# DANUBE POLLUTION REDUCTION PROGRAMME

# NATIONAL PLANNING WORKSHOP MOLDOVA

**Chisinau, July 27-30, 1998**

## NATIONAL ACADEMY OF ECOLOGICAL SCIENCES

*in cooperation with the*

**Programme Coordination Unit**
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# Preface

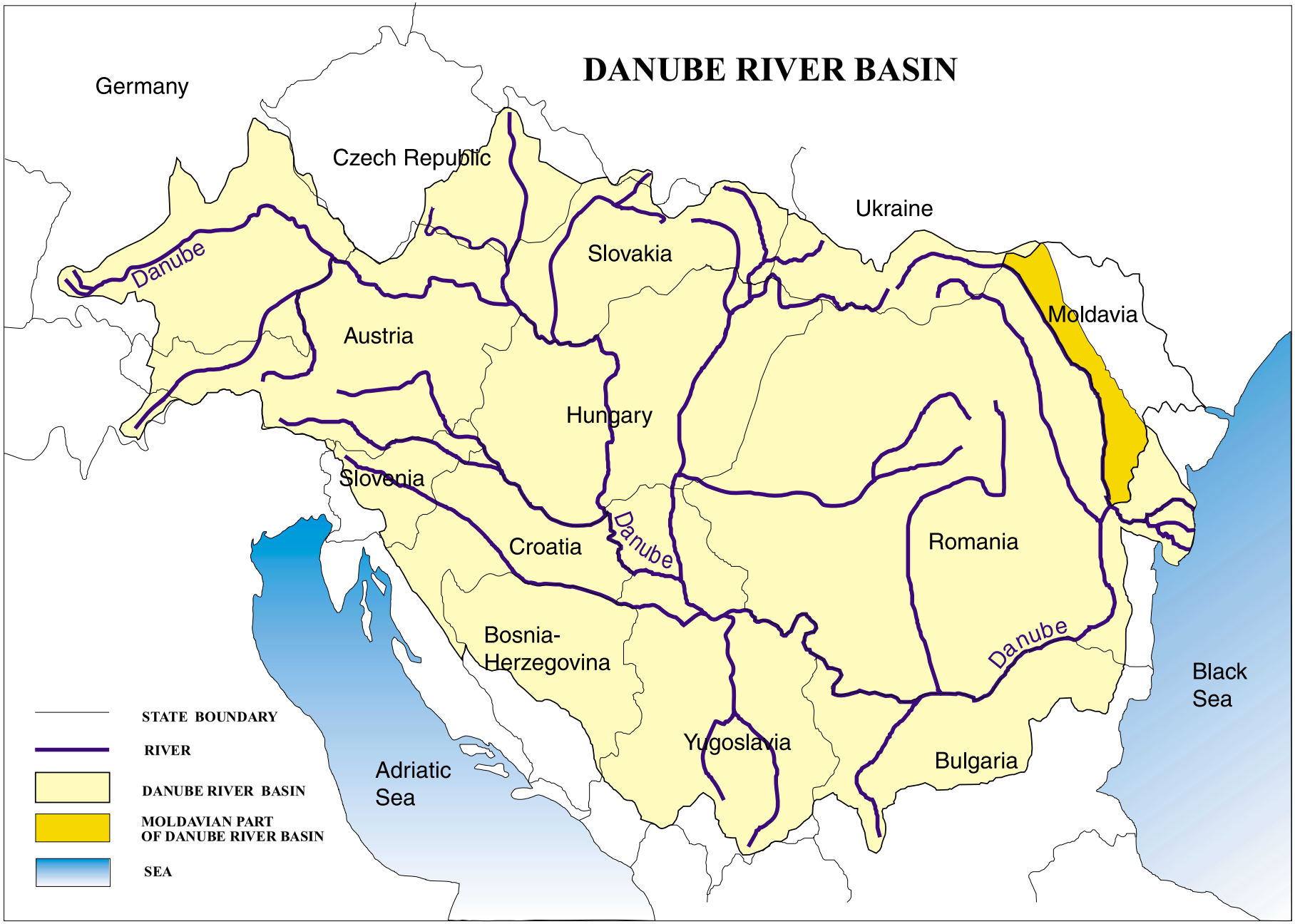
The present report is based on the results of the National Planning Workshop, held in Chisinau, Moldova from 27 to 30 July 1998. The main goal of the workshop and its report is to provide a comprehensive presentation of analysis concerning problems and solutions for reduction, as well as control of water 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, Dumitru Drumea, with the assistance of Angela Bularga. Both also worked as facilitators during the workshop. A team of national experts, who elaborated National Review Reports, was present to guide the participants in scientific and technical matters. Adriana Mircea 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 (Ministry of Environment, as well as the Ministry of Land Development, Buildings and Communal Services) Inspectorates and Local Ecological Agencies. Furthermore representatives of National Institutes, the Economical Council of President, UNDP 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, Olga Kazanteva (Agriculture), Tatiana Belous (Industry) and Dumitru Sireteanu (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
Ukraine
Slovakia
Danube
Austria
Moldavia
Hungary
Slovenia
Danube
Croatia
Romania
Danube
Bosnia-
Herzegovina
Black
Sea
Yugoslavia
Bulgaria
Adriatic
Sea
STATE BOUNDARY
RIVER
DANUBE RIVER BASIN
MOLDAVIAN PART
OF DANUBE RIVER BASIN
SEA

...hard work and engegement of participants in a hot summer in Chisinau...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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 Moldovan experts has elaborated National Reviews, providing information on water quality, analyzing financing mechanisms, describing social and economic framework conditions and developing projects and programs for pollution reduction, improvement of water quality, sustainable management of aquatic ecosystems and 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 Chisinau, Moldova from 27 to 30 July 1998. It is one of 11 national workshops, which have been organized in all participating countries, signatories of the Danube River Protection Convention or adhering to its principles.

The Prut River, which is the main river of the Moldovan part of the Danube River Basin (DRB), forms the border between Moldova and Romania. The upstream part of the river belongs to Ukraine. Inappropriate management of different industrial and agricultural enterprises leads to water pollution with high loads of nutrients, micropollutants etc. and strongly influences water quality conditions of the Prut river, creating many problems for surface water use in Moldova. Emission inventories, undertaken in Moldova, showed those pollution loads originating from the Moldovan part of the Danube River basin are very small and hardly influence water quality. Therefore, one could make the conclusion that transboundary effects from Moldovan sources are minimal and that water quality of the Prut tributaries depends mainly on natural conditions. Moreover, results obtained from monitoring observations show that due to the economic crisis and, consequently, a strong reduction of emissions, water quality has improved.

The Moldovan part of the DRB was divided into three parts: The upper and lower Prut and as a third area, the Yalpugh and Cahul River basins. The division of the Prut River was based on the changes of the river's water quality before and after its confluence with the Jijia River. Yalpugh and Cahul River basins were selected as one part due to common climatic, economical and social features. The report describes the physical aspects, demography and human activities for each of these areas.

Particular causes and effects of pollution from point and diffuse sources, as well as transboundary water pollution have been analyzed in a sector approach, considering agricultural and industrial activities and those activities within the urban sector. Based on the sector analysis, it has been identified as core problem that "**improper human activities lead to pollution in the Moldovan part of the Danube River Basin".** Direct causes of this problem were identified as "degradation of land and water resources", caused by agriculture, "environmentally unsustainable development of industrial, mining and transport sectors", and "inappropriate environmental management in human settlements". A number of effects of activities leading to pollution in the Moldovan part of the DRB were identified, among them soil, air and water pollution, deforestation and, consequently, the degradation of the environment, health risks, as well as social and economic problems.

On the basis of the result of the problem and objective analysis, the program objective was identified as **"pollution reduction by ensuring appropriate human activities in the Moldovan part of the DRB"** which should contribute to the achievement of a "sustainable development in the DRB".

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

***Agriculture and Forestry***

This branch of human activity is the most important in the Moldovan part of the Danube river basin. It is the source of around 80% of national income and a significant part of the population is involved in agricultural activity. In accordance with different studies, this sector is responsible for about 90% of all nutrient loads in water ecosystems. Thus, the sector objective is to "promote the sustainable use of water and land resources". This objective ought to be reached through adopting adequate i) agricultural and ii) piscicol practices, iii) applying sustainable forest management and iv) increasing institutional capacity and public involvement in the protection of water and land resources.

***Industrial sector***

The actual state of industrial development in the Moldovan part of the DRB can be characterized as strongly reduced. Currently, this sector is only responsible for a very low part of pollution loads (up to 5%). However, it is expected, that, especially, food and manufacturing branches have a good perspective to recover. Therefore, the sector objective was defined as "implementation of policies for economical sustainable industrial, mining and transport development are implemented". This objective should be achieved by i) introducing adequate industrial and mining practices, by ii) appropriate management of transportation and harbor facilities and by iii) improving the institutional and legal framework for industrial development.

***Municipal sector***

Industrial and municipal wastewaters in Moldova are treated by the same facilities. Therefore, improvement of local treatment facilities on industrial enterprises is strongly needed in order to recuperate the state of biodiversity in recipient water ecosystems, ameliorate the drinking water quality and reduce eutrophication etc. In order to achieve "a properly managed environment in communities", being the sector objective, it is necessary to i) reduce pollution from wastewater diminished, ii) apply appropriate solid waste management and iii) improve the general framework conditions favorable to correct actual environmental management in communities.

The results of the workshop demonstrated that projects to implement the strategies for pollution reduction in the DRB are clearly needed. Priority projects have been identified as the following:

In the **agriculture and forestry sector:**

- Animal waste management
- Rehabilitation of irrigation systems in the Prut River
- Optimization of land from an anti-erosion point of view
- Use of alternative energy resources in a market economy

In the **industry sector:**

- Waste management in wine processing
- Utilization of toxic industrial waste
- Rehabilitation of wastewater facilities in industrial enterprises
- Strengthening of institutional and management capacities in the industry sector

In the **municipal sector:**

- Pilot project on sewage systems in rural areas
- Pilot project concerning the use of dual water supply system
- Modernization of wastewater treatment facilities and improving waste management at wineries
- Development of a restructuring program for enterprises delivering services (creation of joint stock companies, privatization)

# 1. Introduction

## 1.1. Background

Moldova is a new independent state, created after the collapse of the USSR in 1991. It covers an area of 33.840 $km^2$ with a population of 4.32 million inhabitants. The Danube catchment area covers around 35% of the Moldovan territory.

Currently, Moldova faces a lot of environmental problems. One of the most acute is the pollution of water resources. The recent state of the water ecosystem is strongly affected by microbiological pollution, due to poor management of WWTPs in the Moldovan part of the Danube basin, as well as transboundary effects (e.g. the deterioration of the Prut River water quality after the confluence with the Jijia River from Romania). Most of the WWTPs, especially in rural areas, are destroyed and because of the energy crisis do not work on a permanent basis.

Soil erosion is another important issue in Moldova. In fact, in around 30% of arable land different levels of erosion are evident and 20% of this land is strongly eroded. Deforestation also represents a problem, due to the increased use of forest resources for heating purposes (especially in rural areas). Today, different types of forests cover 346.000 ha or around 9% of the territory. There are two natural reserves in the Moldovan part of the Danube River basin with a total area of around 7600 ha. Many wetland areas were desiccated in the beginning of the 70s. Currently, agricultural units do not have enough financial resources to maintain desiccated networks and in some areas wetland restoration is in process.

Environmental activities are based on different laws, normative acts and regulations. The basic law in the country is the Constitution of the Republic of Moldova. It gives the right to every person to live in a healthy environment and to be informed on the state of environment. It also obligates the population to care about the nature.

The Moldovan Parliament adopted the law on Environmental Protection in 1993. It is *the* act, which regulates environmental relations in the country. Central Government bodies play an important role in the development of different legislative acts and their implementation. They control and issue licenses on the use of natural resources. Further, they are responsible for monitoring the quality of the environment.

Governmental representatives have the right to sign international Conventions and bilateral agreements, which regulate natural resource management and use. In 1994, governmental representatives signed two important documents, which relate to the Danube River Basin: the Strategic Action Plan (SAP) and the Danube Convention. The Danube Convention is ready to be submitted to the Parliament and after ratification this Convention will become a document, which governmental bodies will use in its environmental policy. Moldova has also signed and ratified Conventions on Climate Change, Biodiversity and other environmental issues, which are important for the harmonization of environmental practices in the country.

In accordance with the recommendations of the European Council and in cooperation with international organizations, Moldova has prepared the National Environmental Action Plan (NEAP). This document was developed in a close cooperation with public organizations. NGOs had an opportunity to influence the development of this document through participating in public hearings of the NEAP, preparing written proposals etc. Public involvement in the NEAP development and the document itself were widely discussed in the mass media. Representatives of the NGO community participate in all national workshops, seminars etc. Public institutions have an opportunity to publish different materials on the state of the environment and express their opinion in the mass media and in the newspaper “Natura”. Public institutions are very active in resolving environmental problems. They were the initiators of the inauguration of the Trees Planting Day, which was confirmed by the President’s decree in 1993.

One of the issues aimed at the strengthening of institutional capacity of public institutions is the creation of the New Regional Environmental Center (REC) office, which will coordinate activities of local NGOs with the international public community. This was strongly supported by governmental bodies. Another opportunity for the strengthening of institutional capacity of public institutions is the development of a small grant programme for public organizations.

All important economic measures from governmental bodies have been developed in consultation with civil organizations. This item is reflected in the law on Environmental Impact Assessment, where it is written that NGOs participate on the preparatory stage of project development and participate in the monitoring on its implementation. One of the most important projects, which were carefully studied by governmental and public institutions, was the project concerning the Gurgulesti oil terminal on the Danube bank.

Moldova has participated in the Danube Environmental Programme since 1993. Moldovan representatives work in experts groups under the ICPDR: Monitoring, Laboratory and Information Management (MLIM), Alarm Emergency Warning System (AEWS) and Emission Group (EG). In the frame of these activities, Moldovan representatives participated in different training programmes, seminars and workshops. This allowed creating a database on the state of the environment in the Moldovan part of the Danube River Basin, to improve laboratory practice in routine analyses and information exchange. The results of different activities in the frame of the Danube Programme are presented to the decision-makers and are used for the development of different laws and normative acts as well as for planning activities.

## 1.2. Planning Approach

The organization of the National Planning Workshop in Moldova 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.

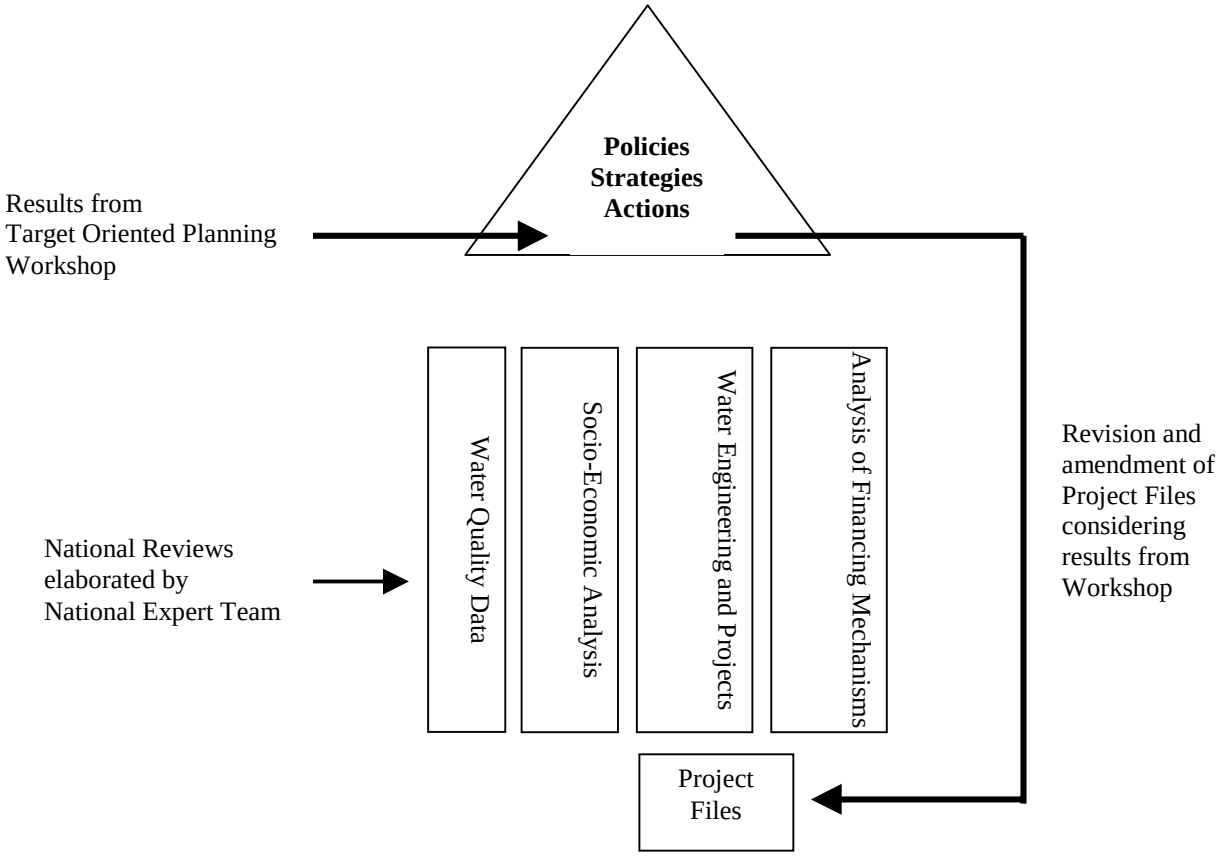
The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects 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 Environment, 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 Chisinau from 4 to 5 July 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. At 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

The territory of the Republic of Moldova covers an area of 33.840 $km^2$. Moldova is situated in the southeastern part of Europe. In the west, it has a common border with Romania, which is formed by the Prut River. In the north, east, and south, it borders on Ukraine. The territory of Moldova from the north to the south is 350 km, and from the west to the east 150 km.

This report is focused on the main issues related to the state of the water environment which have been defined on the basis of the Logical Framework Approach, considering physical, demographic and socio-economic conditions of the Moldovan part of the DRB.

Moldova has 4.32 million inhabitants. The Moldovan Danube catchment area itself has a population of 1.096.464 (25 % of the Republic's population), of which 306.863 people live in urban and 789.601 in rural areas. The quota of the rural population in the Danube catchment area is 71.6 %; whereas the quota of the urban population represents only 28.4%. The average population density is about 90 persons/$km^2$. In general, economic activities in the Moldovan part of the Danube river basin are mainly within the agricultural sector (crop production and farming). In some districts (Cahul, Briceni, Edineti, Glodeni and Ungheni) fish farming is also rather developed. The local industrial enterprises are predominantly associated with district centers and mostly relate to food processing. The share of the food industry in the Danube basin is more than 70%. Manufacturing, as well as machine building is only presented in a few districts and its share does not exceed 14-15%. According to statistical data, in 1996, the per capita income has been estimated at 1779.0 lei, or 378.5 USD (1 USD= 4.7 lei). Concerning the income in the Danube catchment area, it should be noted that special surveys have not yet been conducted and, therefore, there is no statistical data available on this issue. In general, the economic situation in the Moldovan part of the Danube basin is characterized by impoverishment, lack of livelihood and unemployment.

Altogether, there are 570 settlements in the Moldovan part of the DRB. Among them, there are 15 settlements with a population greater than 10.000, 132 settlements have a population from 2000 to 10000 and 423 settlements have a population of less than 2000. There are 8 towns in the Moldovan part of the DRB (Ungheni, Cahul, Comrat, Chiadar-Lunga, Edineti, Falesti, Leova and Ocnita) and 12 town-type settlements. The share of the population connected to centralized water supply in urban areas is 73%, whereas in rural areas only 12 % are connected. The share of the population connected to a centralized sewage system in urban areas constitutes 48%, in rural areas it is a mere 1.5%.

Most of the pollution of the Prut River is due to agricultural run-off, agro-industrial and industrial wastewater discharges, solid waste disposals, wastewater treatment plants, insufficient sewerage in rural areas, and transboundary contamination. Generally, the water of the Prut River on the Moldovan territory is of second class quality, i.e. "moderately polluted". However, on some stretches, one of them is where the Prut flows into the Danube, the water is of third class quality, while in the Valea Mare locality, after the discharge of the Jijia River from the Romanian territory, the water of the Prut is of a poor sixth class quality, i.e. " very polluted".

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

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

### *Layout*

The total catchment area of the Prut River basin in Moldova is estimated at 8240 $km^2$. Besides, there are two small rivers in the southern part of Moldova - Yalpugh and Cahul, which directly flow into the Danube River via the Lakes Yalpugh and Cahul, situated on the territory of Ukraine. Their total catchment area is 3785 $km^2$. Thus, the total catchment area of Danube River in Moldova can be estimated at 12.025 $km^2$, which constitutes 35 % of the Moldova's territory.

### *Geological Structure and Geomorphologic Conditions*

The relief is characterized by a vertical and valley-gully breakdown and active development of destructive geomorphologic processes. The average surface inclination follows from northwest to southeast. The main factor for relief formation is the strengthening of tectonic movements which is present in the country's territory from the Quaternary period up to now. This leads to exogenic processes, which provoke erosion, landslides, mud flows, depressive, landslip, karst and suffusion phenomena. Erosion and landslide processes are widely spread on the whole territory of the country.

### *Hydrographic Stream System*

The hydrographic system of the Moldovan part of the Danube River Basin consists of the Prut River and its tributaries, as well as the Yalpugh and Cahul River with the tributaries of Yalpugh. The Prut River is the second biggest river in the Republic of Moldova and it forms the state border between Moldova and Romania at a length of 695 km. The main tributaries of the Prut from the north to south are Racoveti, Ciugur, Camenca, Lapusna and Larga. The density of the stream network (km of stream length/$km^{2)}$ declines from 0.8 in the north to 0.1 and less in the south. The Cahul and Yalpugh rivers are entering into the Danubian lakes of the same names (the bigger parts of the lakes are outside the Moldovan territory). These rivers can partly dry up in the summer. The main tributaries of the Yalpugh River are Lunguta, Yalpughel and Salcea Mare. The density of the stream network in the south of the Moldova varies moderately from 0.2 to 0.3.

### *Water Resources and Water management*

The Prut within Moldova's boundaries is 695 km long. Its water availability is estimated at 2.9 $mln.m^3$/year in a typical year. The length of the Yalpugh River is 114 km, the length of the Cahul River is 38 km. They have a common average annual volume of less than 1 $km^3$. The total available volume of surface water resources in the Moldovan part of the Danube River Basin is estimated at 507.2 $mln.m^3$ in a typical year. The explored groundwater resources within the boundaries of the Danube catchment area are approximately 140 $mln.m^3$/year. In spite of the fact that total annual water resources appear adequate, there are local and seasonal difficulties with water supply, especially in the southern part of Moldovan DRB. There are about 40 main artificial water bodies with a volume of more than 1 $mil.m^3$ each. The Ministry of Environment is responsible for the overall water management. The Ministry of Health is in charge of the establishment of standards. The Ministry of Agriculture and Food keeps records on the water balance in rivers; prepares technical projects for hydrotechnical constructions and is responsible for domestic water supply, as well as flood control. The Ministry of Municipal Service and Housing is responsible for municipal services in general and the Association of Geology of Moldova prepares cadastre of underground water resources and evaluates them.

***Water Quality Control and Management***

The Ministry of Environment is managing the surface water quality control through a network of regional ecological Inspectorates and Hydrometric Services. Quality control of surface water, which is used for domestic, as well as recreation needs, and underground water for drinking purposes is realized by the Ministry of Health. After pre-treatment, the quality of drinking water is assessed by a special service within the Ministry of Municipal Service and Housing. Generally, and as mentioned above, other environmental units are also involved in water quality control and management: e.g. the Ministry of Environment and the Ministry of Health, the Ministry of Agriculture and Food (fish farms), Association of Geology of Moldova (underground water resources).

## The River Basin Area Approach in Moldova

For this planning workshop it was chosen to divide the Moldovan part of the Danube River Basin into three local river basins areas. One area includes the common catchment areas of two close running rivers the Yalpugh and Cahul (also called the Danubian lakes catchment area). Both are small tributaries of the Danube and flow into the Danube on Ukrainian territory via two close located lakes of the same name, Yalpugh and Cahul. As for the other two basin areas, it was decided to divide the Prut River Basin into two-the upper and the lower part. From the regional physical and geographical point of view this division cannot be properly explained but the significant deterioration of water quality in the Prut River after the discharge of the Jijia River from Romania led to this step of division.

The following river basin areas have been identified:

- **Upper Part of the Prut River Basin** (up to the discharge of the Jijia river) covers a territory of about 4400 $km^2$ and includes (from the north to south) the following districts - Briceni, Ocnita, Edineti, Rascani, Glodeni, Falesti and Nisporeni.
- **Lower Part of the Prut River Basin** (after the discharge of the Jijia River) covers a territory of 3900 $km^2$ and includes the districts - Hancesti, Leova, Cantemir, Cahul and partly Vulcanesti.
- **The Yalpugh and Cahul Rivers Basin** (or Danubian lakes catchment area) covers an area of 3785 $km^2$. Districts in this area include Chimislia, Basarabeasca, Comrat, Chiadar-Lunga, Taraclia and partly Vulcanesti.

## (i) Upper Part of the Prut River Basin

***Physical Aspects***

Plains are the prevalent terrains in this area. The climate is of continental type, with long severe winters and warm, dry summers, during which it can, however, rain torrentially. The average winter temperature varies between -4 and $5^OC$; the average summer temperature between 22 and $25^OC$. . The average atmospheric precipitation is 560 mm per year. Heavy rains could provoke high water in areas situated in the lowlands and allocated along small tributaries of the Prut River. The annual average flow of the Prut River is 2.5 $km^3$ per year; the density of the river network varies between 0.8 and 0.4 $km/km^2$. Explored underground water resources are estimated at 50 $mln.m^3$/year.

***Demography/Social Background***

This part of the Prut River Basin has around 422.000 inhabitants; the share of the urban population is 29.2%, of the rural population 70.8%. The average density of population is 95 persons per $km^2$. Population growth is negative and constitutes -1.7 per 1000. The rate of adult mortality is rather

high 11.75 per 10000. The upper part of Prut river basin is characterized by the presence of endemic areas of fluorose. The share of the urban population connected to centralized water supply is 70.9%; the share of rural population 10.4%. On average, domestic water consumption is 155 l/day/capita. The share of urban population connected to centralized sewage system constitutes 51.9%; the share of rural population is a mere 0.6%.

***Transboundary Effects***

Some negative transboundary effects on the water quality of the Prut River water are received from the Ukraine. The discharge from the wastewater treatment plant in the town of Cernauti and the timber factory in the town of Colombia result in the deterioration of water quality in the Moldovan part of the Prut River.

***Human/Economic activities***

Economic activities are predominantly agricultural and include large-scale crop production, especially sugar beet and tobacco production, numerous orchards and partly wine-yards. The use of pesticides and fertilizers is significantly reduced, as well as the use of water for irrigation. Currently only about 50% of the equipped irrigable lands are irrigated. In this part of the Prut River basin there are a lot of pig, cattle breading, poultry and fish farms. Normally, stockbreeding farms are not sufficiently equipped with proper wastewater treatment facilities. Among industrial activities especially widely spread is the food processing industry (canneries, dairies, sugar and wine production), partly there is also manufacturing and construction materials production.

## (ii) Lower Part of the Prut River basin

***Physical Aspects***

85% of the whole territory of the lower part of the Prut River basin are plains and approximately 15% is mountainous terrain. Annual average flow of the Prut River constitutes 2.9 $km^3$ per year; the density of the river network varies between 0.4 to 0.1 $km/km^2$. Explored underground water resources are estimated at 40 $mln.m^3$/year. The intensity of bank erosion processes varies between 20 to 30 cm per year. Wetlands cover about 0.5% of the whole region. The average atmospheric precipitation is 450 mm per year. The average winter temperature is –3 to $-5^OC$, the average summer temperature $23\text{-}24^OC$.

***Demography/Social Background***

Around 390.000 people live in the lower part of the Prut River basin; the share of urban population is 24.8%, of rural population - 72.6%. The average density of population is 100 persons per $km^2$. Population growth is + 2.6 per 1000. This part of the Prut River basin is also characterized by a presence of different endemic areas. The share of urban population connected to centralized water supply is 76.8%; the share of rural population 13.3%. On average domestic water consumption is 123 l/day per capita. 43.2% of town dwellers are connected to centralized sewage systems. The share of the rural population is slightly higher than in the other regions but, nevertheless, notably low (2.23%). In 1996, the total discharge of wastewater was at the level of 11.31 $mln.m^3$.

***Transboundary Effects***

Significant negative transboundary effects on the quality of Prut river water, perceived from Romania, come from wastewater treatment plants in the towns of Botosani, Jasi and Husi, as well as from the insufficient wastewater treatment facilities of the Tomesti pig farm.

***Human/Economic activities***

The main sector of human activity is, as in the upper part of the Prut River basin, agriculture, mainly large-scale crop production (vegetable, tobacco and cereal production, orchards and numerous wine-yards). A striking fact is that, currently, around 60% of equipped irrigable land are not irrigated. Moreover, there are also activities such as stockbreeding, fish farming and forestry. Among industrial activities, the most significant ones are food processing (canneries, dairies and wine production), manufacturing, leather production, mining of construction materials, oil and gas exploration, as well as oil transportation and building of the Danube dock. A notable share of the wetlands was desiccated and currently these lands are used for agricultural needs.

## (iii) The Yalpugh and Cahul River basin (or Danubian lakes catchment area)

***Physical Aspects***

Plain is the prevalent terrain. The annual average flow of the Yalpugh River constitutes 0.9 $km^3$ per year; whereas the annual average flow of Cahul River is measured as 0.09 $km^3$ per year. The density of the stream network varies insignificantly between 0.2 and 0.3 $km/km^2$. Explored underground water resources are estimated at 50 $mln.m^3$/year. The average atmospheric precipitation is 380 mm per year. The average winter temperature is –2 to $3^OC$. In the summer the average temperature rises to 24 to $26^OC$.

***Demography/Social Background***

This region has a population of 250.000 people, of which the share of urban population is 25%, that of rural population 75.6%. The average density of population is 66 persons per $km^2$, which is the lowest in the Moldovan part of the DRB. Population growth constitutes 2.1 per 1000. The disease rate is particularly high in this region (26.4 per 10000). The share of urban population connected to centralized water supply is 70.8%; the share of rural population 13.4%. On average, domestic water consumption is 75 l/day per capita. The share of urban population connected to centralized sewage system constitutes 34.1%, lower than in the other two river basin areas; the share of rural population 1.78%.

***Transboundary Effects***

No transboundary effects from other countries are perceived in this region. However, Moldova produces water pollution through the discharge of wastewater into the Cahul River, which affects the DRB in Ukraine.

***Human/Economic activities***

The main economic feature is agricultural activity, which includes large-scale crop production, (cereal and vegetable production, orchards and numerous wine-yards) stockbreeding and farming. Among industrial activities, especially developed in this region is food processing (dairies and canneries), wine production, leather production and partly manufacturing. Practically, all agro-industrial enterprises do not have proper wastewater treatment facilities.

## Moldovan part of the Danube river basin


**KEYS:** **- . - State boundary** **- - Catchment boundary**

*1* - Upper Part the Prut River Basin *2* - Lower Prut River basin

*3* - Yalpugh and Cahul Rivers basin (Danubian lakes catchment area)

## 2.2. Problem Analysis

### 2.2.1. Core Problem

Proceeding from the results of analysis performed by sectors, significantly contributing to water pollution in the Moldovan part of the Danube river basin, the core problem was determined. Its formulation reflects the situation in each of the main sectors, integrates current environmental concerns and indicates origins of water quality deterioration.

The core problem is stated as:

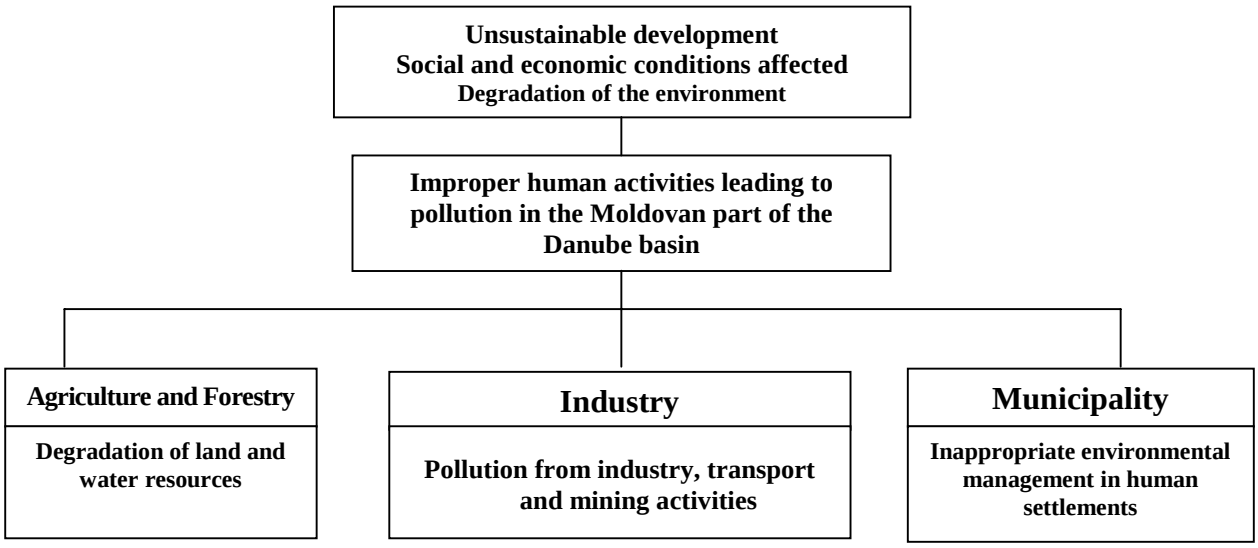
**"IMPROPER HUMAN ACTIVITIES LEADING TO POLLUTION IN THE MOLDOVAN PART OF THE DANUBE RIVER BASIN"**

### 2.2.2. Direct Causes of the Core Problem

The participants have identified the following three direct causes for this core problem. These direct causes are in close relation with activities within the main economic sectors identified in the workshop.

- **Degradation of land and water resources**, within the agriculture sector, is caused by inadequate practices in crop production and animal breeding, unsustainable management of forest and fishing resources and inadequate or not applied legal, educational and economic framework.
- **Pollution from industry, transport and mining activities** results from inadequate industrial and mining practices, inappropriate management of transport activities and an unfavorable general framework.
- **Inappropriate environmental management in human settlements** derives from the discharge of highly polluted wastewater, inadequate management of solid waste and an unfavorable general framework.

**Scheme of Problem**



### 2.2.3. Effects of the Core Problem

The environmental consequences of the core problem are of various kinds, referring to both ecosystems and human health. The multitude of effects was revealed in detail during the situation analysis. The subsequent problem analysis led to a structuring of these effects, considering cause-effect relations.

Thus, participants regarded, as direct effects of the core problem, the following environmental problems common for the whole Moldovan part of the Danube river basin:

- Pollution of surface and ground waters;
- Soil pollution and degradation;
- Change of geologic environment;
- Air pollution;
- Reduction of afforestated areas.

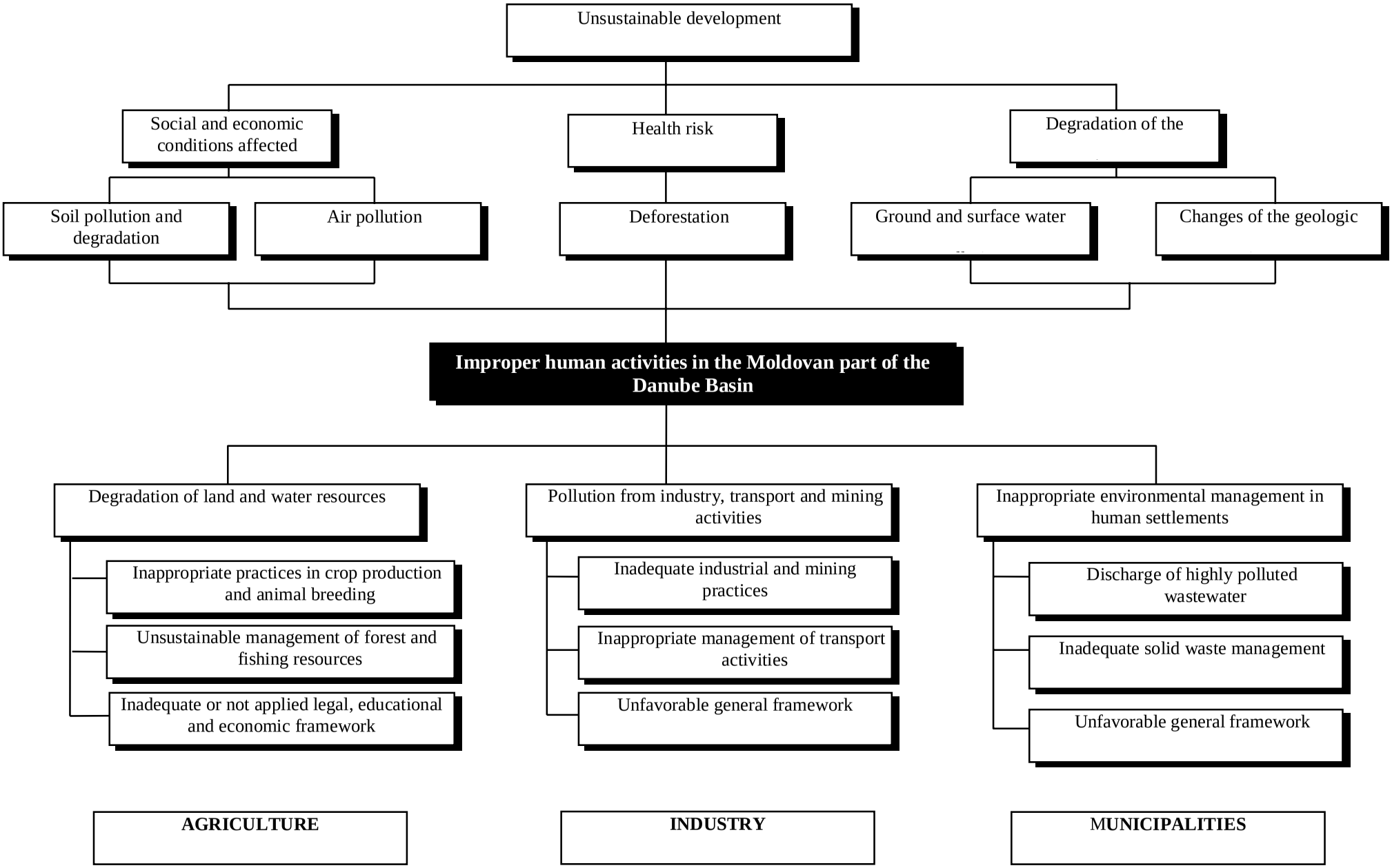
All of the above-mentioned effects occur because of direct or indirect negative impacts produced by inadequate human activities in all three sectors. It should be noted, however, that direct effects are merely the same for all three sectors. Air pollution, for example, is a specific consequence of industrial activities. The reduction of afforestated areas mostly derives from the inappropriate use and planning of land and water resources in the agricultural sector.

The direct effects of the core problem, in their turn, produce further changes.

- **Degradation of the environment** includes, inter alia, changes of hydrologic and hydro-geologic regimes, an increase of erosion processes and landslides, degradation of aquatic ecosystems and wetlands, biodiversity reduction and regional and global climate changes.
- **Human health** also has to suffer because of the existent bad drinking water quality. Morbidity and mortality rates are increase and the life expectancy at birth is decreased.
- **Social and economic conditions** are also affected by pollution in the Moldovan Danube River catchment area since social and economic dynamics are hindered and conflict situations with neighboring countries occur.

The combination of all effects mentioned above hinders the adoption and implementation of sustainable development principles of human society.

