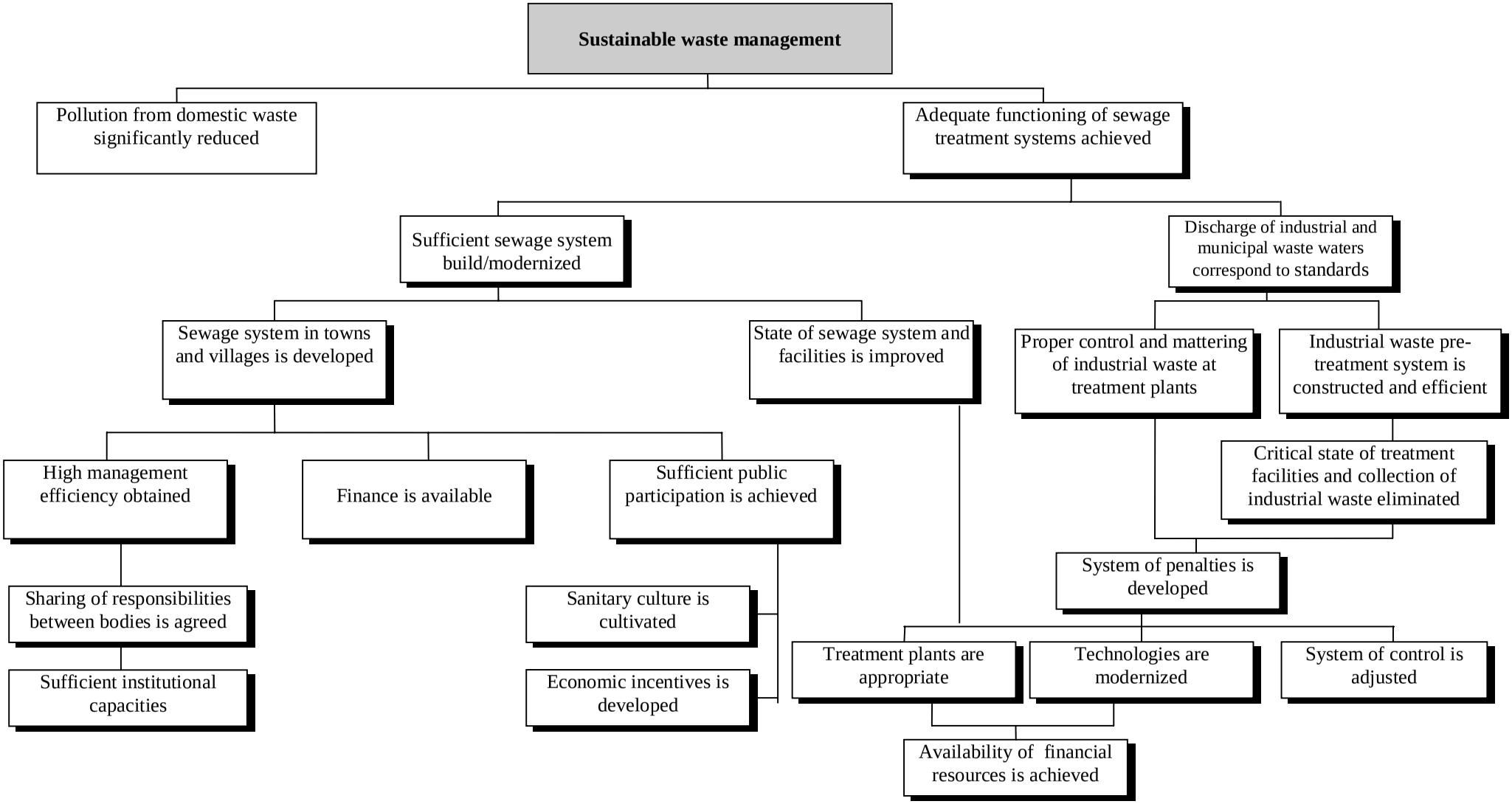
General Objective Hierarchy **Municipality** **Annex 4.3.**
Page 1/3



1. Domestic waste management



2. Sewage systems



Annex 5.
Sector Planning Matrix

5.1. Agriculture

5.2. Industry

5.3. Municipalities

Sector Planning Matrix — Agriculture — Annex 5.1.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Appropriate human activities in the Ukrainian part of the Danube River Basin		
➢ **Sector Objective:** 1. Sustainable use of land and water resources ensured	➢ By the year 2010, diffuse pollution is reduced by 20% (versus 1998) in the Ukrainian part of the Danube basin. (SO-A)	➢ Legislation is improved and enforced (SO-A) ➢ Economic stability achieved.(SO-A)
➢ **Sector Results:** 1.1. Land and water resources optimally protected 1.2. Appropriate cattle breeding practices applied 1.3. Appropriate system for fish farming implemented 1.4. Forest resources adequately managed	➢ From 1998 to 2010, the surface area of arable land in the Ukrainian part of the Danube basin is reduced by 20 %; in comparison with data from 1998. (R1-1) ➢ By 2010, waste utilization technologies in cattle breeding will be introduced in 50% of the cattle farms in the Ukrainian part of the Danube basin. (R1-2) ➢ By the year 2010, water quality indicators in fish ponds in the Ukrainian part of the Danube basin will be adjusted to EU standards.(R1-3) ➢ By the year 2010, forest planting (expansion) will be according to scientifically justified norms. Moreover, there will be an increase in the nature conservation area by 50% and clean production technologies in all forest farms will be introduced. (R1-4).	➢ Appropriate scientific and technical basis is available. ➢ Investment in required amounts is at hand. ➢ Privatization program is implemented before 2010.
Activities: 1.1.1. Optimize land use for agriculture, forestry and pastures 1.1.2. Implement sustainable farming system and technologies 1.1.3. Improve functioning of irrigation and drainage schemes 1.2.1. Regulate cattle breeding activities (incl. private farming) 1.2.2. Implement optimal system for processing and utilization of wastes 1.2.3. Carry out ecological auditing and restructuring of cattle breeding farms 1.3.1. Introduce ecological auditing in privatizing of fishery farms 1.3.2. Optimize technologies of fish farming 1.4.1. Optimize technologies of forest resources use 1.4.2. Introduce measures for restoration and sustainable conservation of forest area 1.4.3. Expand protected areas		

