DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP
CZECH REPUBLIC

Brno, September 2-5, 1998

MINISTRY OF ENVIRONMENT

in cooperation with the

Programme Coordination Unit
UNDP/GEF Assistance

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Preface

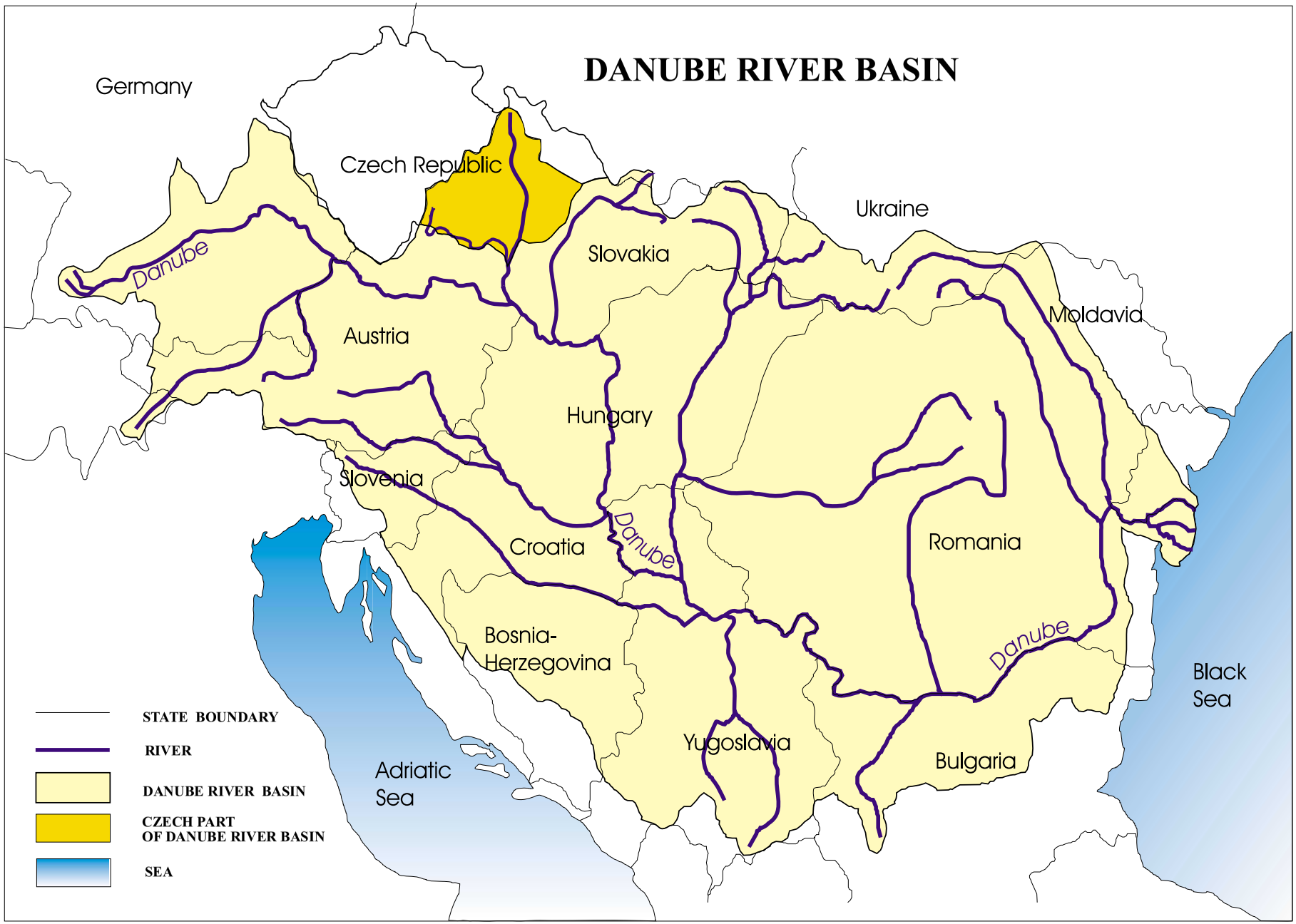
The present report is based on the results of the National Planning Workshop, held in Brno, the Czech Republic from 2 to 5 September 1998. The main goal of the workshop and its report is to provide a comprehensive presentation of analysis concerning problems and solutions for reduction, as well as control 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 Morava River Basin Administration - Brno, the Country Project Coordinator Mr. Milan Bedrich and the facilitators Mrs. Jana Drapalova and Mr. Radek Boucny.

National Planning Workshop has been held under participation of sector ministries, central and local administration, private sector, professional associations, Universities, research institutes and NGOs. This report presents the results of the National Planning Workshop discussions and outputs. The list of participants is attached to this report in Annex.

The present report was prepared by the facilitators, CPC and the experts, in particular Mr. Ladislav Pavlovsky (Agriculture), Mr. Antonin Vaishar (Industry), Mrs. Doubravka Nedvedova and Mr. Ondrej Dusek (Municipality).

A team of international experts from UNDP/GEF, Maxime Belot, Marcela Fabianova and Ulrike Meissner gave assistance, support 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
Moldavid
Hungary
Slovenia
Croatia
Danube
Romania
Bosnia-
Herzegovina
Danube
Black
Sea
Yugoslavia
Bulgaria
Adriatic
Sea
STATE BOUNDARY
RIVER
DANUBE RIVER BASIN
CZECH PART
OF DANUBE RIVER BASIN
SEA

...plenary and group sessions
in Brno workshop

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Executive Summary

In the frame of the Environmental Danube Programme of the ICPDR and with the assistance of UNDP/GEF, a team of Czech 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 Brno, the Czech Republic, from 2 to 5 September 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 Czech Republic's territory consists of three main European river basins. The largest part of the country appertains to the Elbe River Basin (65 %), which is drained to the North Sea, the Odra River drains 7 % of the country area into the Baltic Sea and the Morava River, which is the left hand tributary to the Danube, drains 27 % of the Czech territory into the Black Sea. The geographical position of the country, together with its climatological, morphological and geological conditions make atmospheric precipitation the only source of water. The Danube River itself does not traverse the territory of the Czech Republic.

Between 1948 and 1989, when the economy of the country was subject to directed central planning, the interests of the economic sector and gradually also of the population in environmental protection were suppressed. Emphasis on and preference for maximum production led to disproportionate exhausting of all kinds of natural resources. The soil functions were degraded just to the means of production. Increased use of chemicals in agriculture led also to increased contents of heavy metals and toxic organic substances in soils, resulting in contamination of surface and ground waters. Erosion of soils increased. The subsidy polices of the state were poorly planned and led to a complete deformation of natural value relations, resulting in enormous wasting of energy, raw materials and water. The negative consequences of central planning were equally detrimental to the economy and the environment.

The new political orientation of the country after 1990 has led to significant changes. Transformation of the economy, which has brought about a gradual renewal of value relationships, has had favorable consequences for the impact on the environment. A decrease in production has decreased high pollution loads. A decrease in the intensity of agricultural production together with a considerable increase in the costs of agrochemicals have greatly decreased the polluting of surface and ground waters. The cut-back in economic activities has provided an opportune capacity for carrying out new environmentally oriented strategy focused at introduction of efforts to protect air, water, soil, forests and landscape.

Water quality in most of the water bodies within the Morava River Basin is unsatisfactory in many ways. A permanently unfavorable state is showed by the oxygen regime indices, by the biological and microbiological indices of the basic chemical composition, out of which the indices characterizing nutrient contents are decisive. Together with other effects, the high nutrient content leads to eutrophication of water bodies, producing serious sanitary problems and hindering water treatibility. In the last four years the concentrations of total inorganic nitrogen fluctuated in the sampling sites between 1.4 - 12.2 $mg.l^{-1}$. Little lower maximum concentrations assessed in the Morava River itself (above 7 $mg.l^{-1}$) reflect certain improvement in this water quality parameter in its downstream parts. In 1994-1997 concentrations of total phosphorus were within the range of

0.06 - 1.52 mg.l^{-1}. In major part of sampling sites the average value came up 0.3 to 0.5 mg.l^{-1}, while the permissible immission value in surface waters according to the Czech Governmental Regulation is 0.4 mg.l^{-1}. In the last several years with enlarged spectrum of monitored chemicals a problem of notable high concentrations of PCBs in the surface waters appeared. PCBs originate in the old loads of the environment from PCBs containing products. Even now after their prohibition their leaching into water cannot be excluded. As the PCBs are measured only since 1991, any trends of concentrations can not be given. As the most dangerous for human and aquatic life out of group of heavy metals high mercury concentrations have been assessed in the Morava River and its tributaries. It is not possible to assess the long-term trends in this parameter because the monitoring of heavy metals started at the beginning of nineties.

As to the environmental quality the region of the Morava River Basin belongs among the least problematic areas in the Czech Republic. The only region in this basin with strongly disturbed environment of national importance is a part of Brno town laying in the Svitava River subcatchment, where the old industry is concentrated. As a continuous area with disturbed environment is also indicated the middle and downstream part of the Morava River valley (between the towns Olomouc and Hodonín) with combination of the influences of nearly continuous settlement, industry and intensive agriculture. On the other hand there are many areas with little disturbed environment which are mostly protected by declaring them as National Parks, protected Landscape Areas or Wetlands.

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, forestry, land and water management activities, industry and mining/quarrying activities and the municipal sector. Based on the sector analysis, the core problem of ***"Human activities in the Morava River Basin leading to decrease of environmental quality with negative transboundary effects"*** was identified. Direct causes of the core problem were described as "ecologically unsound agriculture, forestry land and water management", for the agricultural sector; "degradation of aquatic ecosystems and water quality due to pollution from industry and mining/quarrying" for the industry sector and "pollution from municipalities" for the municipal sector.

A number of effects of activities leading to decrease of environmental quality in the Morava River Basin with negative transboundary effects were identified, including negative impact on hydrological regime with consequent soil erosion, water pollution by nutrients with consequent excessive eutrophication, water pollution by harmful hazardous substances (chemical, organic and heavy metals).

Joint consequence of these effects is degradation of surface and ground water quality and water ecosystems. Effect of this is that water costs increase, water is unsuitable for recreation and health risks may occur, and furthermore biodiversity is decreased.

Considering the result of the problem analysis, the program objective was defined as ***"Significant improvement of environmental quality in the Morava River Basin with positive transboundary effects"***, which will contribute to the overall goal of the UNDP/GEF Danube Pollution Reduction Programme: ***" Sustainable development in the DRB Achieved "***.

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

In the sector **Agriculture, Forestry and Land Management** as the main causes of ecologically unsound agriculture, forestry and land management the improper agriculture, negative impacts of forestry on environment and inadequate management of land and water resources have been identified.

In order to achieve ecologically friendly agriculture, forestry, land and water management, it is required to:

- *apply ecologically friendly agriculture* through undertaking measures for suitable exploitation of land, introduction of appropriate agrotechnical practices, facilitating favorable framework condition for agriculture, ensuring appropriate livestock farming and implementation of appropriate fishery and water poultry farming.
- *eliminate negative impacts of forestry activities on environment* through introduction of efficient forest management, supporting suitable manner of wood exploitation management and improvement of ecological stability by adequate growth structure.
- *ensure adequate management of land and water resources* through proper managing river training and structures, undertaking measures for facilitating appropriate use of water resources and ensuring environmentally sustainable management of land-use activities.

In the sector **Industry and Mining**, the negative impact of industry on environment, inappropriate industrial waste management and negative environmental consequences of mining activities, have been identified as the main causes of degradation of aquatic ecosystems and water quality due to pollution from industry and mining/quarrying.

In order to achieve significant reduction of pollution generated from industry and mining/quarrying activities, three expected results were defined. It is necessary to:

- *adopt best available practices in industrial activities* through implementation of best available technologies , undertaking measures for applying adequate social control instruments and mechanisms and ensuring suitable wastewater treatment.
- *implement appropriate waste management* through remedy of old dumpsites, making available appropriate storage facilities for industrial waste and minimizing industrial waste production.
- *apply environmentally friendly practices in mining/quarrying* through remedy of abandoned mines, implementation of sustainable mining and quarrying and monitoring and evaluation of mining and quarrying activities.

In the **Municipality** sector the main causes of pollution from municipalities are inadequate solid waste disposal, weaknesses in municipal waste management and pollution from urban traffic.

In order to achieve significant reduction of pollution generated from municipal activities, three results were expected. It is required to:

- *implement efficient wastewater management* through maximizing treatment of wastewaters, promotion of proper behavior of inhabitants and facilitating in situ pre-treatment of industrial wastewater.
- *manage adequately solid waste disposal* through providing proper manipulation for municipal solid waste, promotion of proper behavior of inhabitants and improvement the sanitary conditions of old dumpsites.
- *highly reduce pollution from urban traffic* through undertaking measures for facilitation environmentally friendly car traffic and elimination of risk of oil products leakage from railway stations.

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

In the **Agriculture, Forestry and Land Management sector**:

- Rehabilitation of important trained watercourses. Should be conceived complexly according to holistic and integrated approaches.
- Definition of obligatory agrotechnical and organizational measures for soil erosion reduction
- Minimization of output of harmful substances from animal husbandry farms (excrements, pharmaceutical substances, operation)
- Introduction of natural regeneration of forests
- Remedial Measures and Reduction of Slurry Production in the Large-capacity Pig Farm Dubnany

In the **Industry and Mining sector**:

- Remedying Measures in Area of Company "Fosfa Poštorná" (among existing projects)
- Intensification of Wastewater Treatment Plant Koželužny Otrokovice (among planned projects)

In the **Municipality sector**:

- Reconstruction of Brno municipal WWTP
- Zlín WWTP – extension and intensification
- Uherské Hradiště WWTP – reconstruction of the technology
- Hodonín WWTP – reconstruction, intensification and extension

1. Introduction

1.1. Background

This report refers to a four-days Czech Planning National Workshop organized in Brno/Czech Republic at the Morava River Basin Administration-"Povodí Moravy, a.s." from 2. to 5. September 1998. The workshop has been organized in the framework of the UNDP/GEF sponsored Danube River Basin Pollution Reduction Programme. This programme continues the work of the first phase of the Danube Environmental Programme (1992-1996) which was concentrated on building regional cooperation for water management, evaluating and defining problems, implementing a basin-wide water quality monitoring strategy and establishing a warning system for accidental pollution.

A major output of the first phase was the Strategic Action Plan (SAP) which provides direction and framework for achieving the goals of regional integrated water management expressed in the Danube River Protection Convention signed by eleven Danubian countries in 1994.

The later presented the Black Sea Transboundary Diagnostics Water Analysis showed that the Danube River Basin is the largest pollution contributor to the Black Sea. About 80% of the nutrients received in the north-western part of the Black Sea come from the Danube River and these loads have resulted in the occurrence of severe eutrophication problems between 1980 –90.

Pollution reduction targets and programs therefore require to be established in order to reverse the degradation of the Black Sea environment, in accordance with the goals of the Danube SAP. The Danube River Protection Convention also foresees the need to develop joint action programmes aimed at the reduction of pollution loads both from industrial and municipal point sources as well as from non-point sources (Article 8).

On the basis of present knowledge, it is expected that the pollution reduction targets needed to protect the Danube River and the Black Sea ecosystem will require significant efforts from all Danubian countries, and will involve levels of investment significantly in excess of what is required to safeguard national interests. The GEF / Danube River Basin Pollution Reduction Programme which is fully consistent with the GEF / Operational Strategy for International Waters would contribute to the elaborating of a strategic framework for a large programme of investment in the basin during the implementation period, particularly in municipal waste management and it will also lay the foundation for a longer programme of investments in the basin.