## Global Problem Hierarchy



## 2.3. Analysis of Objectives and Identification of Priority Sectors

### 2.3.1. Description of Objectives

Following the TOPP methodology, the core problem, its causes and effects were re-formulated into a positive state, desirable to be reached in the future. A careful analysis of means-ends relationships enabled the participants to define the Program Objective as:

**"POLLUTION REDUCTION BY ENSURING APPROPRIATE HUMAN ACTIVITIES IN THE MOLDOVAN PART OF THE DANUBE RIVER BASIN "**

This program objective contributes to the overall objective of the UNDP/GEF Danube Pollution Reduction Program, which was defined as follows:

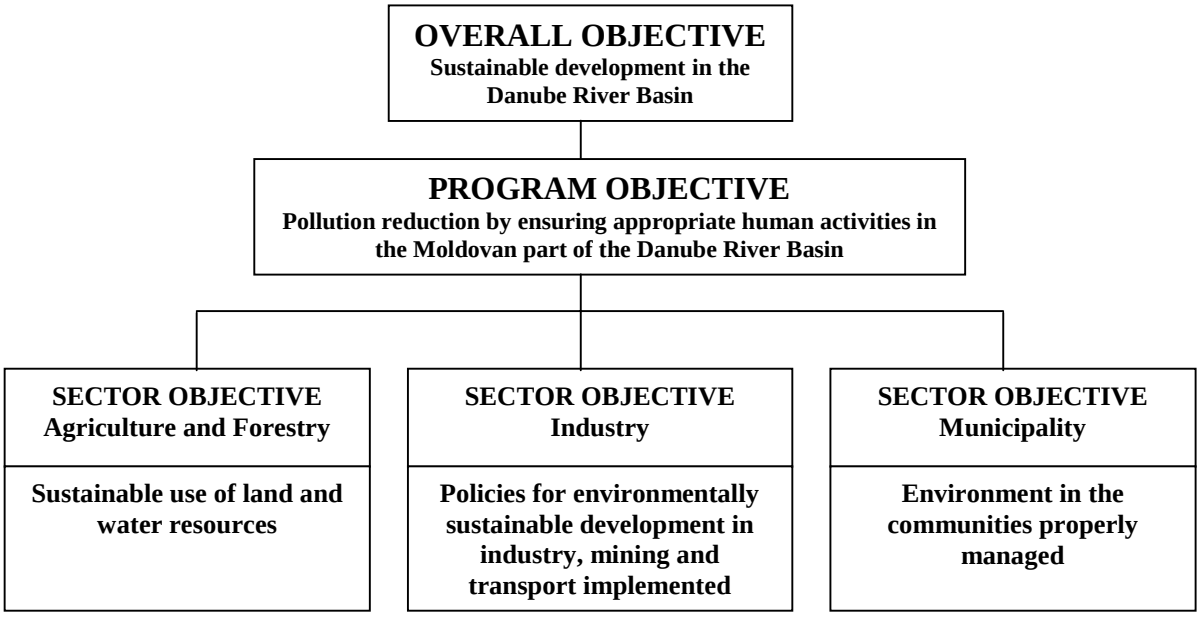
**"ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN"**

In order to ensure pollution reduction by appropriate human activities in the Moldovan part of the Danube river basin, specific objectives have been identified for the following sectors:

- **Agriculture and Forestry:** Sustainable use of land and water resources
- **Industry:** Implementation of policies for environmentally sustainable development in industry, mining and transport
- **Municipality:** Proper environmental management in the communities

In case that all means required are in place (activities, important elements and projects), the expected ends should be obtained. Thus, by implementing the elaborated program, pollution of soil, air, surface and groundwater will be reduced the geologic environment will be rehabilitated, eutrophication will be stopped and the deforestation process will be ceased.

**Scheme of Objective**



### 2.3.2. Identification of Priority Sectors

To achieve the program objective, measures have to be undertaken in the following priority sectors: agriculture and forestry, industry and municipalities.

## (i) Agriculture and Forestry

The labor-intensive economy of the Republic of Moldova is based on agriculture, which, in 1990, before independence, accounted for 42% of net material product (NMP) and employed over 35% of the labor force. Within the former Soviet Union, Moldova specialized in agricultural production and food processing. Processing of agricultural products represented 40% of industrial output, and 20% of industrial employment. Agricultural and food products accounted for over 50% of Moldova's exports in the final years of the existence of Soviet Union. Since independence in August 1991, Moldova's agriculture and food industry has faced a series of shocks, including a large deterioration in terms of trade and severe droughts. A drastic reduction in input of capital into the agriculture sector has gone hand in hand with a significant decline in production. Obvious features and effects of past agricultural practices include: high levels of pesticides (up to 14 kg/ha before 1990) and fertilizer use, risks of landslides, salinization, erosion and compaction of soils, flooding, as well as soil and groundwater pollution. 60% of rural wells are polluted with nitrates and other nitrogen compounds, as there are usually no landfills, no sewage treatment plants and no manure disposal sites.

In order to attain the promotion of sustainable use and planning of land and water resources it is required to:

- adopt adequate practices in crop production;
- adopt adequate piscicol practices;
- apply sustainable forest management;
- enhance the institutional capacity and public involvement in the protection of water and land resources

## (ii) Industry

The transition period badly affected the economic performance of the industrial sector. Gross industrial output declined by almost 30% in 1992-1994. Its growth remained negative in 1995 and 1996, but stabilized in 1997. Despite the economic decline, industry remains one of the most substantial polluters in the Moldovan part of the Danube basin. Although Moldova’s main natural resource is its agricultural potential, it has some mineral resources too, like the small oil deposits and gas wells in the southern part of Moldovan Danube River Catchment Area. Notwithstanding scarce mineral resources, mining practices do not meet requirements of proper environmental management, and has to be adjusted.

Therefore, in order to implement policies for environmentally sustainable industrial, mining and transport development, it is necessary to:

- introduce adequate industrial and mining practices;
- apply appropriate management of transportation and harbor facilities;
- improve the general framework for industrial development.

### (iii) Municipalities

Since Moldova is one of the most densely populated countries in the region (with 128 inhabitants per square kilometer), the impact of the municipal sector on water pollution has not to be neglected.

Domestic sewage and wastewater from industrial and other economic activities are a major source of surface and groundwater pollution. About 70% of the population are connected to municipal wastewater treatment plants, but most of the villages discharge their wastewater without treatment. In 1993, only 60% of the installations were functioning and there is no indication that the situation has improved since.

Data on the generation of household waste are collected only in the large cities and refer to its quantity but not its composition. At present, only rough estimations are available about the generation of waste, generally indicating a total volume of 4-5 million tons annually. The collection of waste is usually centralized and regular only in the largest cities. Irregular collection is the norm in most rural areas. Most of the existing landfills are not properly authorized and do not meet environmental and sanitary standards. The exact number of landfills and their characteristics are not very well known. Also, waste treatment is quite problematic. Thus, environmental management in the municipal sector hardly corresponds to the modern requirements.

To improve the existing situation, it is needed to:

- reduce the pollution from wastewater;
- apply solid waste management;
- improve a general framework favorable to correct environmental management in the communities.

## 2.3.3. Important Assumptions for Program and Sector Objectives

The identification of objectives, led to the necessity to describe important assumptions. These are factors are important for the success of the program, they lie outside of its scope and not under direct control of the programme. However, they are necessary to ensure the success of the program and the sustainability of its results.

At the program objective level, it is important that:

- **Environmental behavior at all levels is improved**
  Pollution reduction can not be ensured without a clear understanding at all levels that inappropriate human activities have a significant impact on the environment and generate health risks. It presumes support and involvement not only of the main stakeholders, but also of the whole society.
- **Water quality improvement remains a priority at the regional level**
  By signing the Danube River Convention, the riparian countries already expressed their concern and willingness to improve the water quality in the basin. Further strengthening of bilateral and multilateral co-operation at the regional level is needed.

The success of the program for the **agriculture and forestry sector** will depend upon:

- **Rehabilitation of wetlands, flood plains and wild life in the catchment area**
  Maintaining and further improving the state of the ecosystem and the biodiversity will secure the necessary potential for the self-purification of natural water.
- **Sustainable consumer behavior**
  Current consumer behavior has to be adjusted to the principle of sustainable development in order to use natural resources in an appropriate way.

For the **industrial sector**, the following assumptions were identified:

- **Implementation of the legal and institutional frame for environmental protection**
  The transition period imposed the need to change not only the economic environment but also the legal and institutional framework. New environmental legislation if being in place and properly enforced by all institutions concerned, will warrant rational use and protection of available resources.
- **Improvement of the state of environment remains a priority in governmental policy**
  Environmental legislation should be transparent, properly implemented and its enforcement should be strictly controlled. The political and financial commitment of the Government has to be ensured, since the program refers both to national and regional problems.

For the **municipal sector**, two assumptions were envisaged:

- **Reduction of transboundary pollution**
  The efforts of only one country will neither be sufficient or efficient if, at the regional level, the practices contributing to water pollution will not be eradicated.
- **Improvement of natural resource management in all sectors**
  Achievements in one sector are not enough, and an integrated approach in resource management and protection has to be applied.

### 2.3.4. Impact Indicators for Program and Sector Objectives

Impact Indicators were developed for the program objective, the sector objectives and the 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.

The following impact indicator has been defined to assess progress towards attaining the program objective:

- **The quality of surface water in the Moldovan part of the DRB will meet the requirements of a 1st class category for microbiological parameters by 2010**
  The level of microbial infection of surface water is quite high in the Moldovan part of Danube River Basin. As a result, the water of the Prut River generally falls into the class of moderately polluted water, but downstream of Ungheni, after the confluence with the Jijia River (coming from the Romanian territory) the water is polluted, even reaching the category ‘strongly polluted’ near Valea Mare. The water quality of most of the small rivers varies from ‘polluted’ to ‘strongly polluted’. Therefore, a good indicator of the program's efficiency will be the improvement of surface water quality, especially with regard to microbiologic parameters.

Achievements within each of main sectors will be monitored according to the specific indicators listed below.

The impact indicator for **Agriculture and Forestry** has been defined as:

- **While experiencing economic growth in the agricultural sector in the period from 1999 to 2005, water and soil quality will at least maintain actual standards or be further improved**
  Agriculture is clearly the key to Moldova’s economic development, at least in the near future. Since independence in August 1991, Moldova’s agriculture and food industry have faced a series of shocks, including a large deterioration in terms of trade and severe

droughts. A drastic reduction in input of capital into agriculture has gone hand in hand with a significant decline in production. Taking into account the current situation, it would be a very ambitious task to rapidly decrease the impact of agriculture on the environment. However, maintaining current standards of water and soil quality is an achievable task whilst the development of the agricultural sector will follow all requirements concerning protection of the environment.

The indicator for **Industry** has been identified as:

- **Pollution from industry, mining and transport activities are, by the year 2005, in conformity with national and international (EU) environmental standards while, at the same time, industrial production has increased.**

  The sharp decline of industrial production in the last years conditioned a substantial minimization of water, soil and air pollution. Economic growth will need a substantial improvement of the industrial performance of the country. As a result, industrial emissions are likely to increase in the near future if existing technologies and environmental protection facilities are not upgraded. Thus, meeting national and international standards when re-structuring and increasing industrial production is a key issue for maintaining the level of pollution at least at current figures.

For **Municipalities**, the impact indicator is:

- **By the year 2010, the number of children with methaemoglobinemia has decreased, due to the improvement of surface and ground water quality, by 15%, in comparison with data from 1993.**

  The main target of pollution reduction in relation with the municipal sector is to diminish health risks associated with the excessive amount of pollutants. One of the diseases occurring due to a high level of water pollution with nitrates is methaemoglobinemia (blue babies syndrome). The decreasing number of children with this disease will indicate the improving quality of water.

# Program Planning Matrix

| Summary of Objectives and Activities | Impact Indicators | Important Assumptions |
|---|---|---|
| ➢ **Overall Objective:** Sustainable development in the Danube River Basin achieved | ➢ In the 5 biggest river basins water treatment is improved by 20% while maintaining EU standards by the end of 2020 | ➢ Sustainable consumer patterns kept in the long term |
| ➢ **Program Objective:** Pollution reduction by appropriate human activities in the Moldovan part of the Danube River Basin ensured | ➢ The quality of surface water in the Moldovan part of the Danube River Basin will meet the requirements of a 1st class category for microbiological parameters by 2010 | ➢ Environmental behavior at all levels is improved<br>➢ Water quality improvement remains a priority at the regional level |
| ➢ **Sector objectives:**<br>**1. Agriculture and Forestry: Sustainable use of water and land resources promoted**<br>**2. Industry: Policies for environmentally sustainable industrial, mining and transport development implemented**<br>**3. Municipality: Environment in communities properly managed** | ➢ While experiencing economic growth in the agricultural sector in the period from 1999 to 2005, water and soil quality will at least maintain actual standards or be further improved (SO-AF)<br>➢ Pollution from industry, mining and transport activities are, by the year 2005, in conformity with national and international (EU) environmental standards while, at the same time, industrial production has increased (SO-1)<br>➢ By the year 2010, the number of children with methaemoglobinemia has decreased, due to the improvement of surface and ground water quality, by 15%, in comparison with data from 1993 (SO-M). | ➢ Rehabilitation of wetlands, flooding plains and wild life in the catchment area (SO-AF)<br>➢ Sustainable consumer behavior (SO-AF)<br>➢ The legal and institutional frame for environmental protection is implemented(SO-I)<br>➢ Improvement of the state of environment remains a priority in governmental policy (SO-I)<br>➢ Transboundary pollution reduced (SO-M)<br>➢ Management of natural resource is improved in all sectors (SO-M) |
| ➢ **Results/Outputs:**<br>**1. Agriculture and Forestry**<br>1.1 Adequate agricultural practices adopted<br>1.2 Adequate piscicol practices adopted<br>1.3 Sustainable forest management applied<br>1.4 Institutional capacity and public involvement in the protection of water and land resources enhanced<br>**2. Industry**<br>2.1 Adequate industrial and mining practices introduced<br>2.2 Management of transportation and harbor facilities applied<br>2.3 General framework for industrial development improved<br>**3. Municipality**<br>3.1 Pollution from wastewater reduced<br>3.2 Appropriate solid waste management applied<br>3.3 General framework conditions favorable to correct environmental management in the communities improved | | ➢ Favorable social-economic sectors (SR-AF)<br>➢ Ratification of the Danube Convention and its application in national legislation and policy (SR-I)<br>➢ National institutional production responds to international and local standards and demands (SR-I)<br>➢ Favorable economic and social framework maintained (SR-M)<br>➢ Pollution from municipal run off diminished (SR-M)<br>➢ Water resource quality improved (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

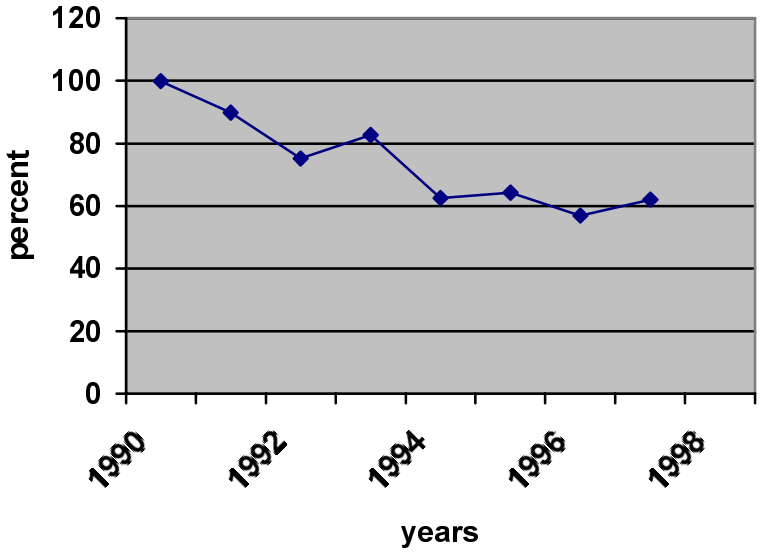
## 3.1. Agriculture and Forestry

### 3.1.1. Situation Analysis

#### 3.1.1.1. Importance of the Sector and Activities Leading to Water Pollution and Environment Degradation

The Republic of Moldova is basically an agrarian country and agriculture is one of the most important economic branches in the region. The agricultural sector produces more than 30% of GDP (Gross Domestic Product) with an output, however, steadily declining (fig. 3.1).

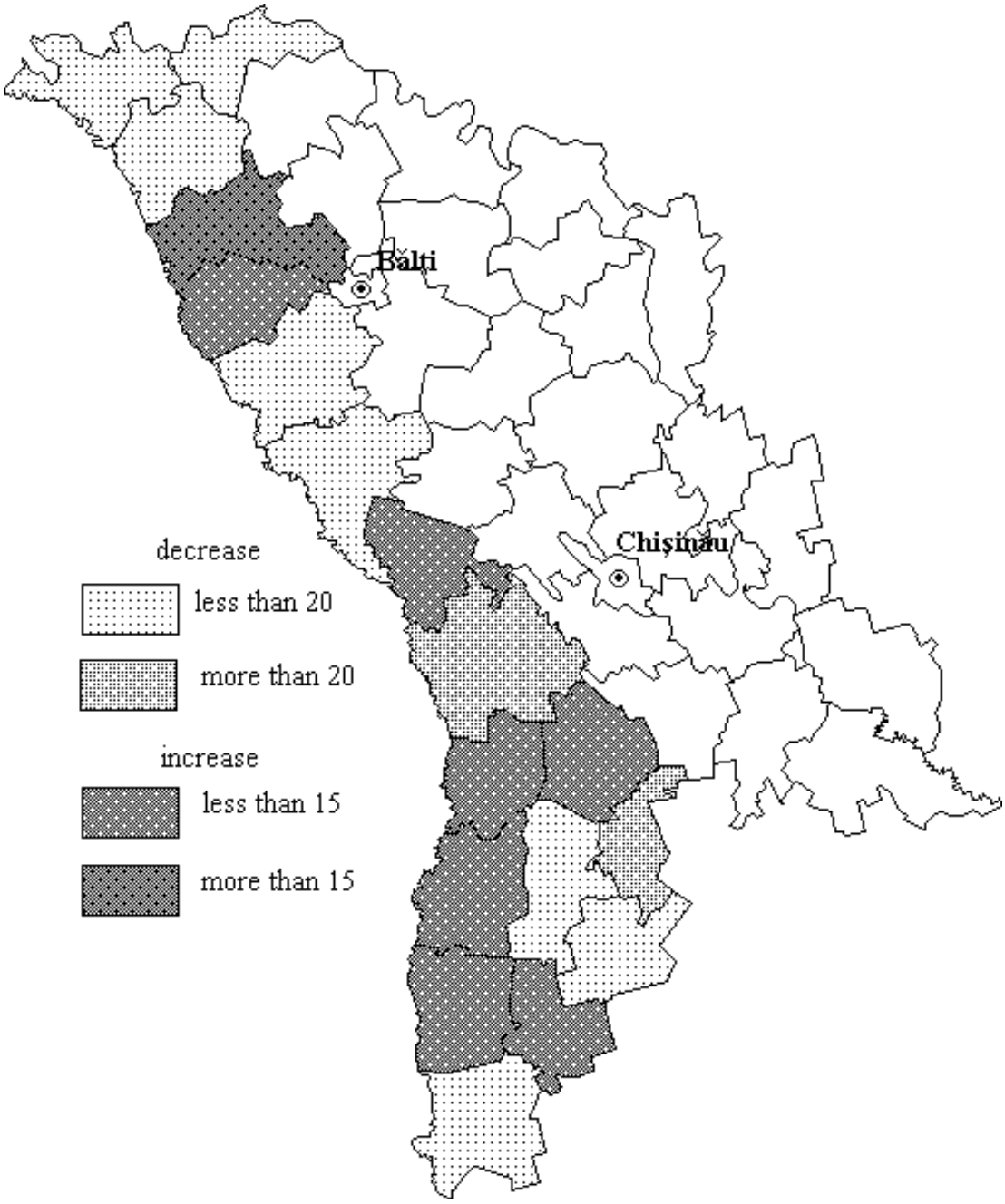
**Fig. 3.1. Evolution of Agricultural Output (%)**




*Source: The Department for Statistics, Republic of Moldova*

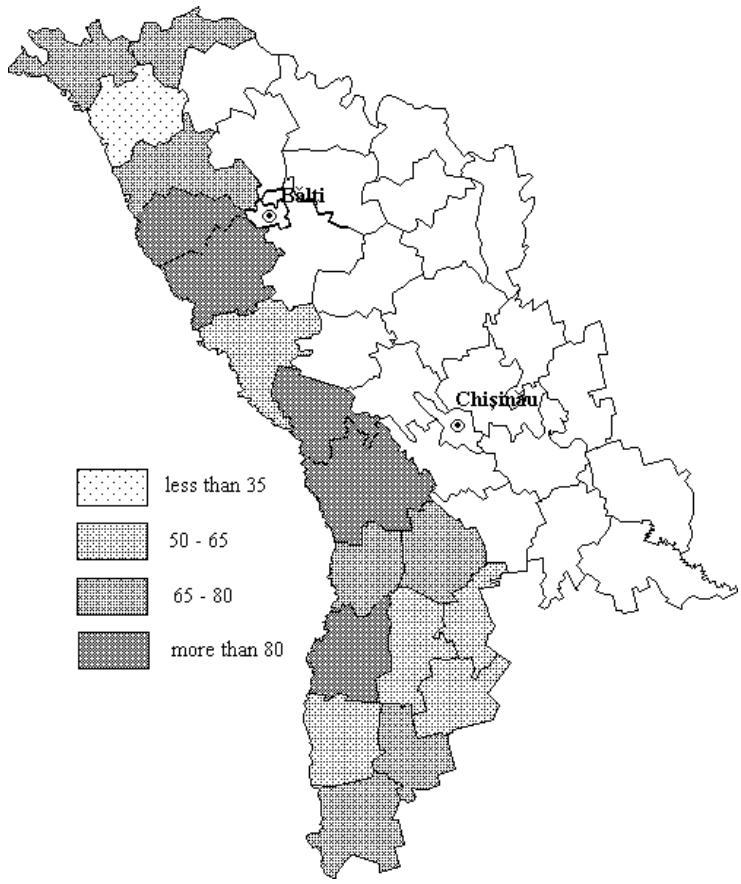
Dynamics of agricultural activities vary by regions (fig. 3.2.). In the Moldovan part of the Danube River Basin, 72,6% of the population live in rural areas, and 42,8% of the labor force are employed in agriculture (fig. 3.3., 3.4.).

**Fig. 3.2. Agricultural Output (1997 versus 1990, %)**




*Source: The Institute of Geography of the Moldovan Academy of Science*

**Fig. 3.3. Rural Population, 1997 (% of total population)**



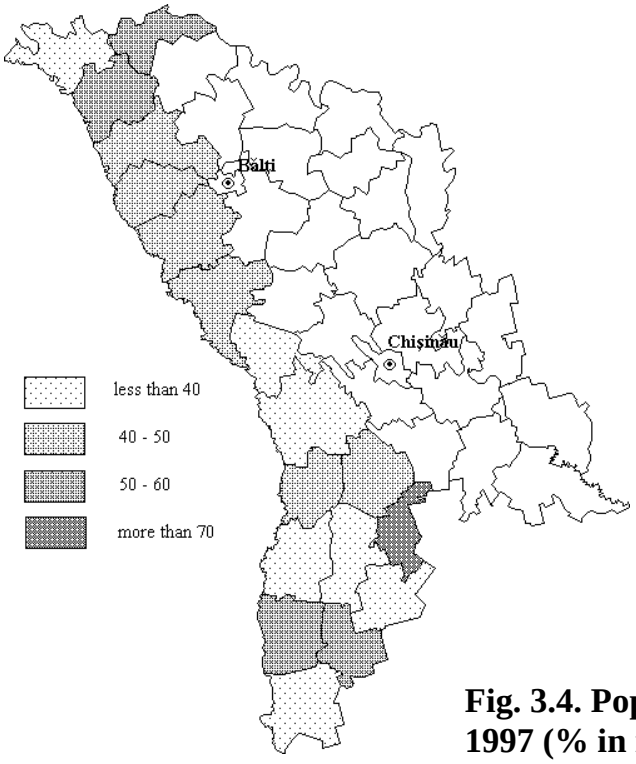




**Fig. 3.4. Population Engagement in Agriculture, 1997 (% in rural population)**

*Source: The Institute of Geography of the Moldovan Academy of Science*

It should be highlighted that the economic crisis, presently underway in Moldova, will have possibly more severe impacts on agriculture than on any other sector of the national economy. The financial situation of the overwhelming majority of farms is alarming, with an average profitability in agriculture being estimated in 1996 at 10,3%. About 50% of all collective farms (co-operatives) are presently bankrupt. Furthermore, the systems of purchase, storage, transportation and the marketing of output are disorganized which leads to substantial losses. There is a shortage, or total absence, of funds for the purchase of agricultural machinery, fertilizers, seeds and pesticides. The latter forces agricultural producers to arrange barter deals on terms that are far from being fair or favorable.

The recently developed private agricultural sector is very fragile and without sufficient support (fig.3.5). On the contrary, it faces innumerable obstacles. The new owners have still no experience in the field of agricultural technology and land management and, as a result, the agricultural associations employ outdated organizational methods and remuneration patterns. The most painful consequence of modern agriculture development is unemployment (fig. 3.6).

By the end of the 80s, the specialization and intensification of agriculture has led to an increase of agricultural land to up to 80 % of the total region. At present, the tendency of agricultural land increase is continued as a result of a large scale felling of forests and forest shelter-belts converting them into pastures and partly into arable land.

**Inadequate methods of crop cultivation** can be observed as one of the activities leading to water pollution in the Moldovan part of the DRB. The changes in the structure of crop cultivated land are connected with the increase of land where cereals and sunflowers are grown and a decrease of land with forage crops, fruit-berry plantations and vineyards. Such changes slacken soil degradation and contribute to a prevention of erosion development. However, in the absence of necessary means for soil protection, a tendency towards soil fertility decreases and land degradation is continued. As a result, the area of eroded land has increased to 35% of agricultural land.

A consequence of the reduction in the use of mineral and organic fertilizer is a negative humus balance resulting in a decrease in soil fertility and, accordingly, in agricultural crop productivity.

A sharp rise in prices of fuel and energy resources has led to the growth of both, planned and illegal felling that has aggravated the situation in a forest fund. In connection with the increase of livestock head, illegal pasturage, and annihilation of tender forests the situation has become aggravated (fig.3.7., 3.8).

**Fig. 3.5. Private Agricultural Sector, 1997**

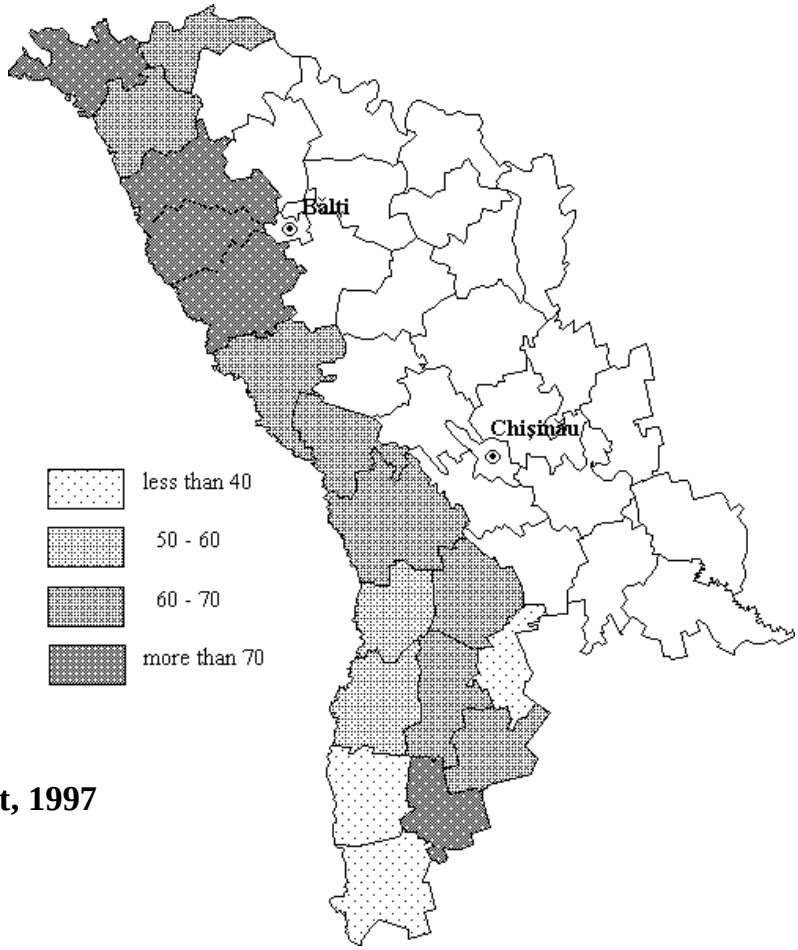
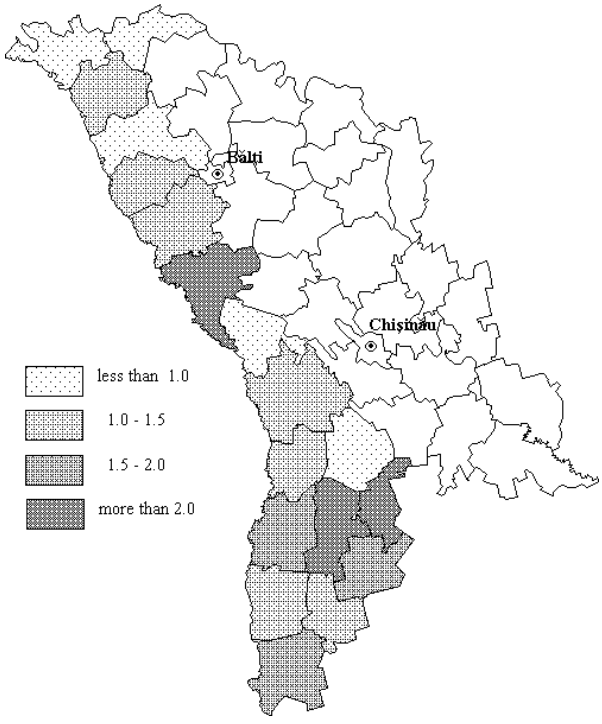



**Fig. 3.6. Unemployment, 1997**




*Source: The Institute of Geography of the Moldovan Academy of Science*

**Fig. 3.7. Forest Distribution, 1996 (% of afforestation)**

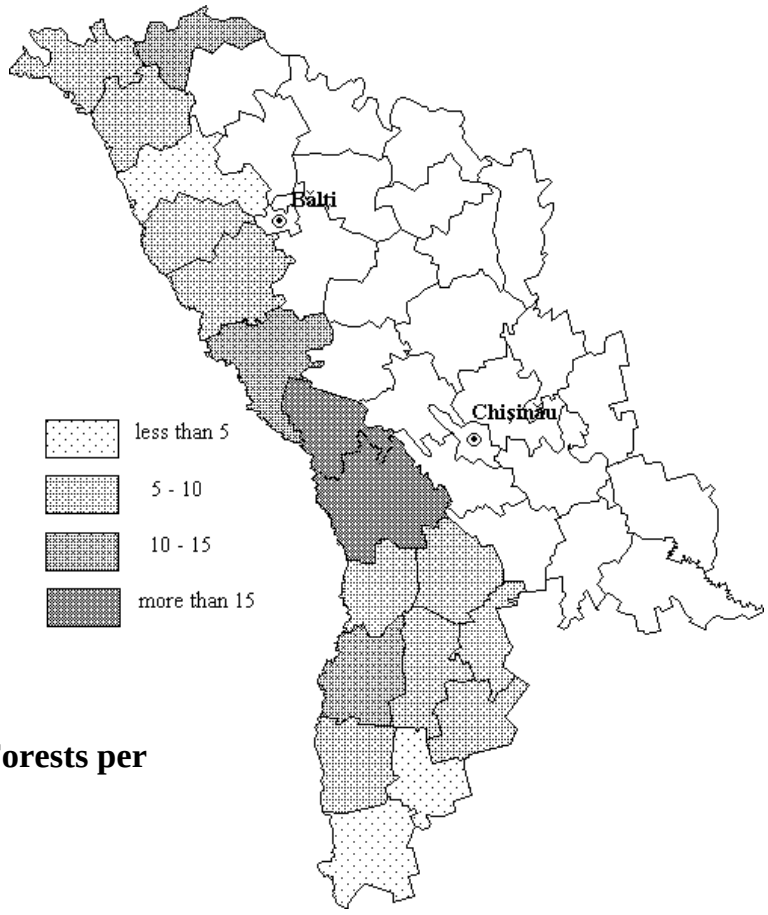
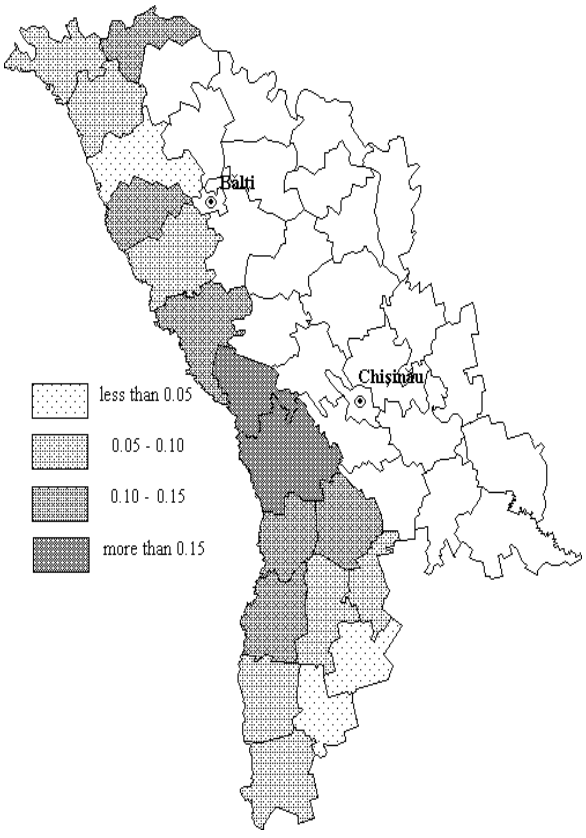


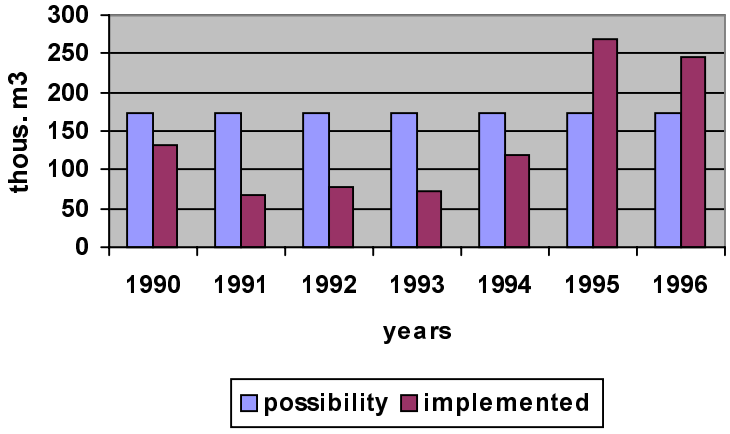

**Fig. 3.8. Surface of Forests per capita, 1996 (ha)**




*Source: The Institute of Geography of the Moldovan Academy of Science*

The current planting of forests neither does not ensure an increase of afforestation, which the region's ecological sustainability would require, nor does it compensate its antrophogenic reduction (fig.3.9.). At the same time, the sanitary conditions in the woods continue to deteriorate. Their area under diseases and pests reaches 20% but necessary phytosanitary actions are only conducted in half of the affected forest areas. **Inadequate management of forest** was mentioned by the participants of the workshop as an activity, which causes negative environmental consequences.

**Fig. 3.9. Regeneration, Conservation and Ecological Reconstruction Felling (volume of wooden mass)**



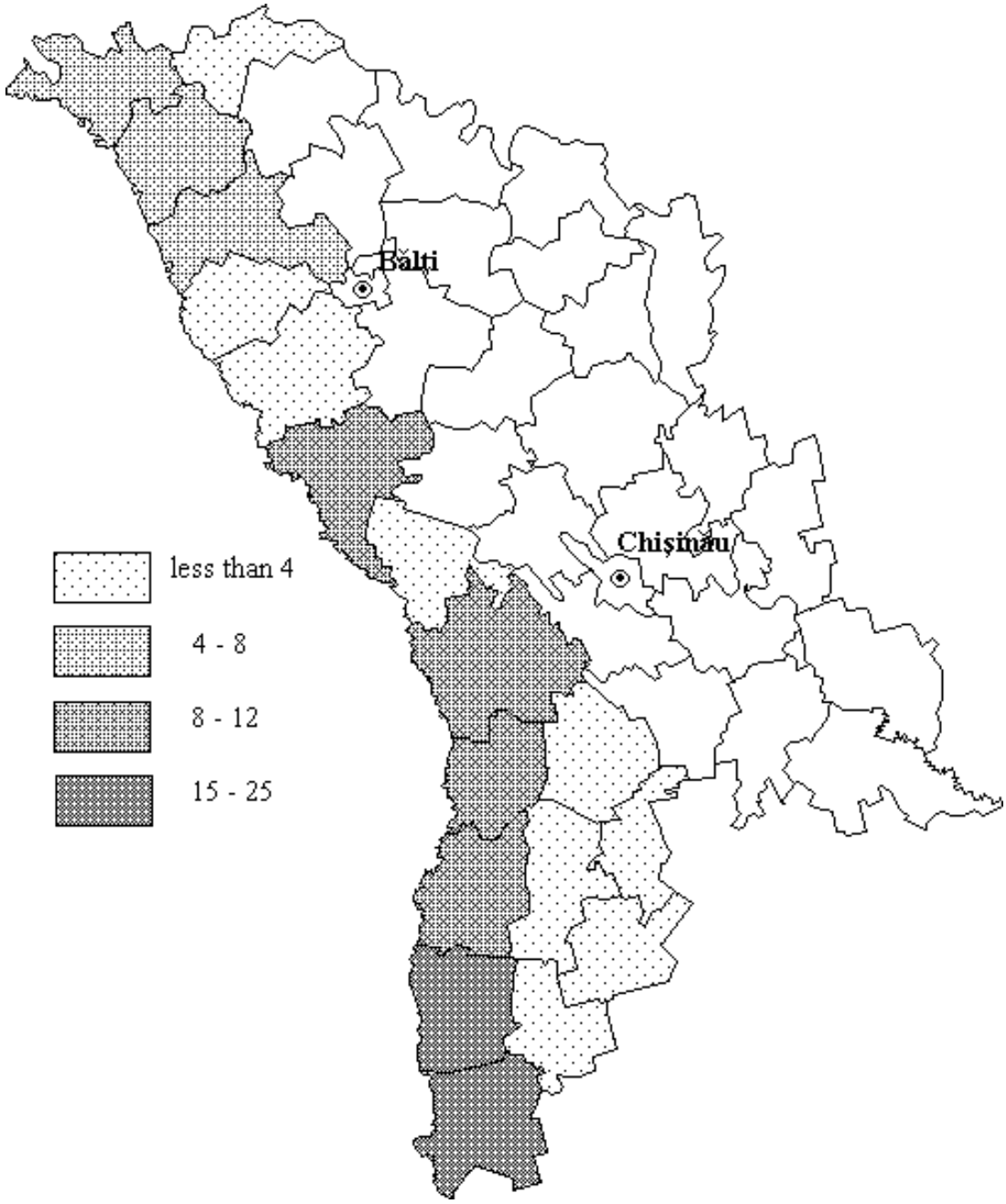

*Source: State forestry association "Moldsilva"*

**Inadequate management of piscicol ponds** also causes negative environmental consequences. In the last years, fishery has been constantly decreasing, both in fish farms and in natural basins. At the same time, the fish catch from natural water bodies and streams have increased. This is evident in the growing number of organizations with permission for fishing, as well as increased poaching.

The most alarming situation is connected with surface and ground water pollution. The **increase of animal breeding within the private sector** (up to 2-3 times of the previous live-stock) and its concentrations in rural settlements, together with the non-observance of sanitary-hygienic rules, result in a progressive pollution of wells' water with nitrates and pathogenic bacteria. In the last decade, the exceeding nitrate Maximal Permissible Concentration (MPC) in wells has increased by 30 %. This situation is especially serious taking into consideration that $^{2}/3$ of the population is supplied with drinking water from ground sources. Another important issue, which has negative consequences for the environment, is **inadequate irrigation.** This is determined by the non-observance of irrigation technologies, the lack of modern equipment, degradation of the existing irrigation systems. However, one has to take into account that irrigated areas are comparatively small in this region (fig. 3.10.).

In the end of the 80s, Moldova took up the unfortunate first place in the former USSR regarding the level of soil pollution. This is linked, first of all, with the redundant and **irrational use of pesticides and mineral fertilizers** and, secondly, with the use of sewage from cattle-breeding complexes for irrigation.

**Fig. 3.10. Irrigated Lands, 1995 (% of total area)**



In the last years, a significant rise in the price of chemicals and the destruction of economic relationships and state structures, concerning Moldova's supply, has led to a sharp reduction in the volume of mineral fertilizer (by 20-30 times) and pesticides (by 8-10 times) used in the country. As a consequence, total soil pollution has been significantly reduced. However, violations of regulations for the use of chemicals cause significant local, as well as surface and ground water pollution

At the current stage of economic transformation, it is typical to continue with the extensive use of natural resources, which leads to their exhaustion. Thus, whereas in 1990 only 0.65 ha of agricultural land was needed for the production of one gross product unit in agriculture, in 1993 it was already 0.78 ha and in 1996 this figure rose to 0.99 ha.