PO - Program Objective SO-A- Sector Objective Agriculture

SR – Sector Result

Sector Planning Matrix — Industry — Annex 5.2.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective**: Appropriate human activities in the Ukrainian part of the Danube River Basin		
➢ **Sector Objective:** 2. Technogenic activities optimized	➢ Trough optimizing technogenic activities in the Danube river basin, water quality increases from category 5 to category 2 in 2010 if compared with the year 1998 (SO-I)	➢ Economic stability of the country is growing (SO-I)
➢ **Sector Results/Outputs:** 2.1. Appropriate hydrotechnical activities implemented 2.2. Modern technologies for goods production and dealing with waste adopted 2.3. Transport and military objects optimized	➢ Trough implementing appropriate hydrotechnical activities in 50% of the industries in Prut river basin, the discharge of solid substances decreases by 25% in 2010 if compared with the year 2005 (R2-1) ➢ As a result of changing the profile of Izmail paper mill quantity of phenols in the Kilia Arm of the Danube decreases by10% before the year 2010, compared with data from 1998 (R2-2) ➢ The concentration of oil products and heavy metals in the ecosystem of the Danube is decreasing by 20% before the year 2010 if compared with data from 1998 (R3-3)	➢ Structural changes in economy are taking place (2.1. to 2.3) ➢ Market mechanism in economic sphere is working (2.1. to 2.3)
➢ **Activities:** 2.1.1. Optimize the water intake 2.1.2. Apply sustainable technologies 2.1.3. Introduce sustainable use of mineral resources 2.1.4. Undertake measures for development and introduction of technologies on the basis of scientific criteria 2.2.1. Reduce/reuse/recycle in production 2.2.2. Improve technologies 2.2.3. Enforce regulations 2.2.4. Apply appropriate system for dealing with waste 2.2.5. Upgrade the quality of treatment technologies to meet the requirements of end quality 2.3.1. Improve the state of ports and marine equipment (military and merchant vessels) to meet MARPOL requirements 2.3.2. Assess the impact of military sites on the state of the environment 2.3.3. Increase reliability of transport means and safety of transportation technologies		➢ Health protection legislation is observed (2.1.1. to 2.3.3.) ➢ Mechanism of economic stimulation of industries is working efficiently (2.1.1. to 2.3.3.) ➢ Ecological education of people is growing (2.1.1. to 2.1.3.)

PO - Program Objective

SO-I - Sector Objective Industry

SR – Sector Result

Sector Planning Matrix — Municipalities — Annex 5.3.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Appropriate human activities in the Ukrainian part of the Danube River Basin		
➢ **Sector Objective:** 3. Negative impact on water quality from municipal wastes decreased	➢ By the year 2010, the concentration of BODs in the Ukrainian part of the Danube river decreases by 25% while the same volume of municipal waste water, in comparison to 1998, has been discharged. (SO-M)	➢ The process of privatization in general and land privatization in particular is in process (SO-M)
➢ **Sector Results:** 3.1.Pollution from domestic waste significantly reduced 3.2. Adequate functioning of sewage treatment system achieved 3.3. Institutional capacities in wastes management reinforced	➢ By the year 2010, the concentration of BOD in groundwater in the towns of Uzhgorod, Kolomya, Izmail, Reny and Vilkovo decreases by 35% and at the same time the domestic waste has not been disposed to other municipal landfills, (R3-1) ➢ By the year 2010, Microbial contamination and coli-titer in surface water in downstream Danube towns (Vilkovo, Kiliya, Reny and Izmail) decrease to standard values and, at the same time, health risks are reduced. (R3-2) ➢ By the year 2010, the amount of 35 mln. UAH is obtained as ear-marked investment for the treatment facilities in the towns of Reny, Izmail, Kiliya and Vilkovo without taking funds from the other environmental and social budget items (R3-3)	➢ Legal and economic mechanism of full Cl phase out from drinking water preparation and waste water disinfection are developed and enforced (3.1 to 3.3.)
➢ **Activities:** 3.1.1 Implement system for the proper collection and separation of domestic wastes 3.1.2. Undertake measures for the appropriate use of landfill territories 3.1.3. Upgrade the treatment of domestic discharges 3.2.1. Develop sewage system in towns and villages 3.2.2. Ensure appropriate sewage system and treatment plants for cities 3.2.3. Apply methods for adequate discharge of industrial wastes into municipal system 3.3.1. Create a basis for efficient waste management 3.3.2. Introduce financial mechanism for environmental friendly technologies in wastes management 3.3.3. Ensure public participation in the process of decision making and control 3.3.4. Raise public awareness		➢ Integrated computerized environmental data-bank is established ➢ Disposal of non-domestic waste at municipal landfills is eliminated ➢ New legislation related to non-governmental organizations is adopted ➢ Mechanism of budget financing for public participation process is established ➢ Adherence to technological mode of operation of treatment plants is ensured ➢ Information and co-ordination center aimed at uniting and co-ordinating NGO activities is established

PO - Program Objective SO-M - Sector Objective Municipality

SR – Sector Result

Annex 6.