One of the Pollution Reduction Programme goals is the reinforcement of National Planning Activities. Therefore, it was firstly necessary to update and elaborate National Reviews as a basis for updating of the Strategic Action Plan. In the frame of revising / preparing of National Reviews a team of Czech experts under support and assistance of UNDP/GEF has elaborated National Reviews analyzing the socio-economic impact of water pollution, the present stage of water quality, the situation in the water environmental engineering and the conditions of financing mechanisms. The content of this National Review was presented and amended during the four days.

The Czech Republic is greatly interested in solving environmental problems including the water quality improvement in the Danube River Basin. Already at the beginning of the 1990s,the Ministry of Environment was looking for a new concept - how to define the best approach to protecting the aquatic environment. It was the feeling that the modern conception of water protection should be based around the river basins. The Czech Republic's territory consists of three river- basins: the Elbe, the Morava (which is the part of the Danube River basin) and the Odra River Basin.

Only twenty-seven per cent of the whole territory belongs to the Danube River Basin and the Czech Republic is one of the Danubian countries lacking direct contact with the Danube. Nevertheless the Czech government ratified The Danube River Protection Convention already in March 1995 as the

second of all Danubian countries. The Czech Republic has signed two other agreements prepared on the same principle for the other two catchment areas. At present the Czech Republic answers to three water protection conventions based on the river-basin principle.

In order to provide for water protection goals within the country and to ensure active international cooperation, three complex projects have been under way since 1991, related to the three main river basins (Elbe, Morava, Odra).

Although a relatively short period of time has passed since the new approach of river basin protection was adopted, significant results have been achieved. Price instruments with new legislation are consistently implemented, and the financial assistance from the state budget and the State Environmental Fund are provided for special purposes. This has resulted in a documented decrease in water pollution.

In order to provide for water protection goals within the country and to ensure active international cooperation, three complex projects have been under way since 1991, related to the three main river basins (Elbe, Morava, Odra).

The Morava River Basin itself has an area of 21,145 square kilometers (26.8 % of the total area of Czech Republic), and the population of 2.78 (26.9 of the population of the Czech Republic). The length of watercourses, which are of importance from the point of view of water management is 3,747 km, the length of other watercourses is 30,000 km. The territory of the Morava River Basin corresponds to 3.25 % of the area of Danube River Basin, but contributes only 1.93 % to its average water flow. Only 1.158 m3 of mean annual discharge corresponds to each inhabitant of the Morava River Basin, which is only 46 % of the average value for the Danube River Basin.

The Morava River Basin is characterized by a great biodiversity since it crosses three biographical zones of central Europe. The ecosystems of almost all vegetation zones of central Europe can be found in altitudes between 148 and 1,491m about sea level. Eight large protected areas have been declared in the basin.

In the Morava River Basin, about 80% of the population are supplied with water from public water supply systems. In 1995, the abstraction of water dropped to 71% of the 1990 figure. The specific water demand of the population supplied from public water systems is 248 l per capita and day, the actual water consumption of the population is estimated to be 98 l per capita and day. About 71% of inhabitants are connected to sewerage systems. The amount of discharge wastewater dropped to 72% of the 1990 figure in 1995. The pollution from other point sources has also dropped significantly. At the present time, the main environmental problems include the negative impacts of large agglomerations of settlement and industries, the adverse impacts of large-scale agricultural production and the negative impacts of rapid development of car traffic.

1.2. Methodological approach

The organization of the National Planning Workshop in the Czech Republic 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

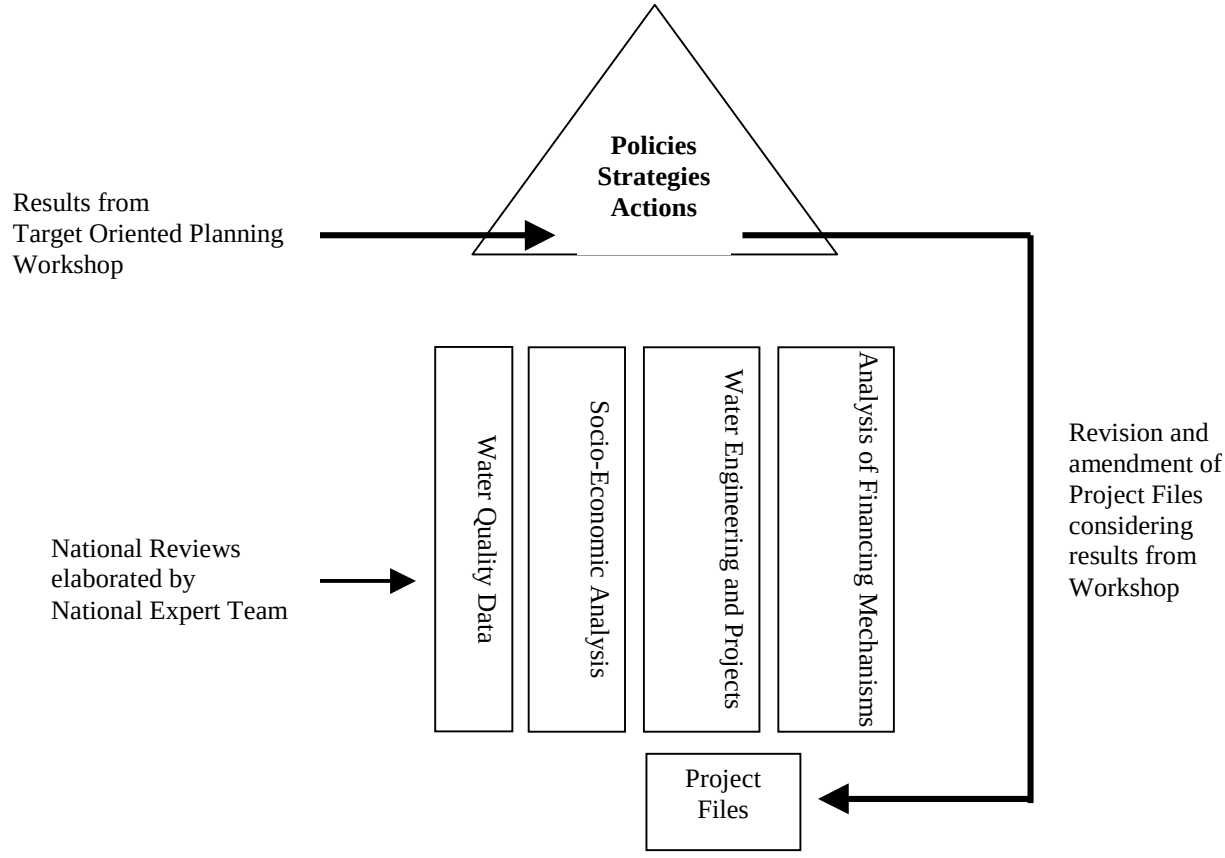
the baseline information for participants of the National Planning Workshop. Moreover, they constitute the national contribution, in technical, economic and financial terms, for the elaboration of the Danube Pollution Reduction Programme with particular attention to transboundary issues and the development 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 Brno from 5 to 6 May 1998. At this occasion, the representatives of eleven 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 using 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: Soil Management (Agriculture), Industry and Municipality. 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 judgements of the participants. The collective effort of decision-makers, planners, implementing agents, and beneficiaries is likely to lead to better results than unilateral decision making. The method builds on group interaction aimed at consensus building; it promotes communication and collaboration between participants in all stages of analysis;
- **Visualization of results** in form of colored cards, which are integrated into formal structures, presenting the various aspects of group discussion so that each stage of the analysis is clearly visible to all participants. Cards also serve as the basis for the documentation of the deliberations and the preparation of the final report;
- **Elaboration of Workshop Report,** presenting in written form the results of the workshop and strictly the charts and planning tables elaborated in consensus by the participants and taking into account the arguments and reasons developed during the discussions.

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

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

2. General Frame of Analysis

2.1. Description of the Morava River Basin Area Considering Physical, Demographic and Economic Situations

The Morava River Basin represents the part of the Danube River Basin within the territory of the Czech Republic. It is a natural spatial unit situated at the crossing point of the Bohemian Highlands, the Carpathians and the Pannonian Province. The Morava River, the Dyje River - its dextral tributary and the Becva River - its sinistral tributary, are the major watercourses of the Morava River Basin.

The Morava River Basin covers 21,145 sq. km (about 27 % area of the Czech Republic) with a population of 2,78 mil. (27 % of total population of the country). The basin can be identified with almost all part of the historical region of Moravia. Important transport communications connecting northern and southern Europe are directed through valleys of the Morava River and its tributaries. It is no fortuity that the first historical Czech State and the cradle of its culture - Great Moravia Empire - was found in this region. After the split of Czechoslovakia, meridian connections renewed their importance.

Not negligible part of the Czech economy is concentrated in the Morava River Basin. On the other side, environmentally and also structurally most problematic industrial agglomerations of the country are in other river basins. Less disturbed environment is one of the consequences of the fact. Most stable population (from the viewpoints of migrations), relatively high level of social control and relatively homogenous ethnic and religious structure are another ones. Within the transition, industrial production in many enterprises has decreased. Some enterprises implemented foreign technologies (within foreign investments). Both causes led to a decrease of total amount of industrial pollution while precipitant development of small industrial plants and services has caused uncontrolled local pollution.

The territory of the basin is ecologically very valuable. The western Hercynian biogeographical subprovince meets here with the eastern Carpathian subprovince of the biogeographical province of central European broad-leaved forests and with the Pannonian province reaching the southern part of the basin. High diversity of species and landscape types is the result of the fact.

Atmospheric precipitation is the basic resource for the whole area. Man-made water reservoirs have been largely constructed in the Dyje part of the basin. In the rest of the area, the rate of water storage is very low. Groundwater occurs in limited amounts, and is concentrated in the floodplains. Watercourses are polluted by discharged wastewater to the considerable extent.

Physical Aspects

The Morava River represents a stream of 2^{nd} order. The length of the main stream is 353 km (284 km in the Czech territory). The flow amounts to 109 m^3/s (downstream the Czech border). The length of important watercourses is 3.747 km, total length of watercourses about 30.000 km. The altitude of the territory fluctuates between 148 and 1491 m above sea level. Average precipitation is 635 mm and fluctuates between 450 mm (Břeclav) and 1150 mm (Beskydy Mts.). The runoff amounts to 20,8 % of the Czech Republic. About 54 % area is made up by agricultural land (45 % of it being arable land), 34 % is covered by forests, 1,5 % are urbanized areas and 1,4 % is covered by water.

Water streams are polluted in the parameters of BOD_5 (about 4.000 t per year), insoluble substances, NO_2, NH_4, phosphorus, zinc, mercury, organic substances etc. The area is affected by relatively high erosion, caused mainly by intensive agriculture. The same branch mainly causes

decreased retention capacity of the area. Streams are regulated to the large extent: only 4 % of them are of natural character, while 50 % is completely denaturalized. About 14 % of the area are protected. National Park Podyjí/Thayatal, 7 protected landscape areas, from which the Pálava and the White Carpathian Mts. have been included in the network of biospherical preserves of the UNESCO, and 530 locations form the protected network. Protected areas are the most important part of regional and supraregional systems of ecological stability. There are 3 Ramsar wetlands in the territory.

Groundwater sources have a low capacity: 5-7 m^3/s. Man-made reservoirs are the main surface sources. There are 34 important reservoirs with the capacity of 659 mil. m^3. In this connection, low improvement of discharges from reservoirs (ca. 1.7 % of total annual runoff) is significant. The water resources are sensitive to accidents and unsuitable human activities. Huge floods in summer 1997 have impacted the relation of society to water management.

Demography/Social Background

Population density in the Morava River Basin is 131 person per sq. km, which responds the population density in whole the Czech Republic. About 60 % inhabitants live in urban municipalities, while 4.2 % in settlements with less than 200 people, 14.3 % in settlements with less than 500 people. In the smallest rural settlements, the problem of water management efficiency plays the role. Only 14 % of population are concentrated in the largest city - Brno (390,000). Olomouc (105,000) and Zlín (83,000) follow. Next 14 towns have a population of 20,000 – 55,000. However, a number of rural settlements are also typical of the Morava River Basin, with a dense network formed by small towns with a population of less than 5,000 being their dominating element.

About 80 % of population are supplied with water from public water supply system and 71 % of inhabitants are connected to sewerage system. About 90 % of wastewater from sewerage systems are treated but the WWTPs are usually not equipped by efficient technologies for removal of nitrogen and phosphorus. Due to implementation of real prices of water, water abstraction by households decreased for 71 % and amount of discharged water for 72 % during the period 1990 - 1995.

Transboundary Effects (as perceived/produced))

Besides of Deutsche Thaya, all other important streams spring in the Czech part of the basin. That is why the Czech Republic is mostly an exporter of water pollution. Pollution from the Dyje part of the basin is mostly caught in water reservoirs, from which the Nové Mlýny Water Reservoir is the most important. On the other side, pollution from Morava River is off to Slovakia and can influenced also Danube. Not only pollution themselves but preliminary polluted sediments can perform a problem. Real danger can originate in connection with accidents: natural or man-made. From the first group, floods are necessary to take into account as was verified in summer 1997. Industrial and transport accidents form another potential of problems. In this connection, it is necessary to mention that the only Czech nuclear power plant including its deposit of burned off nuclear fuel is situated in the basin. Some cases of underground water pollution with transboundary effects caused from the lignite, oil and gas mining in the space between Czech Hodonín and Slovak Gbely. On the other side, there are two cases of common landscape protection: National Park Podyjí / Thayatal and the UNESCO biosphere reserve Pálava-Záhorie-Marchauen.