The decline in agricultural production leads to a reduction of environmental pollution. However, it should be noted that pollution is decreasing at a lower pace than production (sewage, requiring purification, has even enlarged per unit of product from 37 to 48 liters). In some cases, it is a manifestation of the tendency towards progressive pollution (e.g. pollution of ground water, which is due to the cumulative effect of interaction between polluting materials).

### 3.1.1.2. Current Strengths/Assets

In the agricultural sector, several kinds of assets are available for the future to rely on when measures are to be undertaken to overcome the negative consequences. The participants of the workshop have identified the following:

- **International experience**

  The existing international experience in the development of ecological principles in agriculture allows simultaneously settling problems of agricultural production growth and reducing the influence on the environment. Legislation in support of adequate agricultural practices exists and could be amended.

- **Legislation**

  Legislation already exists in the field of land and water resources but must be amended. New laws are being developed to harmonize norms and regulation with international standards.

- **Education**

  The country has well educated and trained personnel in many fields. New NGOs are enhancing their activities in supporting new management models. Institution and consultant firms have capacities to introduce modern technologies and sophisticated equipment in order to reduce pollution from the agricultural sector.

- **Financial Resources**

  Some financial resources are available for the implementation of a pollution reduction program in the agricultural branch. The World Bank, for instance, provides funding by means of grants or low interest loans for the implementation of projects with national priority. Moldova received a special US$18.49 Million loan to support agricultural development within the so-called "First Agriculture Project".

### 3.1.1.3. Analysis of Transboundary Effects

Agricultural activities also result in transboundary effects of high importance for the whole region of the Danube River Basin. One of the consequences is the process of eutrophication in the Black Sea and the Danube Delta.

Potential transboundary effects from Moldova are:

- The increase of transportation of suspended solids caused by inadequate methods of crop cultivation.
- The increase of the mineral and toxicity level in waters due to the development of poultry and animal farms in inappropriate locations, animal breeding (cattle, pig) by households within the private sector, inadequate use of piscicol ponds and the improper construction and use of irrigation systems.
- Degradation of biodiversity caused by the inadequate management of forests and animal breeding within the private sector.

The transportation of suspended solids, as a transboundary effect from Ukraine, was called in question by some participants.

On the whole, the working group came to the conclusion that the question of transboundary effects requires additional special research in order to analyze the problem fully.

## 3.1.2. Sector Problem Analysis

### 3.1.2.1. Core Problem

The core problem of the sector was determined as:

**"DEGRADATION OF LAND AND WATER RESOURCES"**

### 3.1.2.2. Causes Leading to Environmental Problems

The direct causes of the degradation of land and water resources were identified as:

- Inadequate practices in crop cultivation and animal breeding;
- Unsustainable management of forest and fishing resources
- Inadequate or not applied legal, educational and economic framework;

These causes are described in greater detail below:

#### (i) Inadequate practices in crop cultivation and animal breeding

Inadequate agricultural practices and inappropriate technologies and inadequate irrigation have the main contribution to this cause.

**a. Inadequate agricultural practices and inappropriate technologies**

Inadequate agricultural practices and inappropriate technologies are due to the **inadequate management of agricultural wastes**, that in one's turn, is caused by the outdated or not existent technologies for waste management owing to the lack of projects and finances for their development and implementation. The fact that **the existing quantity of animals for breeding purposes exceeds pasture capacity** is another cause for inadequate agricultural practices. This is due to the unfavorable social and economic conditions in rural areas. There are inadequate agricultural and technical practices because of the **lack of technical resources**, which in one's turn are caused, by the lack of financial resources. A further cause of inadequate agricultural practices and inappropriate technologies is the **unregulated application of pesticides and other chemicals** in agriculture owing to the import and use of unauthorized chemicals which again is caused by lack of information transfer to the community.

**b. Inadequate irrigation**

Inadequate irrigation is caused by the **disturbance of hydro-chemical and hydrologic regimes of rivers and ground waters**. Moreover, it is caused by **the non-observance of irrigation technologies** that is due to unfavorable social and economic conditions as a result of a lack of financial resources. A third direct cause for inadequate irrigation is the **degradation of existing irrigation systems** owing to the lack of modern irrigation equipment (machinery etc.) resulting, once again, from a lack of proper finances.

### (ii) Unsustainable management of forest and fishing resources

Unsustainable management of forest and fishing resources is due to inappropriate forest management and improper fishing practices, which affect the environment

**a. Inappropriate forest management**

Inappropriate forest management is caused by deforestation as a result of the energy crisis; by violations of the Forest Law and the lack of application of exploitation rules in forest management, as well as the unwarranted extensive use of woods' resources for export purposes.

**b. Improper fishing practices which affect the environment**

Improper fishing practices are due to excessive fishing, the lack of new technologies (biological techniques) and violations of the Fishery Law and of the rules on exploitation of water basins.

### (iii) Inadequate or not applied legal, educational and economic framework

The reason for the inadequate legal educational and economic framework is the **lack of proper mechanisms for the application of law enforcement, violations of the Law on the Protection of the Environment and insufficient involvement of the civil society**. Furthermore, it is due to the **unfavorable production framework** caused, in one's turn, by the collapse of market of agricultural products, the lack of financial mechanisms, insufficient information training and ecological education of the population, as well as the change of ownership concerning agricultural land.

## 3.1.2.3. Environmental Effects

The environmental consequences of agricultural activities leading to water pollution in the Danube River basin are of important significance for the overall environmental situation in the basin. The participants of the workshop have identified them as:

- **Soil pollution**

  Soil pollution is a consequence of the inadequate methods of crop cultivation, use of pesticides, leakage of manure poultry and husbandry farms and increased animal breeding by households within the private sector.

- **Salinization of soil and creation of swamps**

  Salinization is due to the inadequate management of forests as well as inadequate construction and use of irrigation systems.

- **Deterioration of natural pasture land**

  The deterioration of natural pasture land results from the increased number of animals for breeding purposes, which exceeds pasture capacity

- **Extension of eroded areas**

  The extension of eroded areas is a result of inadequate methods in crop cultivation, increased animal breeding which exceeds pasture capacity, inadequate management of forests, as well as the inadequate construction and use of irrigation systems.

- **Reduction of forest areas**

  The reduction of forest areas is a consequence of inadequate forest management and deforestation as a result of the energy crisis.

- **Pollution of surface and underground water**

  Pollution of surface and underground water is an environmental effect from inadequate methods in crop cultivation, use of pesticides, leakage of manure from poultry and husbandry farms, increased animal breeding within the private sector and the inadequate use of waste. Moreover, it is a result of the inadequate use of piscicol ponds, as well as the inadequate construction and the use of irrigation systems.

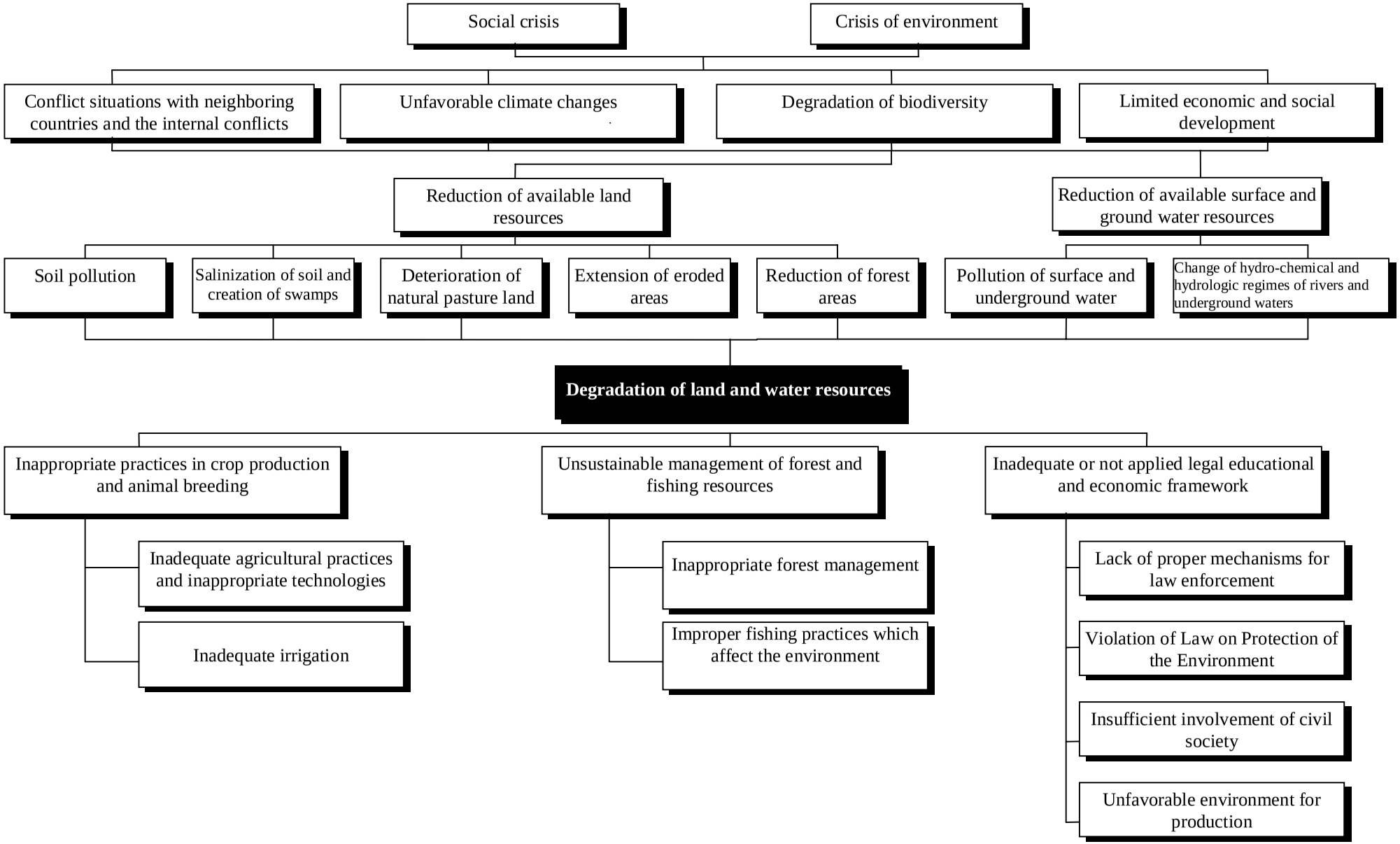
- **Change of hydro-chemical and hydrologic regimes of rivers and underground waters**

  This environmental problem results from the inadequate use of piscicol ponds, as well as the inadequate construction and use of irrigation systems

The consequences of these direct environmental effects of agricultural activities are:

- **Reduction of available land resources** which results from soil pollution, in particular from salinization of soil and creation of swamps. Furthermore, it is a consequence of the deterioration of natural pasturelands, extension of eroded areas and reduction of forest areas.
- **Reduction of available surface and ground water resources** which is a direct environmental effect of pollution of surface and underground water, as well as of the change of hydro-chemical and hydrologic regimes of rivers and ground waters.
- The reduction of available land resources and surface and ground water resources can bring about limited economic and social development, degradation of biodiversity, conflict situations with neighboring countries and internal conflicts, as well as unfavorable climate changes. These factors eventually result in a **social crisis** and a **crisis of the environment**.

## General Problem Hierarchy
## 1. Agriculture and Forestry



### 3.1.3. Objectives, Expected Results, Actions and Related Projects

Following the TOPP methodology the sector objective was determined as:

**"OPTIMAL USE AND PLANNING OF LAND AND WATER RESOURCES"**

In order to ensure pollution reduction by appropriate agriculture activities in the Moldovan part of the Danube River Basin, specific results have to take place:

- Adoption of adequate agricultural practices;
- Adoption of appropriate piscicol practices;
- Application of sustainable forest management;
- Enhancement of institutional capacity and public involvement in the protection of water and land 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 Moldovan part of the DRB are clearly needed and a number of projects were proposed.

### (i) Adoption of adequate agricultural practices

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

- Agro-technical practices;
- Agricultural waste management;
- Pasture management;
- Irrigation.

It is foreseen to:

- **apply adequate agro-technical and protection practices.** Important elements of this activity are the promotion of the rational use of pesticides and other chemicals used in agriculture. The import of existing foreign technologies and the availability of technical means are important for crop cultivation. Furthermore, the reinforcement of financial mechanisms and the introduction of adequate agricultural waste management as well as the availability of appropriate public information are necessary.

  For this activity, the following projects have been identified:

  ***Existing/On-going Projects:***

  - Support to the Agency for Restructuring Agriculture (TACIS Moldova)

    The main objectives of this project are post-restructuring assistance to private farmers, farm debt restructuring, input to agriculture policy and information systems, as well as training.
  - First Agriculture Project (World Bank)

    The project supports the development of Moldova's agricultural research system and gives technical assistance

***Planned Project:***

- Sediments Assessment in the Prut River (TACIS)
  The rehabilitation of the sediment monitoring program and the initialization of a sediment quality-monitoring program is an important task for the project.

***Proposed Projects:***

- Implementation of alternative resources processing technologies in agriculture
- Pesticide management in privatization conditions
- Adaptation of agricultural machinery to small farms
- Introduction of new ploughing methods in erosion-prone areas
- Creation of a monitoring center for the environmental state of sedimentary soils in the Prut River valley
- Financing systems for farm development (agricultural banks) etc.

- **adopt adequate practices in management of wastes from agriculture.** It is necessary to ensure improvement of husbandry in farms and complexes through facilitating the use of alternative technologies in animal waste management as well as to adjust farm sizes to optimal waste management capacities. Furthermore, public information systems regarding waste management will be introduced. In addition to the above mentioned, legislation and tighten animal waste management controls will be enforced.
  The following projects have been defined:

  ***Proposed Projects:***

  - Animal waste management
  - Production of biogas from animal waste
  - Creation of husbandry systems in a market economy
  - Creation of farming consulting center

- **introduce adequate pasture management.** For this activity it is necessary to optimize herd sizes in accordance with pasture capacity. First, programs for degraded pasture rehabilitation will be developed. Moreover, stakeholders will be assisted in the rehabilitation of degraded pastures and public information regarding pasture protection will be carried out.
  In order to introduce adequate pasture management, market factors for protection of pastures will be introduced and mechanisms for environmental law enforcement have to be created.

  Only ***proposed projects*** could be defined:

  - Project for degraded pasture rehabilitation
  - Improving pasture quality (irrigation, plantation)
  - Rehabilitation of eroded soil trough creation of highly productive pastures
  - Studying pasture capacity for husbandry support
  - Creating a center for public information regarding sustainable pasture use

- **introduce adequate irrigation practices.** After introduction new efficient irrigation systems, personnel for these new irrigation technologies will be trained and rules for the irrigation systems should be enforced, in particular introduction of legal stimulation of irrigation. It will be necessary to facilitate the privatization and self-financing of irrigation systems and to ensure monitoring of the hydro-chemical and hydrological regimes.

The following projects were defined

***Proposed Projects:***

- Rehabilitation of irrigation systems in Prut River basin
- Reorganization of irrigation systems in view of their privatization
- Regular checking of the water balance for the maintenance of environmental state of irrigation sources
- Creation of irrigation systems on environmental effective land

## (ii) Adoption of appropriate piscicol practices

To reach this result, measures have to be undertaken in the following areas:

- Aquatic basin exploitation
- New technologies
- Bioproductivity

It is required to:

- **reinforce the rules of aquatic basin exploitation.** In order to manage the water basins according to existing legislation and maintain the quality of water in the basins and downstream, it is necessary to create the buffer zones for the protection of water basins and to training of personnel for the exploitation of water basins.

  In addition, to support management and to assure and optimal aquatic basin exploitation, hydro-chemical and hydrological regime will be monitored.

  Neither existing nor planned projects could be identified:

  ***Proposed Projects:***

  - Rehabilitation of existing fishing systems
  - Organization of personnel training for the exploitation of river basins
  - Hydrological and hydrochemical monitoring of artificial fishing pond's water
  - Elaboration of protection areas schemes for Prut River basin

- **implement new technologies on a large scale.** It is needed to research the results of international fish breeding technologies and their implementation. Besides market economy stimulus will be introduced and existing legislation adjusted to new technologies in order to facilitate the control of water quality during new technologies implementation.

  The following projects have been identified for this activity:

  ***Proposed Projects:***

  - Analysis and synthesis of the work of advanced technologies world-wide and their implementation in fishing here
  - Studies concerning the updating the existing technical basis for new technology use
  - Amendment of existing legislation according to new technology requirements
  - Adjusting economic mechanisms to the requirements of new technology implementation

- **ensure bioproductivity in water basins.** This can be achieved by means of providing adequate hydrological and physico-chemical conditions for bioproductivity, facilitating the bioproductivity through legal measures. Moreover, the trophic base within aquatic basins will be promoted and productive species restored.

  The following projects are defined for this activity:

  ***Proposed Projects:***

  - Improvement of exploitation rules for artificial fishing ponds management for increased water resource protection
  - Restoring the biodiversity of valuable fish species in piscicol ponds
  - Hydrotechnical works in piscicol ponds for increasing biodiversity

## (iii) Application of sustainable forest management

For this result, activities in the following areas need to be undertaken:

- Erosion
- Forest legislation
- Deforestation

It is necessary to:

- **undertake anti-erosion measures.** This includes public awareness raising for the need to undertake erosion control measures. New forest growing technologies have to be introduced. Moreover sufficient financial resources for erosion control have to be created. It is also foreseen to promote application of anti-erosion agricultural techniques and to improve the run-off regime on slopes from the erosion point of view as well as optimization of anti-erosion land use.

  There are no existing or planned projects, only proposed projects have been identified:

  ***Proposed Projects:***

  - Improvement of the run-off regime on slopes for erosion control
  - New anti-erosion projects implementation
  - New agricultural technologies for erosion control
  - Creation of a program for information about anti-arsenal measures
  - Possibilities for extending forest covered areas
  - Optimization of land from anti-erosion point of view

- **implement mechanisms for the application of forest use legislation.** For this activity, it is key to ensure information and education for the population. In this context, forest planning will be improved. Moreover general schemes have to be developed for forest law enforcement and economic incentives for its enforcement created. To ensure the application of forest use legislation, the penalty system have to be reinforced and the control system has to be strengthened.

  The following projects are identified:

  ***Proposed Projects:***

  - Reorganization of control bodies in forestry
  - Economic leverage for forest legislation implementation
  - General schemes for forest legislation implementation

- Analysis of the possibility of applying the existent forestry legal frameworks
- Development of legislation on the export and import of timber
- Updating the legal frameworks and standards in forestry

- **reduce deforestation through the promotion of alternative energy resources.** This activity can be successful by means of making a national inventory concerning possibilities for new energy sources. It is needed to raise public awareness for the importance and the existence of new alternative energy sources.

  In parallel, market economy factors for the use of alternative resources will be introduced. Measures for the use of alternative energy sources through subsidies will be promoted and personnel for the use of new energy resources trained. It is also foreseen to facilitate new technology uses in the production of alternative energy sources and assisting the population in using alternative energy resources.

  For this activity, the following projects have been identified:

  ***Existing/On-going Projects:***

  - Energy Sector reform (World bank)
    This project aims at developing a reform program for the Moldovan energy sector.

  ***Proposed Projects:***

  - National inventory of alternative energy sources possibilities
  - National public information programs concerning the use of alternative energy resources
  - The possibility of subsiding the use of alternative energy resources
  - The use of alternative energy resources in a market economy

## (iv) Enhancement of the institutional capacity and public involvement in the protection of water and land resources

For this result, measures have to be undertaken in the following fields:

- Legislation for land and water resources
- Public participation
- Funds availability

To achieve this result it is foreseen to:

- **reinforce the application of appropriate legislation for the use of land and water resources.** This includes enforcing the legal framework using an informational system and public education. The existing legal framework with laws regarding a land and water resource ownership system has to be completed. Moreover, mechanisms for legal framework enforcement in the field of land and water resources have to be improved. In this context it is also necessary to strengthen the control bodies' capacities and enforce the existing penalty systems and facilitate the application of legislation through economic incentives as well.

  The following projects have been identified:

  ***Existing/On-going Projects:***

  - Biodiversity Strategy Development (World Bank)
    This project supports the formulation and adoption of strategies and actions for the protection and sustainable use of biodiversity.

- Development of Water Resources (World Bank, Japanese Government)

  The main objectives of this project are the preparation of appropriate support legislation and appointing basin authorities or commissions for the two main rivers, the establishment of a basin-wide and central monitoring and evaluation capability, the improvement of the database of existing and planned water supply developments, as well as the database on river discharges and strengthening the cooperation with riparian settlements in order to improve the quality of effluents discharging into the Nistru, Prut and their tributaries.

***Proposed Projects:***

- Accordance between water and land use legislation
- Possibilities of improving the water and soil resource property system
- Legislation enforcement through strengthening control bodies
- Creation of economic leverage for legislation implementation

➢ **facilitate public participation through civil society development.** For the success of this activity it is necessary to develop an informational knowledge system for civil society and public education. The population will be informed on civil society duties, and public participation in environmental protection encouraged. It is necessary to launch governmental training programs on land and water resources protection. In addition, environmental NGO network in rural areas will be expanded and the legal framework for public participation enhanced.

For this activity, the following projects have been identified:

***Existing/On-going Projects:***

- General Education Project (World bank)

  This project supports the introduction of new general education standards.
- Election Administration and Civic Education (USAID)

  The project aims at publishing and disseminating information and materials about democracy, as well as assisting in the development of organized institutions (NGOs, educational institutions, mass media etc. ).
- Rule of Law (USAID)

  The wider objective of the project is to develop continuing legal education programs.

***Proposed Projects:***

- Governmental public information programs
- Public involvement in water and soil protection
- National education system involvement in water and soil resources preservation

➢ **make funds available for protection of water and land resources.** For this purpose, it is necessary to develop financial mechanisms, inform economic agents about existing mechanisms, and introduce tariff systems in the field of land and water resource use. In parallel, the application of cost-benefit criteria in project analysis will be facilitated and a bank for the assistance of environmental projects established.

The following projects have been identified:

***Proposed Projects:***

- Amending of the legal framework with economic and financial provisions
- Creation of economic stimuli for the use of clean technologies in the field of water and soil resources use

- Informing economic agents about existing mechanisms
- Improvement of tariffs and penalty policies in the field of water and soil use
- Creation of a bank for assistance to environmental projects

In order to make sustainable use of water and land resources feasible, the ***proposed projects of high priority*** are as follows:

- Animal waste management
- Rehabilitation of irrigation systems in the Prut River
- Optimization of land from anti-erosion point of view
- The use of alternative energy resources in a market economy

### 3.1.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lie outside its scope and not under the direct control of the program. These external factors may affect the implementation and long-term sustainability of the program. The important assumptions or external factors must be taken into consideration if the objectives defined at (the next) higher levels are to be achieved.

The following assumptions at the activity level have been recognized to achieve the **sector results**:

- **Appropriate technologies for resources management available**
  Achievements in only one sector are not enough. Therefore, an integrated approach in resource management and protection has to be applied.
- **Legal framework effectively respected**
  The transition period imposed the need to change not only the economic environment, but also the legal and institutional framework. New environmental legislation when being in place and properly enforced by all institutions concerned will warrant rational use and the protection of available resources.
- **Alternative energy for population needs available**
  The use of alternative energy sources allows avoiding felling of forests for every-day necessities.
- **Favorable environment for production exists**
  Maintaining and further improving the state of ecosystems and natural resources will secure the necessary potential for agricultural production.

On the result/output level, the following assumption has been identified in order to attain the **sector objective:**

- **Favorable social-economic factors**
  Favorable social-economic factors promote sustainable development of production, the optimal use of natural resources and the protection of the environment.

### 3.1.5. Impact Indicators for Sector Results

Impact Indicators were developed to assess the results derived for this sector. They define the matter of objectives and the results by operationally measurable terms (quantity, quality, target groups, partner institutions, time period and place). The impact indicators must give an adequate picture of situation. Furthermore, they must be measurable in a consistent way at an acceptable cost.

For the particular sector results the following indicators have been identified:

- **From 1999 to 2002, 30% of farmers use adequate agricultural practices, which results in an increase of product quality and, at the same time, in a reduction of water pollution in the Moldovan part of the DRB.**

  The implementation of leading agricultural technologies, mainly based on ecological principles will ensure a better quality of production and a decrease in the development of soil erosion and landslides. As a result, the level of water pollution will be reduced.

- **In the period from 1999 to 2004, water pollution in the Danube catchment area in Moldova generated by harmful substances from pisciculture is significantly reduced and, simultaneously, surface water quality has improved by means of using adequate piscicol practices.**

  Introducing a set of proper regulations, as well as new technologies will ensure a reduction of water pollution generated by harmful substances coming from pisciculture. This should improve bioproductivity in general and fish production in particular.

- **In the period from 1999 to 2002, erosion processes are reduced, simultaneously, forest areas have expanded in the flooding plains of the Prut River by using adequate forest management.**

  Regulations of forestry and a mechanism for their enforcement, as well as using alternative energy sources, will allow enlarging afforestated areas. The use of existing rules of forestry exploitation will allow reducing soil erosion.

- **An appropriate strategy integrating the main aspects of water and land resource use is elaborated and adopted for implementation at national level in the period from 1999 to 2001**

  Improvement of existing environmental legislation regarding the common use of water and land resources will allow avoiding local conflicts concerning the exploitation of nature. The development of economic mechanisms to control the performance of legislation will permit reducing the level of pollution of natural resources.

# 3.2. Industry

## 3.2.1. Situation Analysis

### 3.2.1.1. Importance of the Sector and Activities Leading to Water Pollution and Environmental Degradation

Moldova's economy is characterized by an emphasis on agriculture and agro-industry, a lack of mineral resources, few heavily polluting industries and an underdeveloped technical infrastructure. The industrial sector contributes with about 50% to the Moldovan GDP, despite the fact that its share has decreased in the last years.

Gross industrial output declined by almost 30% in 1992 and 1994 and its growth remained negative from 1995 to1997. To a large extent, industrial productions collapsed because of a sharp decline in heavy industry and because technologically advanced industries were orientated towards production for military activities. At present, the industrial sector produces mainly consumer goods. Agro-industry remains the main source of industrial output in Moldova, with wine and sugar production, canning, tobacco and meat processing being the most important activities. There is also some textile industry, light machinery and cement works. The mining sector is represented mainly by the extraction of construction materials. The part of the country belonging to the Danube basin is even less industrialized because it is a predominantly rural area. However, during the last years, new industrial activities started in the south of this area, with potentially major impacts on the environment in general and on the Danube River in particular: the exploitation of oil and gas, and the construction of an oil terminal on the Moldovan stretch of the Danube.

The structure of industrial production of Moldova that developed under the centrally planned economy was heavily distorted by a rigid pricing system, subsidies to producers and consumers, monopoly and strict administrative regulation. The economic transition, stimulated in part by the price liberalization and economic reforms after the break-up of the USSR, should result in a new production and trade structure for the Moldovan economy.

The substantial movement of key input prices to international levels has led to considerable changes in production, use and export patterns. These changes have resulted in a significant increase in the cost of production for energy-intensive commodities. Alternatively, the producers of labor-intensive commodities have benefited. Consequently, in the medium term, the priorities of the Government's industrial policy were set as follows: (1) preponderant development of industries based on local raw materials resources (food industry, construction industry) as well as labor-intensive and advanced industries (light industry, machinery, microelectronics); (2) reduction of the share of energy- and material-intensive industries in the country's economy; (3) stimulating the export of industrial goods.

The state of the environment in Moldova is largely the result **of inappropriate resource management**. Pollution levels and environmental degradation due to economic inefficiency were mainly a result of the under-valuation of various inputs, as well as an economic system focusing on quantitative production targets and providing minimal incentives for efficiency.

The large drop in industrial output since 1990 has had both positive and negative implications for the environment and natural resources. The industrial decline substantially reduced pollution generated in this sector, both in terms of waste generated by the production processes and emissions generated from energy consumption. However, waste and emission reduction efficiency in industrial wastewater treatment plants (WWTPs) and air pollution abatement has declined, largely due to financial constraints and a lack of resources to operate plants and equipment, as well as weak enforcement capacity of environmental institutions. Moreover, many industrial WWTPs

have been taken out of operation. Over time, the economic transition should bring sustainable environmental benefits. Efficiency considerations in enterprises should, in many areas, reduce environmental pressures, as they are subject to hard budget constraints and privatization. Nevertheless, a strengthening of regulatory and environmental enforcement capabilities will be needed to hold enterprises accountable.

In terms of water pollution, the industrial enterprises of major concern in the Moldovan part of the Danube catchment area are wineries, sugar factories, canneries, diaries, and a few textile and carpet factories. About 140 million $m^3$ of industrial water are discharged to surface waters with or without treatment, of which about 50 million $m^3$ is reported to be polluted above the standards used in Moldova. A large share of industries is connected to municipal treatment plants. Industries connected are required to have facilities for pre-treatment. A large number of industrial WWTP have been constructed, but many of the industries do not use their treatment facilities or maintain the plants in good condition. Malfunctioning industrial treatment systems result in **inadequately or untreated wastewater discharges**. Many agro-industrial plants discharge directly to the rivers or to ponds, and many do not operate their installed treatment plants due to a lack of resources for repairs and maintenance. Number of sugar factories discharge into lagoons that are overloaded or leak, which results in highly polluted drainage that contributes to the pollution of surface and ground water, affecting the rural drinking water supply.

Due to the **low production efficiency** in terms of material and energy consumption, the absence of adequate treatment technologies as well as lack of preoccupation for proper handling of waste, the amount of accumulated industrial waste is increasing steadily. By 1994, about 11 million tons of industrial waste, including considerable amounts of toxic waste, had been accumulated. Waste recycling (or waste treatment) is problematic. No reliable data exist on the actual reuse of wastes. Not one well organized disposal site for **hazardous industrial and chemical waste** exists in the country.. Most toxic industrial wastes are stored at industrial sites while awaiting a solution. The situation is getting worse, as the majority of industrial enterprises are in crisis and efficient standards for treatment and disposal are lacking. Data on leachate emissions from the landfills are missing, thus the danger of pollutants infiltration into groundwater entailing chemical contamination being simply ignored. There are many concerns over illegal and uncontrolled dumping of industrial wastes at numerous locations throughout the country.

In Moldova, like elsewhere, the **transportation of people and a goods is** another important activity leading to water quality deterioration. Presently, vehicles account for 60% of polluting emissions of the country into the air. Indirectly, this affects negatively the condition of surface waters, via polluted precipitation. At the same time, vehicles, transport and maintenance infrastructure are sources of direct water pollution e.g. through discharges of highly polluted effluents from transport companies into the water bodies or municipal sewage network, leakage of fuel and oils from cars or storage facilities, washing of cars in improper conditions and the run-off from urban areas and roads.

Moldova is lacking mineral resources. The **mining sector** is represented mainly by the extraction of construction materials (limestone, sand, and gravel). Limestone quarries and **dredging the Prut River bed for sand** are significant causes of environmental pollution, habitat destruction and the degradation of river ecosystems. This affects the physical state of the Prut River by changing the riverbed and enhancing erosion of riverbanks. Besides direct economic costs, these activities entail significant amenity losses.

### 3.2.1.2. Current Strengths/Assets

The participants in the workshop mentioned several strengths/ assets to rely on when measures are to be undertaken to mitigate the negative consequences of human activities in the industrial sector. These include:

- **Legal framework**

  A number of environmental laws relating to natural resource management were developed and enacted in Moldova, mostly after gaining independence and re-orienting the country's development to the society's democratization and to a market oriented economy. Among them, the Law on Environment Protection (1993), the Law on the Protection of Riparian Zones (1995), the Water Code (1993), the Law an Ecological Expert Evaluation and Environment Impact Assessment (1996), the Law on Hazardous Substances and Product Management (1997), the Law on Natural Resources (1997), the Law on Air Protection (1997), the Law on Wastes (1997) and the Law on Taxes for Environmental Pollution (1998) could be mentioned as the most important.

  Several recent documents, as for instance, the NEAP, the Strategy of Water Resources Management; the Energy Program; the Program of Human Health Protection; the Privatization Program for 1997-1998 and the Concept of Industrial Policy present strategies and policies for pollution abatement. They are guided by the principle of sustainability, including rational use of natural resources and energy carriers, which result in cleaner production stimulated by economic instruments.

  The NEAP (1995) provides some recommendations, specifically referring to the industrial sector, which include the development of resource-saving and low-waste technology, as well as 'good housekeeping' practices in order to reduce losses and stop the inefficient use of resources. It comprises, further, the provision of facilities for the pre-treatment of industrial effluents and a strict supervision of the generation and reprocessing of waste.

- **Institutional framework**

  A number of state institutions deal with environmental management. The main state environmental agency is the Ministry of Environment. The Ministry of Health, the Ministry of Territorial Development, Housing and Public Utilities, the Ministry of Agriculture and Food Industry has, in their turn, specific environmental responsibilities. Moreover, a number of NGOs are active in the field of environmental protection, conducting independent researches on the state of the environment, informing and educating the population, leading clean-up activities, etc. The involvement of the private sector in environmental protection is still low. In time, however, efficiency considerations in privatized enterprises should reduce environmental pressures in some sectors.

- **Human resources**

  Despite the sharp industrial decline in the 1990s, Moldova has maintained skilled and well-educated personnel in industry.

- **Existing know-how**

  There are scientific institutions conducting applied scientific and technological research for several industries (for example, in the food sector), with an appropriate infrastructure and a good scientific potential. Over time, they have developed practical knowledge and skills and, despite the present lack of financial resources, keep the capability to develop high technologies in their fields of activity. However, there is a need to obtain new technologies and experience from other countries.

- **Economic mechanisms for water protection**

  Moldova has existing economic levers such as charges for water use and discharge of effluents/water pollution, penalties for water degradation, compensations for the occurred damage, supplementary taxation for using environmentally dangerous technologies and tax discounts for the introduction of technologies reducing water consumption or recycling water. They could be efficient management tool in industry although a strengthening of enforcement capabilities will be needed to hold enterprises accountable.

- **Industrial wastewater treatment plants**

  Industries connected to municipal treatment plants are required to have facilities for pre-treatment. A large number of industrial WWTP have been constructed, At present, wastewater treatment facilities make up the bulk of the country's environmental protection assets. Keeping these assets in working order take more and more funds and human resource each year. Due to the lack of resources to operate plants and equipment many of the industries do not use their treatment facilities or maintain the plants in good condition. However, the existing WWTPs constitute an important asset for improving the environmental performance of the industrial sector.

- **National Accident Warning System**

  The existing system is meant to prevent dramatic consequences for people and the environment in the case of accidental pollution (including industrial accidents) by informing in due time the relevant authorities and the population. The system foresees also the information of neighboring countries, if the accident has an international dimension.

- **Inventory of industrial "hot-spots"**

  During the last years, the state of the environment in the Moldovan part of the Danube River Basin was subject to several assessments, mainly in the frame of the Environmental Programme for the Danube River Basin. The problems related to industrial pollution have been explicitly analyzed in a number of studies and documents, of which the Pre-Investment Study of the Prut River Basin (1994) and the Study on Nutrient Balances for the Danube countries (1996), have to be noticed first and foremost. The results of these assessments constitute a basis for further investments in pollution reduction measures.

### 3.2.1.3. Analysis of Transboundary Effects

The Prut River is the last major tributary to the Danube. Its catchment area is almost equally divided between Ukraine, Romania, and Moldova. Industrial activities in these countries inevitably result in transboundary effects. Speaking about transboundary issues in the Prut catchment it is necessary to consider the problems "imported" by Moldova from Ukraine, the problems "exchanged" between Moldova and Romania, and the problems "exported" together by Romania, Moldova and Ukraine to the Danube and the Black Sea.

***Transboundary problems in Moldova originating from Ukraine***

The main problems are caused by communal and industrial pollution from point sources on the Ukrainian territory, of which the towns Iaremcha, Kolomyia and especially Chernivtsi (280,000 inhabitants) should be mentioned. Wastewater treatment plants in these towns are not functioning properly because of overloading, old equipment and a lack of resources for repairs and maintenance. The main industrial activities in this area are timber processing, mechanical engineering, metal processing, oil and chemical industry. The industrial enterprises are usually connected to municipal treatment plants.

Concerns are expressed in Moldova regarding the presence of phenols and heavy metals from Ukrainian sources in the Prut River. Mercury, chromium, copper and zinc can be particularly mentioned, possibly relating to the electroplating facilities in Chernivtsi. Their concentrations in

water do not seem to cause serious problems in the upper stretch but they can appear because of the accumulation of micro-pollutants in sediments in the Costesti-Stinca reservoir, a hundred kilometers after the Prut enters Moldova. Presently sediments are not subject to monitoring, neither on the Romanian nor on the Moldovan side.

***Transboundary problems in Moldova originating from Romania***

The water quality of the Prut River in its upper reaches is generally quite good until it is joined, about 350 km from the outfall, by the Jijia River draining the northwestern part of the catchment area within Romania and collecting industrial, agricultural and municipal effluents, including those from Iasi (450,000 inhabitants) and Botosani (130,000 inhabitants). The effect of adding this pollution load via Jijia is a deterioration of the water quality in the Prut River for many kilometers downstream, although there is some improvement towards its confluence with the Danube. BOD concentrations exceed water quality standards for water bodies used for drinking water abstraction. High levels of ammonium, nitrite, nitrate and orthophosphate are reported in this stretch of the river. The level of bacterial pollution is also rather high. This threatens the drinking water supply for the Moldovan towns Leova, Cantemir and Cahul, which entirely rely on the supply from the Prut River.

***Transboundary problems in Romania originating from Moldova***

The Moldovan side of the Prut River basin is predominantly agricultural. A number of studies have demonstrated the particularly important role of non-point sources of pollution in the Moldovan part of the Prut catchment area. The industrial impact on water pollution in this region is considered to be small.

***Effects of the Prut River on the Danube***

In general terms, the effect of the Prut inflow is a deterioration of the water quality in the Danube. There is an increase in BOD, total N and total P concentrations in the Danube and a substantial increase in suspended solids concentrations.

Apart from transboundary problems related to the Prut River, one should consider the impact of pollution originating in Moldova on Ukraine via the Yalpugh and Cahul rivers. However, this is an issue, which requires additional studying.

## 3.2.2. Sector Problem Analysis

### 3.2.2.1. Core Problem

The core problem for the industry sector has been identified by the participants of the workshop as follows:

**“ENVIRONMENTALLY UNSUSTAINABLE DEVELOPMENT OF INDUSTRIAL, MINING AND TRANSPORT SECTORS”**

The state of the environment in Moldova is largely the result of inappropriate resource management. Pollution levels and environmental degradation due to economic inefficiency were mainly a result of the undervaluing of various inputs, as well as an economic system focusing on quantitative production targets and providing minimal incentives for efficiency. In the past the strategy of natural resource exploitation and environmental protection was based on rendering emissions and wastewater harmless after the production cycle rather than avoiding inappropriate uses of water and reducing the amount of waste generated by the technologies in use.

### 3.2.2.2. Causes Leading to Environmental Problems

The main causes leading to environment problems in industry, mining and transport are the following:

- Inadequate industrial and mining practices
- Inappropriate management of transport activities
- Unfavorable general framework

These direct causes are described in greater detail below.

### (i) Inadequate industrial and mining practices

Environmentally unsustainable industrial technologies, inadequate industrial waste management and inadequate mining practices as well as insufficient training of staff are the main causes of inadequate industrial and mining practices.

**a. Environmentally unsustainable industrial technologies**

Pollution levels and environmental degradation due to economic inefficiency are mainly a result of the **undervaluing of various inputs (e.g. energy and raw materials)** under the former central planning economic system. **The old system was not providing real incentives to promote cleaner production**, to introduce energy saving and low waste production technologies. There was no procedure for environmental audits at plant level.

Often, costly end-of-pipe measures, such as wastewater treatment or installing dust collectors, were preferred. Despite the fact that structural measures, such as changes in energy use, restructuring industrial processes or improving the quality of products could reduce not only emissions but also the need for inputs (e.g. of energy and materials) and, therefore, have a financial payback.

At the same time, the possibilities to solve the problem of industrial emissions by taking a number of smaller and more manageable steps which might, however, make a substantial improvement to the environmental performance of industries (such as "good housekeeping" or in-plant improvements of process technology) were largely neglected.

During the last years, industrial pollution problems were magnified by the **inappropriate operation and maintenance of the equipment** due to financial constraints, a lack of discipline, low personal responsibility of managers and a decrease in the personnel's qualification. This is, inter alia, increasing the risk of industrial accidents.

**b. Inadequate industrial waste management**

The problem of industrial waste management has three main aspects: wastewater treatment, solid waste treatment and disposal, as well as the handling of hazardous waste. A large number of industrial WWTPs have been constructed, but many of them do not work properly or are taken off operation, due to **obsolete technologies and equipment** used and the lack of resources for repairs and maintenance. Malfunctioning of industrial treatment facilities result in **inadequately or untreated wastewater discharges**, causing problems where over-discharge of toxic substances into municipal WWTPs undermines the plants' biological step (for example, polyphenols discharged from wineries). Many agro-industrial plants discharge their wastewater, with or without treatment, directly to the rivers or to ponds, which leak into ground- and surface water.