Description of Activities, Important Elements and Projects

6.1. Agriculture

6.2. Industry

6.3. Municipalities

Description of Activities, Important Elements and Projects - Agriculture

Result 1.1.: Land and water resources optimally protected

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 1.1.1 Optimize land use for agriculture, forestry and pastures	➢ Establish network of training and consulting centers for land users ➢ Inform population about restrictions on economic activity in water protection zones and coastal protection areas in terms of Water Code Requirements ➢ Develop a plan for reducing the area of cultivated lands ➢ Develop of implement projects on relief-meliorative system of agriculture management ➢ Organize projects for regulation encouragement to establish coastal protection areas in terms of legislation requirements ➢ Implement demonstration projects on cultivated lands reduction ➢ Introduce river basin management approach ➢ Develop projects and introduce water protection zones and coastal protection areas ➢ Organize public campaigns for recreation of small rivers ➢ Implement sustainable erosion protection measures	➢ Restructuring of agriculture and land privatization (World Bank) ➢ Implementation of the Strategic Action Plan for the Black Sea (1997- 98 (GEF) ➢ TACIS Fund for the Black Sea Environmental Programme, 1997-99 ➢ Accident emergency warning system, monitoring, laboratory and information management for the Ukrainian and Moldovan part of the Danube Basin, TACIS ➢ State inventory and monitoring of land ➢ Rationalization of land use (National) ➢ Anti-erosion agro-technical measures ➢ Improvement of soil fertility		➢ Establishment of a network of training and consulting centers for land users ➢ Pilot projects on relief-meliorative system of agricultural management ➢ Pilot projects on ecological (organic) agriculture
➢ 1.1.2 Implement sustainable farming systems and technologies	➢ Identify sites for safe storage and utilization of waste pesticides ➢ Assure appropriate use of chemical fertilizers and pesticides ➢ Reinforce legislation related to utilization and management of agricultural chemicals ➢ Develop a system to promote organic (local) fertilizers utilization			➢ Establishment of training system for modern agro-chemical management ➢ Production and use of organic fertilizers ➢ Strengthening the control system for agricultural practices
➢ 1.1.3 Improve functioning of irrigation and drainage schemes pesticides	➢ Treatment of irrigation waters to improve its' quality ➢ Develop and implement technologies for the rehabilitation of river beds ➢ Develop standards for return drenage water ➢ Perform audit of analysis of technical conditions of hydro-technical facilities and protection installations of Ukrainian bodies in Danube river basin ➢ Perform analysis of impacts from hydro-melioration on environment ➢ Perform ecological expertise of the projects for reconstruction and erection of new hydro-melioration installations ➢ Develop of implement a system of economic incentives for water consumers irrigating land ➢ Meet rational ecologically based irrigation modes	➢ Erection of anti-erosion hydro-technical construction and recultivation of land destroyed		➢ Reconstruction of irrigation systems taking into account their impact on the environment ➢ Privatization of irrigation system

Result 1.2.: Appropriate cattle-breeding practices applied

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 1.2.1. Regulate cattle-breeding activities, including private cattle farms	➢ Analyze the state of cattle-breeding, including private cattle farms ➢ Improve legislation and regulations on cattle-breeding ➢ Foresee allocation of plots for pasture land ➢ Inform individual cattle farmers on the rules of farming in river valley ➢ Removal of farms and integrated farms from coastal and water protection areas			➢ Demonstration projects on environmentally friendly farms ➢ Demonstration projects on the restructuring of cattle breeding farms ➢ Rehabilitation of deteriorated pasture land
➢ 1.2.2 Implement an optimal system for the processing and utilization of wastes	➢ Application of straw to absorb waste in cattle breeding ➢ Elimination of waste removal by washing off ➢ Introduction of technologies for processing and utilization of cattle-breeding waste ➢ Use of cattle-breeding waste in crop farming			➢ Introduction of updated technologies for processing and utilization of cattle-breeding waste ➢ Creation of information and training centers for advanced farming technologies
➢ 1.2.3. Carry out ecological and restructuring in cattle-breeding farms	➢ Develop a methodology of ecological auditing for cattle farms according to ISO 1400 ➢ Asses the ecological state and develop measures for its improvement together with an economic assessment of measure implementation ➢ Demonstration projects on restructuring cattle-breeding farms			➢ Ecological audit of cattle-breeding farms with respect to privatization ➢ Development of a methodology and legislative basis for restructuring cattle-breeding farms

Result 1.3.: Appropriate system of fish farming implemented

Main Activities	Important Elements	Projects		
		Existing/on-going		Proposed
➢ 1.3.1.Introduce ecological auditing in privatizing of fishery farms	➢ Improve legislation regarding fish farming ➢ Create data bank of fishing farms which require ecological audit ➢ Create data bank of fish farm ponds constructed without design documentation and relevant permissions ➢ Develop methodology for ecological audit exersise of the fish farms (in accordance with ISO 1400)			➢ Establishment of service centers for education and consultation fish farming ➢ Inventory, assessment and rehabilitation of existing fish farming system ➢ Development of an integrated approach for fish farming (including biodiversity and land protection measures)
➢ 1.3.2.Optimise technologies of fish farming	➢ Develop measures on appropriate fish farming ➢ Establish service centers for education and consultation on fish farming ➢ Introduce system for promotion of ecologically balanced technologies ➢ Reduce negative impact of fish farms of quality of ground and underground waters ➢ Develop and implement demonstration projects on ecologically balanced technologies of fish farming ➢ Analyze causes and develop technology to eliminate raising of ground water table			➢ Demonstration projects on ecologically balance technologies of fish farming ➢ Development of Aquaculture technologies in fresh water bodies

Result 1.4.: Forest resources adequately managed

Main Activities	Important Elements	Projects		
		Existing/on-going	Planned	Proposed
➢ 1.4.1. Optimize technologies of forest resources use	➢ Improve control to prevent unauthorized felling ➢ Develop and introduce a system of economic incentives for no-waste felling technology use ➢ Implement complex of measures for informing the people about the consequences of disposal of wastes from felling into the water bodies	➢ Regulated forest planting for land protection (National)		➢ Introduce no waste technologies for felling ➢ Public awareness and public information on sustainable forest management ➢ Alternative energy sources exploitation
➢ 1.4.2. Introduce restoration and reclamation of forest area	➢ Carry out ecological expertise of forest restoration and forests recultivation projects ➢ Organize public forests-planting campaigns ➢ Finance forest planting in the river banks protection bands			➢ Afforestation Projects For The Odessa Oblast ➢ Support of public forest-planting activity
➢ 1.4.3. Expand protected area	➢ Analyze the state of possible protected area ➢ Establish an inventory of territories in the Danubian basin which could be turned into protected area ➢ Draft legislation for organizing new protected areas	➢ Biodiversity Protection in the Danube Delta (GEF) 1994-1998 ➢ Elaboration of the National Strategy for Biodiversity Protection (GEF), 1996-1998 ➢ Biodiversity conservation in the North Black Sea region (GEF) ➢ Conservation of Biological and Landscape Diversity of Bukovyna Carpathians and establishment of transfrontier ecological network of the borders of Ukraine and Romania (TACIS), 1998-1999		➢ Feasibility study and projects for organizing new protected areas