Human/Economic activities

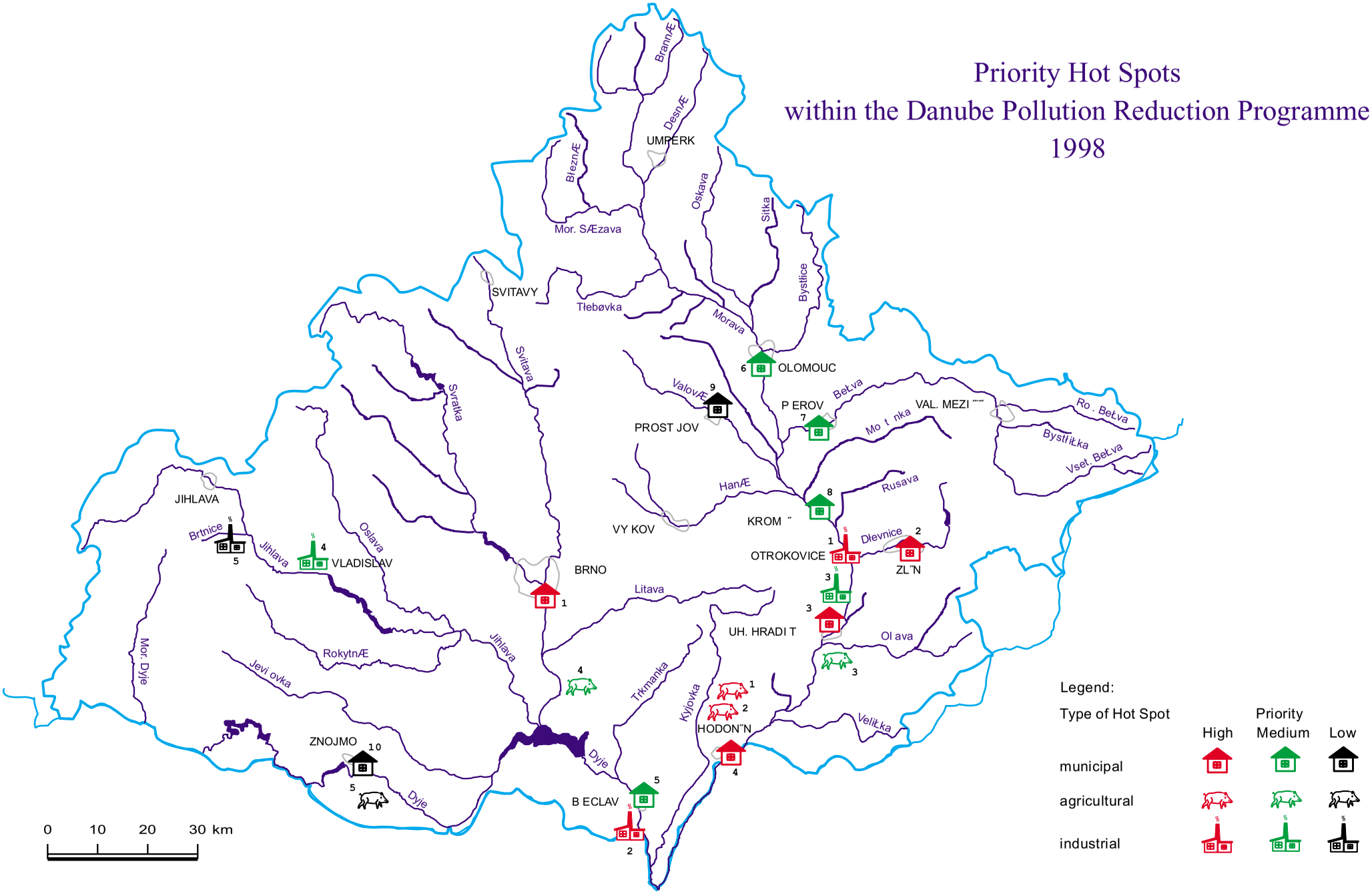
Industry is the main human activity impacted on the environment. The mechanical-engineering and chemical production complemented by the processing of local resources in food, leather and woodworking industry and in the manufacture of building materials is typical for the Morava River

Basin. Metallurgy, chemistry and nuclear power engineering was implemented mostly in the socialist period, while textile industry (leading branch in the past) has rather retreated. Industrial wastewaters and solid wastes perform an important part of wastes in the basin. Mining of coal, uranium, lignite, oil and gas and quarrying of building materials have disturbed some parts of the basin to the local extent. Relatively mature water management built tens of water reservoirs and regulated streams, which changed water regime of the whole basin. Land reclamation was implemented in a large extent in agriculture (irrigation, drainage).

The lowlands represent the most fertile part of the Czech Republic. Intensive agriculture with large-area and large-capacity ways of production has significant impacts on landscape generally and on water management specially. Excessive use of chemical substances, concentrated livestock farming and inappropriate use of land have together with extensive forestry caused either pollution of soil and water or extreme soil erosion. After 1990, intensity of agriculture has rapidly decreased in some branches, but the content of dangerous substances in soil has retreated very slowly.

Relatively dense population produce wastes of all states a significant part of, which find the way to water earlier or later. A decisive majority of households are connected to water supply and sewerage systems. Water abstraction as well as water discharge has decreased but the structure of wastes is changing. Household chemistry (e.g. detergents containing phosphates), use of cars and plastic packing have provoked increase of share of hardly dissociated substances in wastes. Old, many times unknown dump are waiting like timed bombs in the basin.

More than 50 % of the Czech hydropower capacity is concentrated in the Morava River Basin, especially in pumped-storage power plants Dlouhé Stráně and Dalešice. Navigation (Brno storage Reservoir only) and river fishery (sport fishery only) have hardly any importance from general viewpoint. Water recreation is concentrated in impounding reservoirs from which Vranov, Brno and Nové Mlýny play the most important role.


Priority Hot Spots
within the Danube Pollution Reduction Programme
1998
BrannÆ
DesnÆ
UMPERK
BłeznÆ
Oskava
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SVITAVY
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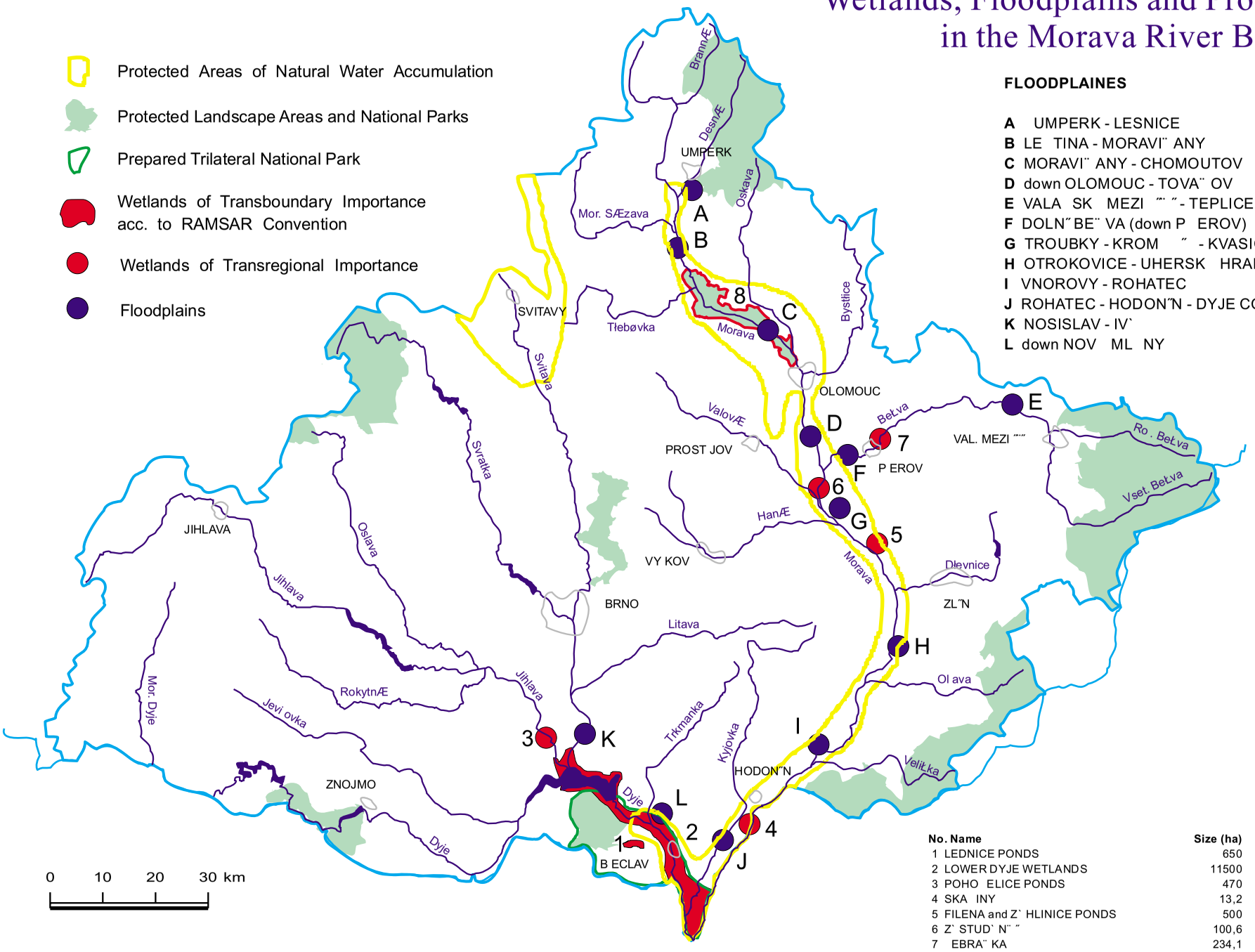
4
Trkmanka
Kyjovka
1
2
HODON˝N
4
Veliłka
ZNOJMO
10
5
Dyje
Dyje
B ECLAV
5
2
0 10 20 30 km
Legend:
Type of Hot Spot
Priority
High
Medium
Low
municipal
agricultural
industrial

Wetlands, Floodplains and Protected Areas in the Morava River Basin



FLOODPLAINES ha

A	UMPERK - LESNICE	5,0
B	LE TINA - MORAVI¨ ANY	21,0
C	MORAVI¨ ANY - CHOMOUTOV	53,0
D	down OLOMOUC - TOVA¨ OV	12,0
E	VALA SK MEZI ˝¨ ˝- TEPLICE \	25,6
F	DOLN˝ BE¨ VA (down P EROV) /	
G	TROUBKY - KROM ˝ - KVASICE	33,0
H	OTROKOVICE - UHERSK HRADI T	6,9
I	VNOROVY - ROHATEC	11,7
J	ROHATEC - HODON˝N - DYJE CONFL.	58,9
K	NOSISLAV - IV`	30,0
L	down NOV ML NY	150,0

No.	Name	Size (ha)	Type
1	LEDNICE PONDS	650	fish ponds, sedge, marshes
2	LOWER DYJE WETLANDS	11500	floodplain forests,meadows and ponds
3	POHO ELICE PONDS	470	fauna of fish ponds and forests - birds
4	SKA INY	13,2	floodplain forest - fauna
5	FILENA and Z` HLINICE PONDS	500	fish ponds, wetlands biotopes - birds
6	Z` STUD` N¨ ˝	100,6	floodplain forest - fauna
7	EBRA¨ KA	234,1	floodplain forest - typical fauna
8	LITOVELSK POMORAV˝	5122	floodplain biotopes and forest oxbows

2.2. Problem Analysis

2.2.1. Core Problem

The following core problem has been identified:

"HUMAN ACTIVITIES IN THE MORAVA RIVER BASIN LEADING TO DECREASE OF ENVIRONMENTAL QUALITY WITH NEGATIVE TRANSBOUNDARY EFFECTS"

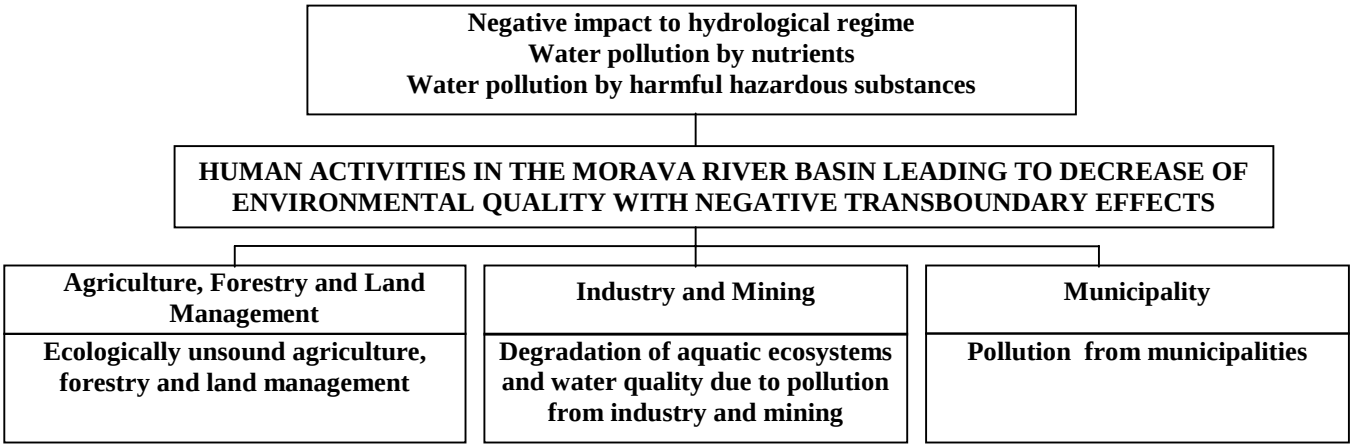
The main human activity leading to water pollution in the Morava River Basin are located into urban areas because of high concentration of inhabitants, industries, small and middle businesses, services and also transportation. Therefore, four key Hot Spots in the Morava River Basin regarding the surface water pollution were identified as municipal wastewater treatment plants: Brno, Zlín, Uherské Hradiste and Hodonín. Also pollution from high number of small municipalities could not be disregarded. Other activities leading to water pollution are connected with deterioration of landscape by agricultural and mining inadequate practices. That type of pollution is hardly to be eliminated by treatment plants, for it comes from big are of land. The real causes need to be identified and special approach has to be applied. Old dumpsites of industrial waste means risky heritage from past. A few industrial plants with particular impact on water with transboundary effect should be mentioned.

2.2.2. Direct Causes of the Core Problem

Three direct causes leading to the core problem were identified>

- **ecologically unsound agriculture, forestry, land and water management** due to improper agriculture, negative impacts of forestry on environment and inadequate management of land and water resources;
- **degradation of aquatic ecosystems and water quality** due to pollution from industry and mining/quarrying, caused by negative impact of industry on the environment, inappropriate industrial waste management and negative environmental consequences of mining activities;
- **pollution from municipalities** because of inadequate solid waste disposal, weaknesses in municipal waste management and pollution from urban traffic.

Scheme of Problems



2.2.3. Effects of the Core Problem

The following direct consequences of human activities in the Morava River Basin leading to decrease of environmental quality with negative transboundary effects have been identified:

- **Negative impact to hydrological regime**

  Improper agricultural, forestry and land management practices led to lowering of land retention capacity, high rate of arable land exposed to erosion and shortening and straightening of water bodies. Considerable industrial consumption of water (including cooling water) which is not returned into water streams as well as landscape changes provoked by mining and quarrying change complex water regime. That has very negative impact on quantity of ground water and influences also local climate changes (dry atmosphere, losing of fertility). Quantity of water in streams and state of water bodies is closely connected with water quality, for self purification ability of water is affected.