**Solid waste recycling and reuse in enterprises is at a low level**, primarily due to the lack of economic incentives and appropriate technologies. Therefore, the amount of accumulated industrial waste is increasing. By 1994, about 11 million tons of industrial waste was accumulated, including considerable amounts of toxic waste, of which 21,000

tons were of highly toxic potassium ferrocyanide from wine production (the wine industry does not have the technology to process this waste). Other types of accumulated toxic/industrial wastes include: waste oils (about 4,500 tons were generated in enterprises in 1996), hydroxides, paints and enamels, used emulsions and used solvents. As waste recycling or waste treatment is problematic, the only available procedure is their disposal. However, **not one well-organized disposal site for hazardous industrial and chemical waste exists in the country**. Most of the toxic industrial waste is stored at industrial sites while awaiting a solution. Currently, only 5% of the industrial waste generated annually is sent to proper disposal sites; $^{3}/4$ is dumped on communal tips, mixed with municipal waste. Monitoring data on leachate emissions from landfills are missing. There are many concerns over illegal and uncontrolled dumping of industrial waste at numerous locations throughout the country.

The reason for the above mentioned situation is, on the one hand, **the lack of control** from authorized institutions and, on the other hand, **insufficient information** about production, treatment and the disposal of industrial waste, especially hazardous one.

**c. Inadequate mining practices**

Presently, the mining sector in Moldova is represented mainly by the extraction of construction materials (limestone, sand, and gravel). Mining activities rely completely on **outdated technologies and equipment**. Often, they are **performed in/near valuable or/and sensitive natural areas**, thus affecting the natural value of landscapes and destroying natural habitats. The dredging of the Prut River bed for sand is an example of such actions. A similar problem is going to occur in the lower Prut area, where oil reserves were prospected on the territory of the state natural reserve "Prutul de Jos". There is a large public concern about the possibility that the extraction of petroleum in this area will be allowed by the Government.

There is no complete information about extractable minerals. Together with **the lack of an efficient control from habilitated agencies** this leads to **many violations of environmental and mining regulations**, like, for example, the unauthorized extraction of construction materials.

**d. Insufficient training of staff**

In the long run, the **lack of training programs** leads to a decrease of staff's qualification, which directly influences the economic and environmental performance of the industries. After the break-up of the USSR the formerly existing system of personnel re-qualifying was disrupted. Apart from this, Moldovan industries **have big problems with accessing international information** networks to get relevant information. The country **does not have enough trainers** to ensure the transfer of knowledge about new technologies. To attract foreign trainers, however, one needs at least to create good facilities for organization of international workshops/seminars and to provide financial means for training, which is problematic in the actual economic situation.

### (ii) Inappropriate management of transport activities

Inappropriate transport practices, pollution from construction and exploitation of fuel storage facilities and bad condition of roads are the main causes of inappropriate management of transport activities.

**a. Inappropriate transport practices**

Due to the poor economic situation in Moldova the fleet of used vehicles is quite old. The exploitation of old cars results in bigger **pollution via exhaust gases, fuel and oil leakage**, etc. **Neither individual car owners nor companies have enough financial resources to regularly check the technical condition of cars**, to buy spare parts, etc.

During the last years, a large number of used cars were imported from European countries, some of them in very bad conditions. The problem is exacerbated by the fact that there is neither a legal, nor an organizational framework, nor is technical equipment at hand to regularly check car emissions**. Leaded petrol is still largely used in Moldova**, mainly because the Government does not provide economic incentives to use the unleaded one (leaded petrol is still cheaper).

**b. Pollution from construction and exploitation of fuel storage facilities**

In the actual economic context, import and commercializing of petrol and oil products became a highly profitable and rapidly expanding business. Consequently, the need for new storage capacities and petrol stations increased sharply. This led to the problem of **wrong emplacement of such reservoirs**, as well as their **improper construction, which entails leakage, and pollution of soil and water resources**, especially dangerous in sensitive natural areas.

Apart from this fact, the ongoing construction of the Giurgiulesti oil terminal on the Moldovan stretch of the Danube is a problem of major public concern. The terminal is designed to receive annually about 2 million tons of oil products (petrol, diesel, kerosene and fuel oil) and will be located in a zone with complicated hydrological, geological and seismic conditions. After unloading the tankers, the oil products are to be transported by trucks to several reservoirs inside the country, which, as a result, increases the risk of road accidents.

**c. Poor road conditions**

The poor state of the road network is mainly caused by the **use of old construction technologies and materials**. Consequently, the roads are insufficiently resistant to the physical influence of vehicles and to the seasonal amplitude of temperature. This results in a deterioration of technical car conditions and increased pollution. The traditionally **insufficient road maintenance service** in Moldova is now additionally negatively affected by the lack of financial resources. The state is still the only owner of the road network, which is also affecting the funds available for road maintenance and extension.

### (iii) The unfavorable general framework

It is conditioned by the lack of favorable conditions for investments, insufficient management practice and inadequate legal and institutional framework.

**a. Lack of favorable conditions for investments**

**The general economic situation of the country does not favor neither local nor foreign investments**. The economy is unstable and still decreasing. The reasons for the continuing economic decline are related to the fact that Moldova has not adequately addressed the deeper institutional reforms necessary for a successful market economy. This includes legal and regulatory measures to support efficient exchange of goods and services, the regulation of monopoly, land reform, and the establishment of asset markets. There are two major distortions: the slow pace of privatization and the unavailability or high prices of credits. Almost all direct governmental subsidies to enterprises have been withdrawn and new credits are extremely tight. Public investment has declined dramatically. However, the **rigid fiscal policy is also adversely affecting investments in infrastructure and natural resource management**.

The lack of projects attractive to foreign investors is another negative factor, both because of the inadequate economic context and the lack of experience in dealing with IFIs when proposing, presenting and promoting project proposals. Furthermore, during the last year, the Government practically ceased to provide guarantees for loans taken by national legal entities. In order to attract funds from abroad it is very important to adopt the law on the protection of foreign investments.

**b. Insufficient management practice**

One of the causes of insufficient management practices is the **low level of environmental education of the decision-makers**. The **inadequate exchange of managerial experience** in the national and international context is also adversely affecting it. Low environmental awareness within the population does **not offer the possibility to involve the general public in the decision-making process**. An important element of this problem seems to be insufficient information, in particular with regards to the knowledge of the environmental legislation.

**c. Inadequate legal and institutional framework**

The existing permitting procedures based on ambient standards impose to the industry emissions ceilings which are sometimes considered as too strict and which do not offer them real possibilities for compliance. This is also one of the reasons for **the low effectiveness of enforcement**. To be enforceable, standards should be realistic. There is an urgent need to adopt interim standards for water quality, which are feasible to attain, with a strategy of gradually achieving higher levels of water quality.

Moldovan ambient standards are stricter than EU ambient standards, and the number of pollutants for which ambient standards have been promulgated is bigger than in EU/OECD countries. But such **strict standards are counterproductive**. Given the limited resources for monitoring, it is difficult or impossible to track all of these pollutants. The staff of the Inspectorates has no adequate equipment to ensure monitoring of polluting sources for compliance with norms or to react immediately in the event of excessive or accidental pollution. It would be better to adopt a simpler set of ambient standards, reflecting current analytical capacity. The system of monitoring and enforcement is bureaucratic and has no resources to implement the national plans. There is lack of enforcement capacity, and reduced management capacity due to the economic situation and budget constraints.

**Regulatory instruments for environmental management are not properly implemented and enforced**. It is not always clear how the tasks and rights of the various services are delimited. The utilization, control and management functions are spread among various institutions. There is no unified water quality monitoring system in Moldova. **The actual situation in natural resource management and control is confusing**.

Another drawback is the missing co-ordination among various national laws with newly developed environmental legislation. The harmonization with international environmental legislation is proceeding very slowly.

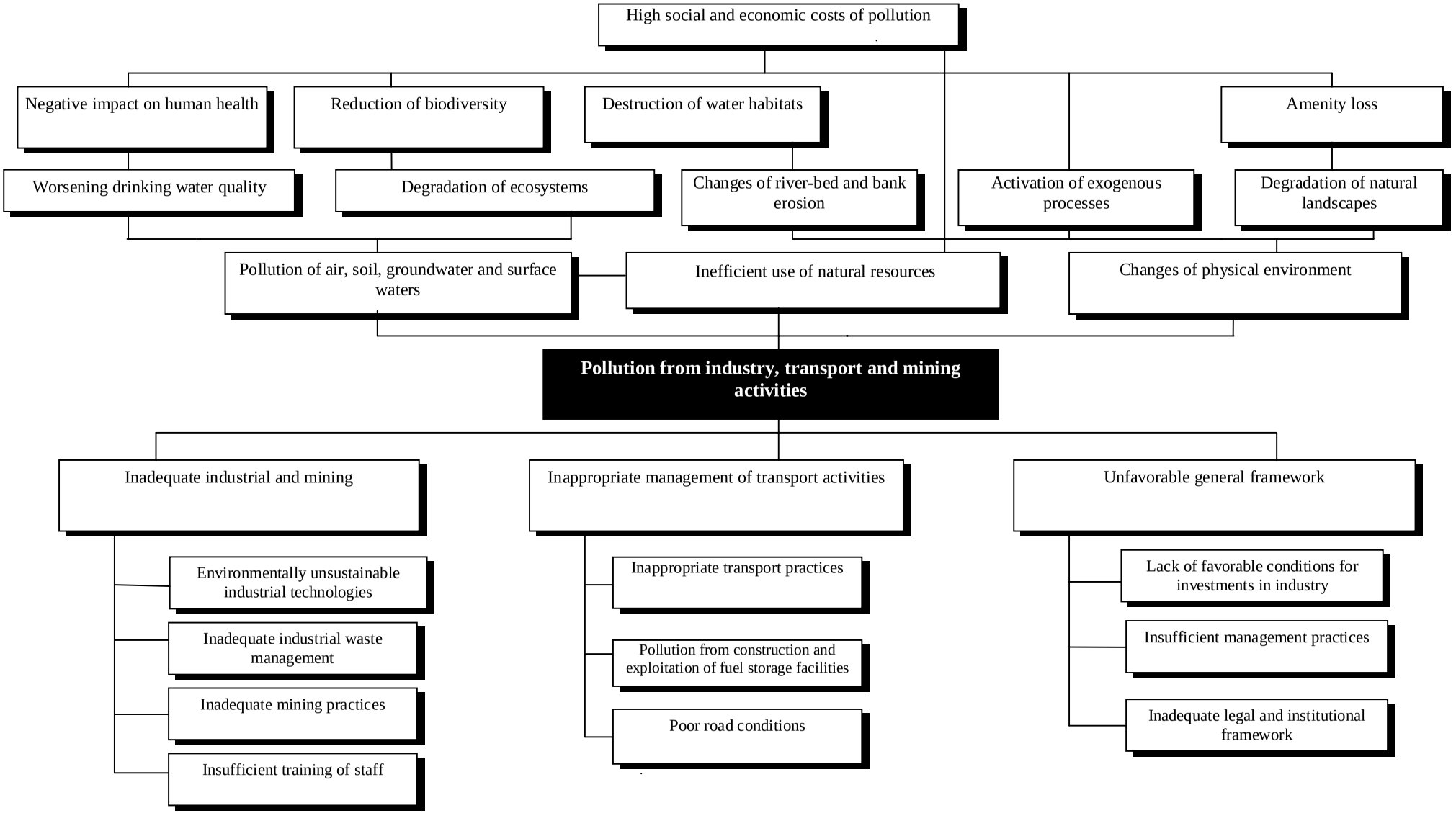
### 3.2.2.3. Environmental Effects

The direct effects of the problems encountered in the industrial sector are:

- Pollution of air, soil, groundwater and surface waters
- Inefficient use of natural resources
- Changes of physical environment

The industry, mining and transport sectors account for a significant part of air, soil and water pollution. This results in a worsening of drinking water quality. Besides the negative impact on human health risks via worsening of drinking water quality, the pollution of air, soil, surface waters and groundwater lead to the degradation of ecosystems and to a reduction in biodiversity. All these effects have high social and economic costs, despite the fact that some of these costs are difficult to be estimated. Unsustainable practices in industry, and especially in mining, lead to significant changes of the physical environment. The activation of landslides and soil erosion, the degradation of natural landscapes, the changes of the riverbeds and bank erosion lead to an irreversible destruction of habitats and amenity losses, also entailing high social and economic costs.

# Problem Hierarchy
## 2. Industry



### 3.2.3. Objectives, Expected Results, Actions and Related Projects

Following the Logical Framework Approach of the TOPP methodology the Sector Objective has been determined as:

**"POLICIES FOR ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT IN INDUSTRY, MINING AND TRANSPORT IMPLEMENTED"**

In order to attain pollution reduction in the Moldovan part of the Danube River basin through appropriate industrial and transport activities, the following specific results have been formulated:

- Introduction of adequate industrial and mining practices
- Application of appropriate management of transportation and harbor facilities
- Improvement of general framework for industrial development

## (i) Introduction of adequate industrial and mining activities

To obtain this result, activities should be undertaken in the following fields:

- Industrial practices
- Waste from industrial activities
- Mining practices
- Modern technologies

It is required to:

- **introduce environmentally sustainable industrial practices**. Introducing environmentally sustainable practices implies the introduction of technologies with reduced energy, water and raw material consumption. The rehabilitation of existing facilities for utilization and recycling of industrial wastes as well as the introduction of new technologies for water treatment in closed circuits are very important. It is also foreseen to realize the activities for the reduction of accident risk. To facilitate introduction of modern sustainable industrial practices, also database on modern technologies will be created.

  For this activity, the following projects have been identified:

  ***Existing/On-going Projects***

  - Waste management within the framework of the Giurgiulesti Oil Terminal Project

    The main objective is to construct up-to-date facilities for proper waste keeping, and utilization.
  - Waste disposal in the framework the Wine Export Promotion Project

    The aim is the rehabilitation of existing facilities and the construction of new facilities for appropriate toxic waste treatment
  - Accident Emergency Warning System and Monitoring, Laboratory and Information Management for Ukrainian and Moldovan part of the Danube Basin ( TACIS)

    The project is intended for providing the equipment, training and expert advice required for establishing AEWS and TNMN systems in Ukraine and Moldova
  - Development of energy conservation programs at national and local levels

    The wider objectives are the development of energy-use statistics, the implementation of en energy-saving survey, demonstrations of energy efficient technologies and training in energy saving.

***Planned Projects***

- Rehabilitation and modernization of equipment at the canneries in the district centers of Ungheni, Glodeni, Nisporeni, Cantemir and Cahul

***Proposed Project***

- Waste management in wine processing
- Clean production demo project in the sugar sector

- **reduce waste from industrial activities**. The reduction of waste from industrial activities includes the application of advanced technologies in industrial processes, improving the normative base for waste management. At the beginning, strategies and programs for the reduction and recycling of waste, use of solid waste in construction materials production have to be developed. Appropriate systems for monitoring and control have to be introduced. It is also foreseen to install nutrient removal units at local industrial treatment facilities and the implementation of biological methods of wastewater treatment at industrial enterprises.

  The following projects have been identified:

  ***Existing/On-going Projects***

  - Environmental Education Program (NGOs)

    The projects funds lectures in high schools on the importance of waste recycling, painting competitions and publications in environmental bulletins.
  - Creation of National Register of Toxic Wastes

    This project aims at improving the management of toxic wastes in the country.
  - Toxic wastes incineration in Cement Kilns

    Presently, large amounts of toxic wastes (galvanic sediments, old and banned pesticides) are stored on the territory of industrial and agricultural units. There are no special sites in Moldova where such wastes can be stored. One of the possible solutions is the incineration in Cement Kilns. The costs of the re-construction of Cement Kiln in order to be used as a toxic waste incinerator constitutes 5% of the costs of a standard commercial incinerator. The requested sum is to be spent for the installation of a waste donator, the procurement of a control system and the training of staff.
  - New technologies for treatment of waste and wastewater containing heavy metals

    The project aims at evaluating the total amount of galvanic wastes accumulated in Moldova and to elaborating new treatment technologies for such wastes.

  ***Planned Projects***

  - Installation of new equipment at Ungheni biochemical plant

- **optimize mining practices.** To implement this activity it is necessary to precisely assess mining resources. Modern mining practices and equipment will be introduced and damaged land rehabilitated. In order to optimize mining practices, it is also important to control application of mining regulations and methods and to introduce and keep a mining register.

  There are several projects for this activity:

  ***Existing/On-going Projects***

  - Gas extraction at the south of the Republic
  - Petrol extraction in Valeni

***Planned Projects***

- Use of by-products in mining activities
- Extraction of sand and gravel in the vicinity of Bolotino village ( district Glodeni)

- **introduce training for application of modern technologies.** First technical and material base for training programs have to be developed for their successful implementation. In this context it is necessary to ensure availability of information on industrial technologies used in advanced countries and facilitate access to relevant information.

  The following projects were mentioned in the workshop:

  ***Existing/On-going Projects***

  - Laboratory Training Program within framework of the Giurgiulesti Oil Terminal project

  ***Planned Projects***

  - Rehabilitation project for food processing plant in Chiadar-Lunga and Comrat
  - Modernization of Ungheni railway facilities and waste treatment process

  ***Proposed Projects***

  - Rehabilitation of wastewater facilities in industrial enterprises

## (ii) Application of appropriate management of transportation and harbor facilities

To achieve this result, it is required to undertake measures in the following areas:

- Transport practices
- Pollution control
- Road network

It is necessary to:

- **ensure appropriate transport practices.** The activity on appropriate transport practices includes enforcing emission controls, using environmentally friendly fuels, controlling the import of used cars, as well as traffic in protected areas.

  For this activity, the following projects have been identified:

  ***Existing/On-going Projects***

  - Development of basic infrastructure at the Giurgiulesti Oil Terminal
  - Improvement of traffic flows in Trans-European corridors II and IX

    The objective is to improve traffic flows on the corridors Germany-Russia and Finland-Greece.

  ***Planned Projects***

  - Enlargement of protected areas and strengthening of control on their status

- **ensure adequate pollution control in harbor and storage facilities.** This activity includes two important elements: the supervision of the functioning of the Giurgiulesti Oil Terminal to prevent Danube pollution and the modernization of storage facilities for oil products and chemicals.

The following projects have been identified for this activity:

***Existing/On-going Projects***

- Environmental quality control within the framework of the Giurgiulesti Oil Terminal Project

***Planned Projects***

- Appropriate management of solid and liquid waste disposals within the framework of the Giurgiulesti Oil Terminal project

***Proposed Projects***

- Utilization of toxic industrial wastes

- **improve the state of the road network.** This activity implies the use of new technologies and quality materials in road construction, the rehabilitation of road protection means, the organization of road maintenance services and the implementation of adequate institutional road management mechanisms.

  Several projects have been identified:

***Existing/On-going Projects***

- Construction of railway Giurgiulesti-Cahul
- Transport vehicles ( Giurgiulesti Oil Terminal)
- Road Kishinev-Vulcanesti-Giuirgiulesti
- Railway in Giurgiulesti
- Southern Area Road Rehabilitation
  road Kishinev-Hancesti
  road Hancesti- Chimislia
- Electrification of railway Bender-Kishinev

***Planned Projects***

- Local projects for reconstructing and repairing of roads

## (iii) Improvement of the general framework for industrial development

Several activities have to be undertaken in order to attain this result in the following fields:

- Investment conditions
- Management practices
- Legal and institutional framework

It is necessary to:

- **develop optimal investment conditions.** This activity includes the modernization of the revenue system (taxes), the development of projects attractive to investors in the framework of the Pollution Reduction Program, the creation of free economic zones, the development of infrastructure for attracting investments and cooperation with international financial institutions.

The following projects have been mentioned:

***Existing/On-going Projects***

- Small GEF Grants within the Environmental Programme for the Danube River Basin
- Creation of a free economic zone Ungheni-Kishinev
- Energy supply and distribution

***Proposed Projects***

- Creation of free economic zone Giurgiulesti-Galati- Reni- Cahul

- **facilitate the implementation of modern management practice.** For this activity, it is key to develop new programs for management improvements, to implement modern communication systems, to develop human resources and to provide jobs with modern management facilities.

***Existing/On-going Projects***

- Widened Environmental Action Programme

  The main objectives of this Programme are the support of activities of the Regional Environmental Center in project preparation, the creation of a mechanism to finance feasibility studies, the provision of an environmental legal advice service, inter-ministerial and inter-NIS environmental cooperation and the enhancement of environmental awareness.
- Regional Seas Programme
- Public participation and awareness

  This project is intended to develop capacities for the media to report environmental issues, to continue support to the CIS Inter-Parliamentary Assembly, to build a "Best Practice Resource Center" for the promotion of "Best Practice Models" and to transfer resources to the REC.

***Planned Projects***

- Prut River Management

  The project's main purpose is to create an Environmental Information System, to develop a river and ground water monitoring strategy, to develop a wastewater management strategy and to modernize monitoring laboratories.

***Proposed Projects***

- Supply of laboratories with modern equipment for water quality control
- Integrated water management of the Costesti-Stinca reservoir on the Prut river

- **develop adequate legal and institutional framework.** This activity includes the development of investment protection legislation. Besides reinforcement of privatization processes, industrial technology centers for international cooperation will be introduced. In parallel, environmental impact assessment studies should be developed. In addition to above mentioned activities, it is required to enforce environmental legislation control and financial discipline control.

The following projects have been named:

***Existing/On-going Projects***

- Environmental legislation
- Development of common NIS environmental policies
  This projects supports the establishment of common national environmental action plans for NIS.

***Proposed Projects***

- Strengthening of institutional and management capacities in the industrial sector

In order to attain the sector objective, the ***proposed projects of high priority*** are as follows:

- Waste management in wine processing
- Utilization of toxic industrial waste
- Rehabilitation of wastewater facilities in industrial enterprises
- Strengthening of institutional and management capacities in the industry sector

## 3.2.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lie outside its scope and not under the direct control of the program. These external factors may affect the implementation and long-term sustainability of the program. The important assumptions or external factors must be taken into consideration if the objectives defined at (the next) higher levels are to be achieved.

Significant factors for the success of the program and sustainability of its results at the activity level to obtain the **sector results** are the following:

- **Advanced technologies for industrial production available in time**
  This item requires the availability of significant financial resources, developed infrastructure, qualified personnel and access to information.
- **Effective cooperation with customs and border control**
  To ensure simplified procedures, the taxation structure should be changed towards reducing any disincentives to abatement technologies and clean production in order to promote mitigation up front in new industrial development and enterprise reconstructing.
- **Experts for advanced training programs available at time**
  This item also requires the availability of financial resources, access to information and qualified personnel.
- **The Government provides necessary financial support for the implementation of infrastructural projects**
  Governmental support could be provided through the availability of necessary financial resources and through establishing and ranking priorities in the development of national economics.

On the result/output level, the following assumptions were identified to achieve the **sector objective**:

- **Ratification of the Danube Protection Convention and its application in national legislation and policy**

  The ratification of the Convention will enable Moldova to meet international obligations at the legislative base and promote regional cooperation, as well as the development of investment programs.
- **National industrial production responds to international and local standards and demands.**

  It requires application of modern technologies in industrial processes, advertisement and proper packaging.

### 3.2.5. Impact Indicators for Sector Results

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

Indicators for sector results are as follows:

- **By the year 2005, energy and water consumption in industry in the Moldovan part of the Danube River Basin will decrease by 15%, in comparison to data from 1995.**

  Applying modern industrial technologies, developing an adequate fiscal system including natural resource users charges will allow reducing the use of natural resources
- **By the year 2005, harmful emissions from vehicles will be reduced by 20%, in comparison to data from 1995, in the Moldovan part of the Danube River Basin.**

  Application of advanced technologies in construction of new roads, rehabilitation of existing roads and improving of road conditions, enforcement of exhaust control system, use of environment friendly fuels and system of control for car import will reduce transport emission
- **By the year 2005, industrial output in the Moldovan part of the DRB has increased by 20%, applying environmentally sustainable industrial policies**

  The availability of national financial resources and foreign investments, access to foreign market, modern industrial management, an adequate legal framework for pollution reduction and its sustainability, resources saved and environmentally friendly industrial technologies, proper control for environmental quality and adequate decision-making will provide sustainable growth of industrial output.

## 3.3. Municipal Sector

### 3.3.1. Situation Analysis

#### 3.3.1.1. Importance of the Sector and Activities Leading to Water Pollution and Environmental Degradation

Since Moldova is one of the most densely populated countries in the region (with 128 inhabitants per square kilometer), the input of the municipal sector to the water pollution cannot be neglected.

Domestic sewage and wastewater from industrial and other economic activities are a major source of surface and groundwater pollution. About 70% of the population are connected to municipal wastewater treatment plants, but most of the villages discharge their wastewater without treatment. Only around 60% of the installations are functioning.

The annual quantity of residual domestic wastewater is around 90.3% of total drinking water supplied to consumers. Drinking water is delivered to the homes of 56% of Moldovans. This proportion reaches 98% in urban areas but is only 18% in rural areas. Therefore, the main sources of drinking water in rural areas are individual wells. Due to the prevailing geological conditions, most of the wells are shallow (3-12 m deep) and, therefore, prone to contamination. In some areas, water is scarce and, in hot, dry summers, disappears from the wells. This creates a need for water transport and storage, which may lead to secondary pollution of drinking water.

The drinking water in a good half of all village wells is estimated as polluted. The risk of water pollution increases with the scarcity of sewage disposal facilities: only 9% of the rural population has access to hygienic sewage disposal.

Intensive (especially in the previous decade) agricultural activities and the use of large quantities of agro-chemicals have also affected water quality. In the centralized water distribution systems, breakdowns, pressure drops and interruption of water supply are common. This is increasing the risk of secondary contamination of water and is posing a health risk.

In the Republic of Moldova, like in other countries, the water system serves as a recipient for the drainage and discharge of wastewater from different sectors of the national economy. Thus, industry and transport are also contributing to the pollution of water through the discharge of highly polluted effluents into the municipal sewage network.

Annually, more than 2.5 million $m^3$ of solid municipal waste and 1.5 million $m^3$ of liquid waste are generated in total in the country. Data on the generation of household waste are only collected in large cities and refer to its quantity but not to its composition. Owing to the absence of adequate treatment technologies, the volume of accumulated waste is growing steadily. The collection of waste is generally centralized and regular in largest cities. Irregular collection is the norm in most rural areas. Most of the sites are not properly authorized and do not meet modern environmental and sanitary requirements (standards dating from the Soviet era), especially in rural areas. More than half of urban landfills, and a high percentage of rural landfills, are assumed to fall in that category. As can be expected, unauthorized landfills (gullies, pits, disused quarries, along roads, etc.) are more polluting than authorized landfills. The exact number of landfills and their characteristics is not very well known. Currently, for at least 30% of the landfills, the volume of waste exceeds capacity (as for instance the Ungheni landfill), which occasionally leads to untenable situations. Construction of new landfills has been stopped owing to a combination of factors such as high population density, strict sanitary and environmental standards, and high costs.

The high concentration of livestock in human settlements has a particularly important impact on the environment. Till the 1990s, the main polluters were large farms. Recently, animal breeding has

shifted to the private sector, and most of the livestock is kept within private households. Thus, liquid waste (e.g. manure) with a high content of salts, organic substances, pathogenic micro-organisms, etc., is stored without adequate protection for leakage and causes pollutants infiltration into the groundwater, entailing chemical and biological pollution.

Other important activities leading to water quality deterioration are construction and cutting slopes for construction purposes, illegal cutting of trees in communities, economic activities in sanitary zones of water sources and reservoirs, mining activities.

### 3.3.1.2. Current Strengths/Assets

Several Strengths/Assets were mentioned by the participants as relevant for mitigating the consequences of incorrect activities in human settlements. These include:

- **Legal framework**

  A comprehensive corpus of environmental laws was developed and approved in Moldova:

  - *Law on Animal Kingdom, Law on the Protection of Riparian Zones, revised Land Code (1991)*
  - *Law an Ecological Expert Evaluation and Environment Impact Assessment, Law on Secondary Material Resources; Forestry Code*
  - *Law on Hazardous Substances and Product Management, Law on Air Protection, Law on Wastes, Law on Natural Resources*
  - *Law on Protected Area, Law on Taxes on Environmental Pollution, Law on Hydro-meteorological Service, revised Law on Environment Protection (1993)*
  - *Laws (codes) concerning access to environmental information and public participation in decision making process, and drinking water are expected to be adopted in the future.*

  Provisions concerning environmental protection were included in some of the strategies, concepts and sector programs, such as the Strategy of Water Resources Management, the Energy Program, the Program of Human Health Protection, the Privatization Program for 1997-1998, the Concept of Industrial Policy, the Concept of Housing, etc.

  The *National Strategic Action Plan for Environmental Protection* (1995) contains priorities and goals of the environmental protection policy under the new economic circumstances. NEAP also provides some recommendations specifically referring to the municipal sector (development of resource-saving, low-waste technology and "good housekeeping" in order to reduce losses and eliminate inefficient use of materials; provision of facilities for the pre-treatment of industrial effluents; strict supervision of the generation and reprocessing of wastes; etc.).

- **International co-operation**

  Moldova participates in several international agreements in relation with water management and management of transboundary watercourses. One of them is the Convention on Sustainable use and Protection of the Danube River Basin (1994). The development of bilateral cooperation with Romania and Ukraine is also a main characteristic of the current international relations. As regards donor assistance, UNDP, GEF, EU Tacis Program, USAID, GTZ, etc. provided a number of grants concerning environmental protection and management.

- **State environmental agencies and NGOs**

  Different state institutions, including the Parliament of Moldova and the Government, as well as local authorities have been assigned with responsibilities in the field of environmental management and protection. The main state environmental agency is the Ministry of Environment, which has in its organizational structure the State Ecological Inspectorate, a network of 12 Zonal Ecological Agencies, Service "Hydrometeo" and the National Institute of Ecology. The Ministry of Health, the Ministry of Territorial Development, Housing and Public Utilities and the Ministry of Agriculture and Food Industry have, in their turn, specific environmental responsibilities. Apart from the state sector, 70-80 NGOs are active in the field of environmental protection. They are mostly conducting independent researches on the state of the environment, inform and educate the population and lead clean-up activities. The involvement of the private sector is still low, because the instability of economy forces people to invest in activities with a rapid profit, which is generally uncharacteristic for the environment protection sector.

- **Human resources**

  In general, the scientific potential of the country is still maintained. In different sectors, a highly qualified personnel is available.

- **Information and training systems**

  The mass media is steadily developing after gaining independence. During the last years, green newspapers have started to be published. National TV and radio stations regularly have environment-related broadcasts.

- **Wastewater treatment plants**

  Despite the fact that existing facilities are outdated, their potential can stand as a basis for the re-structuring and modernization of the sector. The plants are designed to reach a 60-70% reduction in biological oxygen demand.

#### 3.3.1.3. Analysis of Transboundary Effects

There are too few studies on transboundary effects, especially in the domain concerned. As a result, the working group of municipal sector issues considered it necessary to not make any conclusion concerning the pollution due to transboundary transport of pollutants.

However, everybody agreed that water quality is evidently deteriorating after the confluence of the Prut River with the Jijia River, which is suffering an extremely high load of pollutants because of municipal activities in the city of Iasi (Romania).

### 3.3.2. Sector Problem Analysis

#### 3.3.2.1. Core Problem

The core problem of the municipal sector is the following:

**"INAPPROPRIATE ENVIRONMENTAL MANAGEMENT IN HUMAN SETTLEMENTS"**

The roots of this problem are found in the unsound approach to over-use available natural resources and disregard their economic and environmental value, broadly applied in the recent past.

### 3.3.2.2. Causes Leading to Environmental Problems

The main causes leading to environment problems in municipalities are the following:

- Discharge of highly polluted wastewater
- Inadequate solid waste management
- Unfavorable general framework

These causes are described in more detail below:

#### (i) Discharge of highly polluted wastewater

This cause is mainly due to inefficient work of wastewater treatment plants, discharge of untreated wastewater and inappropriate water supply system.

**a. Inefficient work of wastewater treatment plants**

Only 60% of the installations are functioning. They do not work for a variety of reasons. **Obsolete equipment and technologies** are still used and its maintenance and repair is often too costly. Frequent **energy cut-offs** affect the proper functioning of treatment facilities, especially the biological phase. Many municipal wastewater treatment facilities have been overloaded by heavy metals because some **industrial facilities do not work properly**. In some rural areas, facilities have stopped operation because their technical lifetime has been exceeded. The **modernization of old WWTPs and the construction of new ones were stopped because of the economic crisis**.

Pollution standards for residual wastewater are, in some cases, ignored because of the limited capacity of some treatment plants compared to the high amount of discharges and the high pollution load (as for instance, in Cantemir).

Many industrial establishments are connected to municipal treatment plants. Connected industries are required to have pre-treatment facilities. Industrial wastewater plants have been constructed, but many of the industries do not use them or do not maintain them in good condition. The absence of a detoxifying pre-treatment for wastewater discharged from galvanic workshops leads to an excess of heavy metals in municipal wastewater treatment plants, undermining the biological treatment.

**b. Discharge of untreated wastewater**

As previously mentioned, most of the villages are discharging their wastewater without treatment. A special problem is posed by **the absence of drainage and treatment systems for rainfall waters**. The discharge of untreated water may also happen, as a result of leakage from the sewerage, and accidental spills from the WWTPs. **Leakage** is quite frequent because the **materials used for pipes are inappropriate**.

**c. Inappropriate water supply system**

A major problem in the effort to manage water resources is to ensure adequate drinking water supply. Presently, there are some technical problems, **like inefficient water treatment facilities, lack of water resources meeting hygienic requirements**, and a low level of protection of water sources (intakes). The **absence of water supply systems in rural areas**, in tandem with the absence of sanitation facilities, transform all of the villages to a point pollution source for soil, surface and underground water. Financial problems of water supply are the result **of tariffs, which do not correspond to the real cost of drinking water**. Their adjustment is questionable, since the population insolvency took unexpected proportions.

### (ii) Inadequate solid waste management

Poor waste management in private households, inappropriate centralized waste collection and disposal system and illegal and/or inappropriate use of chemicals is the main causes of inadequate solid waste management

**a. Poor waste management in private households**

The main causes of bad waste management in private households are **illegal dumping of solid waste** (both in urban and rural areas) and animal breeding within localities. There are many concerns over illegal and uncontrolled dumping of municipal solid waste at numerous locations. The situation is escalating owing to rising petrol prices, and the consequent temptation to shorten hauling distances by illegally dumping wastes before they reach authorized landfills.

The **high concentration of livestock in human settlements** has a particularly important impact on the environment. Until the 1990s, the main polluters were large farms. Recently, animal breeding shifted to the private sector, and most of the livestock is kept within private households. Thus, liquid waste (e.g. manure) with a high content of salts, organic substances, pathogenic microorganisms, etc., is stored without adequate protection for leakage and causes pollutant infiltration into groundwater, entailing chemical and biological pollution.

**b. Inappropriate centralized waste collection and disposal system**

The collection of waste is generally centralized and regular in largest cities. Irregular collection is the norm in most rural areas. Most of the **existing landfills are not properly authorized and do not meet environmental and sanitary standards**. The exact number of landfills and their characteristics are not very well known. Also, waste treatment is quite problematic, since **advanced technologies on waste use are not implemented**. Thus, there is almost no waste treatment or re-cycling in Moldova.

**c. Illegal and /or inappropriate use of chemicals**

The control over the use of chemicals within human settlements (courtyards) is much more difficult than in the agricultural sector. Apart from **the inefficient control of chemicals' use**, their acquisition is a threat for the quality of the environment: unauthorized pesticides can be found on the black market, and, since the **population is not informed about the consequences of their application, banned agro-chemicals are utilized**. The low knowledge about recommended dosage also affects the correct use of pesticides, organic and mineral fertilizers, etc. The use of pesticides for pest control in green zones also contributes to the high level of chemicals in water sources located on the territory of localities.

### (iii) Unfavorable general framework

Incorrect territorial planning and construction, unfavorable social and economic factors, law observance at a very low level and lack of environmental awareness are the main causes of unfavorable general framework.

**a. Incorrect territorial planning and construction**

In the last years, the development of localities was missing a very important element: correct planning. **The territories' development and construction is quite haphazard, and does not respond to elementary environmental and sanitary requirements**. Cutting of slopes, construction in zones affected by exogenic processes, especially by landslides and economic activities in the protective zones of rivers led even to tragic consequences such as human deaths. In this order of idea, the participants mentioned that

geological assessment is one of the elements, which should precede any construction in human settlements. Municipalities have to care about the development of Master Plans for urbanization, and strictly respect norms of design and construction. **The development of rural settlement is hindered by the absence of the municipal services' infrastructure and institutions specialized in delivery of these services.** To a broader extend, incorrect planning applies not only to settlement, but also to the development of regions. Thus, measures should be undertaken to improve communication among different parts of the basin.

**b. Unfavorable social and economic factors**

Incorrect planning is not the only factor contributing to an unfavorable framework. The **unbalanced economy** with a predominating agricultural sector and a very low share of services, the general economic decline, **insolvency of population**, low allocation of funds from local and states budgets, as well as a **shortage of foreign investments and donations** constitutes a general social-economic environment**,** which does not offer the possibility to develop municipal services on a sound basis. Specifically, **the economic mechanism of environmental management and protection is insufficient** for further sector development.

**c. Laws observance at a very low level**

Besides economic instruments, the regulatory instruments for environmental management are not properly implemented and enforced. **It is not always clear how the tasks and rights of the various services are delimited**. The division of utilization, control and management functions by various entities (ministries, departments and commissions with various interests) is a tradition from the former Soviet institutions. There is no unified water quality monitoring system or practice in Moldova. The actual situation in natural resource management and control is confusing and the system needs to be completely overhauled.

Another drawback is the **missing coordination among various national laws** with newly developed environmental legislation. Harmonization with international environmental legislation also does not meet current needs.

**d. Lack of environmental awareness**

The very low environmental awareness of the population does not offer the possibility to incorporate broad public participation in natural resource protection. It has a negative impact not only on the state of environment, but also on human health. A social assessment, conducted within a recent study on the quality of drinking water in the Prut River, showed that the population considered the water from wells as good for consumption while it was highly microbiologically and chemically polluted. An important element of this problem seems to be **insufficient information, in particular knowledge of environmental legislation**. Last but not least, there is an **environmental incompetence of decision-making factors**, apart from environmental agencies.

### 3.3.2.3. Environmental Effects

The direct effects of the problems encountered in the municipal sector are:

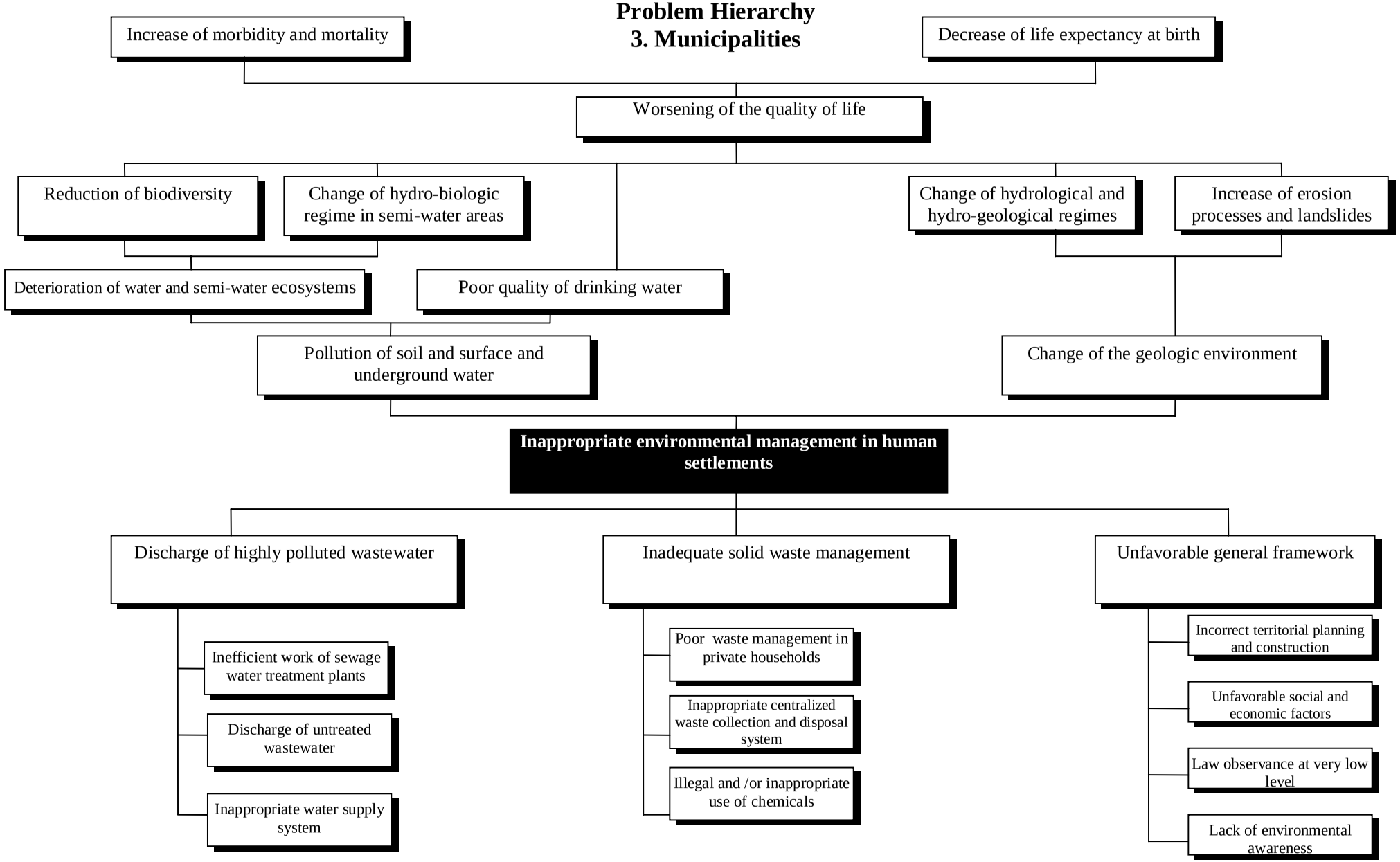
- Change of the geologic environment
- Pollution of soil, surface and underground water

Accelerated soil erosion and more frequent landslides, as well as the deterioration of hydrological and hydro-geologic regimes characterize **changes arisen in the geologic environment** as a result of inappropriate activities in localities. These lead to a general deterioration of the environment and a worsening of the quality of life.