Result 2.1.: Appropriate hydrotechnical activities implemented

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 2.1.1. Optimize the water intake	➢ Introduce regulations and economic measures to stimulate industrial enterprises to use closed water supply ➢ Increase control and metering of water intake ➢ Improve control, metering and economic incentives to bring down water losses ➢ Stimulate measures to decrease net water consumption in agriculture ➢ Stimulate measures for the introduction of meters in the municipal sphere			➢ Improvement of the Project for Danube water supply South Ukraine for irrigation purposes ➢ Development of the Danube water treatment technologies to remove suspended pollutants
➢ 2.1.2. Apply sustainable technologies	➢ Independent expertise of feasibility studies of projects ➢ Introduce technologies for the rehabilitation of river beds ➢ Develop methodologies for complex cost assessment of ecological consequences of projects ➢ Inform the population about negative consequences of the unauthorized changing of water bodies configurations ➢ Develop technologies for the utilization of hydrotechnical waste technologies	➢ Danube bank stabilization in emergency sites ➢ Renewal of emergency parts in Danube check dams ➢ Integrated term program to prevent flooding in Ivno-Frankovsk oblast for 1994-2000 ➢ Integrated term program to prevent flooding in Zackarpatskaya oblast ➢ Integrated long term program to prevent flooding in Odesa oblast	➢ River bank protection of the Prut around the pumping station 2 (Kolomya) ➢ Measures for the elimination of flooding consequences on the drinking water facility in the town of Kolomya (river bank protection)	➢ Development of new technologies for river bed excavated soil processing ➢ Develop technologies for river bed rehabilitation ➢ Prepare and distribute a set information materials about the role of coastal protection zones ➢ Develop and implement pilot projects for small rivers' beds rehabilitation ➢ Develop and implement an integrated program for measures on the ecological improvement of the water collection of the Prut river

Result 2.1.: Appropriate hydrotechnical activities implemented

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 2.1.3. Introduce sustainable use of mineral resources	➢ Minimize mining of mineral resources in river beds and riparian lands ➢ Stop discharging of untreated water from mines into open water bodies ➢ Stop placing of mining wastes in the riparian lands ➢ Stop pumping water from mines, which results in karst processes ➢ Develop and implement technologies for ecologically safe utilization and disposal of mining industry wastes in river basins			➢ Prevention of the karst rock formation in the Dnestr-Prut water sections
➢ 2.1.4 Undertake measures for the development and introduction of technologies on the basis of scientific criteria	➢ Organize international basin expert groups to harmonize technologies of hydrotechnical activities ➢ Develop a system of unified and local criteria for sustainable water use in the basin f rivers of the Danube system ➢ Develop a common data base in hydrotechnical technologies and methods to assess their impact to be used in the Danube countries ➢ Develop criteria and methodology for international economically and legal assessment to stimulate implementation to ecologically safe technologies ➢ Hold international scientific conferences on water management in all the countries of the Danube basin in turn ➢ Assist stakeholders in the use of technologies on the basis of scientific criteria	➢ Pilot project for the improvement of the concept of water supply in Chernivtsy city, TACIS N-1796/69	➢ Program of the enterprise “Danube-Dnipro” ➢ Pilot project for sanitation and reconstruction of the sewage network in Chernivtsy including the prevention of the bank slippery cases ➢ Approved National program for ecological improvement of the Danube River	➢ Development and implementation of automatic water quality control system

Result 2.2.: Modern technologies of goods production and dealing with wastes adopted

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 2.2.1Close material and power cycles of production	➢ Consequently introduce the assessment of material and power balance in technological industrial processes in accordance with the principles of life cycle assessment ISO M040 ➢ Stimulate measures to recycle materials and power agents in industry using regulations and economic incentives ➢ Develop a system of data bases on power saving technologies for main types of industries and services which are typical for the Danube basin ➢ Conduct researches and develop information technologies on wastes and secondary power agents using instead of natural materials and power at the typical industries in the Danube basin ➢ Hold a series of scientific and technical workshops of the Danube countries dedicated to power saving in the main branches of economic activities in the country		➢ Complex use of wood raw materials with green technologies at the Tereasviansky wood processing plant ➢ Complex use of wood raw materials with green technologies at the Velykobichkovsky wood processing plant	➢ City twinning project for the Chernovitsky region, based n the life cycle assessment tools
➢ 2.2.2. Improve technology	➢ Develop an information base on the typical kinds of economic activities, industries and basic technologies which influence the state of the Danube basin ecosystem ➢ Organize expert groups to work and e-mail conferences on the types f economic activities to exchange information and contribute to new technologies introduction ➢ Organize training for staff and conditions for experience exchange between sister industries on using economically and ecologically acceptable technologies ➢ Compile in the Danube basin a catalogue of closed water us systems and recommendations on the implementation for typical kind of economic activities ➢ Hold workshops and email conferences on the experience of modern technologies implementation		➢ Assessment of environmental protection measures implemented in Danube basin regarding the impact on the South-western part of the Black Sea	➢ Switch from contemporary technology to a technology based on clean production principles or change of production profiles at the Ismail pulp and paper plant

Result 2.2.: Modern technologies of goods production and dealing with wastes adopted