- **Water pollution by nutrients**

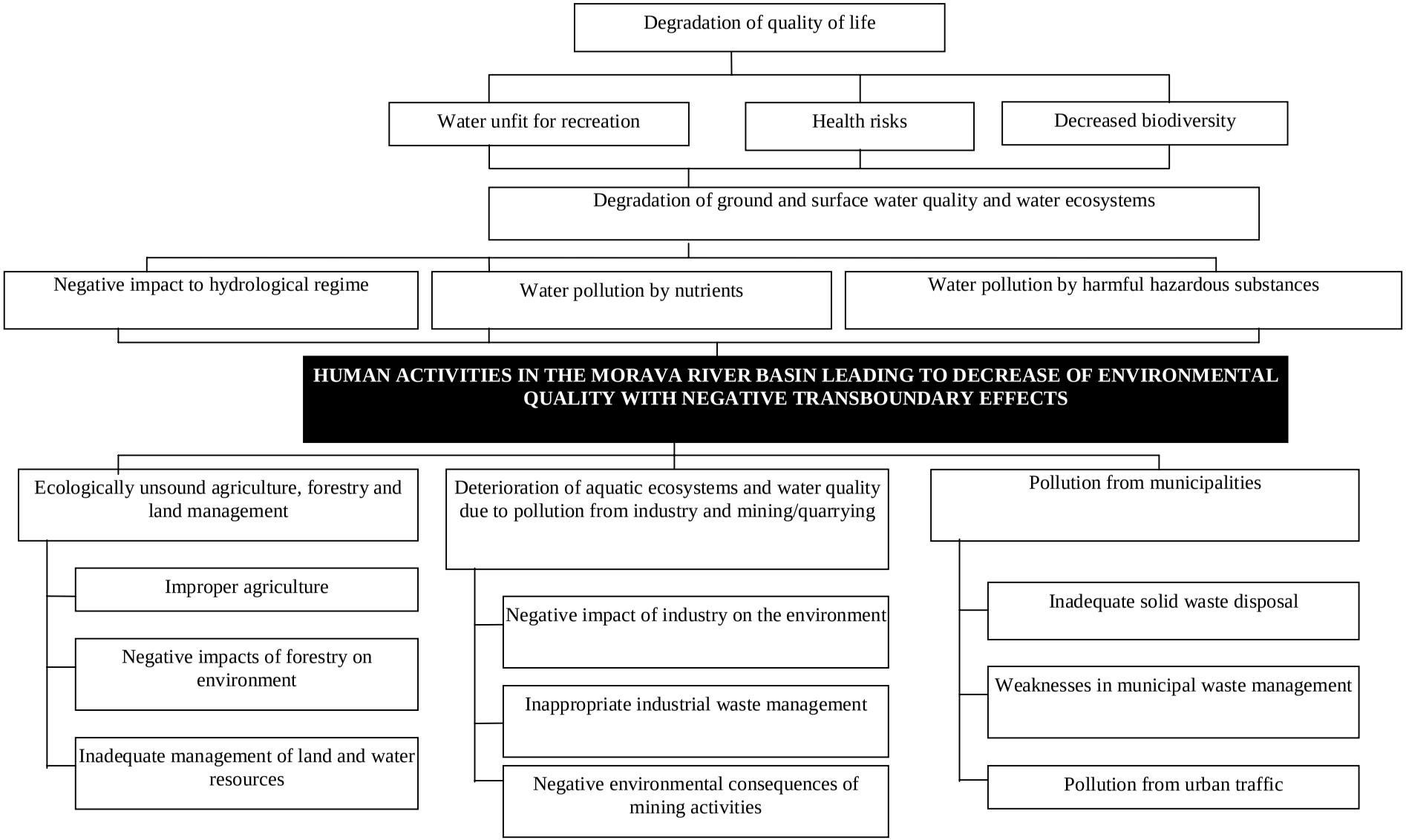
  The predominant problem for surface waters in the Morava River Basin is the presence of nutrients (e.g. nitrogen and phosphorus compounds), which are transportable over long distances and cause eutrophication. Eutrophication is one of the most serious phenomenon in stagnant surface waters, only few number of lakes and short part of upper water streams are suitable for bathing for all summer period, in others there are known various kinds of allergic reactions from bathing. Biodiversity is also negatively affected, because the content of oxygen decreases rapidly due to eutrophication.

  High concentration of nitrates in ground waters makes many wells and springs unfit for drinking and supplement from local resources is often unable. Though quantities of applied fertilizers decreased in last years due to their high costs, concentration of nitrates at some ground water resources for drinking water supply stagnates, locally it even increases. That causes high cost of water supply and purification of drinking water. Minor part of population uses local resources of low quality (especially high content of nitrates). There are health consequences of long-term exposure to water

- **Water pollution by harmful hazardous substances**

  The occurrence of organic pollutants - both biodegradable and chemically degradable ones - is also very abundant. Some streams are polluted by heavy metals, for example zinc and mercury. Due to ecologically unsound agriculture, harmful substances like PCBs, nitrates, heavy metals etc. accumulate in the agricultural products and human food. Concentration of some of these substances locally exceeds national limits for concentration in foodstuff. Ground waters are affected by old industrial risks (toxic organic substances, oil etc.) that make some ground water resources unsuitable for even treatment.

General problem hierarchy



2.3. Analysis of Objectives and Identification of Priority Sectors

2.3.1. Description of Objectives

The following program objective have been identified:

”SIGNIFICANT IMPROVEMENT OF ENVIRONMENTAL QUALITY IN THE MORAVA RIVER BASIN WITH POSITIVE TRANSBOUNDARY EFFECT”

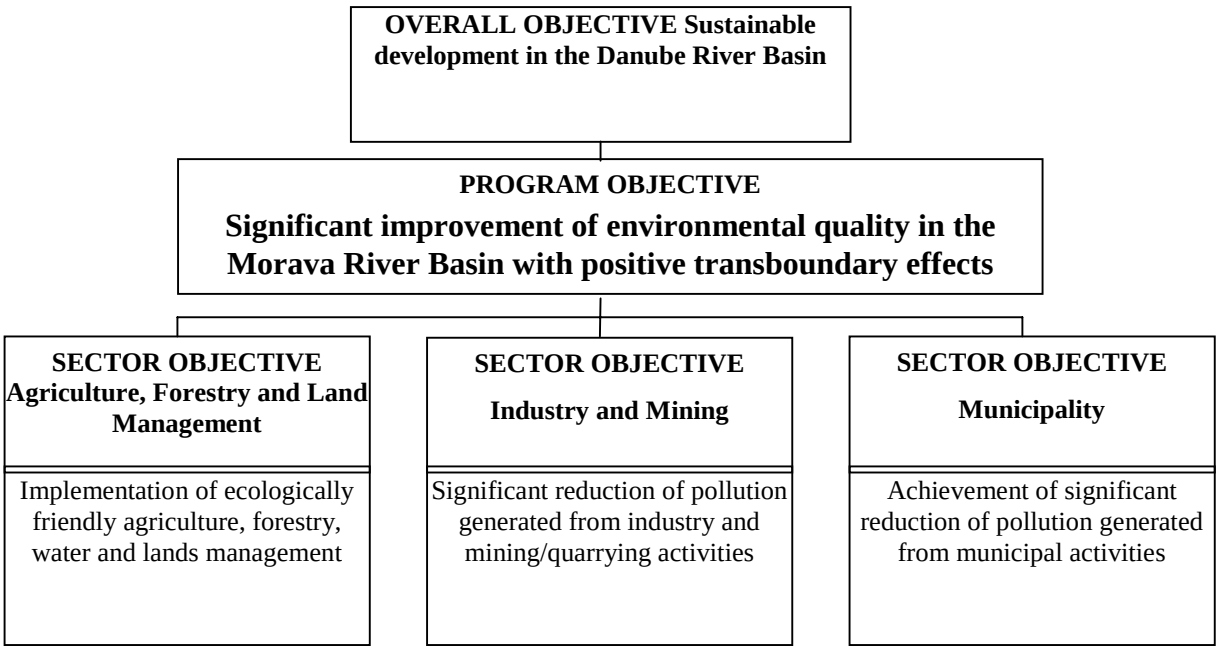
This programme objective contributes to the overall objective of the UNDP/GEF Danube Pollution Reduction Program, which was defined as follows:

”ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN”

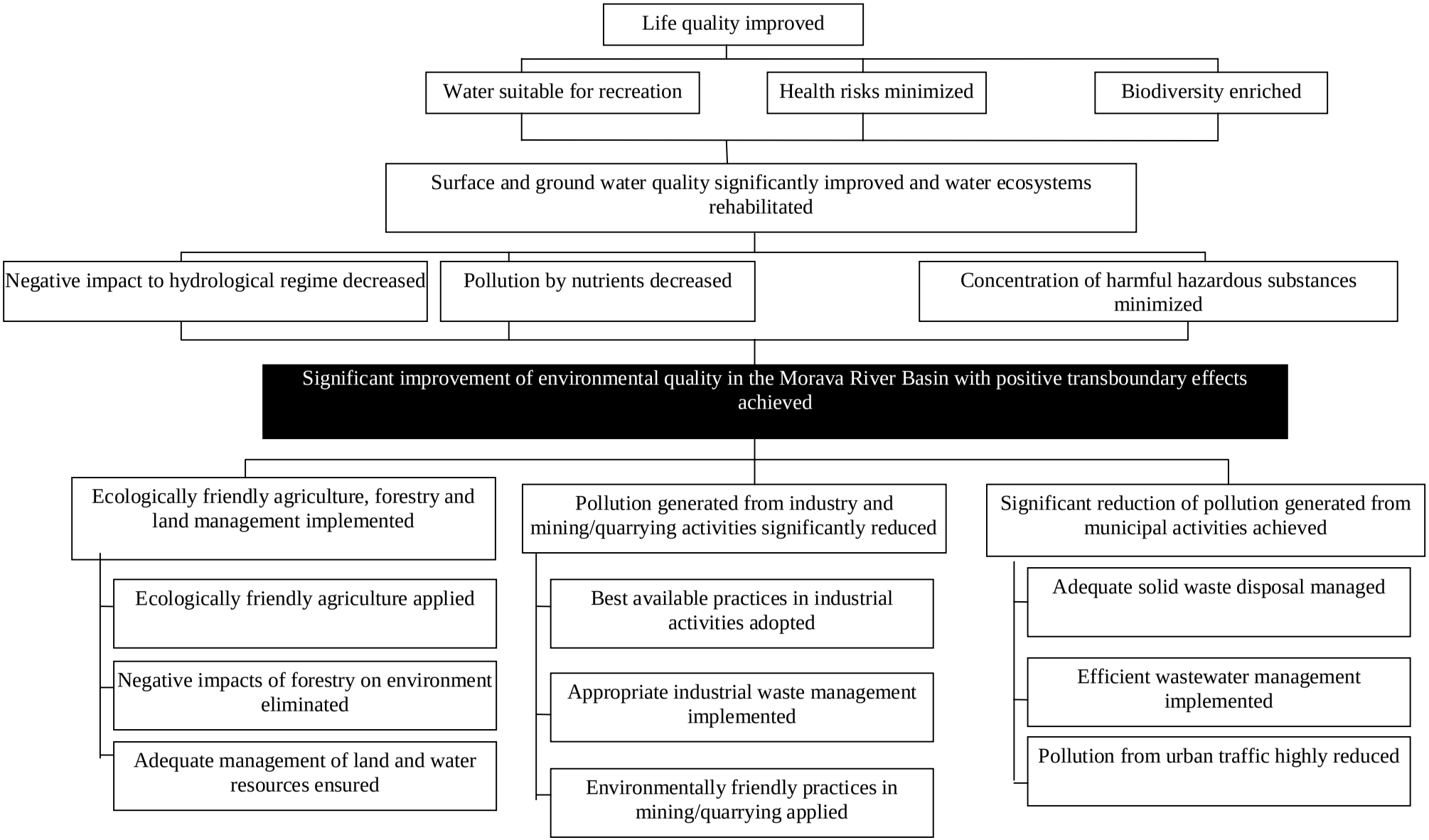
In order to assure significant improvement of environmental quality in the Morava River Basin with positive transboundary effect, specific objectives have been identified for the following sectors:

- **Agriculture, Forestry and Land Management:** Implementation of ecologically friendly agriculture, forestry, land and water management
- **Industry and Mining:** Significant reduction of pollution generated from industry and mining/quarrying activities.
- **Municipalities:** Achievement of significant reduction of pollution generated from municipal activities

Scheme of Objective



Global Hierarchy of Objectives



2.3.2. Identification of Priority Sectors

In order to achieve the program objective, measures have to be undertaken in the following priority sectors:

(i) Agriculture, Forestry and Land Management

Concerning Agriculture, Forestry and Land Management sector, it is necessary to implement ecologically friendly agriculture, forestry, land and water management. To obtain this objective, it is required to:

- **Implement ecologically friendly agriculture**
- **Eliminate negative impact of forestry activities on the environment**
- **Ensure adequate management of land and water resources**

(ii) Industry and Mining

In order to achieve significant reduction of pollution generated from industry and mining/quarrying activities, it is necessary to:

- **Adopt best available practices in industrial activities**
- **Implement appropriate waste management**
- **Apply environmentally friendly practices in mining/quarrying**

(iii) Municipalities

Regarding the Municipal sector, the immediate objective is the achievement of significant reduction of pollution generated from municipal activities. To obtain this objective, it is necessary to:

- **Management of adequate solid waste disposal**
- **Implement efficient wastewater management**
- **Highly reduce pollution from urban traffic**

2.3.3. Important Assumptions for Program and Sector Objectives

The objective identification was assisted by considering important assumptions. External factors, important for the success of the program, but are outside of its scope and not under direct control of the program. These external factors may influence the implementation and sustainability of the program from the long-term point of view.

The following assumptions for the **program objective** have been identified:

- **Environmental code is accepted end effectively enforced**

  Businesses and private sector play crucial role in innovation, application of new technology and progress in effectiveness. They also play essential role in mobilizing financial resources for these changes. That's why is very important that private sector would be engaged into program. On one site the businesses mast see clear social demand and also accept public access to environmental information, on the other site there are positive examples just inside private sector. Many companies deal with remedy of environmental problems, non-governmental org. "Business council for sustainable development" represents most serious businesses and has high credit. That should lead step by step to high responsibility of private sector for environmental problems. Environmental code of production and businesses behavior could became important ingredient of competition.

- **Government and municipal strategies and policies respecting sustainable development principle adopted**

  In the Czech republic important strategies and policies has been developed by two last years (Governmental transportation policy, Governmental Energetic policy, and governmental policy for exploitation of mineral resources and Nature protection policy). According to Act for Environmental Impact Assessment all governmental policies have to be assessed.

  But in reality due to demand and pressure of NGOs, only the first policy was negotiated by EIA. (Governmental energetic policy in 1997). In this time all main parliament political party in Czech republic own to promote sustainable development because they cannot ignore current trends. Also municipalities have to start develop local strategies and action plans for environmentally sound development, as recommended in Agenda 21, chapter 28.

  Role of municipalities is essential, because many decisions is to be done on local level and also cooperation within other municipalities is crucial. Also cross-sector partnership can effectively exist on local level. Although in the free market economy the tools of authorities and municipalities are limited, political acceptance of sustainable principles can strongly influence awareness and patterns of value in the society.

The following important assumptions at the **sector objective** level are necessary to achieve the program objective:

- **Existence of authorities responsible for integrated management of water quality in respective river basins (SOAFLM), (SOM)**

  Many problems in Morava River Basin are solved not efficiently because of poor cooperation between different stakeholders responsible for exploitation, management and water quality monitoring.. Strengthening of the competencies of Ministry of Environment and its role in coordination of regional and natural unit oriented management and efficient sharing of finances of Environmental Fund, Agency for Nature and Landscape Conservation and Ministry of Agriculture is crucial.

- **ISO standards are accepted and applied in wide area (SOIM)**

  In competition with other producers in Europe also Czech businesses will have to implement more effective way of management and technological processes. Large number of consultation agencies and auditing services can help to the businesses to assess their management system. At present, the Czech owners are limited by finance, so enterprises with foreign shareholders or owners introduce ISO standards more quickly. Quite new is procedure ”Environmental management system for municipalities”.

- **Authority responsible for holistic water management in natural river basins is established (SOIM)**

  That is necessary to undertake measures for effective transition of Morava River Basin administration, that should not be depend only on incomes from water purchases. Clarification of water management financing should increase interest for implementation holistic and integrated water management (rehabilitation, increase self-purification processes, integrated flood protection).

2.3.4. Impact Indicators for Program and Sector Objectives

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

The following impact indicator for the **program objective** has been determined:

- **Water quality in main water courses according surface water quality classification (Czech Technical Standard 757221) is improved at least to class III by the year 2005 at all monitored profiles**

  The program objective is to improve water quality in Morava River Basin focused on reducing the transboundary pollution and its negative impact. The better quality of the surface water can also indicate improvement of healthy and ecological stability of connected ecosystems.

The impact indicator of agriculture, forestry and land management sector has been identified as follows:

- **By implementation of ecologically friendly measures in agriculture, forestry and water management the diversity of the river system biota will be enriched by 3-5 fish species, and at the same time, the number of endangered species will decrease by 2-3 while utilizable fish production will increase by 15% till 2005 comparing to 1996**

  This indirect indicator was identified for agriculture, forestry, land and water management, because there is unable to measure discharges in all important profiles. Increase of biodiversity indicate better quality of waters and environmentally friendly changes in water bodies that improve conditions for migration and increase fertility of fishes

The impact indicator for the **industry and mining sector** has been determined:

- **Industrial emissions to water bodies in the Morava River Basin will be reduced to 40% till 2005 (SOIM)**

  Indicator means significant reduction of industrial pollution discharged into water bodies that can be achieved by better treatment of wastewaters (in situ) and lowering production of wastewaters. The application of indicator would depend on perseverant monitoring, evaluation and information system by state authorities.