The municipalities have quite a significant impact on soil, surface and underground water pollution. The pollution is due to the direct exposure to negative activities, or arises as a result of pollutant migration. Besides human health risks due to the poor drinking water quality, the **pollution of soil, surface and groundwater leads to the deterioration of the water ecosystems and wetlands, and generally to a reduction of biodiversity**. These effects have a considerable impact on the decrease of the welfare.

As a result of the decreasing quality of life in the past five or six years, several indicators show **deterioration in the health status of the Moldovan population**. Life expectancy at birth decreased from 69.0 years in 1989 to 65.9 years in 1995. Life expectancy at birth in Moldova is 5.5 years lower than the central and eastern European average and 11.4 years lower than in EU countries. The mortality rate slightly exceeds the rates in the neighboring countries Romania and Ukraine, is 30% higher than the central and eastern European average and 2.2 times greater than in the EU.

# Problem Hierarchy
# 3. Municipalities



### 3.3.3. Objectives, Expected Results, Actions and Related Projects

The main objective for the municipal sector in the Moldovan part of the Danube River basin is:

**"ENVIRONMENT IN THE COMMUNITIES PROPERLY MANAGED"**

In order to achieve this objective, three results have been identified:

- Reduction of pollution from wastewater
- Application of appropriate solid waste management
- Improvement of general framework conditions for correct environmental management in communities

Each of these results can be achieved by undertaking specific activities, which were identified in the workshop. Afterwards, existing and planned projects were discussed for each activity. The result of this exercise demonstrated that additional projects to implement strategies for pollution reduction in the Moldovan part of the Danube River Basin are clearly needed and a number of projects were proposed.

### (i) Reduction of pollution from wastewater

It supposes that activities will be undertaken in the following areas:

- Wastewater treatment plants;
- Sewage systems;
- Water supply systems.

It is required to:

- **undertake measures for the efficient functioning of WWTPs.** This activity includes maintaining in a good state and correctly operating the equipment of existing WWTPs, ensuring permanent electricity supply as well as building and correctly operating local WWT facilities at enterprises. The construction of unfinished WWTPs has to be finalized. Implementation of advanced technologies has to be promoted, sludge de-hydration methodologies introduced and efficient use of sludge and its disposal ensured. Moreover, in order to ensure efficient functioning of WWTPs and respecting of treatment rules, the personnel have to be trained and automated control system introduced.

  For this activity, the following projects have been identified:

  ***Existing/ongoing projects:***

  - Modernization of wastewater treatment plant in Nisporeni
  - Completing construction of wastewater treatment plant in Falesti
  - Tacis Prut River Water Management Project (Cross-Border Cooperation Program 1997).

    The objective of this project is to develop a wastewater management strategy whereby the operation and efficiency of the largest sewage treatment plants can be assessed and which will provide the method by which the local requirement for sewerage and piped potable water systems in regional rural areas will be investigated. A further objective is to install appropriate software system(s) and programs, which can be used to analyze data as, listed above and support other aspects of assessment. It also aims at upgrading and modernizing, as appropriate, a minimum of three laboratories, each of which will be able to analyze water and soil samples in accordance with international standards.

***Planned projects:***

- Construction of a wastewater treatment plant in town Cantemir

***Proposed projects:***

- Construction of wastewater treatment plants in rural areas (one plant may render services to a number of villages)
- Modernization of wastewater treatment plants in Ungheni, Leova, Cahul, Ceadir-Lunga, Comrat, Vulcanesti, Taraclia
- Modernization of local wastewater treatment facilities at enterprises: Ungheni Carpet Plant, Ungheni Biochemical Plant, warehouse at Ungheni railway
- Implementation of modern technologies for use of sludge, including production of biogas
- Modernization of wastewater treatment facilities and improving waste management at wineries

- **rehabilitate and extend the existing sewage systems.** To implement this activity, it is necessary to design and construct new sewage systems, to modernize sewage network and equipment, to use anti-corrosion materials, to keep sewage wells in a good state of repair. These measures will facilitate correct operation and maintenance of the pumping equipment, and adequate exploitation of the networks in the basement of flats residential blocks. It is also important to introduce automated control systems.

  The following projects have been mentioned by the participants:

  ***Planned projects:***

  - Rehabilitation of drainage system in Comrat, Cahul

  ***Proposed projects:***

  - Rehabilitation of sewage system in Falesti, Ungheni, Leova, Cantemir, Nisporeni
  - Pilot project on sewage systems in rural areas

- **protect water sources and optimize water supply systems.** It is important to define, delimitate and protect water intake areas. Water supply systems in rural areas have to be built. It is also foreseen to detect and repair leaks, to introduce and use dual water supply systems, to use insulated and plastic pipes. Automated control systems will be introduced, tariffs that reflect the real cost of water supply will be applied and water meters has to be installed.

  There are several projects for this activity:

  ***Existing/ongoing projects:***

  - Construction of a collective water supply network in the districts Rascani, Falesti and Nisporeni
  - Development of unique tariffs for all categories of consumers

  ***Planned projects:***

  - Construction of centralized water supply systems in Ungheni, Glodeni, Leova, Cantemir, Cahul, Vulcanesti, Comrat, Taraclia and Ceadir Lunga.
  - In 1994, the Government of Moldova, together with foreign partners, prepared a three-year draft public investment program.

    Projects included in the program relate to the improvement of water supply systems for a number of major towns and are a high priority for the Government.

- Construction of a plant producing individual and collective filters for use in case of inadequate drinking water
- Demonstration project for rural water supply development.

  The project should be considered as pilot, for the demonstration of flexible, adapted to local conditions and problem oriented approaches for water supply system planing and materialization. The experience and lessons learned will be used for the development of rural water supply schemes in Moldova.
- Local groundwater resources and their adequate utilization for water supply in rural areas.

  The project should be considered as pilot, for the demonstration of Good Practices in case of shallow groundwater utilization for drinking water supply. Because shallow groundwater resources are relatively limited and vulnerable to human activities, rational and environmentally safe management, as well as public participation are crucial aspects.

***Proposed projects:***

- Development of a Regulation regarding the operation of water supply systems and sewage systems in basements of apartment houses
- Construction of a bottling plant for high quality drinking water for large consumption
- Pilot project regarding the use of a dual water supply system
- Construction of a water supply network in Hancesti

## (ii) Application of appropriate solid waste management

To attain this result, measures have to be undertaken in the following fields:

- Household practices
- Solid waste disposal and handling
- Use and storage of chemicals

It is necessary to:

- **introduce appropriate individual household practices.** This activity includes optimizing the livestock number in human settlements, closing down unauthorized landfills, disseminating information on correct organization of individual farms, ensuring incentives for the proper observance of ecological law by the population and using manure for practical purposes (fertilizers, energy production).

  There are no existing or planned projects.

  ***Proposed projects:***

  - Development of a Regulation stipulating measures for the close down of dumping sites and appropriate waste handling in settlements
  - Development of the Code of good household practices

- **improve methods of solid waste disposal and handling.** It is key to identify and assess new areas for landfills, to introduce separate waste collection and disposal, to promote advanced technologies for waste disposal and utilization. In this context the users will be familiarized with new technologies. Proper arrangement and appropriate management of landfills have to be ensured. The efficiency of control over waste disposal and handling has to be increased as well.

For this activity, the following projects have been identified:

***Planned projects:***

- Development of Master Plan and feasibility study on solid waste management in Moldova.

  The main objectives of the project are, on a basis of a comprehensive assessment of waste management system in Moldova, to develop a Master Plan and evaluate feasibility of priority actions in this sector. It is also foreseen to enhance local capacity in the field of assessment, planning, management and control of solid waste and to raise public awareness with regard to waste management issues.

***Proposed projects:***

- Setting up a system foreseeing marketing of new technologies
- Pilot project foreseeing the separate collection of household solid wastes

- **undertake measures for the proper use and storage of chemicals in human settlements.** This implies drafting regulations on the use of chemicals for plant protection in communities. An information system for the population regarding the use of chemicals and fertilizers has to be developed. For the proper use and storage of chemicals in human settlements the population has to be familiarized with harmful consequences of inappropriate use of chemicals and control over the distribution and the use of chemicals has to be ensured.

  For this activity the following projects have been identified:

  ***Planned projects:***

  - Complex Program of toxic wastes management in the Prut River basin.

  ***Proposed projects:***

  - Development of regulations and setting up a control system regarding the use of chemicals in settlements
  - Setting up an information system which disseminates knowledge among the population on the use of chemicals and mineral fertilizers
  - Development of a centralized system for the distribution of chemicals

## (iii) Improvement of general framework conditions for correct environmental management in communities

In order to achieve this result a number of activities in the following fields need to be undertaken:

- Territorial planning and construction;
- Social and economic framework;
- Environmental awareness;
- Environmental legislation.

It is foreseen to:

- **promote correct territorial planning and construction.** This activity includes the development and implementation of Master Plans for urbanization, the creation of Geographic Information Systems in localities, the introduction of integrated water management principles. Moreover, exogenic processes within human settlements have to be monitored and assessed. Information exchange on the state of the environment among upstream and downstream localities will be supported. Remote control methods for modeling and prognosis of the state of environment in localities will be applied as well.

The following projects have been identified:

***Existing/Ongoing projects:***

- Construction of petrol and gas supply stations in conformity to developed projects (Cahul)

***Planned projects:***

- Prut River tributaries –Tacis CBC'98 (appraisal phase).

  The project is intended to involve local administration, sector (environmental, health, land planning, etc.) authorities and population in the process of environmental planning and decision making. The project will assist local authorities to obtain actual information regarding water quality of tributaries (local surface water resources) and Riparian Zones status. The project should help in prioritizing water quality problems, establishing water quality goals and protection targets, introducing strategic environmental planning at local level (tributary basin), and identifying cost-effectiveness measures to reach environmental goals and targets.
- Protection of settlements against over-flooding

***Proposed projects:***

- Development of a geo-informational system for settlements
- Set up of the network of regional services in the basin

➢ **undertake measures improve the social and economic framework.** It is important to introduce economic incentives for the rational use of natural resources, provide tax reductions for enterprises investing into environmental protection facilities. Moreover, the private sector will be encouraged to deliver municipal services. To make funds available, it is necessary to strengthen national and local environmental funds and to attract foreign investments and donations.

For this activity the following projects have been identified:

***Existing/Ongoing projects:***

- MOLDOVA 21 (UNDP/Capacity 21)

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

***Proposed projects:***

- Training in ecological management for local officials
- Development of a restructuring program for enterprises delivering services (creation of joint stock companies, privatization)
- Development of measures to ensure a favorable environment for the operation of private enterprises delivering services in this area
- Setting up a legal framework encouraging capital investments in environmental protection facilities

- **raise environmental awareness.** For this activity it is key to implement a program of information concerning environmental legislation. It is also necessary to ensure broader involvement of local authorities in environmental management and achieve environmental awareness of decision making factors. Moreover, the development of environmental mass media has to be supported as well as activities of non-governmental organizations encouraged.

  In order to obtain optimal involvement of the public, teaching manuals on environmental issues have to be developed and the content and way of lecture delivery on environmental issues in higher education have to be improved.

  The following projects have been identified for this activity:

  ***Proposed projects:***

  - Development of a set of manuals and teaching materials on the protection of the environment for the use in higher education
  - Setting up central and regional training and information centers for environmental issues

- **ensure the enforcement of environmental legislation.** It is important to harmonize the general legal framework with updated environmental legislation and the national environmental legislation with the international one. In collaboration with all institutions concerned, a unique body to control the quality of the environment has to be established. It is also foreseen to supply the control bodies with necessary equipment and ensure advanced training for the personnel.

  For this activity, the following projects have been mentioned:

  ***Existing/on-going projects:***

  - Development of a realistic system of water quality standards.

    The goal of the project is the enhancement of the capacity of national authorities to revise the system of ambient water quality standards, with a strategy to gradually achieve their harmonization with EU standards.

  ***Proposed projects:***

  - Updating Civil and Penal Codes of sector legislation in line with environmental legislation
  - Supply of control systems with materials for modern express experiments and adequate automatic equipment
  - Development of a program stipulating the creation of a unique body for environmental quality control
  - Development of a standardization program of methodologies and of equipment for environmental quality control

Besides the planned projects, ***high priority*** for improving environmental performance in the municipal sector was given to the following proposals:

- Pilot project on sewage systems in rural areas
- Pilot project regarding the use of a dual water supply system
- Modernization of wastewater treatment facilities and improving waste management at wineries
- Development of a restructuring program for enterprises delivering services (creation of joint stock companies, privatization)

### 3.3.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lie outside its scope and not under the direct control of the program. These external factors may affect the implementation and long-term sustainability of the program. The important assumptions or external factors must be taken into consideration if the objectives defined at (the next) higher levels are to be achieved.

The following assumptions at the activity level have been identified to achieve the **sector results**:

- **New water sources prospected and their quality assessed**
  Currently, shallow groundwater resources are not considered as alternative sources for drinking water supply, because of the widespread opinion of human-made pollution. At the same time a case-study shows that in rural areas local sources of safe shallow groundwater can be found outside residential areas and could be used to supply the rural population with good quality water at relatively small costs.
- **Advanced technologies of waste disposals, including toxic wastes, are available**
  Due to the reduced possibility to construct new landfills, the progress in waste management can be achieved only through adopting new advanced technologies of disposal.
- **Companies specialized in delivery of municipal services in rural areas created**
  At this time, there are no companies providing municipal services to the population. However, in case water supply and sanitation facilities are constructed, some organizations will have to be established to ensure their technical functioning and financial management.
- **Capital investments from the state and local budgets allocated**
  Currently, the funds allocated from the state and local budget do not meet actual needs. The participants assumed that the situation would be changed in the near future, especially with regard to the flow of money from the local budget. The latter is based on the supposition that local authorities will have to increase their involvement as a response to de-centralization and re-structuring of the sector at the country scale.
- **National economy stabilized**
  The stabilization of the economy will influence many other external factors, and will contribute mainly to the increase of the share of investments with a long pay back period.
- **Conditions for the increase of population income created**
  This assumption has a great impact on the financial viability of the municipal sector, because the main part of services' consumers is the population. Thus, the solvency of consumers has a direct impact on the solvency of the municipal sector. Currently, problems are encountered because of the very low level of payment. Therefore, a creation of conditions for the increase of population's income will lead to a better collection of consumer fees, and will offer, at least, the possibility to operate and maintain facilities in a proper way.

On the result/output level, the following assumption has been identified in order to attain the **sector objective:**

- **Favorable economic and social framework maintained**
  This is an essential condition for the proper functioning of any sector, including the municipal one.

- **Water resources quality improved**

  It is important to have pollution decreased not only at the end of the pipe (sewage system). The improved quality of water will pose fewer problems both at the stage of pre- and after- treatment. Availability of water resources near the consumer will make water supply systems cheaper and will free funds for sanitation facilities.

- **Pollution from municipal run-offs diminished**

  The input of municipal run-offs in the pollution of water resources is not to be neglected. As a rule, intensive rainfalls bring a considerable amount of particles to the surface water, which are, presently, hardly treated because of a missing sewage network. However, the level of pollution can also be slightly diminished by other measures than the construction of a sewage network, which would require considerable funds.

## 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.

Indicators for sector results are as follows:

- **By the year 2010, as a result of reduced pollution of wastewater, the value of Biological Oxygen Demand (BOD5) will reach 3mg $O_2/dm^3$ in the surface water downstream towns located in the Moldovan part of Danube basin, other monitored parameters will at least remain at the same level**

  The BOD is a very specific and illustrative indicator of water pollution with effluents of municipal WWTPs. Therefore it was adopted for measuring the impact of activities specified for achieving the Result 1 of the sector program. The specified figure of BOD5 corresponds to the standard for surface waters. Currently, the level of BOD5 in the effluents is 40 mg $O_2/dm^3$.

- **By the year 2010, the quality of drinking water from wells in the Moldovan part of the Danube basin is improved due to the decrease of nitrate concentration in shallow ground water to 45-50 mg/$dm^3$**

  The improper storage and disposal of waste influences at a very high degree the quality of groundwater. Since the high content of nitrates is the main parameter determining the quality of drinking water from the shallow wells in rural areas located in the Moldovan part of the Danube basin, the participants have considered, that it is necessary to expect that nitrates will comply with existing standards after undertaking all measures concerning correct waste management.

- **By the year 2010, Municipal Water and Waste Management Master Plans are developed, according to Agenda 21 principles, and adopted in at least five communities located in Moldovan part of the Danube River Basin (3.3)**
- The principles of environmentally sound management and sustainable development were duly reflected in Agenda 21, adopted by UNCED in 1992. The worldwide trends are to implement Agenda 21 at the local level. Proceeding from this, the development of municipal master plans will have to be done accordingly.

# 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. Upper Prut River Basin

## 1.2. Lower Prut River Basin

## 1.3. Yalpugh/Cahul River Basins

**Identification of River Basin Areas** **Upper Prut River Basin** **Annex 1.1.**

| Physical-Geographical Characteristics | Demographic Characteristics | Transboundary Impacts | Human Activities in the Basin |
|---|---|---|---|
| **Terrain**<br>➢ Mountainous - 20%<br>➢ Plains - 80%<br>**Characteristic of the river basin**<br>➢ River bank erosion = 20-30 cm/year<br>➢ Agricultural lands = 82%<br>➢ Artificial lakes = 15<br>➢ Forests = 8%<br>➢ Irrigated land = 33800 ha<br>➢ High water from tributaries of Prut River - RISK!<br>**Numerical parameters**<br>➢ Area = 4400 $km^2$<br>➢ Annual average flow of Prut River = 2.5 $km^3$/year<br>➢ Density of the river network = 0.8-0.4 $km/km^2$<br>➢ Irreversible water losses = 18.1M $m^3$/year<br>➢ Water abstraction = 50M $m^3$/year (1996)<br>➢ Explored underground water resources = 50M $m^3$<br>➢ Climate<br>➢ Precipitation = 560mm/year<br>➢ Average annual temperature = 7.5-10C<br>➢ Average summer temperature=22-25C | **Population**<br>➢ 422000<br>➢ Urban: 29.2 %<br>➢ Rural: 70.8 %<br>➢ Population density = 95 persons/$km^2$<br>➢ Population growth = -1.7 per 1000<br>➢ Adult mortality rate = 11.75 per 10000<br>➢ Disease rate=18.3 per 10000<br>➢ Average wage = 31 USD/month<br>➢ Population with centralized water supply:<br>➢ Urban = 70.9%<br>➢ Rural = 10.4%<br>➢ Population with centralized sewage:<br>➢ Urban = 51.9%<br>➢ Rural = 0.6%<br>➢ Health problems: endemic areas<br>➢ Wastewater discharge = 18.12M $m^3$/year<br>➢ Domestic water consumption = 155 l/day/capita<br>➢ Economic characteristics<br>➢ Impoverishment<br>➢ Lack of livelihood<br>➢ Unemployment<br>➢ | ➢ Wastewater treatment plant in town Cernauti (Ukraine)<br>➢ Timber factory in town Colomya (Ukraine) | **Agriculture**<br>➢ Large scale crop production<br>➢ Cereal production<br>➢ Sugar beet production<br>➢ Vegetable production<br>➢ Tobacco production<br>➢ Orchards<br>➢ Operation of irrigation systems<br>➢ Cattle breading<br>➢ Poultry breading<br>➢ Fish-farming<br>➢ Forestry<br>**Industry**<br>➢ Food processing<br>➢ Sugar production<br>➢ Wine production<br>➢ Manufacturing<br>➢ Transport activities<br>➢ Construction materials production<br>➢ Operation of hydro-technique units<br>➢ Production of electricity<br>➢ Mining of sand and gravel<br>➢ Industrial solid waste disposal<br>**Municipality**<br>➢ Sewage from settlements<br>➢ Waste disposal |

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

| Physical-Geographical Characteristics | Demographic Characteristics | Transboundary Impacts | Human Activities in the Basin |
|---|---|---|---|
| **Terrain**<br>➢ Mountainous = 15%<br>➢ Plains = 85%<br><br>**Characteristics of the river basin**<br>➢ River banks erosion: 20-30 cm/year<br>➢ Agricultural lands: 68%<br>➢ Wetlands: 0.5%<br>➢ Irrigated land = 48915 ha<br>➢ Lands affected by exogenic processes<br>➢ Artificial lakes: 9<br>➢ Forests: 12%<br>**Numerical parameters**<br>➢ Area: 3900 km2<br>➢ Annual average flow of Prut River: 2.9 km3/year<br>➢ Density of the river network: 0.4-0.1 km/km2<br>➢ Irreversible water losses: 11M m3/year<br>➢ Water abstraction = 30M m3/year (1996)<br>➢ Explored underground water resources = 40M m3<br>**Climate**<br>➢ Precipitation = 450mm/year | **Population**<br>➢ 390000<br>➢ Urban: 24.8 %<br>➢ Rural: 72.6%<br>➢ Population density = 100 persons/km$^2$<br>➢ Population growth = 2.6 per 1000<br>➢ Adult mortality rate = 11.2 per 10000<br>➢ Disease rate = 21.7 per 10000<br>➢ Average wage = 31 USD/month<br>➢ Population with centralized water supply:<br>➢ Urban = 76.75%<br>➢ Rural = 13.25%<br>➢ Population with centralized sewage:<br>➢ Urban = 43.22%<br>➢ Rural = 2.23%<br>➢ Health problems: endemic areas<br>➢ Wastewater discharge = 11.31M m$^3$/year<br>➢ Domestic water consumption: 123 l/day/capita<br>➢ Economic characteristics<br>➢ Impoverishment<br>➢ Lack of livelihood<br>Unemployment | ➢ Dumping of prohibited and non-used pesticides in the Vulcanesti district ( Moldova)<br>➢ Tomesti pig farm ( Romania)<br>➢ Wastewater treatment plants in Botosani, Iasi and Husi (Romania)<br>➢ High level of water turbidity due to extensive ploughing on both banks ( Moldova, Romania) | **Agriculture**<br>➢ Large scale crop production<br>➢ Wine-yards<br>➢ Orchards<br>➢ Vegetable production<br>➢ Fish-farming<br>➢ Cattle breading<br>➢ Poultry breading<br>➢ Forestry<br><br>**Industry**<br>➢ Food industry<br>➢ Manufacturing<br>➢ Construction of the Danube dock<br>➢ Leather production<br>➢ Oil transportation<br>➢ Oil and gas exploration<br>➢ Mining of construction materials<br>➢ Mining of sand from river bed<br>➢ Operation of engineering units on flood lands<br>➢ Industrial solid waste disposal<br><br>**Municipality**<br>➢ Waste disposal<br>➢ Sewage from settlements |

**Identification of River Basin Areas** **Yalpugh/Cahul River Basins** **Annex 1.3.**

| Physical-Geographical Characteristics | Demographic Characteristics | Transboundary Impacts | Human Activities in the Basin |
|---|---|---|---|
| **Terrain**<br>➢ Plains = 100%<br>**Characteristics of the river basin**<br>➢ River bank erosion = 20-30 cm/year<br>➢ Arable lands = 80%<br>➢ Wetlands = 0.7%<br>➢ Irrigated land = 8470 ha<br>➢ Artificial lakes = 15<br>➢ Forests = 3-7%<br>**Numerical Parameters**<br>➢ Area = 3785 $km^2$<br>➢ Annual average flow=0.9km3/year (Yalpugh)<br>➢ Annual average flow=0.09 km3/year (Cahul)<br>➢ Density of the river network = 0.2 -0.3 km/km2<br>➢ Irreversible water losses: 20M m3/year<br>➢ Water abstraction = 26M m3/year (1996)<br>➢ Explored underground water resources = 50M m3<br>**Climate**<br>➢ Precipitation = 380mm/year<br>➢ Annual average temperature = 10-12C<br>➢ Annual average summer temperature = 24-26C | **Population**<br>➢ 250000<br>➢ Urban: 25 %<br>➢ Rural: 75%<br>➢ Population density: 66 persons/km2<br>➢ Population growth: 2.1 per 1000<br>➢ Adult mortality rate: 10.6 per 10000<br>➢ Disease rate : 26.4 per 10000<br>➢ Average wage: 31 USD/month<br>➢ Population with centralized water supply:<br>➢ Urban: 70.8%<br>➢ Rural: 13.4%<br>➢ Population with centralized sewage:<br>➢ Urban: 34.1%<br>➢ Rural: 1.78%<br>➢ Health problems: endemic areas<br>➢ Wastewater discharge 6.75M m3/year<br>➢ Domestic water consumption: 75 l/day/capita<br>➢ Economic characteristics<br>➢ Impoverishment<br>➢ Lack of livelihood<br>➢ Unemployment | ➢ Wastewater discharge into the Yalpugh River (pollution of lake Yalpugh, from Moldova) | **Agriculture**<br>➢ Large scale crop production<br>➢ Wine-yards<br>➢ Vegetable production<br>➢ Orchards<br>➢ Land irrigation and desiccation<br>➢ Fish-farming<br>➢ Cattle breading<br>➢ Forestry<br>**Industry**<br>➢ Food industry<br>➢ Wine production<br>➢ Canneries<br>➢ Dairies<br>➢ Manufacturing<br>➢ Leather production<br>**Municipality**<br>➢ Waste disposal<br>➢ Sewage from settlements |

# Annex 2. Situation Analysis

## 2.1. Agriculture

## 2.2. Industry

## 2.3. Municipality

**Situation Analysis** **1. Agriculture and Forestry** **Annex 2.1.**

| Activities leading to water pollution | Current Strengths/ Assets | Environmental consequences of economic activities | Transboundary effects | Causes leading to inappropriate activities | Measures to be undertaken |
|---|---|---|---|---|---|
| ➢ Inadequate methods of crop cultivation (1)<br>➢ Orchards displaced in the Prut River protected area (2)<br>➢ Poultry farms and use of waste (3)<br>➢ Husbandry farms located in inadequate conditions (4)<br>➢ Increased animal breeding (cattle, pig) by households within private sector (5)<br>➢ Inadequate use of piscicol ponds (6)<br>➢ Inadequate management of forests (7)<br>➢ Inadequate construction and use of irrigation systems (8) | ➢ International experience in adequate agricultural practices for water pollution prevention exists.<br>➢ Legislation in support of adequate agricultural practices exists and could be amended.<br>➢ Education in using new technologies is available and being provided<br>➢ Some financial resources are available for the implementation of the pollution prevention program in the agricultural branch (WB project). | ➢ Soil pollution (1-5)<br>➢ salinization of soil and creation of swamps (7-8)<br>➢ Deterioration of natural pasture lands (5)<br>➢ Extension of eroded areas (1-5,7)<br>➢ Reduction of forest areas (1-5, 7-8)<br>➢ Pollution of surface and underground waters (1-8)<br>➢ Change of hydro-chemical and hydrologic regimes of rivers and underground waters (6-8) | ➢ Degradation of biodiversity (produced)<br>➢ Increase of water toxicity level<br>➢ Increased transportation of suspended solids (from Ukraine)<br>➢ Increase of quantity of mineral level in waters (produced)<br>➢ Lower quality of surface water | ➢ Inadequate crop cultivation technology (1)<br>➢ Changes in the land ownership (1-5)<br>➢ Collapse of agricultural products market (1-8)<br>➢ Inadequate implementation of law (1-8)<br>➢ Unregulated use of pesticides (2)<br>➢ Inadequate disposal of fecal mass and wastes (3,4,5)<br>➢ Inadequate technologies and cattle breeding (3,4,5)<br>➢ Discrepancy between the number of cattle and meadow use norms (5)<br>➢ Violation of water basin use norms (6)<br>➢ Energy crises. Outdated technologies (7)<br>➢ Outdated irrigation technologies (8) | ➢ Improvement of existing crop cultivation technologies (1)<br>➢ Improved information and education of population (1)<br>➢ Encouragement of community participation in rehabilitation activities (1-8)<br>➢ Improvement of law enforcement (1-8)<br>➢ Amendments to legal framework (1-8)<br>➢ Improvement of existing system of water quality monitoring (1-8)<br>➢ Penalty system applied to violating entities (1-7)<br>➢ Introduction of market economy elements (1-8)<br>➢ Observation of technologies correct use of pesticides (2)<br>➢ Use of existing and alternative technologies (bio-humus, biogas, pellets, etc.) (3,4,5)<br>➢ Use of alternative technologies in animal waste management (biogas, etc.) (3,4,5)<br>➢ Extension of forest covered areas. Introduction of forest growth technologies (7)<br>➢ Introduction of new irrigation technologies (8) |

***Abbreviations:***
***RISA*** - Research Institute of Soil and Agroecology "Pushkarov"; ***HIoA*** -Higher Institute of Agriculture – Plovdiv; ***RIEDA*** - Research Institute of Economics and Development of Agriculture; ***MoEW*** - Ministry of Environment and Waters; ***MAFAR*** - Ministry of Agriculture, Forestry and Agrarian Reform

**Situation Analysis** **2. Industry** **Annex 2.2.**

| Activities leading to water pollution | Current strengths/ assets | Environmental consequences of economic activities | Transboundary effects | Causes leading to inappropriate activities | Measures to be undertaken |
|---|---|---|---|---|---|
| ➢ Inadequate industrial production processes (1)<br>➢ Inadequate industrial wastewater treatment (2)<br>➢ Improper management of industrial waste, especially hazardous waste (3)<br>➢ Activity of transport (4)<br>➢ Mining activities (5)<br>➢ Dredging Prut River bed for sand (6)<br>➢ Construction of the Danube oil terminal (7)<br>➢ Generation of hydropower (8) | ➢ Industrial wastewater treatment facilities<br>➢ Human resources<br>➢ Knowledge on appropriate technologies<br>➢ Sector scientific institutions<br>➢ Existence of an inventory of industrial “hot spots”<br>➢ Existence of the National Alarm Warning System<br>➢ Legislation relating to water use and water discharges<br>➢ Economic instruments for water resources management (tariffs, charges, taxes, penalties)<br>➢ Self-monitoring at biggest industrial enterprises<br>➢ Existence of old quarries as environmentally safe sites for hazardous waste disposal | ➢ Negative impact on human health<br>➢ Reduction of biodiversity<br>➢ Accumulation of toxic industrial waste<br>➢ Degradation of aquatic and terrestrial ecosystems<br>➢ Partial flooding of riverside lands<br>➢ Pollution of soils<br>➢ Pollution of surface waters<br>➢ Pollution of groundwater<br>➢ Inefficient water use<br>➢ Reduction of natural landscapes areas<br>➢ Activation of exogenous geological processes<br>➢ Change of the natural state of the riverbed and bank erosion<br>➢ Destruction of water habitats<br>➢ Intensification of erosion processes<br>➢ Air pollution | ➢ Industrial pollution of the Prut river from towns of Cernauti and Colomya (Ukraine)<br>➢ Industrial pollution of the Prut river from towns of Botosani, Iasi and Husi (Romania)<br>➢ Acid rains as a result of transboundary air circulation<br>➢ Discharge of industrial wastewater into transboundary watercourses (Prut, Yalpug) from Moldova | ➢ Outdated industrial technologies for both production and pollution abatement (1-2)<br>➢ Insufficient enforcement capacity (1-2)<br>➢ Bad management of enterprises (1-3)<br>➢ Low investments in cleaner production (1-3)<br>➢ Lack of financial resources (1-3)<br>➢ Lack of know-how (1-3)<br>➢ Insufficient state control of polluters (1-3)<br>➢ Unrealistic emission standards (1-3)<br>➢ Non-existence of properly organized hazardous industrial waste disposal sites (3)<br>➢ Low environmental awareness and poor mentality(1-4)<br>➢ Lack of incentives for pollution mitigation (1-4)<br>➢ Unfavorable economic, legal and institutional framework (1-8)<br>➢ Use of lead-containing petrol (4)<br>➢ Exploitation of used cars (4)<br>➢ Weak emission control (4)<br>➢ Poor condition of roads (4)<br>➢ Car washing in improper conditions (4)<br>➢ High demand for construction materials (5-6)<br>➢ Ineffective use of excavated materials (5-6)<br>➢ Government interest to have oil products import facilities on the Danube stretch (7)<br>➢ Lack of integrated management of the Prut river water resources (8) | ➢ Effective bilateral and international coordination in planning and building objects with an environmental impact (1)<br>➢ Building of modern treatment facilities at enterprises<br>➢ More severe penalties for exceeding emission limits, including cancellation of activity (1-4)<br>➢ Tightening emission controls (1-4)<br>➢ Revision of emission standards (1-4)<br>➢ Stopping the discharge of untreated residual waters, including rainfall waters from urban areas potentially contaminated by oil products (2, 4)<br>➢ Ensuring efficient work of industrial WWTPs (1,2)<br>➢ Installation of modern equipment for collection and treatment of toxic waste (1-3)<br>➢ Creating attractive conditions for foreign investors<br>➢ (Environmental education of managers and staff in enterprises (1-8)<br>➢ Regular information of public on environmental issues (1-8)<br>➢ Controlling the import of used vehicles (4)<br>➢ Use of environment friendly fuels: unleaded petrol, gas (4)<br>➢ Prohibition of excavating sand from the river bed<br>➢ Actions towards achieving the integrated management of Prut river basin |

**Situation analysis** **3. Municipalities** **Annex 2.3.**

| Activities leading to water pollution | Current Strengths/ Assets | Environmental consequences of economic activities | Transboundary effects | Causes leading to inappropriate activities | Measures to be undertaken |
|---|---|---|---|---|---|
| ➢ Sewage systems in communities (1)<br>➢ Water treatment (2)<br>➢ Management of rainfall waters (3)<br>➢ Collection, evacuation, storage and use of solid waste from households, including hazardous ones (4)<br>➢ Domestic animal breeding (cattle, sheep, pigs) (5)<br>➢ Use and storage of pesticides, mineral substances, organic fertilizers (6)<br>➢ Activity of municipal transport (7)<br>➢ Constructions and cutting of slopes for construction purposes (8)<br>➢ Illegal cutting of trees in communities (9)<br>➢ Economic activities in the sanitary zones of the river and water reservoirs (10)<br>➢ Mining activities (11) | ➢ Information and training systems<br>➢ Wastewater treatment plants<br>➢ Green zones<br>➢ International cooperation<br>➢ Existence of state environmental agencies and NGOs<br>➢ Human resources<br>➢ Legal framework | ➢ Increase of morbidity and mortality<br>➢ Destruction of water ecosystems and wetlands<br>➢ Losses in fishery<br>➢ Siltation of reservoirs<br>➢ Increase of land slides and soil erosion<br>➢ Pollution of soils<br>➢ Change of hydrologic and hydro-geological regime<br>➢ Pollution of underground waters<br>➢ Pollution of surface waters | ➢ No precise data on trans-boundary pollution | ➢ Lack of financial resources (1-11)<br>➢ Lack of appropriate knowledge among population (1-11)<br>➢ Weak enforcement of laws (1-11)<br>➢ Weak promotion of environmental protection knowledge (1-11)<br>➢ People's low income (1-11)<br>➢ Inadequate quality control in surface water sources (many services are not interconnected) (1-11)<br>➢ Lack of wastewater treatment plants or inefficient functioning of existing facilities (1)<br>➢ Electricity supply cut-off (1,2)<br>➢ Use of outdated technologies and equipment (1,2)<br>➢ Incorrect operation of sewage water treatment plants (1)<br>➢ Lack of adequate knowledge among decision-makers(1-11)<br>➢ Lack of water supply systems (2)<br>➢ Lack of treatment for rainfall waters (3)<br>➢ Incorrect disposal of sludge from WWPTs and manure from households (4)<br>➢ Incorrect waste management (4)<br>➢ Violation of rules concerning use and storage of pesticides and fertilizers(6)<br>➢ Unauthorized washing of vehicles (7)<br>➢ Violation of construction norms and design specifications (8)<br>➢ Lack of facilities for landslides and erosion control (8)<br>➢ Lack of integrated management and control for water resources (10)<br>➢ Unauthorized mining activities (11) | ➢ Correct operation of sewage water treatment plants (1)<br>➢ Promotion of alternative technologies for energy generation (1,2)<br>➢ Implementation of advanced technologies (1,2)<br>➢ Ensuring continuous power supply (1,2)<br>➢ Facilitating information exchange among basin's regions (1-11)<br>➢ Longer duration of environmental courses in higher education (1-11)<br>➢ Environment control. data capture, processing, scientific forecast and simulation (1-11)<br>➢ Allocation of capital investments from central and local budgets (1-11)<br>➢ Attraction of foreign investments and grants (1-11)<br>➢ Ecological education of population (1-11)<br>➢ Drafting manuals for protecting the environment (1-11)<br>➢ Training for decision-makers (1-11)<br>➢ Construction of appropriate water supply systems (2))<br>➢ Treatment of rainfall water (3)<br>➢ Construction of new landfills and improvement of existing ones(4)<br>➢ Construction of facilities for waste treatment(4)<br>➢ Improvement of waste management in rural communities (4)<br>➢ Implementation of new technologies for waste utilization (4)<br>➢ Correct use of sludge and manure (4)<br>➢ Creation of companies specialized in the construction of landslide control facilities (8)<br>➢ Introduction of integrated in water resources management (10) |