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 2.2.3. Enforce regulations	➢ Carry out inventory and revision of regulations on industrial and environmental protection activities in order to agree them and harmonize with EU regulations and on the transboundary level ➢ Review regulations on water use by international experts to harmonize them and decrease environmental impact ➢ Develop in Danube countries harmonized requirements for measuring and control of water quality on all the stages of water cycle ➢ Harmonic technologies for ecological monitoring in the Danube basin ➢ Harmonize regulations and/or develop manual for emergency situations classification, preventative measures and plans of consequences liquidation n the transboundary regions of the Danube Basin		➢ Pilot implementation of the Austrian ECOPROFIT Programme in the Eco EuroRegion as a facility for ISO 14000 and CIS waste management standards	➢ National and regional legal basis inventory
➢ 2.2.4. Apply an appropriate system for dealing with wastes	➢ Implement a step-by-step classification system and wastes certification according to the types of economic activities to comply with the law of Ukraine “on waste” and the system of GOST (state standards) 17.0.005 ➢ Develop technical and economic incentives to bring down waste generation in the main types of industries in the Danube basin n the bases of their material and power balances comparison according to ISO 14040 ➢ Develop international automated data bases on technologies of dealing with wastes according to GOST (State standards) ➢ Develop and step by step introduce experimental basis stimulating economic measure which are foreseen in the law of Ukraine “on waste” ➢ Hold workshops and email conferences on technologies of dealing with waste in the Danube basin	➢ Landfill for communal solid wastes in Chernivtsy city ➢ Wastes management system in accordance with State Standards (GOST): ➢ - GOST-17.0.0.05.1 (DSTU 21.95.1) ➢ - GOST-17.0.0.05.2 (DSTU 21.95.2) ➢ - GOST-17.0.0.05.3 (DSTU 21.95.3)	➢ Development of the methodological background to establish setoral classifications of wastes ➢ Development of the methodological background to create data base on waste management technologies ➢ Review and improvement of the environmental safety of sludge formation at the Chernivtsy enterprise “Vodocanal”	➢ Further development and implementation of standards, norms and corresponding software to ensure their active use
➢ 2.2.5 Upgrade the quality of treatment technologies to meet the requirements of environmental quality	➢ Carry out an inventory of local treatment and pre-treatment facilities of industries to assess their correspondence to existing an prospective technologies and requirements for ecological safety on the next stages of water cycle ➢ Improve inner systems of liquid wastes collection in industries to prevent them from mixing which will make their qualitative treatment impossible ➢ Improve the system of metering and quality control of industrial wastes discharged to the municipal treatment facilities ➢ Introduction on municipal treatment facilities of flexible technologies to react to the changes in municipal and industrial wastes composition ➢ Introduction of technologies for methane extraction and sludge of treatment facilities dehelmintisation for its further utilization and stopping of silt grounds organizing on the river banks	➢ Completion of the discharges collector from Luzhansk industrial area to the Chernigov wastes treatment plant	➢ Investment project for Luzhansk alcohol plant reconstruction regarding processing bio wastes into fertilizers ➢ Development of the requirements to decrease antropogene load on the Danube basin taking into account requirements for Black Sea rehabilitation ➢ Assessment of nature protection measures in Danube basin regarding the impact on the Black Sea	➢ Project for the construction of a plant for de-helmintology and sludge from treatment plants and closure of the sludge sites at Chernivtsy treatment plant ➢ Removal of oil products from water (technology development)

Result 2.3.: Transport and military objects optimised

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 2.3.1 Improve the state of ports and marine equipment (military and merchant vessels) to meet MARPOL requirements	➢ Organize an international bank of technologies for dealing with wastes from vessels both in the sea and in ports ➢ Attract investments from international funds to build waste water reviewing facilities in the Danube ports ➢ Purchase equipment to comply with international standards for combating oil spills as a result of accidents ➢ Introduce an additional ecological tax for the ports which do not have receiving facilities for waste waters ➢ Make bilateral and multilateral agreements on the prevention of pollution from river transport Develop international classification catalogue of wastes from navigation including internationally accepted technologies of dealing with these wastes ➢ Modernize the navy	➢ Program of measures regarding implementation of the Black Sea Convention		➢ Study of international experience of elimination of oil spills and its implementation in Ukraine
➢ 2.3.2 Assess the impact of military sites' on the state of the environment	➢ Develop methodology for ecological certification of military sites on the basis of GOST (state standards) 17.0.0.0.4-90 and 17.0.0.0.5-93 ➢ Establish a catalogue of wastes from military activities and technologies of dealing with those wastes ➢ Elaborate classification guide for emergency situations in military sites, their potential environmental impact and measures for prevention ➢ Generalize international experience and develop recommendations to decrease impacts and risks from military activities in the Danube basin ➢ Make available the issues of technogenic-ecological safety of military activities in the Danube river basin through scientific and technical conferences	➢ Program of measures regarding the implementation of the Black Sea Convention		➢ Development of an impact assessment from military sites on the environment ➢ Development of a methodology for ecological standardization of military sites ➢ Development of the emergency cases classification for the military sites
➢ 2.3.3. Increase reliability of transport means and safety of transportation technologies	➢ Establish a system of classifying guides on emergency situations in different kinds of transport in the Danube basin and the program of measures to increase their technogenic ecological safety ➢ Develop the system of classifying catalogues of wastes and technologies in different kinds of transport in the Danube basin ➢ Organize international expert group and development of common action plan to decrease technogenic load in trans-european transport corridors in the Danube basin ➢ Elaborate recommendation for ecologically safe automobile tourism in the countries of the Danube basin ➢ Introduction of automatic radiological transboundary traffic security in the transport corridors	➢ Program of measures regarding the implementation of the Black Sea Convention		➢ Develop a system of classifying catalogues of wastes and technologies in different kinds of transport in the DRB ➢ Creation of an international common action plan to decrease the technogenic load in trans-european transport corridors in the DRB

Result 3.1.: Pollution from domestic waste significantly reduced

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 3.1.1. Implement system for the proper collection and separation of domestic wastes	➢ Develop technologies for the proper domestic wastes collection and separation ➢ Develop technologies for the proper domestic wastes utilization ➢ Install facilities for proper domestic wastes collection, separation and utilization ➢ Develop facilities for hospital non-plastic waste burning ➢ Perform inventory of the system for the proper collection and separation of domestic wastes ➢ Make funds available			➢ Study international experience in the sphere of proper collection and separation of domestic waste with a further development of national technologies to address the problem or an introduction of foreign ones ➢ Set up a pilot project for the proper collection, separation and utilization of household solid waste
➢ 3.1.2. Undertake measures for the appropriate use of landfill territories	➢ Develop an adequate landfill policy ➢ Ensure measures for an inventory of landfills (old and functioning) ➢ Assess impact of landfills on the environment ➢ Apply appropriate measures for sanitation of landfills ➢ Introduce technologies for biogas collecting ➢ Implement technologies for the recultivation of closed landfills ➢ Make funds available ➢ Reinforce the system of quality control		➢ The site for collection of solid domestic waste in Chernovtsy city	➢ Inventory of landfills (both old and functioning
➢ 3.1.3. Upgrade the treatment of domestic discharges	➢ Build new treatment facilities and increase the capacity of existing ones ➢ Ensure measures to introduce technologies for biogas collecting in the sludge cites ➢ Provide for utilization of sludge from treatment facilities ➢ Introduce appropriate wastes pre-treatment system in industry ➢ Ensure proper control and metering for industrial wastes ➢ Make funds available ➢ Perform an inventory of domestic discharges facilities	➢ Construction of waste water treatment facilities in Vorokhta and Kuty ➢ Construction of sewage collector for the discharge of contaminated waste water of industrial sites in Luzhansky with a simultaneous implementation of technologies for waste water treatment in the Luzhansky experimental distillery	➢ 4 projects in the Odessa Oblast, ➢ 5 projects in Ivano-Frankovsky Oblast ➢ 9 projects in Chernivetsky Oblast ➢ 20 projects in Zakarpatsky Oblast	➢ Reconstruction and capacity upgrade of Chernivtsy WWTP ➢ Reconstruction and capacity upgrade of Uzhgorod WWTP ➢ Reconstruction and capacity upgrade of Kolomya WWTP ➢ Sludge processing and reduction of environmental hazards pertaining to water sludge in the Chernivtsy water utility