The impact indicator for the **municipality sector** has been identified:

- **Water quality in the main watercourses (the Morava and Dyje Rivers) improved from IV. And V. class to at least III. Class (oxygen regime) by 2005at all monitored profiles with exception of the extreme flows (SOM)**

  The improvement of treatment of discharged municipal wastewaters should lead to significant improvement of water quality in main course Morava and Dyje rivers. To eliminate impact of agricultural pollution is necessary to exclude the data from extreme flows period. To achieve III. class of quality in all small streams seems to be unrealistic, because of law ability of existing WWTP to reduce nutrients (P, N).

Program Planning Matrix

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Overall Objective:**		
➢ **Program Objective:** Significant improvement of environmental quality in the Morava River Basin with positive transboundary effects achieved	➢ Water quality in main water courses according surface water quality classification (Czech Technical Standard 757221) is improved at least to class III by the year 2005 at all monitored profiles.(PO)	➢ Environmental code in private business sector is accepted end effectively enforced (PO) ➢ Government and municipal strategies and policies respecting sustainable development principle adopted (PO)
➢ **Sector Objectives:** **1 Agriculture, Forestry and Land Management:** Ecologically friendly agriculture, forestry and land and water management implemented **2. Industry and Mining:** Pollution generated from industry and mining/quarrying activities significantly reduced **3 Municipality:** Significant reduction of pollution generated from municipal activities achieved	➢ 1 By implementation of ecologically friendly measures in agriculture, forestry and water management the diversity of the river system biota will be enriched by 3-5 fish species and at the same time, the number of endangered species will decrease by 2-3 while utilizable fish production will increase by 15% till 2005 comparing to 1996 (SOAFLM)	➢ Existence of authorities responsible for integrated management of water quality in respective river basins (SOAFLM), (SOM) ➢ ISO standards are accepted and applied in wide area (SOIM) ➢ Authority responsible for holistic water management in natural river basins is established (SOIM)
➢ **Results/Outputs:** **1. Agriculture, Forestry and Land Management** 1.1 Ecologically friendly agriculture applied 1.2 Negative impact of forestry activities on environment eliminated 1.3 Adequate management of land and water resource ensured **2. Industry and Mining** 2.1 Best available practices in industrial activities adopted 2.2 Appropriate waste management implemented 2.3 Environmentally friendly practices in mining / quarrying applied **3. Municipality** 3.1 Adequate solid waste disposal managed 3.2 Efficient wastewater management implemented 3.3 Pollution from urban traffic highly reduced	➢ 2 Industrial emissions to water bodies in the Morava River Basin will be reduced to 40% till 2005 (SOIM) ➢ 3 Water quality in the main watercourses (the Morava and Dyje Rivers) improved from IV. And V. class to at least III. Class (oxygen regime) by 2005 at all monitored profiles with exception of the extreme flows (SOM)	➢ Consistent control and punishment of environmental law infractions (1.1 –1.3) ➢ Achievement of final state of ownership relations (1.1 to 1.3) ➢ Legislation amendment in sectors of agriculture, forestry and land and water protection (1.1 –1.3) ➢ Producers are pressed through legislation and moral principles (2.1, 2.2, 2.3) ➢ Regional authorities and self – governments are created (2.1, 2.2, 2.3, 2.2) ➢ Economic tools for environmental protection are enforced (2.1,2.2, 2.3) ➢ Civil service act is approved and effectively applied (2.1, 2.2, 2.3) ➢ Results of environmental education are implemented in practice (2.1, 2.2) ➢ Sufficient funding for studies, inventories and projects implementation provided continually .(3.1, 3.2) ➢ Continuation of government policy supporting public transport .(3.3) ➢ (These assumptions will be described within the sector strategy)

PO - Program Objective SOAFLM - Sector Objective Agriculture, Forestry and Land Management SOIM - Sector Objective Industry and Mining SOM - Sector Objective Municipality

3. SECTOR STRATEGIES

3.1. Agriculture, Forestry and Land Management

3.1.1. Situation Analysis

3.1.1.1. Importance of the Sector and Activities leading to Water Pollution and Environmental Degradation

Agriculture

Agriculture in the Morava River basin has a long tradition. Fertile areas along the central and downstream reaches of rivers rank among the most important agricultural regions within the Czech Republic. Among the key production territories belong above all wide vales and valleys along the Morava, Dyje and other rivers. However, other parts of the respective region are significant too, including foothills and highlands. Agriculture contributes considerably to the pollution by nutrients, organic substances and other contaminants in the Morava River basin.

Agriculture is pursued at 54% of the river basin area, which is above the average for the whole country. The arable land represents nearly 80% of agricultural land. The Czech Ministry of Agriculture, residing in Prague, controls sectors of agriculture, forestry and water management. The regional offices of the Agriculture Ministry were set up in each district town in the Morava River basin (altogether 24).

Main role of agriculture in the Morava River basin consists in a plant production. Cereals (mainly wheat and barley) are the main crops. Other crops include sugar beet, rape, fodder crops (maize, sunflower), vegetables. Highland areas are suitable for production of potatoes. Ratio of grassland is about 20%. During the ”socialist” era, many floodplain meadows were changed to arable land.

Before 1990, most of agricultural activities were performed at large co-operative or state-owned farms of 1,000 to 6,000 ha. At these farms the crop production was usually associated with animal husbandry, part of the crop production being used for animal feed and with manure in turn being used for field dressing. Storage constructions for manure and silage were in unsatisfactory conditions, enabling leakage to ground and surface water. This also took place at open-air dunghills.

After 1990 started the transition process - also with respect to ownership relations. However, all needful procedures have been in a very slow progress and the rights are not satisfactory solved. Former collectivized farms broke up largely into enterprises founded on a rate-ownership in cooperatives and they are mostly aimed at profit maximization all along. Some farms have been given back to ex-owners (peasant families, about 20% in the Morava River basin). This process is accompanied by changes in crop structure (decrease in sugar beet production etc.), animal production and technologies applied.

Principal legislation tool in the sector of agriculture (and along with it of forestry, water management and land use) is the ”Act No. 138/1973 on Water” and coherent laws, regulations, decrees (including the Governmental Decree No. 171/1992) and standards concerning water quality and water pollution in water bodies. The water act - partially upgraded in 1998 – should be amended in the near future due to many economic, environmental and social changes in Czech Republic and due to the necessary adoption of sustainable approaches.

The changes after 1989 have been based on new legislation: ”Act No. 229/1991 on Arrangement of Ownership Relations to Land Property and to Other Agricultural Goods and Belongings”, ”Act No. 92/1991 on Assign Conditions of State Goods, Properties and Belongings to Other Legal or Physical Persons”, ”Act No. 569/1991 on Land Fund Setting up in Czech Republic” and ”Act No. 252/1997 on Agriculture”. This act forms a very good groundwork with respect to environmental quality demands on water, soil and other natural resources, with respect to need of imperative changes by stimulation conditions for ”new” farmers. The agriculture transition process started in 1991 by preparation of privatization projects, which have been slowly and step by step implemented. However, this process is not yet finished and will continue for relatively long period.

The agriculture is highly burdened by previous encroachments in the socialist era, when quantity of production was preferred to quality parameters and environmental interests. Long-term peasant traditions were disrupted. In nineteen fifties and sixties small fields were unified and drainaged, balks destroyed and large crop monocultures were introduced. Later - mainly in seventies - the arable land was intentionally extended to the detriment of meadows. Crop production at large unified plots is still applied at present.

Large animal farms in the Morava River basin were constructed in sixties - seventies with up to above 5,000 and sometimes more than 20,000 livestock. There were built up large-capacity pig, beef cattle, poultry and water poultry farms. This caused considerable problems with improper sewage and manure storage and disposals. Technical solution of many slurry storage tanks was not suitable. Field capacities to handle the spread manure and slurry were not often respected and somewhere the animal wastes polluted the environment by discharging straight to watercourses. Since 1990 much effort was developed to combat the negative effects of large-scale animal husbandry. Some projects were considered to solve slurry disposal and application at large pig farms with ”hot spots” priority, for example near Dubňany (with approx. 20,000 livestock).

After 1990, farmers have applied much less quantities of fertilizers than in previous times. This has been reflected in only slight decrease in crop production. Likewise, the process in animal husbandry led to waste reduction. Nevertheless, according to recent data the agricultural sector is always responsible for appr. 50% of nitrogen and phosphorus loads in surface water within the Morava River catchment.

There is an effort at present to speed up the transition process in agriculture and to find ways to harmonize current foodstuff production with demands of the market.

Forestry

Forests cover about 30% of the region, mainly in mountain areas in northern, eastern, western and northwestern part of the basin. Water bodies in forested region have been less or more affected by 1) acidification impacts due to long-distance transfer of sulfur dioxide and other oxides emitted in particular from power plants in Bohemia, Germany and Poland, 2) extensive forestry management and intensive felling (with reflects to water erosion, oil contamination etc.), 3) use of chemicals, 4) consequences of historical burden (monocultures, inappropriate gene resources, removal of game refugees, unsuitable zoning, clear felling system and so on), 5) consequences of unclear ownership rights and unsuitable work arrangements tending towards insufficient care of controlled forests. On the other side the pollution originating from forests is not substantial and most of mountain torrents are marked by good or very good water quality

Special problems have been connected with removal of floodplain forests owing mostly to building-up (above all hydraulic structures). It resulted often in discontinuation of natural biocorridors and decrease of floodplain and wetland areas.

A new legislation incentive in forestry was given by ”Act No. 289/1995 on Forests and Completion of Some Laws” which involves all imperative environmental requirements. There are also other complementary regulations to this act.

Land Use

All area of the Morava River basin comprises almost every categories according to land-use classification: a) agricultural, b) forest and other wooded land, c) built-up and related land, d) wet open land, e) waters. Special attention must be paid to build-up land, to roads and other hard surfaces. These pieces of land are characterized by anomalous water regime contributing to runoff concentration and speed-up, to evaporation increase and reduction of infiltration. Summary result of this hydrological modification consists in greater concentration of pollutants on built-up areas mainly of oil substances, heavy metals, organic substances.

Among important legislation tools belong - besides mentioned water, agriculture and forestry laws - the ”Act No. 114/1992 on the Nature Protection and Landscape Conservation”, ”Act No. 50/1976 on Land-use Planning and Construction Order” (with amendment No. 262/1992), ”Act No. 244/1992 on Environmental Impact Assessment”, ”Act No. 125/1997 on Wastes”, upgraded law concerning the traffic on roads etc.

The above-mentioned impacts on water regime have been more and more significant. The surface of build-up areas has permanently risen and it amounts to 1.5% of all surfaces in the Morava River basin.

Water Management

Main impacts of former water management activities on water quality regime consist in changes of hydraulic conditions in watercourses, in straightening of rivers and brooks, in river training which has broken off the useful contacts with floodplain areas, wetlands, side stream branches, oxbows and oxbow lakes, with parallel groundwater movement. Other problems have been connected with changes of runoff and sediment regime by constructions of storage reservoirs, weir pools and by inter-basin water transfers.

All these changes have also influenced the water quality regime. These changes are not unfavorable every time, nevertheless more complicated situation concerns the nutrients regime and the interruption of natural migration of fishes and other aquatic animals. Likewise, we often meet other encroachments into the homeostasis of ecosystems. On the other side some hydraulic structures fulfil important functions by water supply, flood control, water recreation and transboundary effects.

The most important legislation tools are the ”Act No. 138/1973 on Water” (which was partially amended as new ”Act No. 14/1998”) and mentioned laws referring to land-use planning and construction order, to water quality etc.

Relevant stakeholders to the sector

There are these relevant stakeholders:

- ministries as Ministry of Environment, Ministry of Agriculture, Ministry of Interior, Ministry of Finance, Ministry of Regional Development,
- district and local authorities (for 24 districts, appr. 1,800 municipalities),
- representatives of Austria and Slovakia (mainly with regard to transboundary impacts in southern Moravia),
- non-governmental organizations (Union for the Morava River basin, different environmental endowments, specialized associations and professional groups),

- representatives of agriculture, forestry, water management (Morava River Basin Administration, different companies for waterworks and sewerage), land-use planning, building industry, related industrial enterprises etc.,
- project sponsors and funders,
- other interested bodies (development and proposal of projects, supervision by construction etc.),
- respective research institutes and universities.

3.1.1.2. Current Strengths/Assets

Regarding **animal husbandry and plant production**, the following assets have been identified:

- existing legislation for agriculture and soil management
- existing information and education material on agriculture and soil management
- financial mechanisms to support farming activities
- state agricultural strategy
- international trade relationships
- consumption pattern for agricultural products
- scientific-technical research potential
- engagement of NGO in agriculture and resources management
- transition to private land ownership
- international experience and progressive adoption of EU technical standards
- ecological and integrated agriculture

These assets are explained below:

- **Existing legislation for agriculture and soil management**

  In recent years - as was said, a number of new laws in agricultural sector has been issued, for example amendment of a law on owner relationships (1996), Act on Agriculture (1997) etc.

- **Existing information and education material on agriculture and soil management**

  At the Czech Ministry of Agriculture operates the Department of Research and Education. It is the principal body dealing with research and education, with consultancy, publicity and advertising. One of the consultancy programmes focused on economical and technical expertise for agricultural enterprises, another one focused at development of agricultural enterprise economy and technological processes.

- **Financial mechanisms to support farming activities (with the aid of subsidies)**

  After essential political change in 1989 was the strategy of Ministry of Agriculture re-oriented at investment subsidies and restructuralization of agricultural primary production. At the beginning many subsidies represented a stabilizing factor in the course of running changes.

  The most important programme aimed at promotion of activities in agriculture (and also for forestry) is based on the Relief and Guarantee Fund for Agriculture and Forestry. This programme was approved by the Czech Government on June 23 1993 and programmes activities started on 1st January 1994. This programme has continued. One of programme funding aspects is a long-term support of agricultural undertaking aimed at targeted increase of effectiveness and improvement of structure of peasants and agricultural enterprises. Many new farmers have used this instrument covering their financial requirements by means of advantageous subsidies, credits, guarantees and interest rates. Very large attention was focused on restored overgrowing with grass.

- **State agricultural strategy**

  The process of issuing amendments to existing legislation is running with respect to advancement of the transition process. It is proposed to speed up development of a long-term agricultural strategy, that will be based on the principal and standards of the Common agricultural policy of the European Union (CAP), including acceptation of non-productional and environmental functions of agriculture, forestry and water management. Programmes of investment subsidies to basic agricultural producers will be further developed, the objective being enforcement of competitiveness with view of admittance of the country to European Union. With respect to the admittance to the EU a schedule of respective programmes and procedures was developed - that contribute to better information concerning the legislative and organizational changes.

  Market with the basic agrarian commodities will be controlled, to stabilize acceptable prices for both consumers and producers. The conception also reckons with support of non-food utilization of agricultural production.

- **Consumption pattern for agricultural products**

  With the approximation of the Czech republic to Western European countries also changes in consumption pattern to agricultural products take place. There is higher demand for quality meat, consumption of poultry meat and fish rises, on the other hand, demand for beef and pork stagnates or even decreases. However, the increase in consumption of vegetables is bounded by its high and still increasing prices, due to its passive international trade balance.