# Annex 3. Problem Analysis

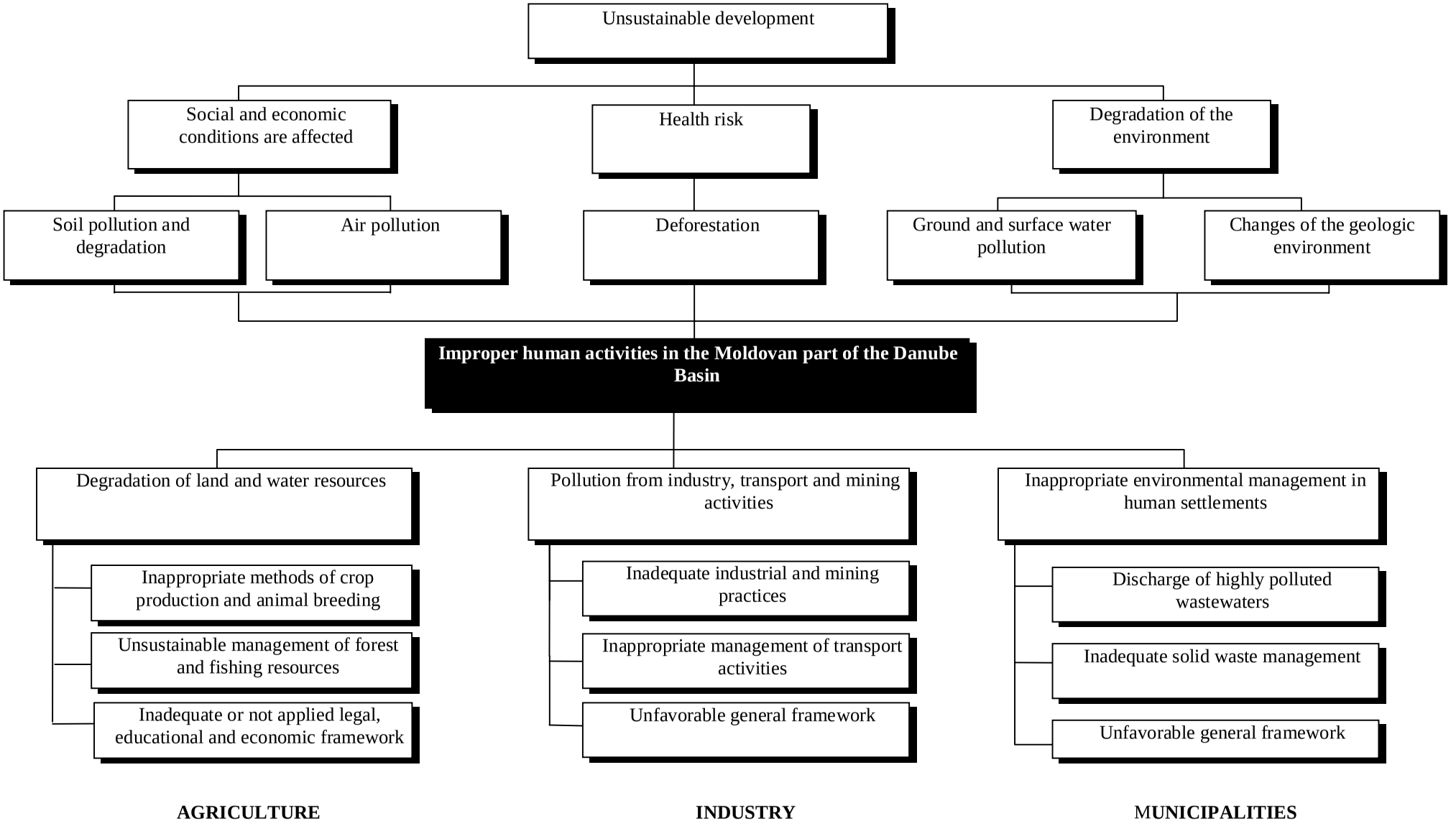
## 3.0. Global

## 3.1. Agriculture and Forestry

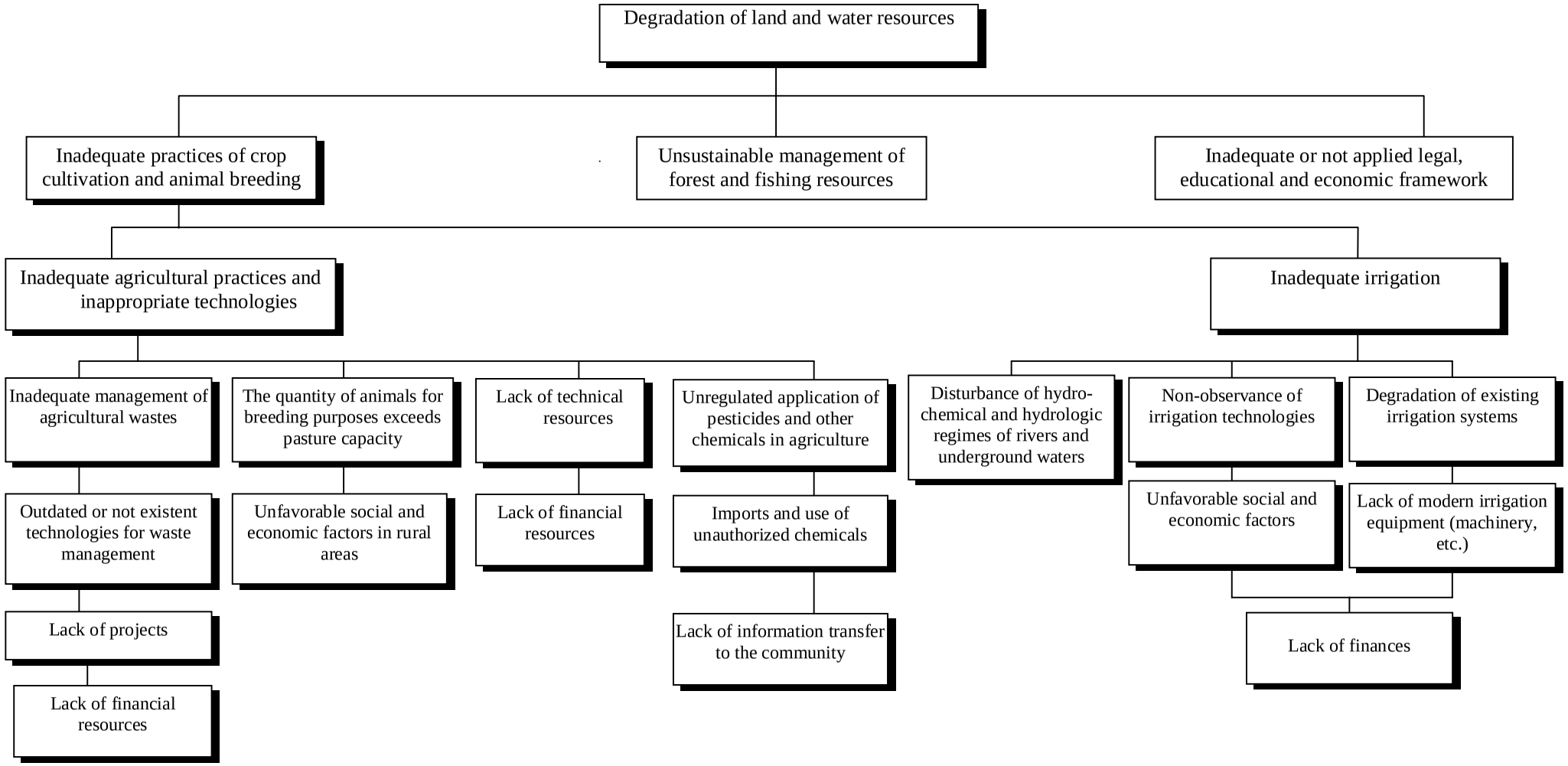
## 3.2. Industry

## 3.3. Municipalities

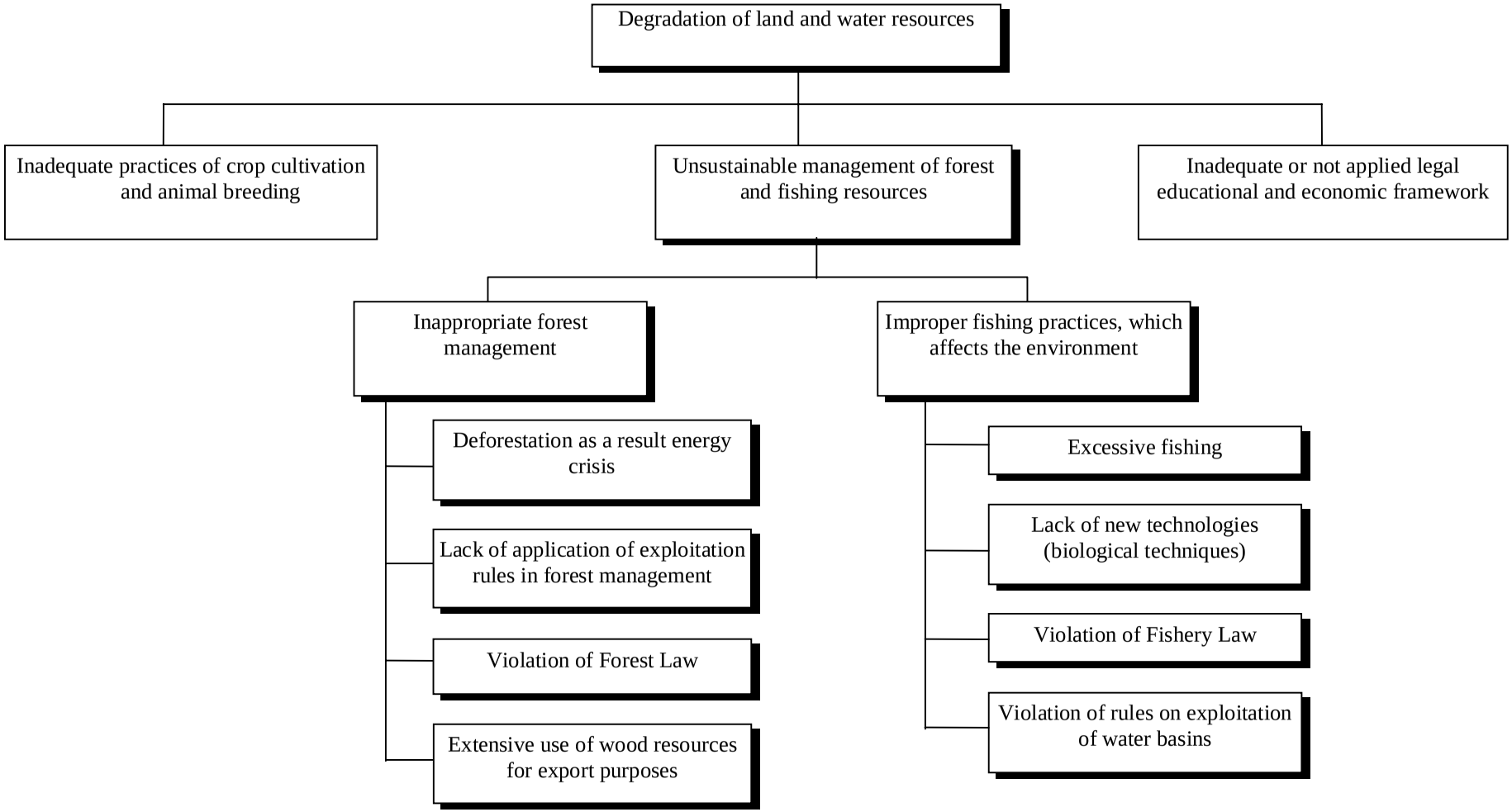
**Global Problem Hierarchy** **Annex 3.0.**



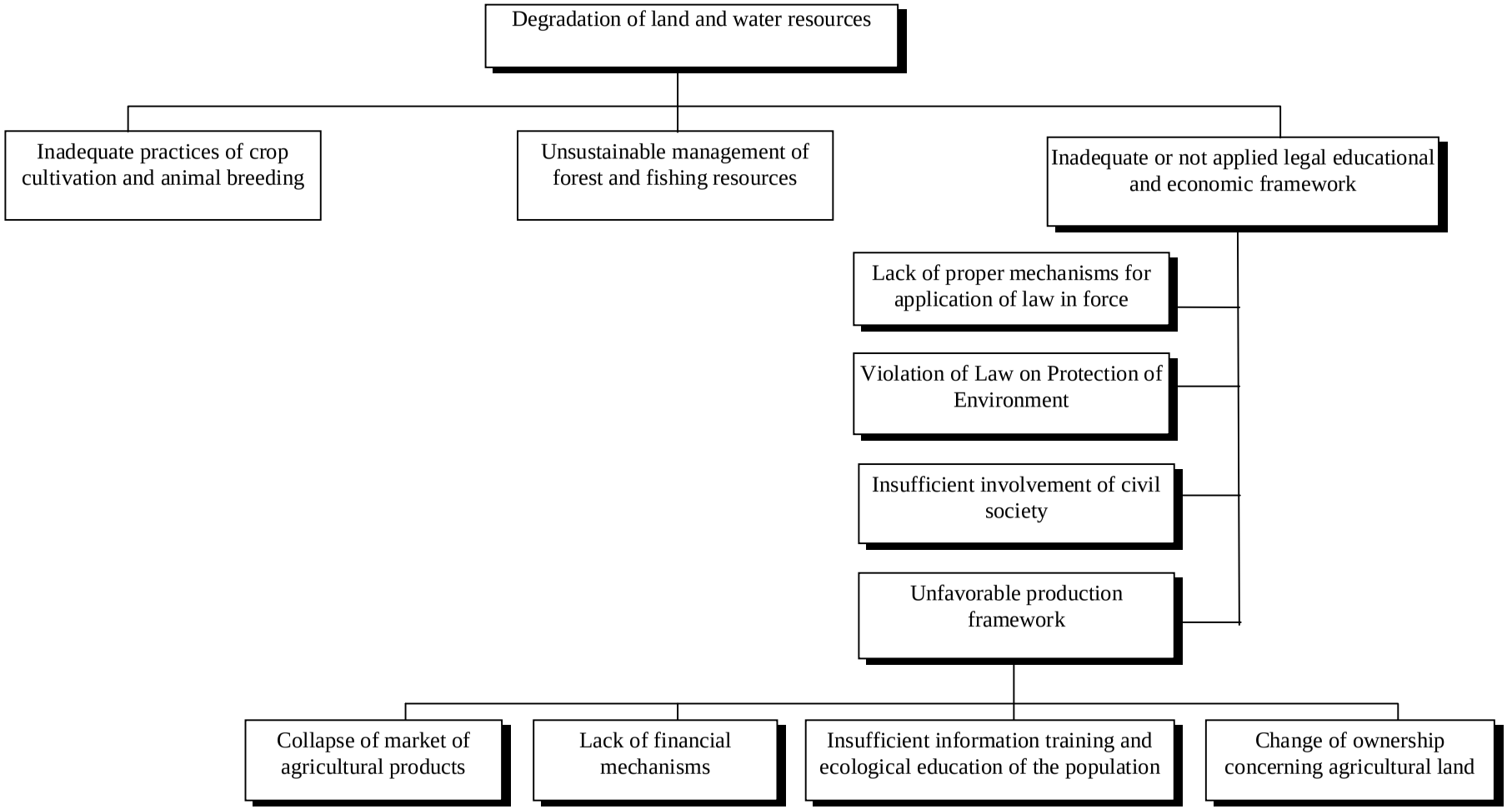
## 1. Crop Cultivation and Animal Breeding



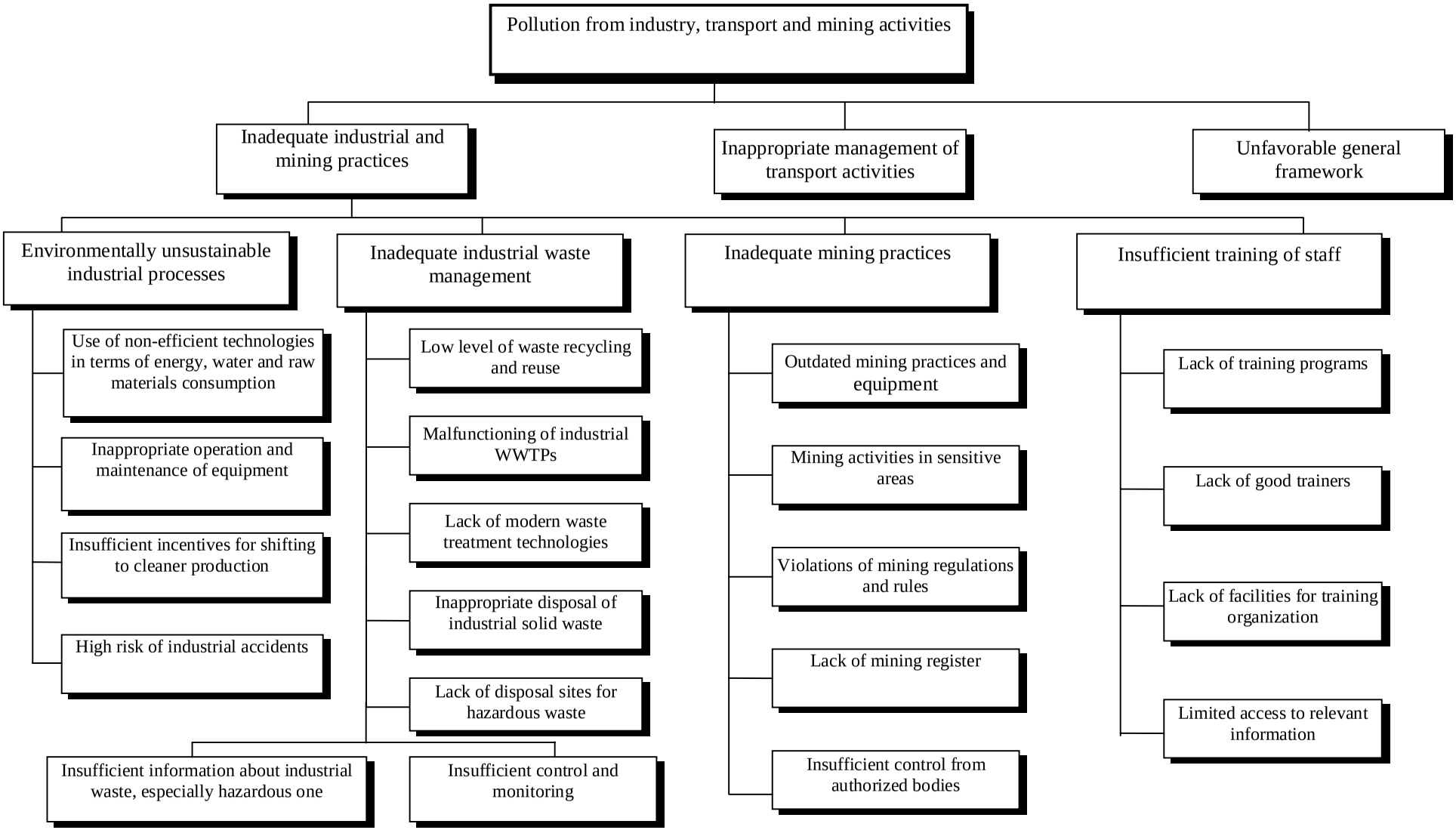
## 2. Forest Management and Fishing Practices