Result 3.2.: Adequate functioning of sewage treatment system achieved

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 3.2.1.Develop sewage system in towns and villages	➢ Perform inventory of existing sewage system in towns and villages ➢ Strengthen the system of quality control ➢ Analyze existing western practices for towns and villages ➢ Develop and introduce environmentally friendly technologies ➢ Construct sewage systems in towns and villages where they do not exist ➢ Establish cluster pipelines and sewage systems for small villages and individual farms ➢ Rehabilitate and cover the deficit of capacity in existing sewage systems of towns and villages ➢ Make funds available			
➢ 3.2.2. Ensure appropriate sewage systems and treatment plants for cities	➢ Perform an inventory of sewage systems in cities ➢ Analyze Western practices of sewage treatment for cities ➢ Develop and introduce environmentally friendly technologies of sewage treatment for cities ➢ Rehabilitate and cover the deficit of capacity in existing sewage systems of cities ➢ Strengthen the system of quality control ➢ Make funds available	➢ Construction of WWTPs in Vorokhta and Kuty	➢ Construction of sewage facilities in rural areas of Zakarpatsky Oblast ➢ Construction of local sewage networks in villages of Zakarpatsky Oblast (with and overall length of 46.3 km) which belong to the developed sewage systems in towns and villages	➢ Inventory of existing sewage system in towns and villages ➢ Strengthen the system of quality control by updating branch standards and introducing new technologies ➢ Analysis of existing western practices for towns and villages
➢ 3.2.3. Apply methods for adequate of industrial wastes into the municipal system	➢ Carry out an inventory of pre-treatment facilities ➢ Develop pretreatment facilities ➢ Introduce proper control and metering of industrial wastes at the treatment facilities ➢ Introduce practice of water re-use and recycling in technological processes ➢ Apply appropriate wastes pre-treatment system in industry		➢ 2 planned projects for the implementation of environmentally friendly technologies in Teresviansky and Velikobichkivsky timber plants	➢ Inventory of existing pre-treatment facilities ➢ Introduction the proper control and metering of industrial wastes at the treatment facilities of Izmail and Zakaratian timber processing factories ➢ Introduction of practices for water re-use and recycling in technological processes as a pilot project

Result 3.3.: Institutional capacities in wastes management reinforced

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 3.3.1. Create a basis for the efficient management of wastes	➢ Carry out an inventory of all wastes facilities in the Danube basin ➢ Develop the registration and regulations for management waste ➢ Share the responsibilities between bodies ➢ Eliminate disproportion between the capacities drinking water supply and sewer systems ➢ Undertake measures for stakeholders involvement in decision-making process ➢ Optimize the existing structure of the territory of the basin and plan its balanced (sustainable) development ➢ Unify rules for industrial wastewater discharge to the municipal sewer ➢ Introduce clean production principles into technological processes ➢ Establish river basin councils			➢ Inventory of all waste facilities in the Danube basin ➢ Develop the regulation to share responsibilities between the bodies ➢ Eliminate the disproportion between the capacities for drinking water supply and sewage systems through the implementation of the State program ➢ Update rules for industrial waste water discharge to the municipal sewage system
➢ 3.3.2. Introduce financial mechanisms for friendly technologies in wastes management	➢ Create favorable investment conditions ➢ Introduce economic mechanism for establishment of private enterprises for domestic waste collection, separation and utilization ➢ Develop economic incentives ➢ Develop and introduce mechanism and using the money collected as “environmental incomes” ➢ Develop a system of penalties and tariffs			➢ Upgrade the Ukrainian Civil Code and develop a Penalty Code

Result 3.3.: Institutional capacities in wastes management reinforced

Main Activities	Important Elements	Projects		
		Existing/On-going	Planned	Proposed
➢ 3.3.3. Ensure public participation in the process of decision making and control	➢ Ensure the obligatory procedure for the public participation process ➢ Increase the role of public environmental expertise ➢ Give NGOs the right to come out with legislative initiatives ➢ Ensure public participation in municipal wastes management budget planning ➢ Approve procedure for direct public control of funds using ➢ Assess the level of human resource development ➢ Introduce a human resource service system for the expertise ➢ Introduce a proper system of staff training for improving its qualification ➢ Develop economic incentives			➢ Develop a new NGO legislation that could make public an equal part in a dialogue with governmental bodies ➢ Introduce a human resource service system for the expertise and a proper system of staff training to improve its qualification
➢ 3.3.4.Raise public awareness	➢ Develop a mechanism to provide public to information ➢ Make available free access to the information for the public ➢ Establish a system for taking into consideration public opinion ➢ Ensure big-boarding broadcasting and publication of public awareness advertising from NGOs for free ➢ Ensure legislation protection for “whistlers” both from governmental organizations and NGOs ➢ Adopt a law “Free access to environmental information” ➢ Promote sanitary culture			➢ Set up and info/coordinating NGO Center

Annex 7.
Workshop Organization

7.1. Agenda of the Workshop

7.2. List of Participants

7.3. Opening Speech

Annex 7.1.