- **Scientific-technical research potential**

  In the Czech Republic, there exist several research institutes dealing with agricultural sector, e.g. Agricultural Economy Research Institute, Forestry and Hunting Research Institute, Institute of Agriculture and Food, Veterinary Medicine Research Institute, Agricultural Technology Research Institute and so forth. The Ministry of Agriculture is not very successful in fulfilling the task of enlisting undertakers to finance the agricultural research.

- **Engagement of NGOs in agriculture and resources management**

  Numerous non-governmental organizations are active within the Morava River basin. Activities of some of the NGOs partly cover environmental problems connected with agriculture like erosion, change of the arable land in floodplains to grassland etc.

- **Transition to private land ownership**

  The transition to private land ownership is going on, though there was a delay due to not clear rules, inertia and scope in the process of ownership restorations. It is desirable that the privatization process speeds up but there is still a range of variables in the process.

- **International experience and progressive adoption of EU technical standards**

  After 1990, people in the Czech Republic have had a good try to adopt again well-tested agricultural methods and ways as in western countries.

  For the Czech Republic, the Association Agreement to EU was signed in December 1991, which until the enter of the CR to EU remains a basic document tailoring the relations for CR association to EU. Reformation of the common agrarian policy with view of the EU distension was proposed in a document at the Madrid summit (1995). In March 1997, working groups were formed which compare the EU legislation with the Czech one.

- **Ecological and integrated agriculture**

  Ecological agriculture is not directly supported by financial support to the controlling system. Ecological agriculture is applied at about 0.5% of agricultural land in the Morava River basin. The rate of agricultural areas in the Czech Republic cultivated within integrated grow system presents 6.8% of the total are of plantations, vineyards and land with vegetable production.

The following assets have been identified for **forestry activities**:

- **Existing plans for forest exploitation**
  The system of forest exploitation is given by forest management plans, which give groundwork for attainment of relative stability of wood growths. The basic trends of forestry formed in forest legislation are worked out in detail it forest management plans.
- **Wood industry**
  The existing wood industry with the potential to implement new technologies for better efficiency of wood exploitation could also be considered as an asset for improvement of economy of forest exploitation.

Concerning **use of land and water resources** the following assets have been identified:

- **Integrated bioindication of ecological situation in river basin and for monitoring of accident situation of water quality**
  There is developed a bioindication system monitoring of ecological situation within the Morava River basin as well as the Accident Emergency Warning System controlled by the Principal Alert Center operated by the Morava River basin Administration
- **Economical plans of activities in smaller river basins**
  Economical plans of activities in small river basins were developed, which are managed by administration organization for soil reclamation. This organization deals particularly with regions where agricultural activities prevail.
- **Existence of land-use plans and river basin management plans**
  For most regions land-use plans were developed by district authorities along with a central institution called TERPLAN. In the frame of water management long-term strategy was elaborated the strategic water management plan covering all the Morava River basin territory.

3.1.1.3. Analysis of Transboundary Effects

Considering ecologically unsound agriculture, forestry and land management and particularly in relation with use of land and water resources the following transboundary effects have been identified:

- **Changes of regime and sediment loads of the Morava and Dyje Rivers**
  Many activities of the sector influence negatively the regime of water, including its quality. This is reflected above all in Slovakia and Austria. The rapid surface runoff eventuates in losses of soil and high loads of sediments mainly in the Morava River. On the other hand, in the Dyje River basin, which makes up a considerable part of the Morava catchment, numerous water reservoirs have been constructed, where various human interests concur (hydropower production, irrigation, artificial wood flooding), influencing the natural pattern of river discharge and sediment load - also towards other countries.
- **Unsatisfactory water quality**
  As the most important activities leading to water pollution along with high population concentration are pursued mainly in the central and downstream reaches of the Morava, Svratka and Dyje Rivers, there is unsatisfactory water quality in some river reaches. The downstream reaches of the Dyje and Morava Rivers at some places form a boundary with Slovakia and Austria. Nevertheless, it must be said, that the last year’s trend in water quality even in these reaches shows improvement.

- **Negative effect on water quality in case of flood**
  As the disastrous flood in 1997 showed, there is a high risk of pollution of surface water during floods by splashed chemicals and oils. In this respect, unsafe petrol stations and oil mining present a peril. In case of storage of manure at open-air hills, these also present a danger during floods.
- **Change of river beds of the Morava and Dyje River**
  The border making reaches of the Dyje and Morava Rivers with Slovakia and Austria were trained to a large extent. The large-scale river training started 100-110 years ago.

3.1.2. Sector Problem Analysis

3.1.2.1. Core Problem

For this sector, the following core problem has been identified:

"ECOLOGICALLY UNSOUND AGRICULTURE, FORESTRY AND LAND MANAGEMENT"

In the sectors of agriculture, forestry and land and water management practices are being applied within the territory of the Morava River basin, which lead to deterioration of both ground and surface water quality. To a considerable extent, the present problems descend from previous management mistakes during the socialist era of the Czech history. Some of them are really large-scale problems, which, though much effort has been developed to eliminate them, realistically can not be eliminated in a short period of time.

3.1.2.2. Causes Leading to Environmental Problems

With the economical development of the sector and market demands some practices were applied which took insufficient respect to ecological criteria. Especially after 1950 serious mistakes appeared in agriculture, forestry, water management and land-use planning.

The following direct causes of ecologically unsound agriculture, forestry and land management have been identified

- Improper agriculture
- Negative impact of forestry activities on environment
- Inadequate management of land and water resources

These problems have other direct causes. An explanation of each of these problems together with their cause-effect relation will be given below:

(i) Improper agriculture

Problem of improper agriculture is mainly due to unsuitable exploitation of land, unfavorable framework conditions and inappropriate agrotechnical measures, inappropriate livestock farming, fishery and water poultry.

a. Unsuitable exploitation of land

First of the causes to unsuitable exploitation is **too large pieces of land and high rate of arable land**. More than one half of the arable land within the Morava River basin is exposed to erosion. This cause is closely connected with too small rate of meadows resulting from their change to arable land.

Unsuitable exploitation is due to **unsuitable crop structure** and **unsuitable crop rotation procedures**. Crops are cultivated rather according to demands of the market than according to environmental principles. Regarding soil exposition to erosion, the crops are not often adequate to needs of soil erosion protection.

The problem of suitable disposal and **application of sludge from wastewater treatment** as dressing is not properly solved. These wastes are often polluted by heavy metals.

Degradation and contamination of soil is a result of previous activities. Use of heavy machines led to compression of the soil profile and to decreased moisture retention capacity. Presence of hardly degradable chemicals in soils, including pesticides, PCBs etc. is also a burden.

b. Unfavorable framework conditions

The unsuitable framework conditions are the next direct cause of improper agriculture. It is raised by disrupted traditions in agriculture and by unsuitable technical stage and design of structures and equipment.

Disrupted traditions in agriculture started in the era of collectivization, connected with **unsuitable division of land** and too **large fields**, not respecting of geomorphology and slopes of fields and removal of natural obstacles to surface water runoff (small woods, balks etc.).

In fifties the traditional ownership relations were interrupted which reflects in present unclear ownership rights and very slow transformation procedures in this respect.

The next direct cause to unfavorable framework conditions is an **unsuitable technical state and design of agricultural structures and equipment**. Bad state of the structures and equipment often leads to leakages of slurry, silage, dung-water and sewage.

Also the large-scale agricultural structures is a result of extensive strategy of socialist farming. At present, these structures are obsolete and unsatisfactory. Also the agricultural equipment is obsolete. The agricultural sector in the transition does not dispose with enough finance for adequate renewal and modernization.

c. Inappropriate agrotechnical measures

Improper agriculture is also due to inappropriate agrotechnical measures. **The unsuitable application of manure and slurries** relates to the limited capacity of field. In case if the limits are not respected, then much higher volumes of dressings are applied. The next aspect to this problem is the timing of the application of manure/slurry (with respect to the best period for its use).

The next cause to inappropriate agrotechnical practices **is tillage to the very bank of a water bodies**. This measure leads to the risk of very proximate danger of surface water pollution by washed-out agrochemicals, manure/slurry etc.

The **degradation of soil** is a result of previous activities. **Heavy machines** are still being used and the process of soil compression or degradation continues.

In addition to above mentioned problems it is necessary to consider **inappropriate use of chemicals**, because of **the unsuitable storage and application of chemical su**bstances **and fertilizers** and the **use of hardly degradable pesticides**. The use of chemicals is a use of hardly degradable chemicals is connected with the needful legislation adoption on the admissible pesticides and with the promotion of biological means for plant protection.

d. Inappropriate livestock farming

Inappropriate livestock farming is one of the most relevant aspects of agriculture with respect to water pollution, with regard also to transboundary effects. In particular, it is due to **inadequate capacities of livestock**, which is mostly related to large dimensioned livestock buildings - a historical burden.

Besides, there are also **inappropriate patterns of drinking water supplying and feeding the livestock**. Feeding patterns should be applied which lead to less excrements and waste production.

Another cause for inappropriate livestock farming is **inappropriate storage of manure and slurry** with respect to the hazard of water pollution. It is often stored in underdimensioned containers with effluents to surface/ground water, or the containers are rusty, untaught and leaking. The excessive amounts of manure can be seen stored in the open-air terrain, providing ideal conditions for pollution of ground/surface waters

The cause to the above problem is also inappropriately designed or operated dunghills.

e. Inappropriate fishery and water poultry

Many ponds within the Morava River basin are used for fish/water poultry production. The pond farming, under certain conditions, may also lead to water quality decrease.

First cause to the above named problem is **excessive pond manuring**, leading of course to deterioration of water quality.

Moreover, **inappropriate manipulation** with water in ponds can cause problems with the change in surface water regime, especially if there is a system of ponds on a small brook.

Excessive additional feeding leads also to inappropriate pond farming.

It is not assumed that inappropriate fishery and water poultry farming could induce serious deterioration of water quality in view of its transboundary effects.

(ii) Negative impact of forestry activities on environments

Insufficient forest management, improper stand composition and exploitation of forest are contributing toe the problems of negative impact of forestry activities on environment.

a. Insufficient forest management

Though the negative impacts of forestry compared to other sectors are less important, they are not small. Besides the industrial air pollution leading to acidification of waters, the implications of the forest management itself, is a major problem. An efficient external, objective control is missing and the forest management is oriented to wood exploitation rather than to retaining of the ecological functions of forests.

Forestry plans are not respected. The responsible forest managers do not observe the forest management plans in respect of wood exploitation and stand composition. There is a lack of external control (forest inspection), as a tool of the state policy of care for forest.

There is also disharmony between administration and economic activities.

Besides, forestry is oriented mostly on **wood production**. In order to get the highest profit possible, non-wood production functions of forests were reduced.

Similarly to agricultural sector, also the ownership rights in forestry are a problem, which is one of the causes of the insufficient forest management. The **unsolved ownership** again is caused by the lengthy process of owner rights transformation.

b. Improper exploitation

In fact, the improper exploitation is caused by inappropriate technology, which has two causes. The first one is unsuitable manner of exploitation caused by the used **unsuitable practices of trunk approaching**.

Exploitation manners are not considerate to the forest environment and facilitate erosion. Wood is usually cut in large sectors, which brings about consequent damages.

Next cause to improper exploitation technology **is inadequate use of mechanization and chemicals**. The problem with chemicals mostly consists in inadequate disposal of the containers.

c. Improper stand composition

This improper stand composition is caused by excessive exploitation of forest ecosystems, excessive game population and by historical burden. The **excessive exploitation of forest ecosystems** means, that there is not taken consideration to non production forest functions, the stand composition is modified in order to get the highest possible profit. The spruce and pine tree, which are characteristic by rapid accretion, were introduced instead of original forests with mixed species.

The **excessive game (mainly deer) population** causes large damage to young trees with successive putridity and vast damages to wood quality and quantity taking place. The management of the forests is not exerting much effort to reduce the excessive deer population.

The last direct cause to improper stand composition is a **historical burden**, which in fact is somehow (more or less) connected to most of the above mentioned problems. The most evidently the heritage of the past makes itself felt in an inadequate species and age forest composition, which, partly, was mentioned above.

At the end of nineteen sixties, the reorganization of the Czech forestry started, evoking the exploitation of trees in large sectors and promoting monocultural composition of stands. It must be said, that the range of problems mentioned in the paragraph dealing with historical burden is to some extent connected with industrial pollution of air.

This historical burden is due to liquidation of small woods in the country, which also functioned in the hydrological regime, as they were natural obstacles to surface water runoff.

(iii) Inadequate management of land and water resources

This problem is caused mainly by improper river training and structures, inappropriate use of water resources and inadequate land use.

a. Improper river training and structures

Improper river training and structures is due to **badly designed drainages**. These drainages were constructed mainly since 1950. They led to excessive drainage of water from land and elimination of small brooks. They also led to concentration of agricultural polluters.

Besides, **construction of structures** fragment river ecosystems continuum and change water regime. They include straightened watercourses, storage reservoirs, weir pools and water transferring structures.

Removed riverbanks vegetation, which is closely connected with the watercourses straightening is another important cause of improper river training.

b. Inappropriate use of water resources

Improper operation of water structures, connected mainly with day-peak runoff regime, change in downstream water temperature due to unsuitable water outlet regime, excessive bank abrasion in reservoirs leads to inappropriate use of water resources. This improper operation is due to **insufficient maintenance of river corridors and bank vegetation** mainly because of lack of finance, as well as **unsolved owner rights** to water structures. This cause is similar to relevant problems in agriculture and forestry.

Inappropriate use of water resources is also due to **improper public behavior**. It is caused by gaps in ecological knowledge, excessive water withdrawals by some private companies, which may not respect licenses released by water management authorities, and unsuitable recreational activities, particularly with inadequate amenities for recreation.

In addition to improper operation of water structures and public behavior, **insufficient control and punishment, inefficient economic incentives and insufficient ecological monitoring** play important role in the inappropriate use of water resources.

c. Inadequate land use

Inadequate land use is due to **inefficient economic incentives** for land-use planning and for construction discipline and improper changes in land and inappropriate encroachment in floodplain areas.

Improper changes in land is caused by unclear ownership rights, misbalance between urban and rural population distribution (shift of population from the country to towns), removal of solitary trees, building of roads that cause erosion and concentration of runoff, and the last two causes under improper changes in land are missing discipline of land-users and sometimes also insufficient land-use planning.

Concerning **inappropriate encroachments in floodplains and wetlands**, inadequate changes in floodplains involve cutting of floodplain forests, quarrying of gravel, removal of oxbows etc. Disconnection of floodplains from the main streams led to change in the hydrological regime in the stream corridor and changes of ecosystems and biocorridors. A closely related cause is the reduction of wetlands particularly in lowlands.

3.1.2.3. Environmental Effects

Direct environmental consequences of ecologically unsound agriculture, forestry and land management are:

- **Accumulation of harmful substances in agricultural production (health risk)**

  Due to ecologically unsound agriculture, harmful substances like PCBs, nitrates, heavy metals etc. accumulate in the agricultural products and human food. Concentration of some of these substances locally exceeds national limits for concentration in foodstuff.

- **Pollution of surface waters**

  The core problem for the sector results in pollution of surface waters, the most serious being waste discharges from animal husbandry farms, leakage from unsatisfactory storages of silage, manure and slurry and impacts of their application. The application of chemicals near water bodies could lead to increased risk of pollution.

- **Pollution of ground water**

  Similar risks are also relevant to ground water pollution. The most serious problems for men are associated with fertilizing and manuring. Though quantities of applied fertilizers decreased in last years due to their high costs, concentration of nitrates at some ground water resources for drinking water supply stagnates, locally it even increases.