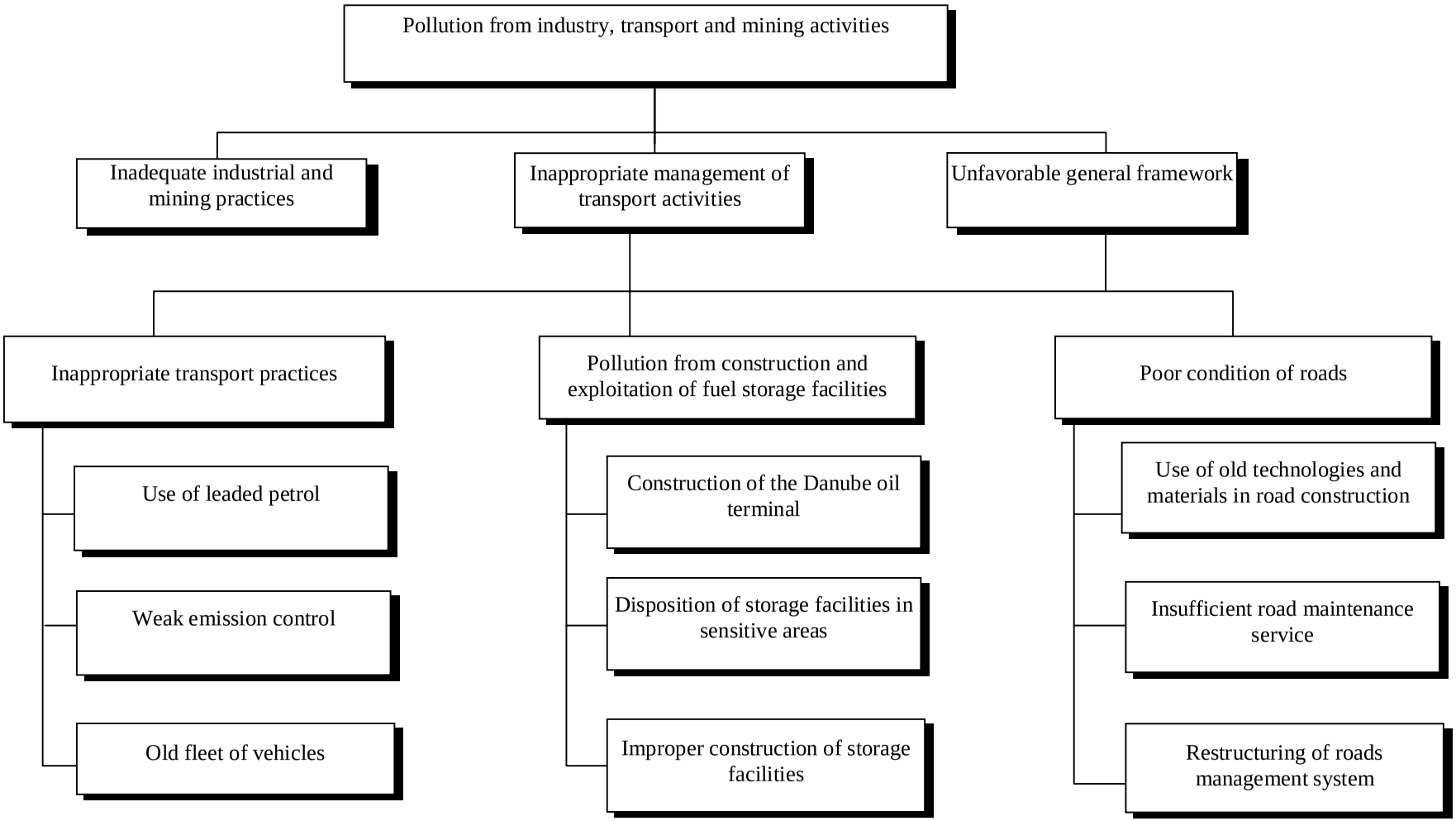
## 3. General Framework



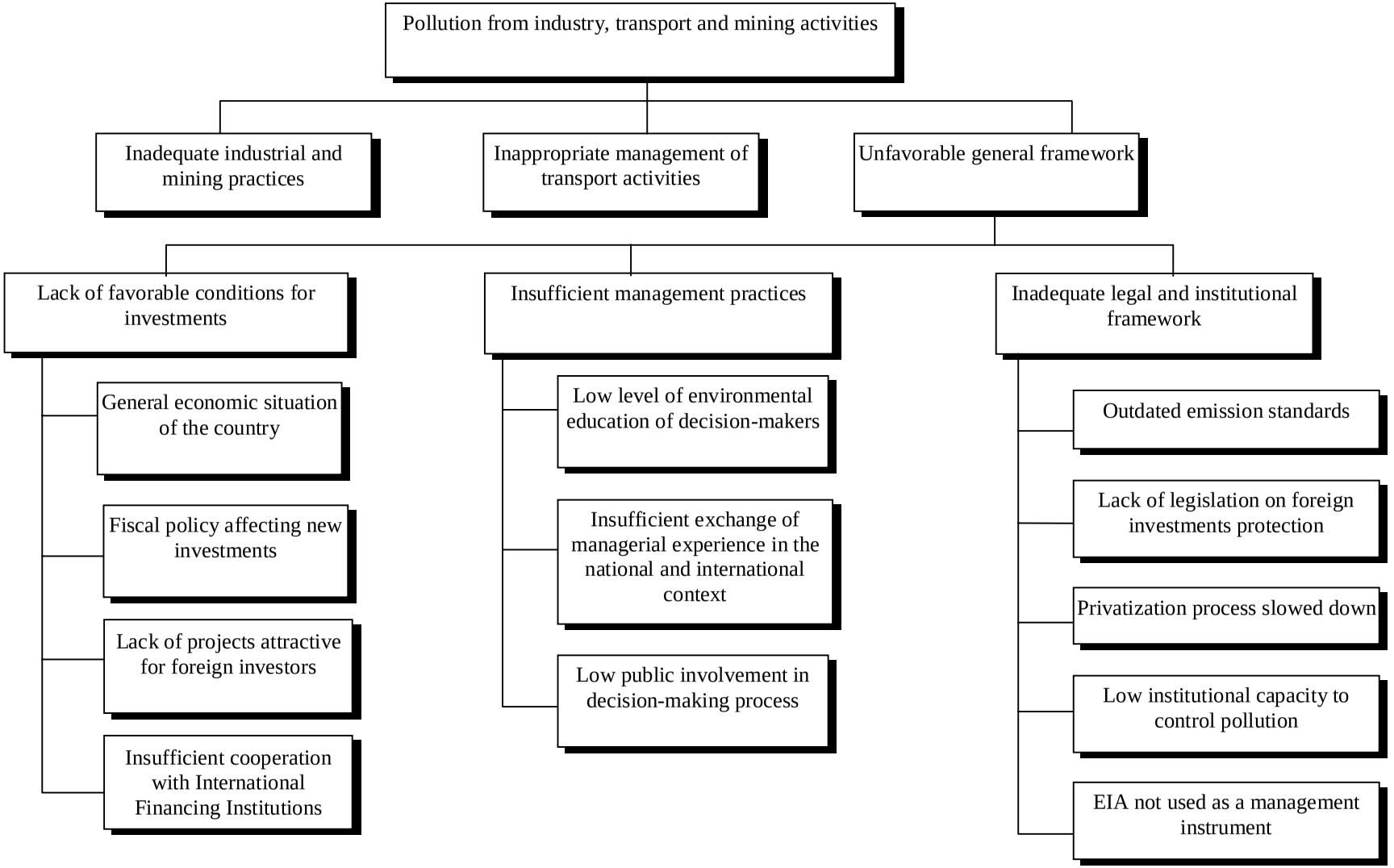
## 1. Industrial and Mining Practices



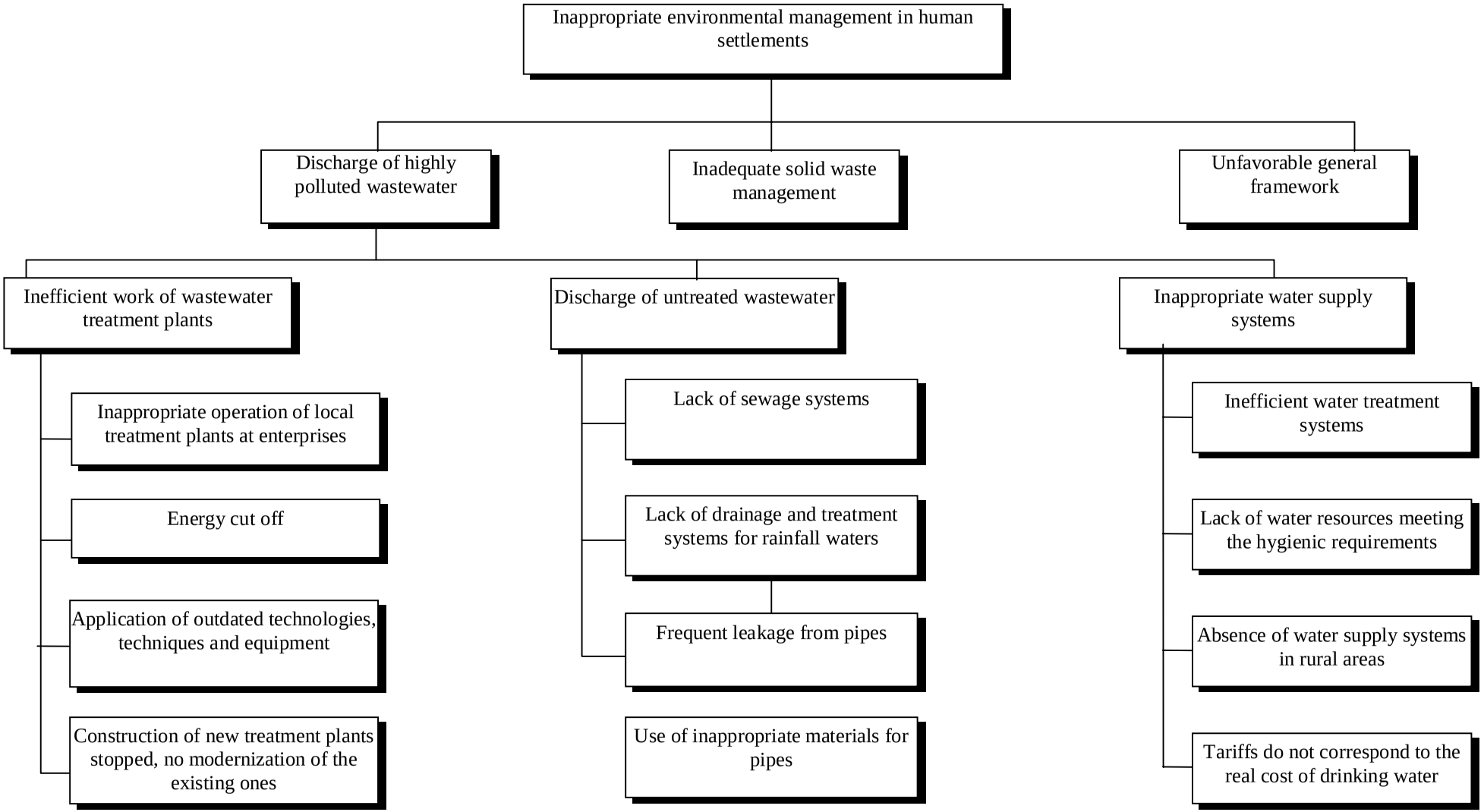
## 2. Transport Activities



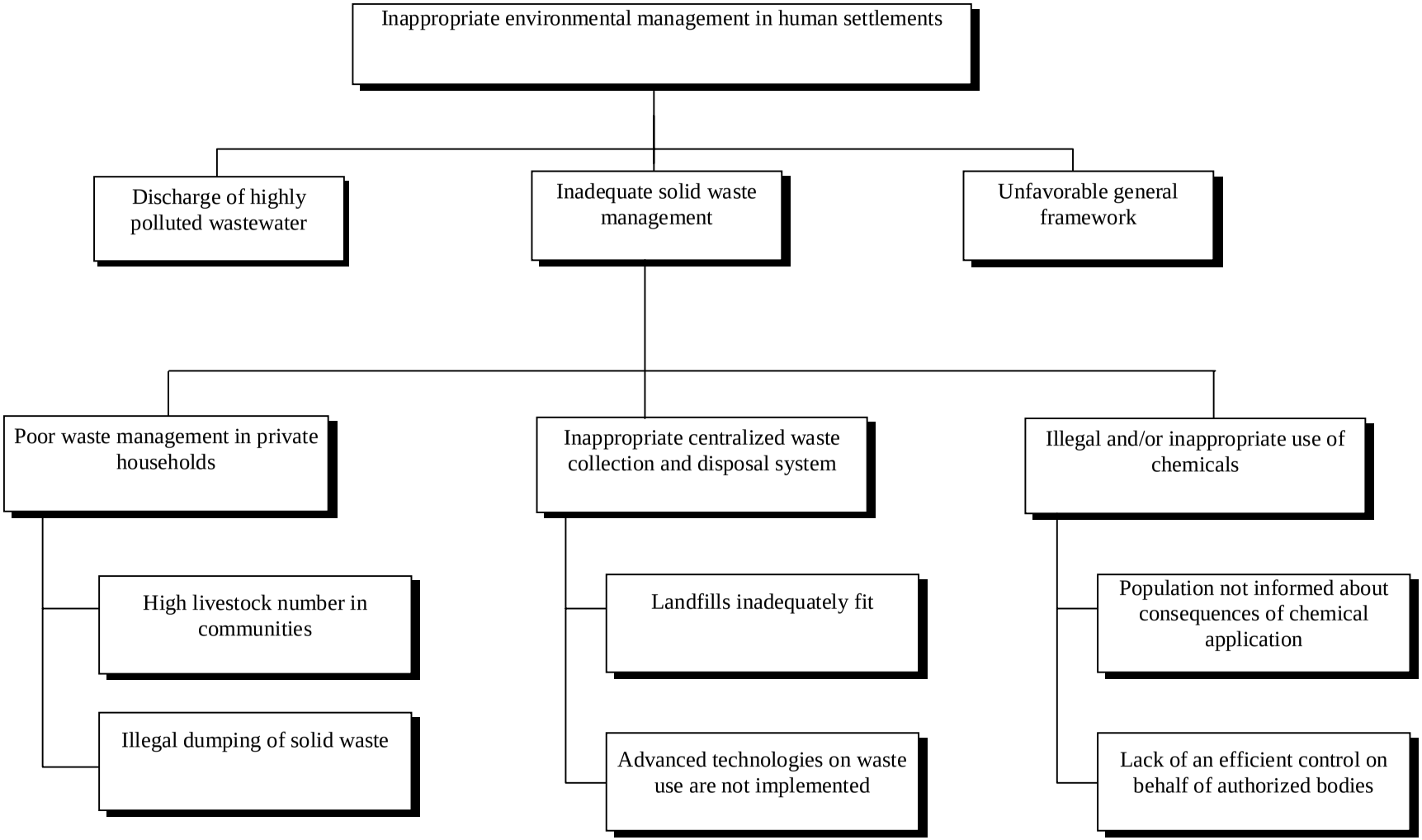
## 3. General Framework



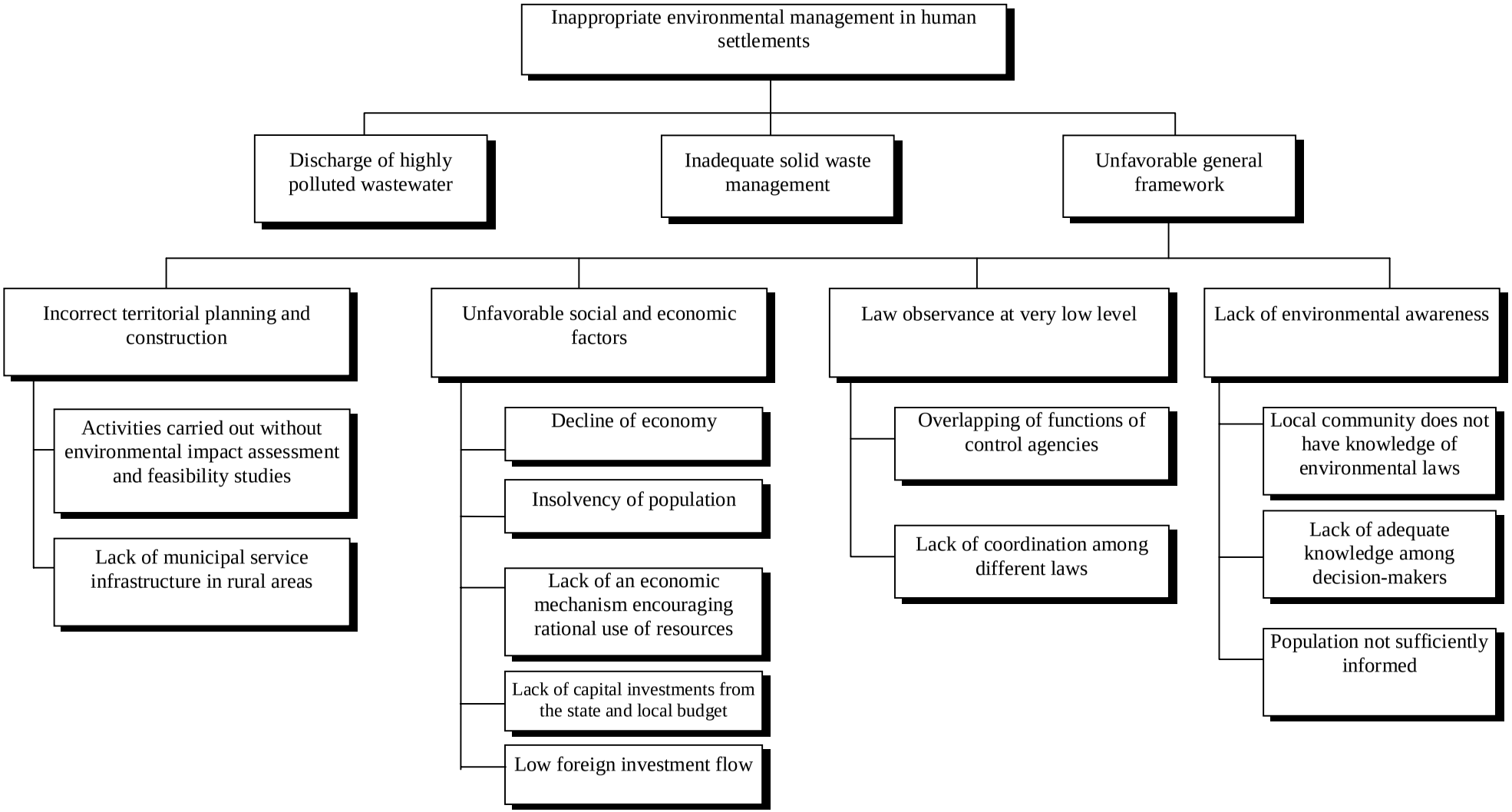
## 1. Discharge of Wastewater



## 2. Solid Waste Management



## 3. General Framework



# Annex 4. Objective Analysis

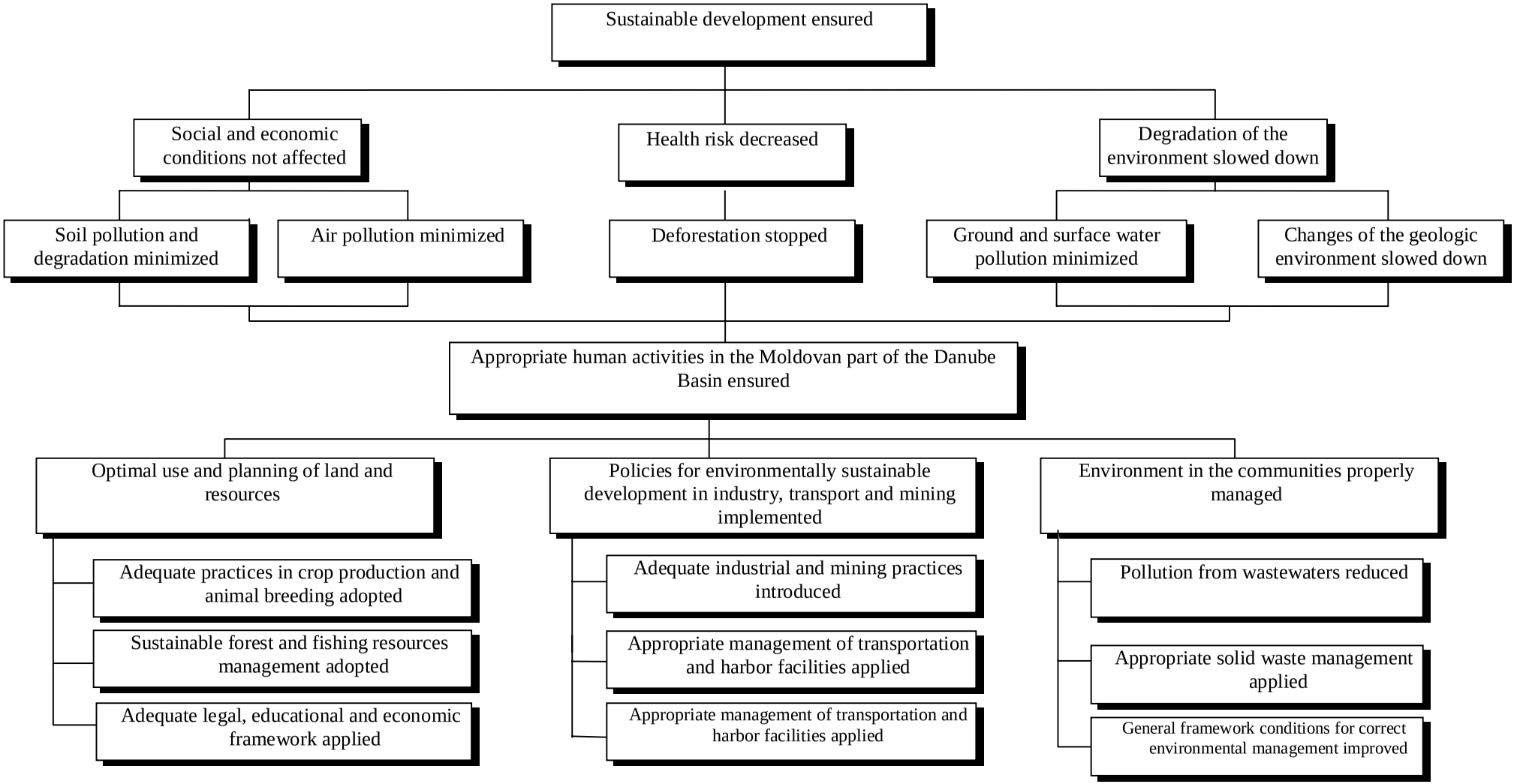
## 4.0. Global

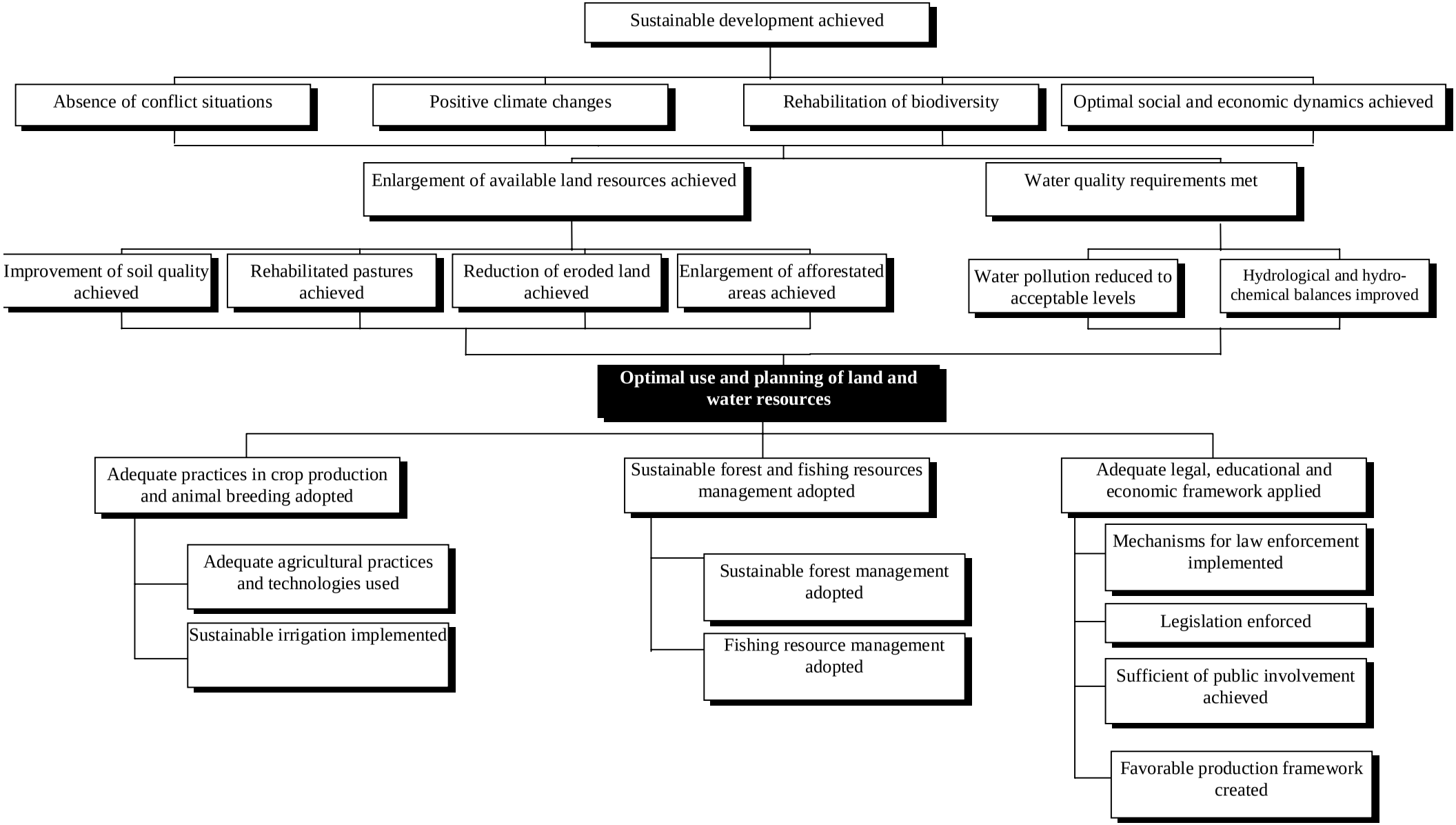
## 4.1. Agriculture and Forestry

## 4.2. Industry

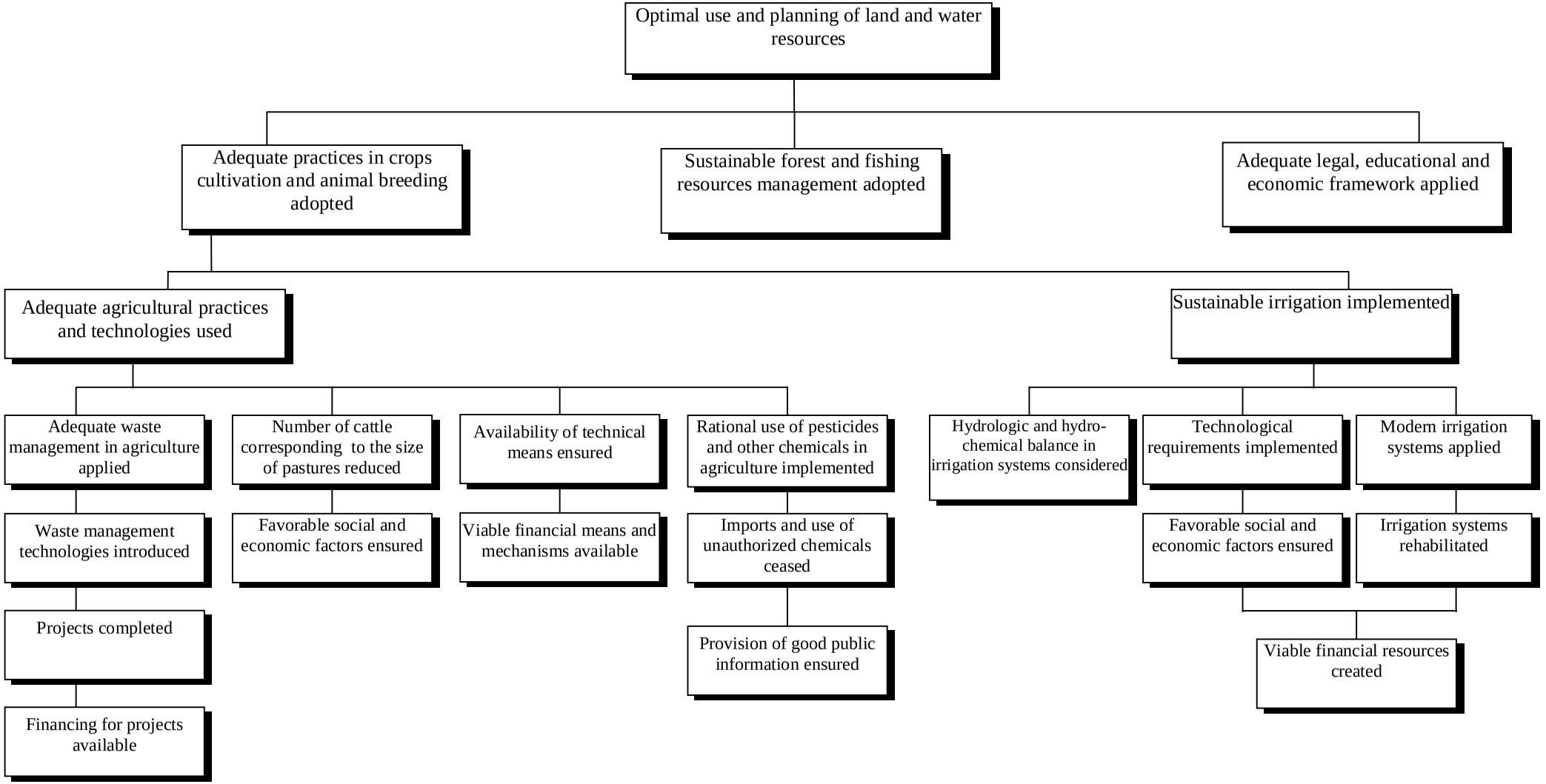
## 4.3. Municipalities

**Global Hierarchy of Objectives** **Annex 4.0.**



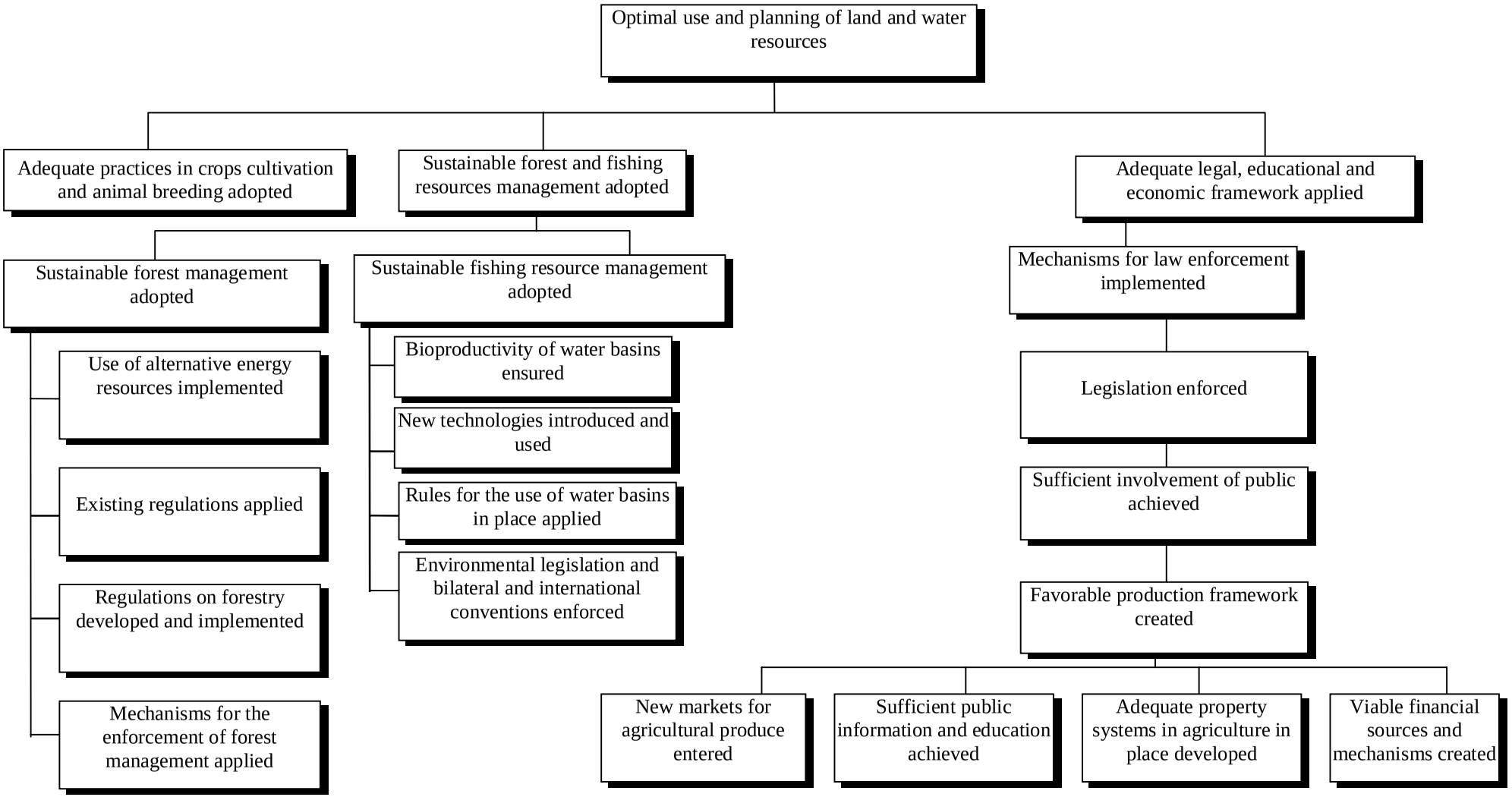

Sustainable development achieved
Absence of conflict situations
Positive climate changes
Rehabilitation of biodiversity
Optimal social and economic dynamics achieved
Enlargement of available land resources achieved
Water quality requirements met
Improvement of soil quality achieved
Rehabilitated pastures achieved
Reduction of eroded land achieved
Enlargement of afforestated areas achieved
Water pollution reduced to acceptable levels
Hydrological and hydro-chemical balances improved
Optimal use and planning of land and water resources
Adequate practices in crop production and animal breeding adopted
Sustainable forest and fishing resources management adopted
Adequate legal, educational and economic framework applied
Adequate agricultural practices and technologies used
Sustainable irrigation implemented
Sustainable forest management adopted
Fishing resource management adopted
Mechanisms for law enforcement implemented
Legislation enforced
Sufficient of public involvement achieved
Favorable production framework created

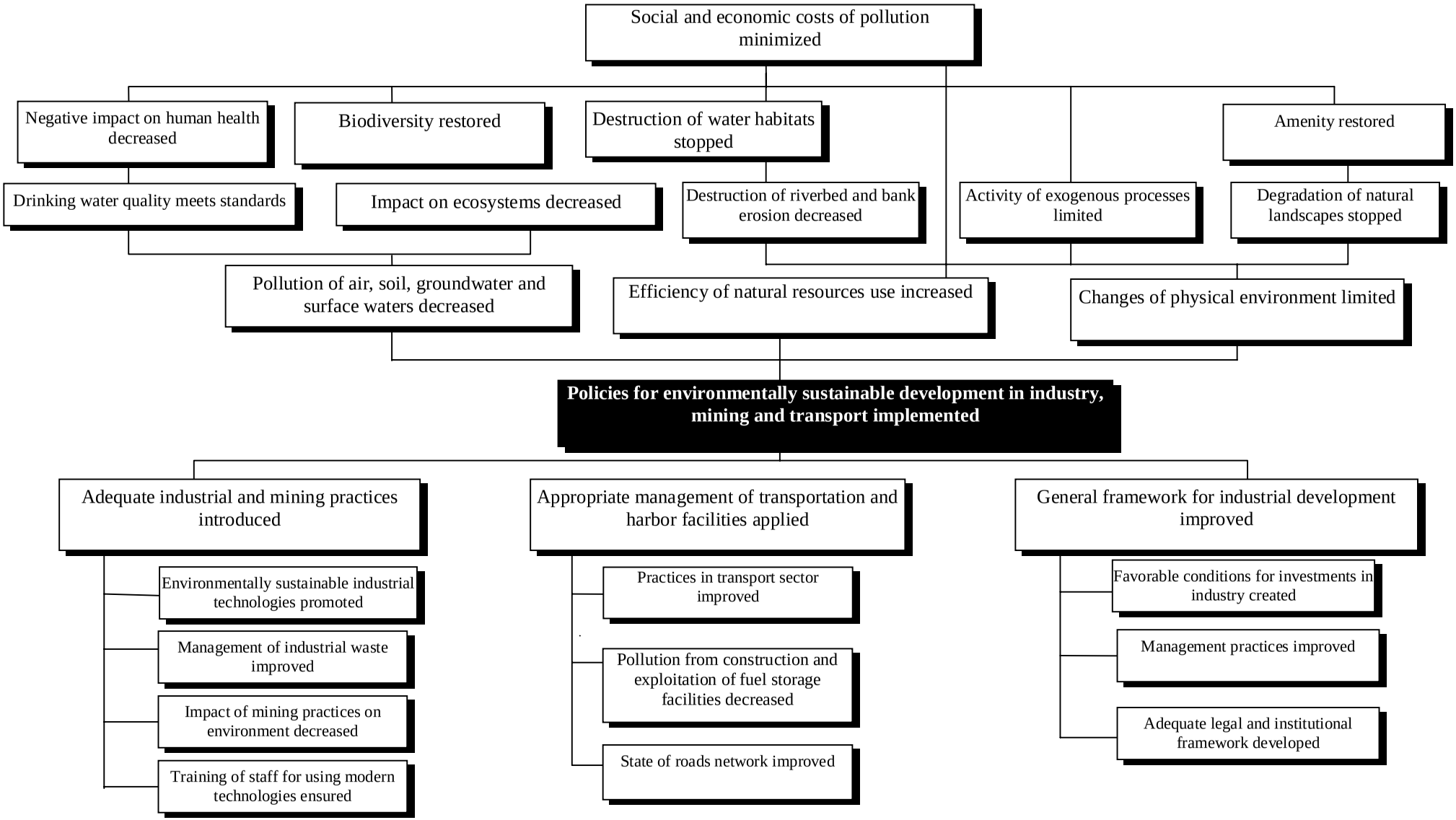
## 1. Crop Cultivation and Animal Breeding



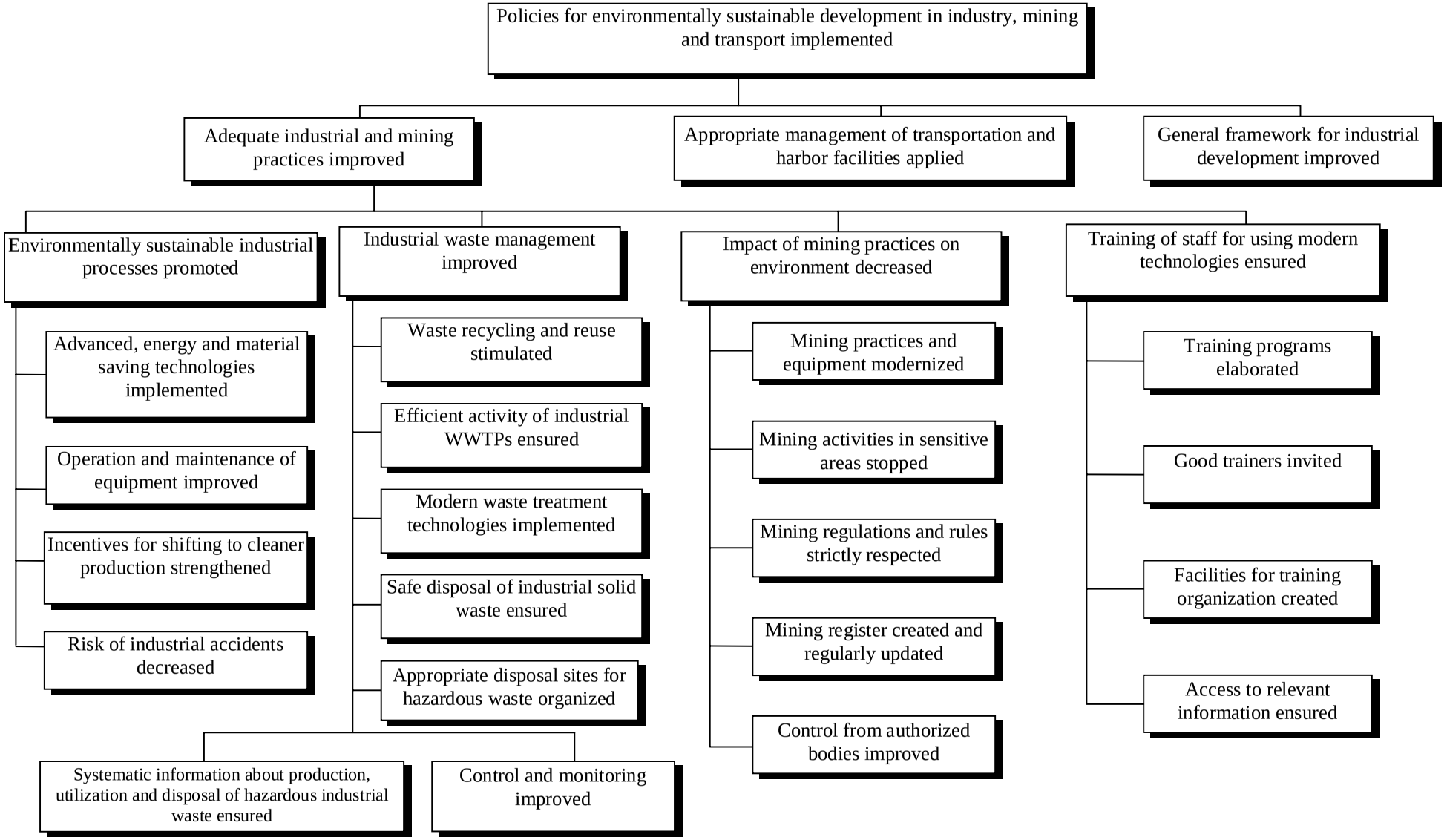
**2. Forest Management and Fishing Practices**

**3. General Framework**

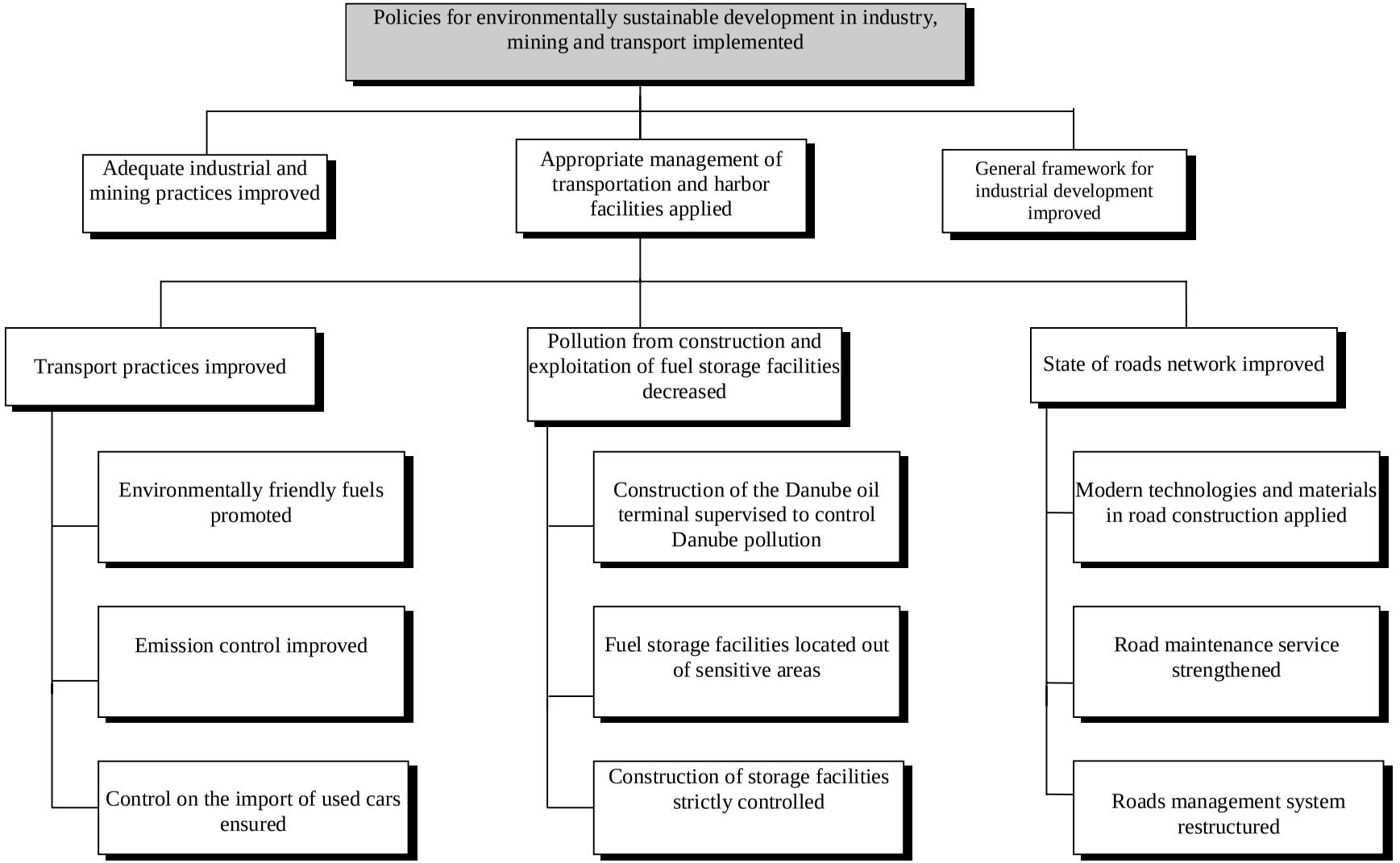



Social and economic costs of pollution minimized
Negative impact on human health decreased
Biodiversity restored
Destruction of water habitats stopped
Amenity restored
Drinking water quality meets standards
Impact on ecosystems decreased
Destruction of riverbed and bank erosion decreased
Activity of exogenous processes limited
Degradation of natural landscapes stopped
Pollution of air, soil, groundwater and surface waters decreased
Efficiency of natural resources use increased
Changes of physical environment limited
Policies for environmentally sustainable development in industry, mining and transport implemented
Adequate industrial and mining practices introduced
Appropriate management of transportation and harbor facilities applied
General framework for industrial development improved
Environmentally sustainable industrial technologies promoted
Management of industrial waste improved
Impact of mining practices on environment decreased
Training of staff for using modern technologies ensured
Practices in transport sector improved
Pollution from construction and exploitation of fuel storage facilities decreased
State of roads network improved
Favorable conditions for investments in industry created
Management practices improved
Adequate legal and institutional framework developed

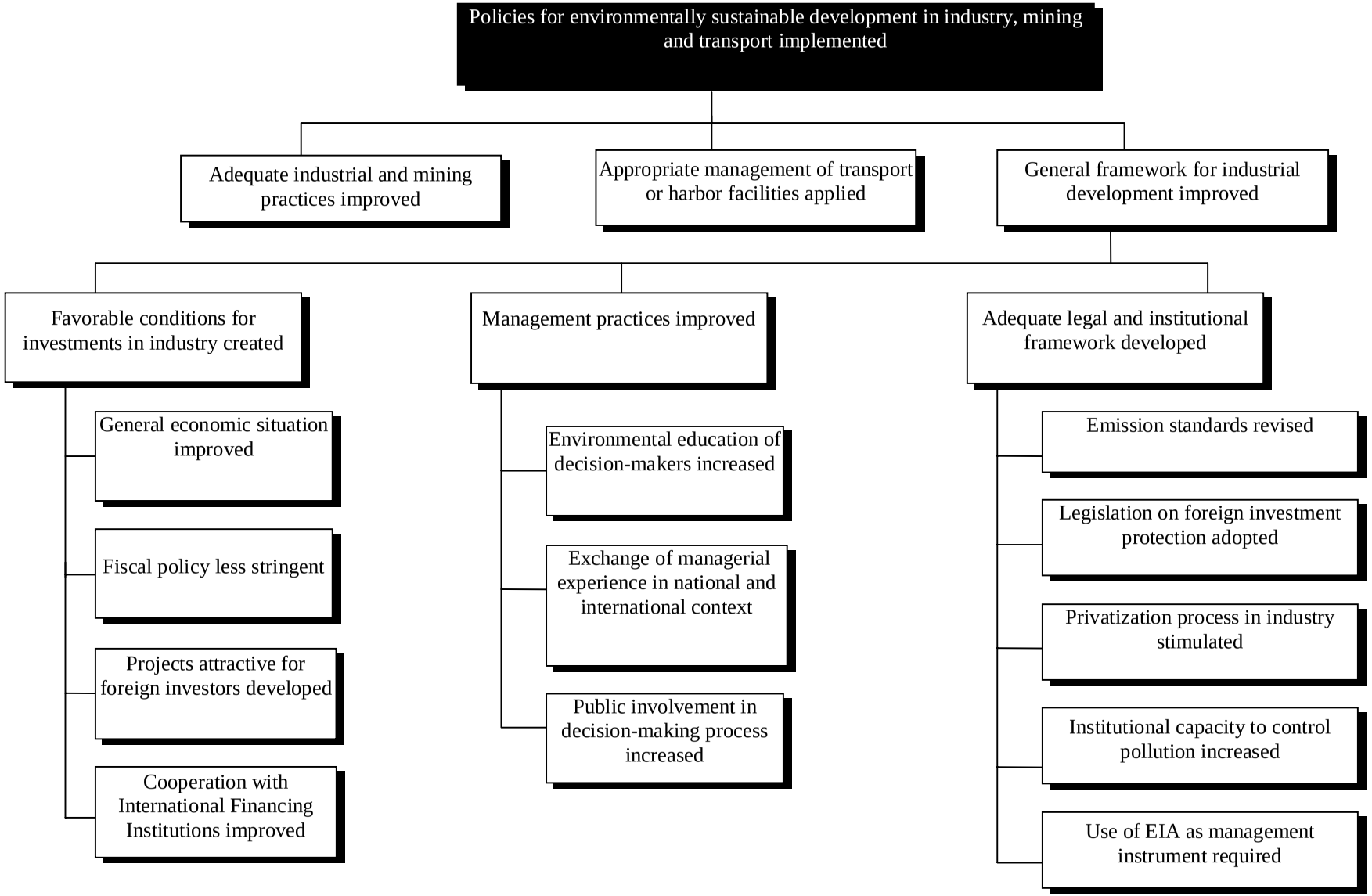
## 1. Industrial and Mining Practices

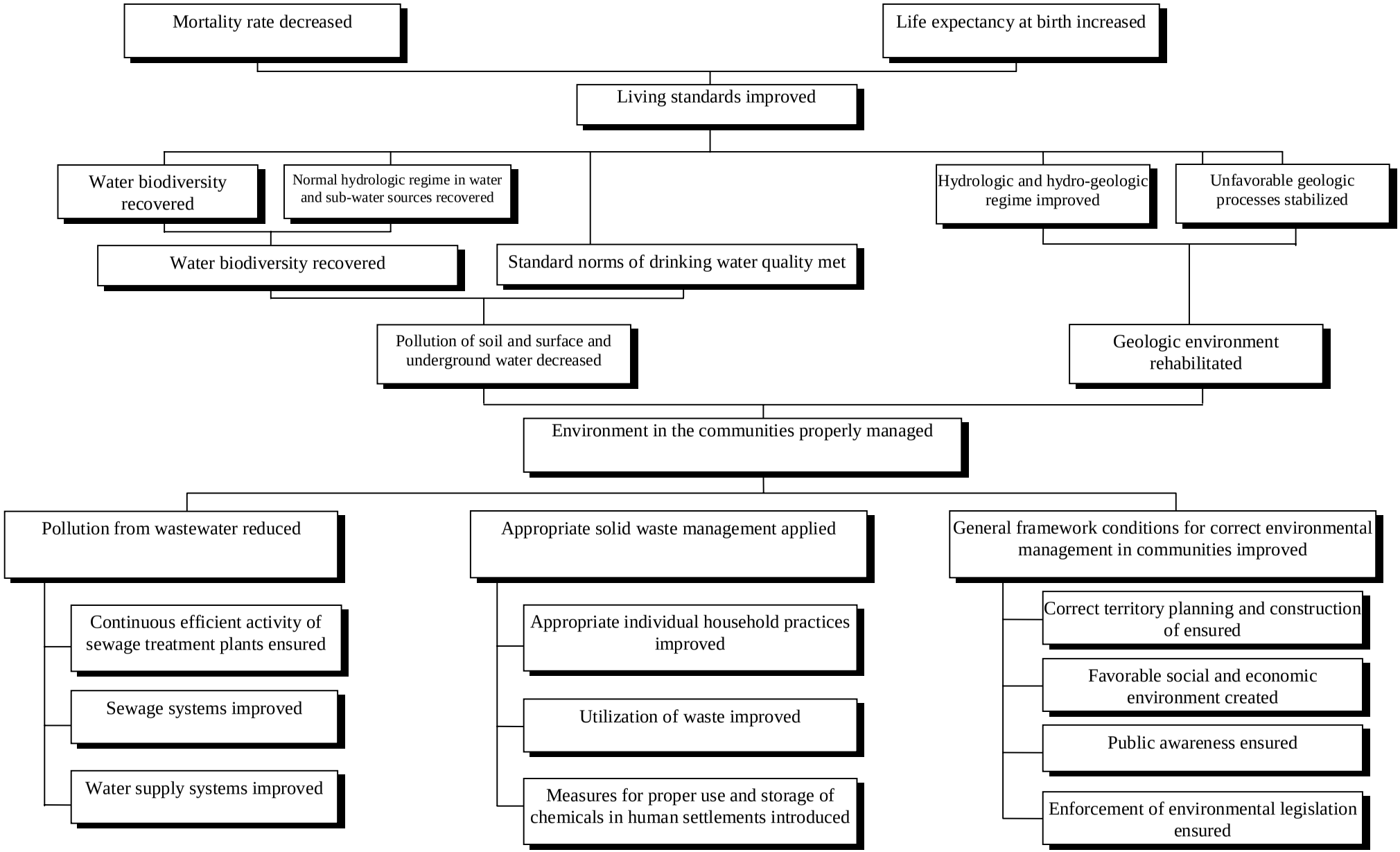


## 2. Transport Activities

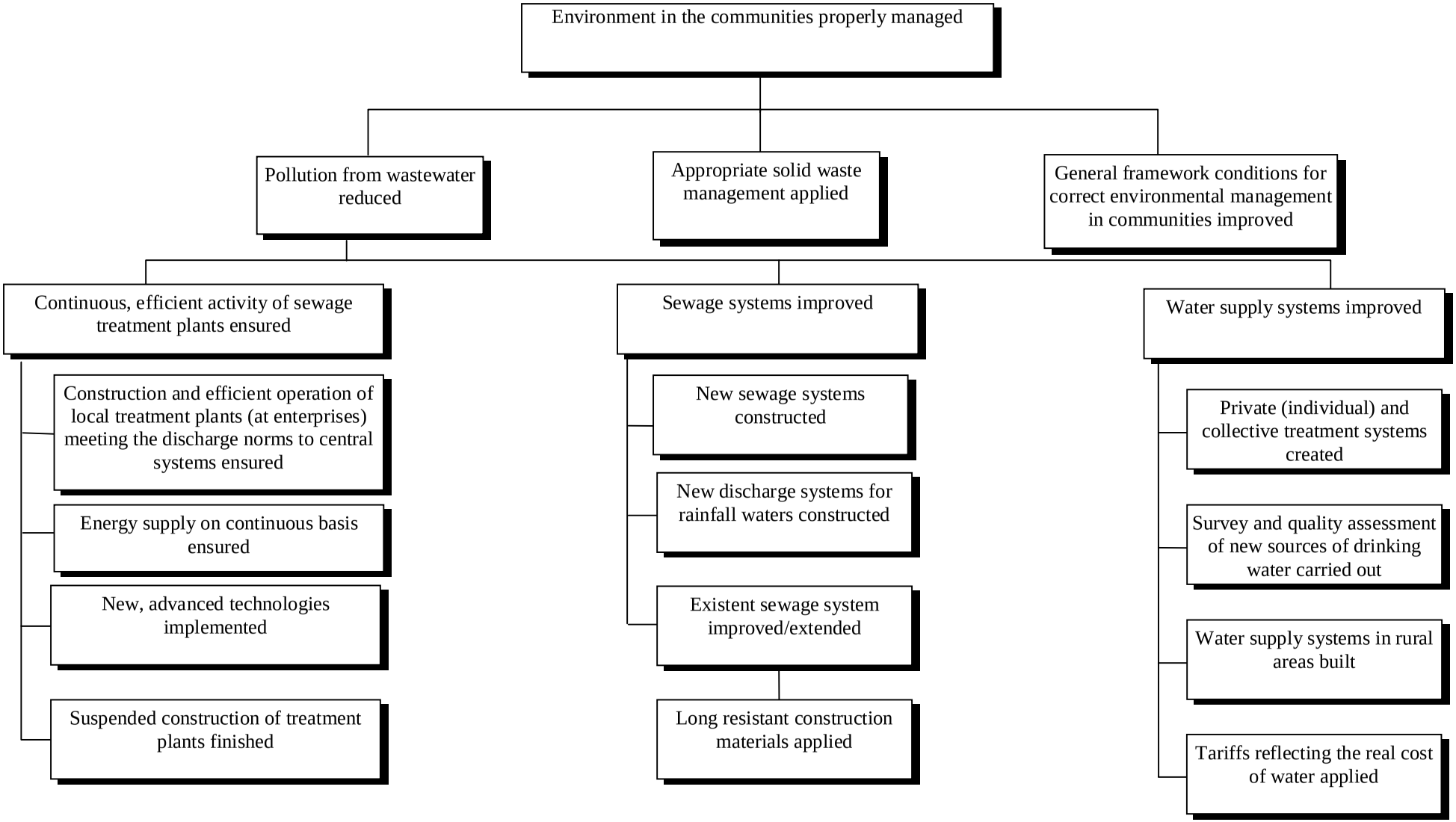


## 3. General Framework

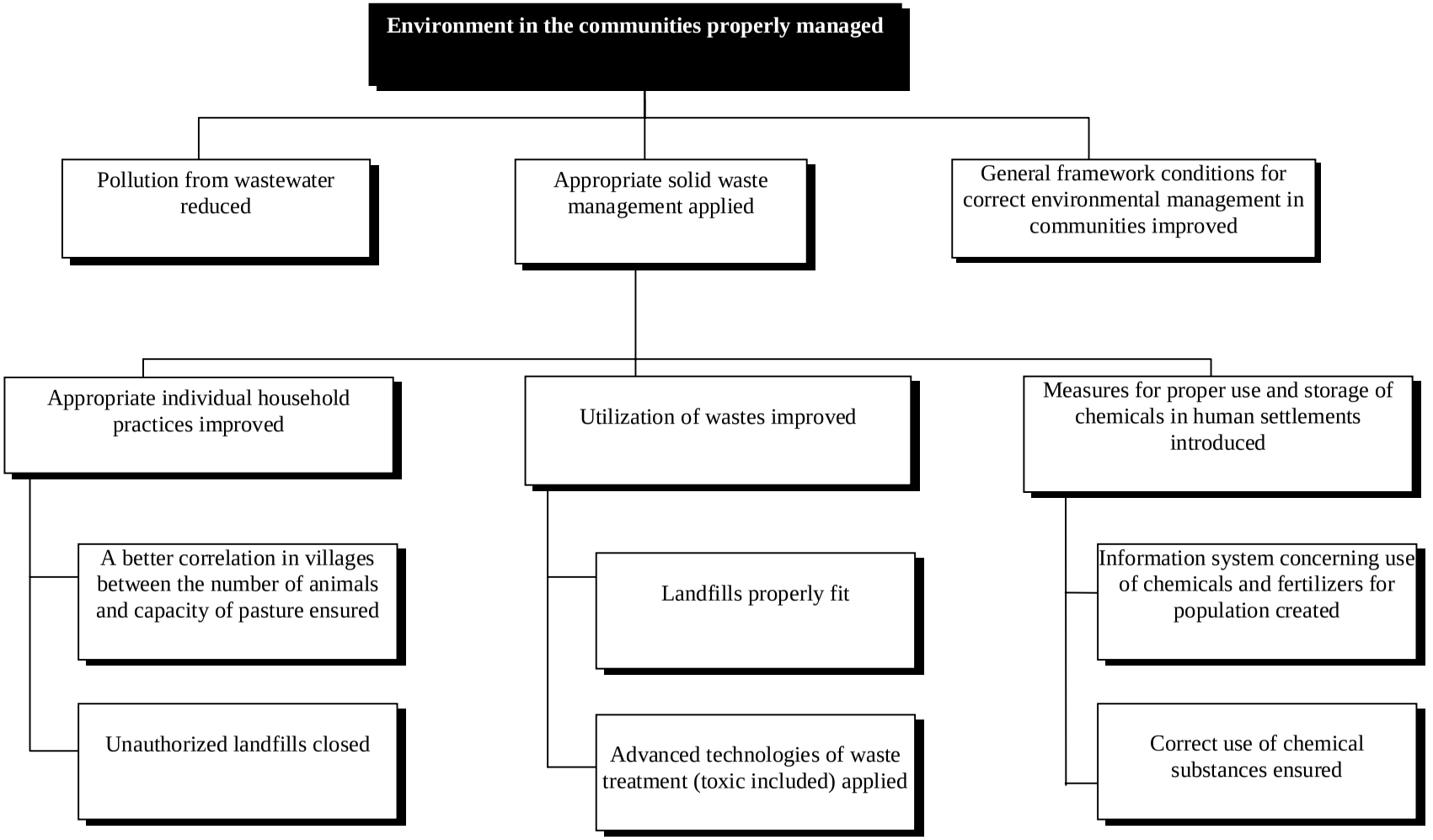



Mortality rate decreased
Life expectancy at birth increased
Living standards improved
Water biodiversity recovered
Normal hydrologic regime in water and sub-water sources recovered
Hydrologic and hydro-geologic regime improved
Unfavorable geologic processes stabilized
Water biodiversity recovered
Standard norms of drinking water quality met
Pollution of soil and surface and underground water decreased
Geologic environment rehabilitated
Environment in the communities properly managed
Pollution from wastewater reduced
Appropriate solid waste management applied
General framework conditions for correct environmental management in communities improved
Continuous efficient activity of sewage treatment plants ensured
Sewage systems improved
Water supply systems improved
Appropriate individual household practices improved
Utilization of waste improved
Measures for proper use and storage of chemicals in human settlements introduced
Correct territory planning and construction of ensured
Favorable social and economic environment created
Public awareness ensured
Enforcement of environmental legislation ensured