Danube Pollution Reduction Program
National Planning Workshop

July 15 – 19, 1998, Odessa

Agenda

Wednesday, July 15		
8.30 - 10.00	**Opening of the workshop** ➢ Introduction ➢ Opening Speech ➢ **Program/Planning Process** ➢ **Presentation of Work Program** ➢ Methodological Approach of TOPP	**Plenary** Mr. Vasylchenko Mr. Bendow Facilitators
10.00 - 10.30	*Coffee break*	
10.30 - 12.30	**Presentation and discussion of River Basin Areas** River Basin Approach in Ukraine ➢ Physical Aspects ➢ Demography ➢ Transboundary Effects as perceived ➢ Human Activities/Economy	**Plenary**
12.30 - 15.00	*Lunch break*	
15.00 - 16.30	**Situation Analysis** ➢ *Methodology:* Actions leading to Pollution will be proposed for each sector by the Facilitators ➢ Exercise applying the method. Formation of Working Groups (by sector)	**Plenary**
16.30 - 17.00	*Coffee break*	
17.00 - 19.00	**Situation Analysis**	**Group work**

Thursday, July 16		
8.30 -10.00	**Presentation of Situation Analysis** ➢ Municipal Sector	**Plenary**
10.00-10.30	*Coffee break*	
10.30-12.30	**Presentation of Situation Analysis** ➢ Agriculture ➢ Industry	**Plenary**
12.30-15.00	*Lunch break*	
15.00-16.30	**Presentation of Problem Analysis (Problem Tree)**	**Plenary**
16.30-17.00	*Coffee break*	
17.00-19.00	**Presentation of Problem Analysis (Continued)** **Presentation of Objective Analysis (Objective Tree)**	**Plenary**

Friday, July 17
Yalta: Excursion

Saturday, July 18		
8.30 -10.00	**Planning Matrix** a. *Methodology* b. *Sector Objectives*: proposed by Facilitators out of the Situation Analysis and Objective Analysis c. *Results/Outputs*: developed by participants out of Situation Analysis and Objectives Analysis d. *Definition of Activities : Methodology*	**Plenary**
10.00-10.30	*Coffee break*	
10.30-12.30	**Definition of Activities in relation to Results/Outputs**	**Group work**
12.30-14.00	*Lunch break*	
14.00-15.00	**Activities, Important Elements and Projects** ➢ Methodology ➢ Exercise in applying the method	**Plenary**
15.00-15.30	*Coffee break*	
15.30-18.30	➢ Definition of Important Elements ➢ Identification of Existing/Ongoing, planned (in Preparation) and Proposed Projects in Relation to Activities and Important Elements	**Group work**

Sunday, July 19		
8.30 -10.30	**Important Assumptions** ➢ Methodology ➢ Exercise applying the method (Definition of Important Assumptions for Activities) **Impact Indicators** ➢ Methodology ➢ Exercise applying the method (Determination of Impact Indicators for Sector Objectives) Definition of Important Assumptions for Results/Outputs Determination of Impact Indicators for Results/Outputs	**Plenary** **Group work**
10.30-11.00	*Coffee break*	
11.00-12.30	**Presentation of Activities, Important Elements and Projects**	
12.30-14.00	*Lunch break*	
14.00-15.30	**Presentation of Sector Planning Matrix** **Presentation of Program Planning Matrix** **Evaluation of the Workshop** **Closing of the Workshop**	**Plenary**

Annex 7.2.

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Annex 7.3.

Opening Speech

held by

Vasyl Vasylchenko
Deputy Minister of Environmental Protection

Dear participants, dear guests,

Let me welcome you on board of the MEP research boat "Ernst Krenkel" where we will spend the next five days discussing and considering the National Action Plan on the improvement of the environment in the Danube River basin.

First of all, I would like to express my thanks to the sponsors of the GEF Project due to which we have this opportunity to have a detailed discussion of the Danube basin environmental problems and to take into account the proposals of representatives from various ministries, authorities, research organizations, non-governmental organizations concerning the ways to resolve them. I would like to dwell upon some problems that directly or indirectly shall be reflected in our work.

In the past, the development of the economic complex in the Danube basin, similar to the whole of Ukraine, did not take into account the ecosystem ability of self-reproduction. It resulted in the degradation of the environment and, sometimes, to irrecoverable changes. Fortunately, the Ukrainian part of the Danube basin does not suffer from industrial giants. However it had its own problems. And they can arise again as soon as the economy starts to recover. I would like to propose some of them for discussion.

The major pollution source for the Danube basin, which can be promptly identified and controlled, is wastewater discharge from pollution sources. The current situation in water supply and wastewater discharge is more or less identified and somewhat consoling in terms of pollution reduction: the stop of industrial production and the decline of agriculture led to a decrease in water supply and wastewater discharge in the Danube basin by 30-40%. However, the existing treatment plants are almost not maintained and fall into decay. If economy returns to the level of 1990-1991 we will not be able to reach even the stage of treatment which existed in those years.

Therefore, it is already now that the problem with the situation forecast for future arises:

- Is it possible today to obtain a reliable forecast for the trend of the Danube basin social and economic development?
- Are water management balances for the future ever made and how reliable are they?

One of **the most important pollution sources for the Danube is municipal wastewater**. The existing treatment plants are mainly overloaded, sometimes more than several times, technologically obsolete. In some places they do not exist at all.

This is especially the case for villages and towns. It is often here that development of water supply substantially outdistances development of water disposal and sewage capacities. The universally outstanding problem for existing treatment plants remains reclamation and disposal of sludge waste. It is almost never processed, it accumulates and requires new areas (sludge sites) contaminating surface and underground water. Municipal treatment plants are often used for non-

pretreated discharge of industrial wastewater significantly polluted with highly toxic organic matters, heavy metals putting of action the treatment plants themselves and preventing agriculture from using activated sludge as organic fertilizer.

- What are the forecasts for development of municipalities? Is it envisaged to continue works on canalization of villages? Will there be any increase in specific water consumption in urban and rural areas?
- What are opportunities and prospects for reclamation and disposal of sludge waste, their further use for agriculture?
- Is it possible for local authorities to finance construction or rehabilitation of sewage treatment plants from own budgets?
- Is it possible in the current circumstances to discuss an introduction of tertiary treatment for removal of nutrients at municipal treatment plants? Can we afford it technologically and financially?