- **Eutrophication**

  Inputs of nutrients in context with application of manure and fertilizers contribute to inputs from other human activities. This results in high rate of eutrophication of surface water bodies, which reflects on decreased usability for drinking water production (higher treatment costs) as well as usability for recreation.

- **Soil erosion**

  According to statistics for the Czech Republic, more than half of arable land in the country is exposed to erosion. Due to geological conditions and geomorphology, this rate in the Morava River basin is even higher. The natural conditions are made more favorable to erosion due to improper agricultural, forestry and land management practices.

- **Disruption of water regime**

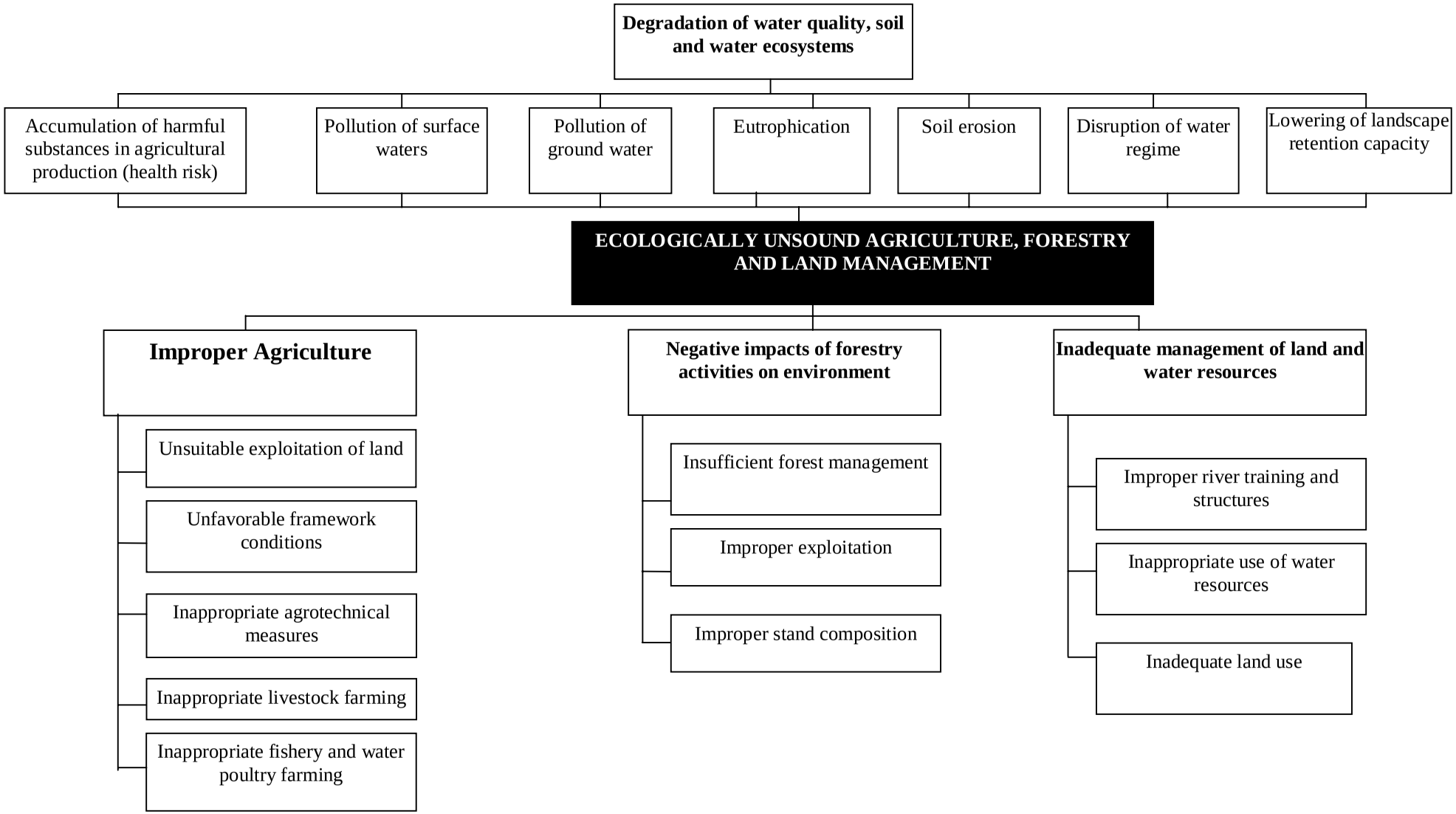
  Removal of natural obstacles for surface water runoff, structure of crops and forests, compression of soils due to application of heavy machinery, abstractions for irrigation, large segments of cut forests along with forestry exploitation practices and intervenes of water management lead to changes of water regime in the basin.

- **Lowering of land retention capacity**

  This direct consequence is very coherent with the above-described disruption of water regime and many of the causes of water regime impacts are same for lowering of land retention capacity. It is not easy however to define means-end relationship between them.

All the above described direct consequences lead to **Degradation of ground and surface water quality and water ecosystems,** which reflects in degradation of quality of life.

PROBLEM HIERARCHY
1. Agriculture, Forestry and Land Management



3.1.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective have been identified:

"ECOLOGICALLY FRIENDLY AGRICULTURE, FORESTRY AND LAND AND WATER MANAGEMENT INTRODUCED"

Fulfilling of the sector core objective will contribute to essential reduction of water pollution within the Morava River Basin, improvement of ecological stability and significant positive transboundary impacts. Mainly the decrease of nitrogen and phosphorus loads will be achieved.

In order to achieve ecologically friendly agriculture, forestry and land and water management, the following results are foreseen:

- Application of ecologically friendly agriculture
- Elimination of negative impacts of forestry activities on environment
- Ensuring of adequate management of land and water resources

(i) Application of ecologically friendly agriculture

With respect to surface water pollution, having in mind also transboundary effects, it is assumed that implementation of ecologically friendly agriculture will result in considerably decreased BOD and nutrients in water bodies. With respect to pollution of drinking water resources, water quality improvement in nitrates, ammonia and phosphorus concentration, microbiological parameters and organic matters will be the most significant achievements.

In order to apply ecologically friendly agriculture, it will be required to undertake several activities in the following fields:

- exploitation of land
- agrotechnical practices
- framework conditions for agriculture
- livestock farming
- fishery and water poultry farming

It is necessary to:

- **undertake measures for suitable exploitation of land.** Promotion of initiatives for development of ecological farming is one of the important elements for this activity. It is also needed to assure appropriate rate of arable land together with optimal crop structuring and restoration of meadows in floodplains. These elements are closely related with tools and mechanisms for soil rehabilitation. It will be also necessary to apply suitable seed procedures and to promote application of environmentally safe sludge from WWTPs.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Ecological Agriculture Development in the Czech Republic
  - Integrated Sites Reallocation
  - Agro-Environmental EC Program for the Czech Republic
  - Morava Project. It is aimed at water quality improvement in the Morava River Basin with relation to Danube Basin and Czech legislation
  - Program of Restructuring of Agriculture
  - Program based on Relief and Guarantee Fund for Agriculture and Forestry. It is focused at promotion of agriculture and forestry after political changes in 1989.

Planned Project(s)

- Integrated Sites Reallocation
- Morava River Basin National Action Plan. Based on the Morava Project and Danube River Program. Till now has not been approved by the Czech Government.

Proposed Project(s)

- Biomonitoring program aimed at integrated evaluation of changes in the basin, which should be developed by Agency for Landscape and Nature Conservation in cooperation with Academy of Science of the Czech Republic
- Consulting system program in hydrology for small farmers

- **introduce appropriate agrotechnical practices.** Optimization in use of agricultural chemicals is very important for this activity and it is closely related with promotion of use of biological crop protection and use of biodegradable chemicals. Regarding use of fertilizers, only environmentally friendly fertilizers should be used and capacity of fields for manure and slurry application has to be taken into account as well.

  Reduction of heavy machines utilization and consequent introduction suitable agricultural machinery are important as well and together with reintroduction of non-cultivated strips along watercourses will help to reduction of soil erosion.

  For this activity, the following projects have been identified:

  Proposed Project(s)

  - Definition of obligatory agrotechnical and organizational measures for soil erosion reduction
  - Harmonization of standards for agrochemicals with standards of EC

- **facilitate favorable framework conditions for agriculture.** There are several important elements necessary for this activity. Reestablishment of traditional relations of farmers to land and soil is related with clarification of ownership rights and relations as well as privatization conditions of state land. For these elements the preparation and passing adequate legislation is essential.

  Effective system of ecological education for farmers should be introduced to increase their awareness and knowledge on environmental consequences of their activities.

  Construction and maintaining of obstructions for surface water runoff and erosion, and rehabilitation of land with respect to geomorphology are important elements for this activity as well.

  Unsuitable technical state of agricultural structures has to be improved in way, what it will assure their adequate capacity and reduce leakages from these structures. Elimination of unsafe field dunghills is required as well. Overall modernization of agricultural equipment is essential.

  For this activity, the following projects have been identified:

  Proposed Project(s)

  - Consulting system (in hydrology) for small farmers
  - Definition of obligatory agrotechnical and organizational measures for erosion reduction
  - Harmonization of standards for agrochemicals with standards of EC

- **ensure appropriate livestock farming.** This activity should be supported with defining and retaining acceptable capacity of livestock farming. Introduction of new technologies of feeding and providing water to animals and preferring extensive cattle pasturing are also important. Furthermore, implementation of appropriate field storage of manure and slurries and preventing leakage from silage and manure storages (dunghills) into soil and water are essential elements for appropriate livestock farming.

  For this activity, the following projects have been identified:

  Planned Project(s)

  - Dubňany pig farm rehabilitation. (Project already developed). Rehabilitation consists in reconstruction of farm buildings and waste storage and in remedy of slurry lagoon. Significant transboundary effect (10 km to border with Slovakia)
  - Milotice pig farm rehabilitation. (Project not yet developed). Also transboundary effect (15 km to border with Slovakia)
  - Těšnovice pig farm rehabilitation and solution of wastewater treatment within municipal WWTP. (Project not yet developed).

  Proposed Project(s)

  - Minimization of outputs of harmful substances from animal husbandry farm (with respect to excrements, pharmaceutical substances and operation manner). Veterinary Research Institute should elaborate the project.
  - Specification of limits and forms of animal husbandry – harmonization with EC standards.
  - Rehabilitation of other priority pig farms (Kunovice, Velké Němčice etc.)
  - Evaluation of animal husbandry and meat production demands in the Czech Republic.

- **implement appropriate fishery and water poultry farming.** Rational utilization of fish production from natural waters with respect to principles of sustainability and conservation of nature is one of the key important elements for this activity. Furthermore, optimal numbers of ducks kept and fish with respect to capacity of ponds has to be taken into account and adequate manners of feeding applied. Proper operation is required at ponds as well.

  For this activity, the following projects have been identified:

  Proposed Project(s)

  - Reestablishment of fish community constitution and development of transboundary strategy for sustainable fishery for the Morava River. The project should be developed by Academy of Science of the Czech Republic.
  - Revision of operation guides of ponds. Should be developed by operation enterprises of ponds in cooperation with water management organizations.

(ii) Elimination of negative impacts of forestry activities on environment

Elimination of negative impacts of forestry activities on environment will probably not have such a substantial consequences to water quality in the Morava River Basin. By adequate manipulation with chemicals applied in forestry however, including the disposal of containers the risk of water contamination could considerably decrease. Appropriate forest management, changes in exploitation technology and introduction of ecologically adequate stand composition will result in the improvement of hydrological regime and non-wood production functions of forests.

In order to eliminate negative impact of forestry activities on environment, several activities have to be completed in the following areas:

- forest management
- wood exploitation management
- ecological stability

It is necessary to:

- **introduce efficient forest management.** Reinforcement of the role of state administration in care for forest is important for this activity, as well as solving and speeding up of transformation of ownership rights.

  Environmentally sound forestry plans have to be respected. The non-wood production functions of forest need to be strengthened together with optimal exploitation of forest ecosystems. Assessment of composition of forest stands has to take into account ecology and economy as well.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Forest management plan
  - Forest reclamation

  Planned Project(s)

  - Forest reclamation

  Proposed Project(s)

  - Harmonization of production and non-production functions of forests. Project should be developed at Mendel Agriculture and Forest University Brno, Faculty of Forestry.
  - Harmonization of forestry practices with environmental interests
  - Assessment of acidification consequences in forest areas
  - Program of forest control and zoning with respect to stands, gene resources and functions

- **support suitable manner of wood exploitation management.** Environmentally friendly forestry mechanization has to be used, particularly environmentally sound manners and mechanization for wood exploitation. It will be also important to use ecologically friendly methods of trunk approaching.

  Application of ecologically friendly chemicals is supported with control of handling and disposal of chemicals to prevent water pollution.

  For this activity, the following projects have been identified:

  Proposed Project(s)

  - Harmonization of forestry practices with environmental needs

- **improve ecological stability by adequate stand composition.** It is necessary to assess composition of forest cultures with respect to ecology and economy and promote ecologically sound care for forest ecosystems. Considering current situation, it is important to find ways and tools for transition from monocultural wood production to environmentally favorable cultures. Acceptable game population, adequate species and game composition have to be kept. Small woods and game shelters have to be reintroduced to the country.

For this activity, the following projects have been identified:

Proposed Project(s)

- Introduction of natural regeneration of the forest
- Harmonization of forestry practices with environmental interests

(iii) Ensuring adequate management of land and water resources

Within the sector, application of ecologically friendly agriculture will have the most important direct influence on the improvement of water quality. Ensuring of adequate land and water resources management would have major influence on the renewal of environmental and esthetical functions of land and biodiversity. Water quality, by adequate land and water resources management will rather be influenced not directly, by improvement of the self-purifying ability of surface water bodies.

In order to ensure adequate management of land and water resources, it will be required to undertake measures in the following fields:

- river training and structures
- use of water resources
- management of land use activities

It is foreseen to:

- **manage properly river training and structures.** In general, the river ecological continuum should be renewed. It is important to introduce vegetation strips by watercourses and reservoirs and rehabilitate soil reclamation systems.

  In this context, the creations of a state land fund for ecological activities in the country as well as development of effective system of regional water management competencies division are essential. Moreover, water structures operation guides and schedules have to be reviewed according to environmental needs, taking into account harmonization of economical and ecological functions of river systems.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Program of rehabilitation of fluvial system (developed by Ministry of Environment and Morava River Basin Administration).
  - Phare Project: Rehabilitation of Floodplains and Fish Habitat Restoration in Lower Dyje/Morava Rivers (developed by Morava River Basin Administration and Academy of Science)
  - Optimization of Water Management System in the Morava River Basin During Floods

  Planned Project(s)

  - Nove Mlyny Hydraulic Structure – Revision of Operation Guides and Schedules (worked out by Morava River Basin Administration, in cooperation with Aquatis Brno)

  Proposed Project(s)

  - Optimal reconstruction of an irrigation system with regard to ecology and economy (worked up by Research Institute for Soil Reclamation and Protection Brno)
  - Optimal operation of water management system at periods of extreme discharges (Water Research Institute Brno, Technical University Brno, Faculty of Civil Engineering)

- Negative effects of river continuum fragmentation on natural ecological relations in the river and proposals of their reduction at example of the Dyje River (Masaryk University Brno, Faculty of Natural Sciences + water Research Institute Brno)
- Rehabilitation of main important trained watercourses
- Ecologically acceptable discharges in relation to operation of small hydropower plants (Brno University + Academy of Science Brno)
- Definition of ecologically justified minimum discharges downstream water uptake objects (Water Research Institute Brno + Water Protection IKM)
- Revision of operation guides and schedules for storage reservoirs and ponds (to be developed by operation organizations)

➢ **undertake measures for facilitating appropriate use of water resources.** It is important to develop effective system of regional water resources competencies with respect to environment protection. It is needed to clarify ownership relations to water management structures and also to emphasize solution of water resources management in the amendment of Water Act under preparation.