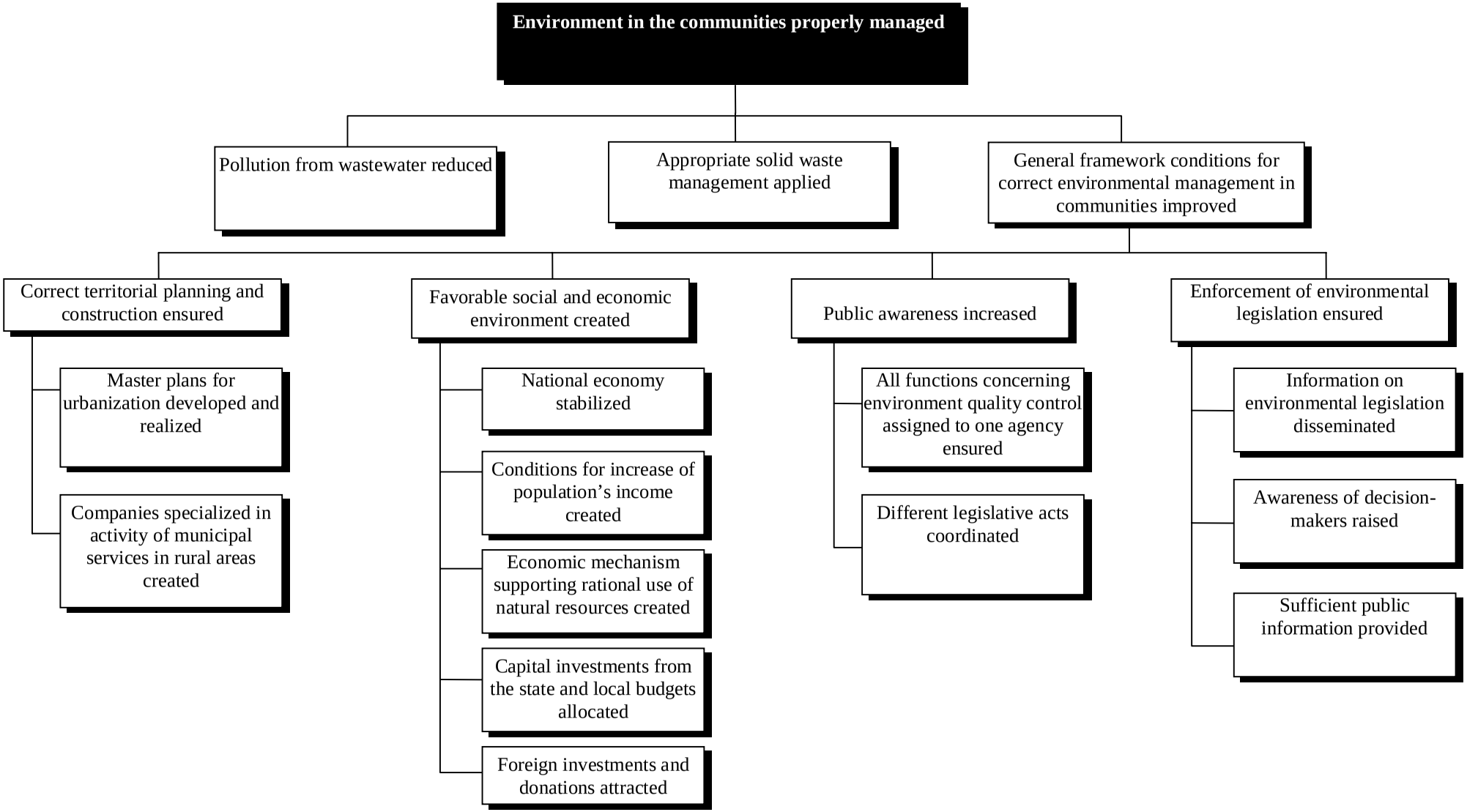
## 1. Discharge of Wastewater



## 2. Solid Waste Management



## 3. General Framework



# Annex 5. Sector Planning Matrix

## 5.1. Agriculture and Forestry

## 5.2. Industry

## 5.3. Municipalities

## Sector Planning Matrix — 1. Agriculture and Forestry — Annex 5.1.

| Summary of Objectives and Activities | Impact Indicators | Important Assumptions |
|---|---|---|
| ➢ **Program Objective:** Pollution reduction by appropriate human activities in the Moldovan part of the Danube River Basin ensured | | |
| ➢ **Sector Objective:** 1. Sustainable use of water and land resources | ➢ While experiencing economic growth in the agricultural sector in the period from 1999 to 2005, water and soil quality will at least maintain actual standards or be further improved. (SO-A). | ➢ Rehabilitation of wetland flood in plains wild life in the catchment (SO-A)<br>➢ Sustainable consumer behavior (SO-A) |
| ➢ **Sector Results:**<br>1.1. Adequate agricultural practices adopted<br>1.2. Appropriate piscicol practices adopted<br>1.3. Sustainable forest management applied<br>1.4. Institutional capacity and public involvement in the protection of water and land resources enhanced | ➢ From 1999 to 2005, 30% of farmers use adequate agricultural practices, which results in an increase of product quality and, at the same time, in a reduction of water pollution in the Moldovan part of the DRB. (1.1)<br>➢ In the period from 1999 to 2004, water pollution in the Danube catchment area in Moldova generated by harmful substances from pisciculture is significantly reduced and, simultaneously, surface water quality has improved by means of using adequate piscicol practices.(1.2)<br>➢ In the period from 1999 to 2002, erosion processes are reduced, simultaneously forest areas have expanded in the flooding plain of the Prut River by using adequate forest management.(1.3)<br>➢ An appropriate strategy integrating the main aspects of water and land resource use is elaborated and adopted for implementation at the national level in the period from 1999 to 2001.(1.4) | ➢ Favorable social-economic factors (1.1 - 1.4))<br>➢ Appropriate technologies for resources management available (1.1.2)<br>➢ Legal framework effectively respected (1.2.1/1.4.1)<br>➢ Alternative energy for population needs available (1.3.2.)<br>➢ Favorable environment for production exists (1.4.3.) |
| ➢ **Activities:**<br>1.1.1. Apply adequate agro-technical protection practices<br>1.1.2. Adopt adequate practices in agricultural waste management<br>1.1.3. Introduce adequate pasture management<br>1.1.4. Introduce adequate irrigation practices<br><br>1.2.1. Reinforce the rules of aquatic basin exploitation<br>1.2.2. Implement new technologies on a large scale<br>1.2.3. Ensure bio-productivity in water basins<br><br>1.3.1. Undertake anti-erosion measures<br>1.3.2. Implement mechanisms for the application of forest use legislation<br>1.3.3. Reduce deforestation through the promotion of alternative energy resources<br><br>1.4.1 Reinforce the application of appropriate legislation for the use of land and water resources<br>1.4.2. Facilitate public participation through civil society development<br>1.4.3. Make funds available for protection of water and land resources | | |

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

## Sector Planning Matrix — 2. Industry — Annex 5.2.

| Summary of Objectives and Activities | Impact Indicators | Important Assumptions |
|---|---|---|
| ➢ **Program Objective:** Pollution reduction by appropriate human activities in the Moldovan part of the Danube River Basin ensured | | |
| ➢ **Sector Objective:** 2. Policies for environmentally sustainable development in industry, mining and transport implemented | ➢ Pollution from industry, mining and transport activities are, by the year 2005, in conformity with national and international (EU) environmental standards, while, at the same time , industrial production has increased.(SO-I) | ➢ Improvement of the state of the environment remains a priority issue in the governmental policy (SO-I)<br>➢ Legal and institutional frame for environmental protection effect are implemented (SO-I) |
| ➢ **Sector Results:**<br>2.1. Adequate industrial and mining practices introduced<br>2.2. Appropriate management of transportation and harbor facilities applied<br>2.3. General framework for industrial development improved | ➢ By the year 2005, energy and water consumption in industry in the Moldovan part of the Danube basin will decrease by 15%, in comparison with data from 1995. (2.1)<br>➢ By the year 2005, harmful emissions from vehicles will be reduced by 20%, in comparison with data from 1995 in the Moldovan part of the Danube basin. (2.2)<br>➢ By the year 2005, industrial output in the Moldovan part of the Danube River Basin has increased by 20% applying environmentally sustainable industrial policies. (2.3) | ➢ Ratification of Danube Protection Convention and its application in national legislation and policy (2.1 - 2.3)<br>➢ National industrial production responds to international and local standards and demands (2.1 - 2.3) |
| ➢ **Activities:**<br>2.1.1. Introduce environmentally sustainable industrial practices<br>2.1.2. Reduce waste from industrial activities<br>2.1.3. Optimize mining practices<br>2.1.4. Introduce training for the application of modern technologies<br><br>2.2.1. Ensure appropriate transport practices<br>2.2.2 Ensure adequate pollution control in harbor and storage facilities<br>2.2.3. Improve the state of the road network<br><br>2.3.1. Develop optimal investment conditions<br>2.3.2. Facilitate the implementation of modern management practices<br>2.3.3. Develop an adequate legal and institutional framework | | ➢ Advanced technologies for industrial production available in time (2.1.1 - 2.1.3)<br>➢ Effective cooperation with customs and border control (2.3.1 - 2.3.3)<br>➢ Experts for advanced training programs available in time (2.1.1 - 2.3.3)<br>➢ The government provides necessary financial support for the implementation of infrastructural projects (2.1.1 - 2.3.3) |

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

**Sector Planning Matrix** **3. Municipality** **Annex 5.3.**

| Summary of Objectives and Activities | Impact Indicators | Important Assumptions |
|---|---|---|
| ➢ **Program Objective:** Pollution reduction by appropriate human activities in the Moldovan part of the Danube River Basin ensured | | |
| ➢ **Sector Objective** 3.Environment in the communities properly managed | ➢ By the year 2010, the number of children with methaemoglobinemia has decreased, due to the improvement of surface and ground water quality, by 15%, in comparison with data from 1993. (SO-M) | ➢ Management of natural resources improved in all sectors (SO-M)<br>➢ Transboundary pollution reduced (SO-M) |
| ➢ **Sector Results:**<br>3.1. Pollution from waste water reduced<br>3.2. Appropriate solid waste management applied<br>3.3. General framework conditions for correct environmental management in communities improved | ➢ By the year 2010, as a result of reduced pollution from waste water, the value of Biological Consume of oxygen will reach 3mg $O_2/dm^3$ in the surface water downstream towns located in the Moldovan part of Danube basin, other monitored parameters remaining at the same level at least (3.1)<br>➢ By the year 2010, the quality of drinking water from wells in the Moldovan part of the Danube basin improved due to the decrease of nitrate concentration in shallow ground water to 45-50 $mg/dm^3$ (3.2)<br>➢ By the year 2010, municipal water and waste management Master Plans are developed according to the Agenda 21 principles and adopted in at least 5 communities located in the Moldovan part of the Danube River Basin (3.3) | ➢ Favorable economic and social framework maintained (3.3)<br>➢ Water resource quality improved (3.1 - 3.2)<br>➢ Pollution from municipal run-offs diminished (3.1) |
| ➢ **Activities:**<br>3.1.1 Undertake measures for the efficient functioning of WWTPs<br>3.1.2. Rehabilitate and extend existing sewage system<br>3.1.3. Protect water sources and optimize water supply systems<br><br>3.2.1. Introduce appropriate individual household practices<br>3.2.2. Improve methods of solid waste disposal and handling<br>3.2.3. Undertake measures for the proper use and storage of chemicals in human settlements<br><br>3.3.1. Promote correct territorial planning and construction<br>3.3.2. Undertake measures to improve the social and economical framework<br>3.3.3. Raise environmental awareness<br>3.3.4 Ensure the enforcement of environmental legislation | | ➢ New water sources prospected and their quality assessed (3.1.3)<br>➢ Advanced technologies of waste disposals, including toxic wastes, available (3.2.2)<br>➢ Companies specialized in delivery of municipal services in rural areas created (3.2.1 - 3.2.3)<br>➢ Capital investments from the state and local budgets allocated (3.3.2)<br>➢ National economy stabilized (3.3.2<br>➢ Conditions for the increase of population income created (3.3.2 - 3.3.3) |

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

# Annex 6. Description of Activities, Important Elements and Projects

## 6.1. Agriculture and Forestry

## 6.2. Industry

## 6.3. Municipalities

## RESULT 1.1.: Adequate agricultural practices adopted

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 1.1.1 Apply adequate agro-technical protection practices | ➢ Promote the rational use of pesticides and other chemicals used in agriculture<br>➢ Import existing crop cultivation technologies<br>➢ Reinforce financial mechanisms<br>➢ Carry out appropriate public information<br>➢ Ensure the availability of technical means<br>➢ Introduce adequate waste management in agriculture | ➢ Support to the Agency for Restructuring Agriculture (TACIS Moldova)<br>➢ First Agriculture Project (World Bank) | ➢ Sediment assessment in the Prut river (TACIS) | ➢ Implementation of alternative resources processing technologies in agriculture<br>➢ Pesticide management in privatization conditions<br>➢ Adaptation of agricultural machinery for small farms<br>➢ Introduction of new ploughing methods in erosion-prone areas<br>➢ Creation of a monitoring center for environmental state of sedimentary soils in the Prut River valley<br>➢ Financing systems for farm development (agricultural banks) |
| ➢ 1.1.2 Adopt adequate practices in management of waste from agriculture | ➢ Improve husbandry in farms and complexes<br>➢ Facilitate the use of alternative technologies in animal waste management<br>➢ Adjust farm sizes to optimal waste management needs<br>➢ Introduce public information systems regarding waste management<br>➢ Enforce legislation and tighten animal waste management controls | | | ➢ Animal waste management<br>➢ Production of biogas from animal waste<br>➢ Creation of husbandry systems in a market economy<br>➢ Creation of farming consulting center |
| ➢ 1.1.3 Introduce adequate pasture management | ➢ Optimize herd sizes vis-à-vis pasture capacity<br>➢ Carry out public information regarding pasture protection<br>➢ Introduce market factors for protection of pastures<br>➢ Create mechanisms for environmental law enforcement<br>➢ Develop programs for degraded pasture rehabilitation<br>➢ Assist stakeholders in the rehabilitation of degraded pastures | | | ➢ Project for degraded pasture rehabilitation<br>➢ Improving pasture quality (irrigation, plantation)<br>➢ Rehabilitation of eroded soil trough the creation of highly productive pastures<br>➢ Studying pasture capacity for husbandry support<br>➢ Creating a center for public information regarding sustainable pasture use |
| ➢ 1.1.4 Introduce adequate irrigation practices | ➢ Enforce rules for the use of irrigation systems<br>➢ Introduce new and efficient irrigation systems<br>➢ Monitor the hydro-chemical and hydrological regimes<br>➢ Train personnel for new irrigation technologies<br>➢ Facilitate the privatization and self-financing of irrigation systems<br>➢ Introduce legal stimulation for irrigation | | | ➢ Rehabilitation of irrigation systems in the Prut River basin<br>➢ Reorganization of irrigation systems in view of their privatization<br>➢ Regular checking of the water balance for the maintenance of environmental state of irrigation sources<br>➢ Creation of irrigation systems on environmental effective land |

## RESULT 1.2.: Appropriate piscicol practices adopted

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | Existing/On-going | Planned | Proposed |
| ➢ 1.2.1.Reinforce aquatic basin exploitation rules | ➢ Train personnel for the exploitation of water basins<br>➢ Create zones for the protection of water basins<br>➢ Maintain the quality of water in the basin and downstream<br>➢ Monitor the hydro-chemical and hydrological regime<br>➢ Manage water basins according to existent legislation | | | ➢ Rehabilitation of existing fishing systems<br>➢ Organization of personnel training for the exploitation of river basins<br>➢ Hydrological and hydro-chemical monitoring of artificial fishing pond's water<br>➢ Elaboration of protection areas schemes for the Prut River basin |
| ➢ 1.2.2 Implement new technologies on a large scale | ➢ Improve the technical base for new technology implementation<br>➢ Research the results and the implementation of international fish breeding technologies<br>➢ Introduce market economy factors<br>➢ Adjust existing legislation to new technologies<br>➢ Control water quality during new technology implementation | | | ➢ Analysis and synthesis of the work of advanced technologies world-wide and their implementation in fishing here<br>➢ Studies concerning the updating the existing technical basis for new technology use<br>➢ Amendment of existing legislation according to new technology requirements<br>➢ Adjusting economic mechanisms to the requirements of new technology implementation |
| ➢ 1.2.3. Ensure bio-productivity in water basins | ➢ Provide adequate hydrological and physico-chemical conditions for bioproductivity<br>➢ Facilitate the bioproductivity through legal measures<br>➢ Promote the trophic base within aquatic basins<br>➢ Restore productive species | | | ➢ Improvement of exploitation rules for artificial fishing ponds management for increased water resource protection<br>➢ Restoring the biodiversity of valuable fish species in fishing ponds<br>➢ Hydro-technical works in piscicol ponds for increasing biodiversity |

## RESULT 1.3.: Sustainable forest management applied

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | Existing/on-going | Planned | Proposed |
| ➢ 1.3.1.Undertake anti-erosion measures | ➢ Raise public awareness for the need to undertake erosion control measures<br>➢ Introduce new forest growing technologies<br>➢ Make available financial resources for erosion control<br>➢ Promote the application of the anti-erosion agricultural techniques<br>➢ Ameliorate the run-off regime on slopes from the erosion point of view<br>➢ Optimize anti-erosion land development | | | ➢ Improvement of the run-off regime on slopes for erosion control<br>➢ New anti-erosion projects implementation<br>➢ New agricultural technologies for erosion control<br>➢ Creation of a program for information about anti-arsenal measures<br>➢ Possibilities for extending forest covered areas<br>➢ Optimization of land from anti-erosion point of view |
| ➢ 1.3.2. Implement mechanisms for the application of forest use legislation | ➢ Ensure information and education for the public<br>➢ Improve forest planning<br>➢ Develop general schemes for forest law enforcement<br>➢ Create economic leverage for law enforcement<br>➢ Reinforce the penalty system<br>➢ Strengthen the control system | | | ➢ Reorganization of control bodies in forestry<br>➢ Economic leverage for forest legislation implementation<br>➢ General schemes for forest legislation implementation<br>➢ Analysis of the possibility of applying the existent forestry legal frameworks<br>➢ Development of legislation on the export and import of timber<br>➢ Updating the legal frameworks and standards in forestry |
| ➢ 1.3.3. Reduce deforestation through the promotion of alternative energy resources | ➢ Make a national inventory concerning possibilities for new energy sources<br>➢ Raise public awareness for the importance and the existence of new alternative energy sources<br>➢ Introduce market economy factors for the use of alternative resources<br>➢ Promote the use of alternative energy sources through subsidies<br>➢ Train personnel for the use of new energy resources<br>➢ Facilitate new technology uses in the production of alternative energy sources<br>➢ Assist population in using the alternative energy resources | ➢ Energy Sector reform (World Bank) | | ➢ National inventory of alternative energy sources possibilities<br>➢ National public information programs concerning the use of alternative energy resources<br>➢ The possibility of subsiding the use of alternative energy resources<br>➢ The use of alternative energy resources in a market economy |

## RESULT 1.4.: Institutional capacity and public involvement in the protection of water and land resources enhanced

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | Existing/on-going | Planned | Proposed |
| ➢ 1.4.1. Reinforce the application of appropriate legislation for the use of land and water resources | ➢ Enforce the legal framework using an information system and public education<br>➢ Complete the existing legal framework with laws regarding land and water resources ownership system<br>➢ Improve mechanisms for legal framework enforcement in the field of land and water resources<br>➢ Strengthen control bodies capacities<br>➢ Enforce existing penalty systems<br>➢ Facilitate the application of legislation through economic leverages | ➢ Biodiversity Strategy Development (World Bank)<br>➢ Development of Water Resources (World Bank, Japanese Government)<br>➢<br>➢ | | ➢ Accordance between environmental water and land use legislation<br>➢ Possibilities of improving the water and soil resource property system<br>➢ Legislation enforcement through strengthening control bodies<br>➢ Creation of economic leverage for legislation implementation |
| ➢ 1.4.2. Facilitate public participation through civil society development | ➢ Develop an information system for civil society and public education<br>➢ Inform the population about respect to civil society duties<br>➢ Encourage public participation in environmental protection<br>➢ Launch governmental training programs for land and water resource protection<br>➢ Expand environmental NGO network in rural areas<br>➢ Enhance legal framework on public participation | ➢ General Education Project (World Bank)<br>➢ Election Administration and Civic Education (USAID)<br>➢ Rule of law (USAID)<br>➢ | | ➢ Governmental public information programs<br>➢ Public involvement in water and soil protection<br>➢ National education system involvement in water and soil resources preservation |
| ➢ 1.4.3. Make funds available for the protection of water and land resources | ➢ Develop financial mechanisms<br>➢ Inform economic agents the existing mechanisms<br>➢ Introduce tariff systems in the field of land and water resource use<br>➢ Facilitate the application of cost-benefit criteria in project analysis<br>➢ Establish a bank for the assistance of environmental projects | | | ➢ Amending of the legal framework with economic and financial provisions<br>➢ Creation of economic stimuli for the use of clean technologies in the field of water and soil resources use<br>➢ Informing economic agents about existing mechanisms<br>➢ Improvement of tariffs and penalty policies in the field of water and soil use<br>➢ Creation of a bank for assistance to environmental projects |

## RESULT 2.1.: Adequate industrial and mining practices introduced

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 2.1.1. Introduce environmentally sustainable industrial practices | ➢ Introduction of technologies with reduced water and raw material consumption<br>➢ Rehabilitation of existing facilities for utilization and recycling of industrial wastes<br>➢ Introduction of new technologies for water treatment in closed circuits<br>➢ Reduction of the accidents risk<br>➢ Creation of database on modern technologies | ➢ Waste management within the framework of the Giurgiulesti Oil Terminal Project<br>➢ Waste disposal in the framework of Wine Export Promotion Project<br>➢ Alarm Emergency Warning System and Monitoring, Laboratory and Information Management for Ukrainian and Moldovan parts of the Danube Basin (TACIS)<br>➢ Development of energy conservation programmes at national and local levels | ➢ Rehabilitation and modernization of equipment at the canneries in the district centers of Ungheni, Glodeni, Nisporeni, Cantemir and Cahul | ➢ Appropriate waste management in wine processing<br>➢ Clean production demo project in the sugar sector |
| ➢ 2.1.2. Reduce waste from industrial activities | ➢ Application of advanced technology in industrial processes<br>➢ Improving the normative base for waste management<br>➢ Introduction of appropriate systems for monitoring and control<br>➢ Development of strategies and programs for the reduction and recycling of waste<br>➢ Use of solid waste in construction material production<br>➢ Installation of nutrient removal units at local industrial treatment facilities, where necessary<br>➢ Implementation of biological methods of wastewater treatment at industrial enterprises | ➢ Environmental Education Program (NGOs)<br>➢ Creation of National Register of Toxic Wastes<br>➢ Toxic wastes incineration in cement kilns<br>➢ New technologies for treatment of waste and wastewater containing heavy metals | ➢ Installation of new equipment at the Ungheni biochemical plant | |
| ➢ 2.1.3. Optimize mining practices | ➢ Precise assessment of mining resources and delimitation of mining areas<br>➢ Introduction of modern mining practices and equipment<br>➢ Rehabilitation of damaged land<br>➢ Control of application of mining regulation and methods<br>➢ Introduction and keeping of a mining register | ➢ Gas extraction in the south of Moldova<br>➢ Petrol Extraction in Valeni | ➢ Use of by-products in mining activities<br>➢ Extraction of sand and gravel in the vicinity of Bolotino village, Glodeni district | |
| ➢ 2.1.4. Introduce training for application of modern technologies | ➢ Development and implementation of training programs<br>➢ The development of a technical and material base for training<br>➢ Information availability on industrial technologies used in advanced countries<br>➢ Facilitation of access to relevant information | ➢ Laboratory Training Program within framework of the Giurgiulesti Oil Terminal Project | ➢ Rehabilitation project for food processing plant in Ciadir-Lunga and Comrat<br>➢ Modernization of Ungheni railway facilities and waste treatment process | ➢ Rehabilitation of wastewater facilities in industrial enterprises |

## RESULT 2.2.: Appropriate management of transportation and harbor facilities applied

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 2.2.1. Ensure appropriate transport practices | ➢ Enforcement of emission controls<br>➢ Use of environmentally friendly fuels<br>➢ Control import of used vehicles<br>➢ Control of the traffic in protected areas | ➢ Development of basic infrastructure at the Giurgiulesti Oil Terminal<br>➢ Improvement of traffic flows in Trans-European Network corridors II and IX | ➢ Enlargement of protected areas and strengthening the control of their status | |
| ➢ 2.2.2. Ensure adequate pollution control in harbor and storage facilities | ➢ Supervision of the functioning of the Giurgiulesti Oil Terminal to prevent Danube pollution<br>➢ Modernization of storage facilities for oil products and chemicals | ➢ Environmental quality control within framework of the Giurgiulesti Oil Terminal Project | ➢ Appropriate management of solid and liquid waste in the framework of the Giurgiulesti Oil Terminal Project | ➢ Utilization of toxic industrial wastes |
| ➢ 2.2.3. Improve the state of the road network | ➢ Use new technologies and quality materials in road construction<br>➢ Rehabilitation of road protection means<br>➢ Organization of road maintenance services<br>➢ Implementation of adequate institutional road management mechanisms | ➢ Railway in Giurgiulesti<br>➢ Transportation vehicles (Giurgiulesti Oil terminal)<br>➢ Road Gurjiulest-Kishinev<br>➢ Southern area road rehabilitation<br>➢ Electrification of railway Bender-Ungheni<br>➢ Construction of railway Giurgiulesti -Cahul | ➢ Local projects for reconstruction and repairing of roads | |

## RESULT 2.3.: General framework for industrial development improved

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 2.3.1.Develop optimal investment conditions | ➢ Modernization of the revenue systems (taxes)<br>➢ Development of projects attractive to investors in the frame of the Pollution Reduction Program<br>➢ Creation of free economic zones<br>➢ Development of infrastructure for attracting investments<br>➢ Cooperation with international financing institutions | ➢ Small GEF Grants within the Environmental Programme for the Danube River Basin<br>➢ Creation of a free economic zone Ungheni-Chisinau<br>➢ Energy supply and distribution | | ➢ Creation of the free economic zone Giurgiulesti-Galati-Reni-Cahul |
| ➢ 2.3.2. Facilitate the implementation of modern management practice | ➢ Development of new programs for management improvements<br>➢ Implementation of modern communication systems<br>➢ Development of human resources<br>➢ Providing jobs with modern management facilities | ➢ Widened environmental action programme<br>➢ Regional seas programme<br>➢ Public Participation and Awareness | ➢ Prut River Water Management | ➢ Supply of laboratories with modern equipment for water quality control<br>➢ Integrated water management of the Costesti-Stanca reservoir on the Prut river |
| ➢ 2.3.3. Develop adequate legal and institutional framework | ➢ Development of investment protection legislation<br>➢ Reinforcement of privatization processes<br>➢ Introduction of industrial technology centers for international cooperation<br>➢ Development of environmental impact assessment studies<br>➢ Environmental legislation enforcement control<br>➢ Financial discipline controls | ➢ Environmental legislation<br>➢ Development of common NIS environmental policies | | ➢ Strengthening of institutional and management capacities in the industrial sector |

## RESULT 3.1.: Pollution from wastewater reduced

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 3.1.1. Undertake measures for the efficient functioning of the wastewater treatment plants | ➢ Ensure permanent electricity supply<br>➢ Implement new advanced technologies<br>➢ Finalize the construction of unfinished purification station<br>➢ Build and correctly operate local WWT facilities at the enterprises<br>➢ Dehydrated sludge and ensure efficient use and disposal<br>➢ Respect treatment rules<br>➢ Train personnel<br>➢ Maintain in a good state and correctly operate the equipment of existing WWTPs<br>➢ Introduce automated control system | ➢ Modernization of wastewater treatment plant in Nisporeni<br>➢ Completing construction of sewage water treatment plant in Falesti<br>➢ Prut River basin water management (TACIS) | ➢ Construction of a sewage water treatment plant in Cantemir | ➢ Construction of sewage water treatments plants in rural areas (one plant may render services to a number of villagers<br>➢ Modernization of sewage water treatments plants in Ungheni, Leova, Cahul, Ceadir-Lunga, Comrat, Vulcanesti, Taraclia<br>➢ Modernization of sewage water treatment plants at enterprises: Ungheni Carpet Plant, Ungheni Biochemical Plant, warehouse at Ungheni railway<br>➢ Implementation of modern technologies for use of mud, including production of biogas<br>➢ Modernization of sewage systems and systems for disposal of by products from wineries |
| ➢ 3.1.2. Rehabilitate and extend existing sewage systems | ➢ Design and construct new sewage systems<br>➢ Modernize sewage network and equipment<br>➢ Use anti-corrosion materials<br>➢ Keep sewage wells in a good state of repair<br>➢ Correctly operate and maintain the pumping equipment<br>➢ Exploit adequately the networks in the basement of blocks of flats residential blocks<br>➢ Introduce automated control system | | ➢ Rehabilitation of drainage system in Comrat, Cahul | ➢ Rehabilitation of sewage system in Falesti, Ungheni, Leova, Cantemir, Nisporeni<br>➢ Pilot project on sewage systems in rural area |
| ➢ 3.1.3. Protect water resources and optimize water supply systems | ➢ Define, delimitate and protect water intake area<br>➢ Build water supply system in rural areas<br>➢ Introduce and use dual water supply system<br>➢ Use insulated and plastic pipes<br>➢ Detect and repair leaks<br>➢ Introduce automated control systems<br>➢ Apply tariffs that reflected the real cost of water supply<br>➢ Install water meters | ➢ Construction of a collective water supply network in the districts Riscani, Falesti, Nisporeni<br>➢ Development of unique tariffs for all categories of consumers | ➢ Construction of centralized water supply systems in Ungheni, Glodeni, Leova, Cantemir, Cahul, Vulcanesti, Comrat, Taraclia and Leadir Lunga<br>➢ Construction of a plant producing individual and collective filters for use in case of inadequate drinking water<br>➢ Local groundwater resources and their adequate utilization for water supply in rural areas | ➢ Development of a Regulation regarding the operation of water supply systems and sewage systems in apartment house<br>➢ Construction of a bottling plant for high quality drinking water for large consumption<br>➢ Pilot project regarding the use of a dual water supply double system<br>➢ Construction of a water supply network in Hincesti |

## RESULT 3.2.: Appropriate solid waste management applied

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 3.2.1.Introdce appropriate individual household practices | ➢ Optimize the livestock number in human settlements<br>➢ Close down unauthorized land fills<br>➢ Disseminate information on the correct organization of individual farms<br>➢ Ensure incentives for the proper observance of ecological law by the population<br>➢ Use manure for practical purposes (fertilizers, energy production) | | | ➢ Development of a regulation stipulating measures for the close down of dumping sites and appropriate waste handling in settlements<br>➢ Development of the code of good household practices |
| ➢ 3.2.2.Improve methods of solid waste disposal and handling | ➢ Identify and assess new areas for landfills<br>➢ Introduce separate waste collection and disposal<br>➢ Implement advanced technologies for waste disposal and utilization<br>➢ Familiarize the users with new technologies<br>➢ Ensure proper arrangement and appropriate management of landfills<br>➢ Increase the efficiency of control over waste disposal and handling | | ➢ Development of Master Plan and feasibility study on solid waste management in Moldova | ➢ Setting up a system foreseeing marketing of new technologies<br>➢ Pilot project foreseeing the separate collection of household solid wastes |
| ➢ 3.2.3. Undertake measures for the proper use and storage of chemicals in human settlements | ➢ Draft regulations on use of chemicals for plant protection in communities<br>➢ Develop and information system for the population regarding use of chemicals and fertilizers<br>➢ Familiarize the population with harmful consequences of inappropriate use of chemicals<br>➢ Ensure control over distribution and use of chemicals | | ➢ Complex Program of toxic wastes management in the Prut River basin. | ➢ Development of regulations and setting up a control system regarding the use of chemicals in settlements<br>➢ Setting up an information system disseminating knowledge among the population on the use of chemicals and mineral fertilizers<br>➢ Development of a centralized system for the distribution of chemicals |

## RESULT 3.3.: General framework conditions for correct environmental management in communities improved

| Main Activities | Important Elements | Projects | | |
|---|---|---|---|---|
| | | **Existing/On-going** | **Planned** | **Proposed** |
| ➢ 3.3.1.Promote correct territorial planning and construction | ➢ Develop and implement Master Plans for urbanization<br>➢ Create Geographic Information System<br>➢ Introduce integrated water management principles<br>➢ Monitor and assess exogenic processes within human settlements<br>➢ Ensure information exchange on the state of environment among upstream and downstream localities<br>➢ Apply remote control methods for modeling and prognosis of the state of environment in localities | ➢ Construction of petrol and gas supply stations in conformity to developed projects (Cahul) | ➢ Prut River tributaries – TACIS CBC'98 (proposed) appraisal phase<br>➢ Protection of settlements against overflooding | ➢ Development of a geo-informational system for settlements<br>➢ Ensure exchange of information among regional services in the basin<br>➢ Design of projects, displacement schemes for petrol and gas stations in Ungheni, Falesti, Leova, Nisporeni, Cantemir, Briceni, Edinet, Glodeni<br>➢ Updating and development of new planning and development projects<br>➢ Development of a national plan on corrosive protection of sewage pipes, operation of system, etc |
| ➢ 3.3.2. Undertake measures to improve the social and economic framework | ➢ Introduce economic incentives for the national use of natural resources<br>➢ Attract foreign investments and donations<br>➢ Provide tax reductions for interpreting investments into environmental protection facilities<br>➢ Strengthen national and local environmental funds<br>➢ Encourage private sector to deliver municipal services | ➢ Development of a mechanism facilitating the operation of local ecological funds | | ➢ Training in ecological management for local officials<br>➢ Development of a restructuring program for enterprises delivering services (creation of joint stock companies, privatization)<br>➢ Development of measures to ensure a favorable environment for the operation of private enterprises delivering services in this area<br>➢ Setting up a legal framework encouraging capital investments in environmental protection facilities |
| ➢ 3.3.3Raise environmental awareness | ➢ Implement a program of information concerning environmental legislation<br>➢ Ensure broader involvement of local authorities of environmental management<br>➢ Achieve environmental awareness of decision making factors<br>➢ Support the development of environmental mass media<br>➢ Encourage activities of non-governmental organizations<br>➢ Develop teaching manuals on environmental issues<br>➢ Improve the content and way of lecture delivery process on environmental issues in higher education institution | | | ➢ Development of a set of manuals and teaching materials on the protection of the environment for the use in higher education<br>➢ Setting up central and regional training and information centers for environmental issues |
| ➢ 3.3.4. Ensure the enforcement of environmental legislation | ➢ Harmonize the general legal framework with the update environmental legislation<br>➢ Establish in collaboration with all institutions concerned a control instance for control of the quality of environment<br>➢ Harmonize the national environmental legislation with international one<br>➢ Supply the control bodies with necessary equipment<br>➢ Ensure advanced training of control bodies personnel | | | ➢ Harmonization of existent standards and norms with the international ones (drinking water quality, discharged waters)<br>➢ Updating of civil, penal Codes of sector legislation in line with environment Low<br>➢ Supply of control systems with materials for modern express experiments and adequate automatic equipment<br>➢ Development of a program stipulating creation of a unique body for the environmental quality control<br>➢ Development of standardization program of methodologies and equipment for the environmental quality control |

# Annex 7. Workshop Organization

## 7.1. Agenda of the Workshop

## 7.2. List of Participants

## 7.3. Evaluation of the Workshop

# Danube Pollution Reduction Program
# National Planning Workshop
# July 27-30, 1998, Kishinev

## Agenda

### Monday

| | | |
|---|---|---|
| 9.00-11.00 | **Opening of the workshop** | Plenary |
| | ➢ Introduction | |
| | ➢ Opening Speech | |
| | ➢ Program/Planning Process | Mr. Bendow |
| | ➢ Presentation of Work Program | Facilitators |
| | ➢ Methodological Approach of TOPP | |
| *11.00-11.30* | *Coffee break* | |
| 11.30-13.00 | **Presentation and discussion of River Basin Areas** | Plenary |
| | River Basin Approach in Moldova | |
| | ➢ Physical Aspects | |
| | ➢ Demography | |
| | ➢ Transboundary Effects as perceived | |
| | ➢ Human Activities/Economy | |
| *13.00-14.00* | *Lunch break* | |
| 14.00-16.00 | **Situation Analysis** | Plenary |
| | ➢ *Methodology:* Actions leading to Pollution will be proposed for each sector by the Facilitators | |
| | ➢ Exercise in applying the method. Formation of Working Groups (by sector) | Group Work |
| *16.00-16.30* | *Coffee break* | |
| 16.30-18.00 | **Presentation of Situation Analysis** | Plenary |

**Workshop Organization** **Annex 7.1.**

## Tuesday

| | | |
|---|---|---|
| 9.00-11.00 | **Problem Analysis**<br>➢ Methodology | Plenary |
| | ➢ Exercise in applying the method | Group Work |
| *11.00-11.30* | *Coffee break* | |
| 11.30-13.00 | **Problem Analysis (continued)** | Group Work |
| 13.00-14.00 | *Lunch break* | |
| 14.00-16.00 | **Presentation of Problem Analysis (Problem Tree)**<br>**Objective Analysis**<br>➢ Methodology<br>➢ Exercise in applying the method | Plenary |
| *16.00-16.30* | *Coffee break* | |
| 16.30-18.30 | **Objective Analysis** | Group Work |
| | **Presentation of Objective Analysis (Objective Tree)** | Plenary |

## Wednesday

| | | |
|---|---|---|
| 9.00 -11.00 | **Planning Matrix**<br>a) Methodology | Plenary |
| | 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 | Group Work |
| *11.00-11.30* | *Coffee break* | |
| 11.30-13.00 | **Definition of Activities in relation to Results/Outputs** | Group Work |
| *13.00-14.00* | *Lunch break* | |
| 14.00-16.00 | **Activities, Important Elements and Projects**<br>➢ Methodology | Plenary |
| | ➢ Exercise in applying the method | Group Work |
| *16.00-16.30* | *Coffee break* | |
| 16.30-18.30 | ➢ Definition of Important Elements | Group Work |
| | ➢ Identification of Existing/Ongoing, planned (in Preparation) and Proposed Projects in Relation to Activities and Important Elements | |

## Thursday

| | | |
|---|---|---|
| 9.00 –11.00 | **Important Assumptions**<br>➢ Methodology<br>➢ Exercise applying the method (Definition of Important Assumptions for Activities)<br>**Impact Indicators**<br>➢ Methodology<br>➢ Exercise applying the method (Determination of Impact Indicators for Sector Objectives)<br>**Definition of Important Assumptions for Results/Outputs**<br>**Determination of Impact Indicators for Results/Outputs** | Plenary<br><br><br><br><br><br><br><br>Group Work |
| *11.00-11.30* | *Coffee break* | |
| 11.30-13.00 | **Presentation of Activities, Important Elements and Projects** | Plenary |
| *13.00-14.00* | *Lunch break* | |
| 14.00-16.00 | **Presentation of Sector Planning Matrix**<br>**Presentation of Program Planning Matrix** | Plenary |
| *16.00-16.30* | *Coffee break* | |
| 16.30-18.00 | **Evaluation of the Workshop**<br>**Closing of the Workshop** | Plenary |

# National Planning Workshop in Moldova
# 27–30 July 1998

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**Workshop Organization** **Evaluation of the workshop** **Annex 7.3**

| Organization | Method | Results |
|---|---|---|
| ➢ Perfect<br>➢ Excellent organization but in rush<br>➢ Organization was good<br>➢ Perfect<br>➢ Good<br>➢ Good but too intensive<br>➢ A very good form of combination of interactivity and practice<br>➢ Excellent organization<br>➢ Excellent organization and promotion of the seminar<br>➢ Organization was on a good level. It would be nice to prolong the duration of the seminar, and also to provide the participants with the materials of the seminar<br>➢ Choose a cooler season for undertaking the seminar<br>➢ Sufficiently good, especially taking into account the budget spent for this seminar<br>➢ Include also tea in the coffee breaks<br>➢ Good<br>➢ Good work of the sector's facilitators<br>➢ Excellent organization<br>➢ Well planned a fact which permitted the full realization of the goal of the seminar<br>➢ Organization was on a high level<br>➢ Excellent. Thank you<br>➢ Prolong the duration of the seminar<br>➢ Good organization requires more cold water<br>➢ Good<br>➢ Perfect<br>➢ Qualitative<br>➢ On a high level<br>➢ Active work of Mr. Max increased the effectiveness of the work | ➢ Not ordinary, but positive<br>➢ Original<br>➢ Working method<br>➢ It purchases by rapidity, coherency and results<br>➢ The method is efficient and useful<br>➢ Relatively accessible but "heavy"<br>➢ It deserves to be examined in more detail<br>➢ Excellent method<br>➢ The method is effective and innovative and I shall use it in my practice while preparing projects<br>➢ It is very useful not only from the point of view of<br>➢ highlighting the planning technologies and strategies, but also trains the collective ration<br>➢ Very well determined<br>➢ A too sophisticated method<br>➢ Although the method is of a high intensity, however, it permitted to obtain great effects<br>➢ Complete and very good<br>➢ Good method<br>➢ Not ordinary and positive<br>➢ Original (new) method<br>➢ Worthy to be taken as an example<br>➢ Logical and comprehensive approach<br>➢ Not ordinary and positive<br>➢ Satisfactory method<br>➢ Modern method<br>➢ Useful method<br>➢ Good<br>➢ The method is worth attention | ➢ The results are on the expected level<br>➢ Results do not correspond with the complexity of the method and with the effort made<br>➢ We will better see them in the final documents of the seminar<br>➢ They are good and we hope they will be implemented<br>➢ Results exceeded all my expectations and will serve as a well argumented basis for the projects<br>➢ Good<br>➢ Potentially good<br>➢ I would like to suggest to distribute the materials of the seminar to all the participants<br>➢ Good results<br>➢ Acceptable<br>➢ Acceptable<br>➢ Satisfactory<br>➢ Results for local level projects<br>➢ Positive<br>➢ Good and useful<br>➢ Good results in short term<br>➢ Satisfactory<br>➢ Help in understanding the problems<br>➢ The results are positive, and their significance is underlined by the short terms of achievement |