One of the Danube basin priority problems recognized by Convention, SAP and Program, is significant nutrient pollution (N, P) causing eutrophication of the water bodies. Its major source In Ukraine is agriculture and municipalities. In Ukraine about 90% N and 80% P is discharged to the Danube basin by diffuse sources (mainly agricultural production). It is estimated that in general 35 thousand tons of nitrogen and around 6 thousand tons of phosphorus is discharged annually to the Danube basin surface water from the Ukrainian territory (as of 1994). Substantial damage is caused by sedimentation in water bodies due to extremely high share of arable land. Use of fertilizers and agricultural chemicals has recently substantially reduced. However, farms and farmers purchase fertilizers and agricultural chemicals independently and they are not always available for accounting.

Environment was substantially damaged by intensive animal husbandry around the entire basin and by irrigation in the Lower Danube area. Large animal complexes 10-15 thousand animals each were disastrous for small rivers of the basin. Effluents with extremely high content of nitrogen, phosphorus, organic matters were discharged without any treatment at all. Irrigation of rice fields of the Lower Danube supplied the delta with huge amount of pesticides.

Most of animal husbandry complexes and farms are now liquidated. However, a future stabilized economy and restored agriculture threaten to make them a decisive force of eutrophication.

- How is it presently possible to assess agricultural impact on quality of water resources?
- How is it possible to account for diffuse pollution sources as the major source discharging nitrogen and phosphorus to water sources?
- How is it possible to reduce this impact in the future?
- What are the experiences and opportunities to introduce sustainable agricultural production?
- It is necessary to perform inventory of waste stocks in the basin. In some places there are dumpsites for expired fertilizers and agricultural chemicals without any host and with unknown composition. Sometimes they are buried which makes them a strong "unknown" source for underground water pollution.

Water protection areas are an integrated element of water ecosystem and their establishment is made mandatory by the Water Code. They are able to withdraw up to 80% of pollution, including nutrients - nitrogen and phosphorus. However in the Danube basin, as anywhere in Ukraine, they are only shown on paper and almost never really exist.

- If local authorities with support of non-governmental organizations starts this work it will be possible to achieve significant results.

Oil pollution is an important problem for the Ukrainian part of the Danube basin having transboundary effect. In Kilia Mouth, Ukraine receives oil products from upstream Danubian countries. The Ukrainian contribution in the lower part is now significantly less: ports Izmail and Port-Dunajsky are almost idle. But later this problem will arise again and it is necessary to start resolving it already now.

Zakarpatska Oblast is located in the Upper Tisa basin and is always under risk of accidents on oil product pipelines. Which is the direct danger of transboundary pollution. It was also not once that pollution proved to reach as far as the territory of the neighboring Slovakia.

- What are the ways to prevent and liquidate similar pollution, including resolving on the international level?

The Carpathian part of the Danube basin and the Danube delta area is a potential region **to develop tourism**.

- How can the problem of recreational wastewater treatment be resolved? The water quality in the Uzh River is already referred to Category 3 (polluted) by its bacteriological parameters. And this is a very promising area to develop tourism. The same is fair about the Prout River, particularly within the territory of Ivano-Frankivsk Oblast. Here exist already problems with wastewater treatment from tourist centers, sanitariums, rest homes.
- Are there any opportunities in the Ukraine or do we have to address other states for technology?

Causes of the Danube Lakes degradation. It is clear today that it is primarily discharge of substantial pollution from the Moldavian territory (processing plants, wash-off from agricultural lands, etc.). 90% of water catchment area for lakes Jalpoug, Kugurluj, Kagoul is located in Moldova territory. The situation is aggravated by inhibited water exchange through flood prevention dikes, low performance of locks, sedimentation in canals. Massive loss of fish is observed annually. Water quality exceeds standards by many parameters. Some months ago the Government of Ukraine was addressed by administration of Komrat Rayon, Moldova, warning on possible failure of the sewage treatment plant in Komrat. Fortunately it did not happen. Furthermore, Jalpoug Lake is a water supply source for 30 thousand Ukrainians. These lakes are unique ecosystems to be protected under Ramsar Convention.

In the nearest future the work will be started under TACIS project on assessment of the lakes condition. However this is only preliminary research.

- How can solve this problem comprehensively? Maybe to sign Ukrainian-Moldavian Memorandum on common steps for Danube Lakes conservation and to envisage development of corresponding interstate program under the Danube Convention or Convention on protection and use of transboundary water courses and international lakes.

On monitoring of water resources. Monitoring of water environment is performed by a number of agencies (State Hydrometeorology Committee, MEP, Ministry of Health, State Water Management Committee, municipalities, water users, etc.). Large amount of data is available but they are incomplete, non systematized, no general conclusions are made on their basis. For example, Ministry of Health monitors microbiological contamination of water bodies and this information stays with this Ministry. It sometimes hinders tracking down causes and makers of the trouble. There is a constant cholera risk in the Danube downstream. Available data used by each agency individually makes it ineffective.

- The Danube basin information center needs to be set-up to systematize the data available and to make recommendations. What are the opportunities for this?

Problems of **environmental measures financing**. Financing of environmental measures from both state and local budgets is clearly not enough. Construction, started 5 or more years ago, is still on. Lack of funds leads to work termination and collapse of the constructed.

In 1994 Integrated state program of flood prevention measures was approved. However even in the Oblast so dangerous as Zakarpatska only 10-15% of them is financed. In Odessa Oblast there was no financing for the first half of the year at all.

In 1997 State program of water supply and sewage systems was approved. However there is no central financing envisaged for its implementation. All financing of municipal treatment plants is envisaged from local budgets.

Working on the Danube National Review we faced a problem of the following nature: according to State program of water supply and sewage systems all measures are to be financed from local budgets, and according to the oblasts the same measures are to be financed from the central budget.

Furthermore, for the Review it was reasonably suggested that we split measures into existing and planned. Existing measures are those started in the recent years. However we have water retaining structures which are being constructed (if constructed) from 1985. For others a zero phase was started some years ago and there this construction finished. The remaining ones are only symbolically called existing. Therefore a solid inventory is needed of existing and planned construction and to concentrate funds on the priorities defined as "hot spots".

- How is it possible to find finance for environmental measures? What are opportunities of local authorities, State Water Management Committee, State Construction Committee?

It is only part of the Danube basin problems. I am sure that the efforts of the specialists participating in this workshop will highlight a wider range of problems requiring solution to reduce the Danube basin pollution, as well as ways of this solution will be proposed.

I wish you all to have a fruitful work.