Demands for water management and ecological demands have to be harmonized, particularly it is necessary to take into account minimum ecological discharges and ensure ecologically satisfactory regime of hydropower plants on headraces. Rationalization of non-returnable water uptakes is needed as well.

Adequate finances for management and maintenance of watercourses and river bank vegetation should be allocated in order to maintain properly river corridors including bank vegetation. Rehabilitation of river systems would be supported with re–establishment of connection of floodplains and wetlands with main streams by applying efficient land-use planing.

In addition to effective ecological education will be carried out in order to increase increases environmental awareness. This can also help to minimize unfavorable effects of recreational activities.

Furthermore, efficient system of economic incentives has to be introduced. In order to facilitate an appropriate use of water resources, it is planned to enforce the legislation by ensuring an effective system of control and penalties.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- Environmental Protection Program (State Environmental Fund)
- Wetland Inventory according to Ramsar Convention
- Project Morava (Ministry of the Environment + Water Research Institute Brno)
- Program of Rehabilitation of Fluvial System (Ministry of Environment + Morava River Basin Administration)
- Phare: Rehabilitation of Floodplains and Fish Habitat Restoration in Lower Dyje/Morava Rivers (Morava River Basin Administration + Academy of Science)
- Optimization of Water Management System in the Morava River Basin during Floods
- Biomonitoring Program Aimed at Saprobity Conditions in the Morava River Basin (Water Research Institute Brno)

Planned Project(s)

- Rehabilitation of wetlands (Ministry of Environment)
- Revision of Sanitary Protection Areas of Water Resources (Morava River Basin Administration)

- The Morava River Basin National Action Plan
- Analytical Ecological Study of the Morava River and its Historical and Present Relation to Alluvial Plain (Faculty of Natural Sciences University Olomouc)

Proposed Project(s)

- Definition of water management interests in the region as a basis for integrated sites reallocation
- Harmonization of competitions for water use in the Morava River Basin
- Education in ecological relationship in system water/landscape (VERONICA)
- Study of erosion, its causes and proposals of measures to decrease erosion (Research Institute for Soil Reclamation and Protection Brno)
- Quality and quantity optimization of fluvial network (Technical University Brno, Faculty of Civil Engineering)
- Documentation of disturbed ecological relations between the Morava River and its alluvial plain and rehabilitation proposals (ecological department of Olomouc University, Faculty of Natural Sciences + Academy of Science Brno)
- Evaluation of retention and infiltration capacity in Morava River Basin

➢ **ensure environmentally sustainable management of land-use activities.** It is necessary to implement a territorial system of ecological stability of land and adopt strategies to eliminate impacts of land erosion due to roads. These elements would be supported with efficient economic incentives in land-use and practicing by an efficient land-use planning.

In this frame it is also important to implement measures to increase discipline of country users and to ensure effective system of control and penalties. Carrying out effective ecological education is essential to ensure sustainable management of land use activities.

It is important to adopt measures for effective wetland protection and rehabilitation in order to reduce effects of inadequate changes of floodplains. Connections of main rivers with floodplains and wetlands should be re-established.

Furthermore, measures for development of rural life can be supported with complex reallocation of land and by clarifying the ownership rights.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- Territorial system of country ecological stability
- Rehabilitation of landscape in river basins (design agency)
- Landscape care project
- Rural areas restoration project
- Environmental protection program

Planned Project(s)

- Land trusts
- Landscape rehabilitation in river basins
- Morava River Basin National Action Plan

Proposed Project(s)

- Biomonitoring program aimed at integrated evaluation of changes in the basin (Agency for Landscape and Nature Conservation + Academy of Science of Czech Republic)
- Regional landscape plans (project organizations)

From the above-mentioned projects, four were identified, that can be considered **high priorities**:

1. Rehabilitation of important trained watercourses. Should be conceived complexly according to holistic and integrated approaches.
2. Definition of obligatory agrotechnical and organizational measures for soil erosion reduction
3. Minimization of output of harmful substances from animal husbandry farms (excrements, pharmaceutical substances, operation)
4. Introduction of natural regeneration of forests

3.1.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lies 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.

In particular, the following assumptions have been identified at the **activities** level to achieve the sector results:

- **Adequate areas of plots and pieces of land**
  The fields, which were unified in nineteen fifties into large pieces of land, should be divided again into smaller cultivated units, together with renewal of formerly present balks, meadows and small woods, enabling water runoff retardation
- **Ecologically friendly mechanization**
  Shift from presently used heavy machines in agriculture with high specific weight to ”lighter” machines is the next external factor, desirable for regeneration of water regime in the landscape.
- **Taking account of geomorphologic conditions and slope gradient**
  This assumption is closely related to the last but one. It is an essential prerequisite, along with adequate crop structure on sloping fields, to decrease the rate of soil erosion.
- **Efficient division of work between authorities and forest companies with respect to forest management plans**
  It is necessary to harmonize competencies and responsibility between authorities and forest companies.
- **Appropriate structure of forest stands and of game stock**
  While the change of forest structure is a long-term problem, the deer population could be optimized relatively quickly. Both these external factors would lead to improved health of forests and its correct functioning within the hydrological cycle.
- **Proper maintenance of hydraulic structures, river and brook beds, banks and parallel vegetation**
  This external factor is pertinent mostly to ecological and esthetical function of land, it is not assumed, however, that it has a very straightforward impact to water quality.

For the **results/outputs** the following assumptions have been considered:

- **Consistent control and punishment of environmental law infractions**
  In the sectors of agriculture, forestry, land and water resources protection management, very serious violations against environmental law occur. Nevertheless, there is missing a system of efficient supervisory authorities, which would consistently control violations to the law.

- **Achievement of final state of ownership relations**

  The problem of unsolved ownership relations is common for agriculture, forestry and land and water management. It is such a complex process however, that it can not be comprehended within the program. Resolution of owner relations in these sectors is an important assumption for achievement of the results.

- **Legislation amendment in sectors of agriculture, forestry and land and water protection**

  Besides the consistent control and punishment of environmental law violations, it is also necessary to develop amendatory acts to legislation referring to agriculture, forestry and land and water protection.

3.1.5. Impact Indicators for Sector Results

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

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

- **By adoption of ecological and integrated agriculture in important regions from view of water management, the total nitrogen concentration emitted by agriculture will decrease by 30% till 2005 compared to level of 1996.**

  Total nitrogen concentration was chosen as the best indicator of pollution coming from agricultural practices. The decrease of NO_3 in surface waters will be the result of reasonable and effective utilization of manure and fertilizers. Decrease of NH_4 will result from the measures applied for optimization of livestock farming (capacity and manure disposal).

- **Volume of suspended sediments in defined important profiles will decrease by 40% in 2005 (in comparison to 1996) as result of implementation of agrotechnical and organizational measures to decrease erosion at 80% of agricultural land.**

  The profiles with monitoring of suspended sediments will be chosen downstream the regions with high soil erosion. The results of monitoring will be utilized as a feedback tool for improvement of agricultural practices leading to soil erosion. The trend in suspended sediments should be evaluated continuously.

- **40% of forests managed by joint-stock companies within the Morava River Basin will be managed with respect to principles of environmentally sound forestry till 2005.**

  All the functions of forests managed by joint stock companies will be evaluated regularly mainly with respect to environmental criteria. Special attention will be paid to all components of forest management and their respect to the environment, mainly with view of water protection.

- **Rehabilitation measures will be implemented till 2005 at 15% of the trained watercourses in Morava River Catchment**

  Rehabilitation measures will include restoration of natural river branches, ox-bows and ox-bow lakes, rehabilitation of riverbeds, riverbanks, connection of rivers and floodplains and construction of effective fishpasses. The measures will be applied on downstream as well as upstream parts of rivers. Also the renewal of small watercourses that had been eliminated by application of improper drainage measures should be included.

3.2. Industry and Mining

3.2.1. Situation Analysis

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

Industry and mining is substantial branch of Czech economy from the viewpoints of employment, export, and innovations. Even in the period after 1990 when the share of jobs in industry and mining has rapidly decreased, the mentioned functions cannot be substituted. Although the main industrial base of Czech industry and mining can be found in other watersheds, important industrial capacity is concentrated also in the Morava River Basin. Real transition of Czech industry passes just in present period. Within the coupon privatization, new formal owners were found, but the mode of enterprises behavior has not been very changed. Related to the present economic situation of the country, restructuring of industry is very topical. It can be supposed that the number of enterprises, number of employees, size of plants, used technologies and other important characteristics are to be changed to the large extent in future.

The most significant industrial pollutants are textile, tannery, chemical, papermaking, wood-making, machine-tool, metallurgical, electrical and food-stuff industry, pulp mills and sugar factories. Contamination by heavy metals comes from smaller metallurgical plants and tanneries. Nutrients (nitrogen, phosphorus) and some heavy metals - above all mercury have very significant position among the polluters in the area. There exist potential hazards in the Morava River Basin, particularly specific organic substances (oil products, PCB, PAH, AOX etc.).

In the past, industry was the sector mainly polluted the environment including water. To compare it with the Labe River Basin and the Odra River Basin, lower share of heavy industry and mining can be found in the territory of the Morava River basin. It seems that agriculture, municipalities and transport hardly compete here with the industry concerning water pollution in the last time. Taking into account strict environmental laws after 1990 together with possibilities to implement foreign know-how, it seems that the role of industry in pollution of the Morava River Basin can decrease earlier than in other part of the Czech Republic.

The stakeholders are both national and international. National stakeholders are represented by the state authorities (Ministry of Environment, Ministry of Industry and Trade, Ministry of Finance, Ministry of Regional Development, district and municipal authorities), universities and research institutions, NGOs, industrial and mining enterprises The funds are provided from different branches: State Fund of Environment, National Property Fund (concerning old loads) etc. Municipality budgets take part in liquidation of industrial and mining pollution according to their very limited financial possibilities. Private Czech stakeholders are relatively weak and are disposed to pay environmental costs under the legislative pressure only. International stakeholders pay attention preliminary to transboundary environmental problems or problems in border areas. Let us mention the fund Phare and Austrian and Slovak representatives among others.

Following main activities, leading to waste production were identified: significant pollution coming from industrial production, industrial waste dumping and consequences of mining activities. Pollution from industry depends on technologies used in the whole industrial process (not only in production) and on cleaning of wastewater. A significant part of industrial wastewater is treated in municipal WWTP. Dumping is the most frequent way of industrial wastes liquidation. Industrial wastes dumped both on special and municipal dumpsites perform a danger of pollution of groundwater and in some case also surface water. Old dump sites with unknown location and content are potentially very hazardous. Mining activities impact on water regime in mining areas. Potential pollution from uranium mines in Dolní Rožínka and their dumps and consequences of mining of oil and gas in the surroundings of Hodonín as well as Rosice-Oslavany coalmines are special problems.

3.2.1.2. Current Strengths/Assets

The most important problems following from the activities impacting on water are negative impact of industry on the environment, inappropriate industrial waste management and negative environmental consequences of mining activities.

Regarding the significant pollution coming from **industrial production**, the following assets have been identified:

- **Progressive implementation of low waste production technologies**
  Following new environmental law and application foreign know-how, new technologies have been implemented in progressive enterprises. The main motivation is preliminary economic. But lower consumption of fuel and raw-materials, better valorization of materials, recycling and other positive technological aspects lead to limitation of wastes and water pollution. Such progressive technological improvements were applied in only a part of plants, mainly with foreign investments.
- **Existence of efficient monitoring system for discharged waters**
  Water quality is relatively efficiently monitored by the state administration for a long time. It concerns quality of water resources, water quality in watercourses and also quality of discharged water downstream important sources of pollution.
- **Rehabilitation activities for river networks**
  Rehabilitation of river networks is one of the frequent activities of ministry of environment and its institutions together with ecological movements, universities and scientific institutions. To retrieve past encroachments into water streams (like drainage, straightening up, removing of bank vegetation etc.) is the aim of the asset. These efforts are successful in the case of some small streams till this time.
- **Change in production patterns (closing of production facilities)**
  Within the economic and social transition, many enterprises have lost their economic power. Some of industrial facilities were closed, in many cases the closing is to be expected. In spite of economic causes and consequences of the fact, from direct environmental viewpoint the mentioned changes in production patterns lead to substantial decrease of water pollution.
- **Existing mechanisms for legislation, control and decision-making processes**
  Many individual acts and other legal and control measures directed to improvement of water management and related matters were accepted till 1990. Problems can be found in deficient complexity and ineffective enforcement the law.
- **Educated human sources**
  Czech universities have educated experts in water management and related disciplines for a long time. Special research institutions (T.G. Masaryk Water Research Institute, Czech Hydrometeorological Institute, Institute of Hydrodynamics of Academy of Science of the Czech Republic and others) watch the situation and prepare programs.

Concerning the **waste dumping** the following assets have been considered:

- **Monitoring and setting of priorities for remediation**
  Active dumpsites are monitored according to the law. Remediation depends on priorities in dividing of financial sources. Old industrial dump sites or municipal dumpsites with industrial wastes are the problem.
- **Existence of legal frame for separation, recycling and use of wastes**
  Acts dealing with wastes form a strong legal frame for waste management. Nevertheless, acts and regulations dealing with the problem have to be amended or prepared.

- **Existence of regulations for monitoring of waste dumps (in competence of industrial enterprises)**
  Regulations concerning list of waste, waste management, monitoring and evaluation of dangerous properties of wastes and way of rehabilitation were adopted in 1997.
- **Existence of research programmes, development of new methods for waste processing**
  Research programmes in the field of waste management began to be developed in many scientific institutions (universities, research institutes of individual sectors etc.). Information about their progress is available in the journal ODPADY (wastes).

Regarding the **consequences of mining activ**ities, the following assets have been taken into account:

- **Existence of projects for appropriate reclamation of abandoned mining areas**
  Projects of reclamation of abandoned mining areas (lignite mines near Hodonín, coal mines near Oslavany, uranium mines near Dolní Rožínka, ore mines near Horní Mesto) finished or under degree of completion.
- **Existence of land-use plans taking into account installation of mining activities**
  Land-use plans of various scales according to the *Act on Town and Country Planning and Building Regulations Act* are at disposal or under preparation in the Czech Republic. The Environmental Impact Assessment procedure is required.
- **Legislation for exploitation of natural resources**
  More acts concerning natural resources and their exploitation (including Act on Protection and Exploitation of Mineral Resources) were adopted since 1990.

3.2.1.3. Analysis of Transboundary Effects

The Morava River Basin is situated in the upper part of the Danube River Basin. It means that pollution from it can impact neighboring countries (Slovakia, Austria). Direct impacts on the Black Sea are remarkable only as a part of an accumulative pollution from the whole Danube River Basin. Passive impacts from Austria (Dyje River Basin) are not very important.

As a consequence of pollution coming from industrial production and mining, the following transboundary effect have been identified:

- **Accidents in border areas**
  Industrial accidents are one of possible hazards of water pollution if they occur near the border. Also transport accidents with a leakage of oil or other dangerous substances can impact on pollution downstream of the Morava River. This danger is potential; substantial consequences of all accidents were eliminated in the Czech territory till this time.
- **Transfer of pollution to downstream part of river basin**
  The water quality in the border section of the Morava River reaches level IV - it means heavy polluted. It is possible to suppose that this pollution passes out to downstream part of the Morava River. Not only polluted water but also solid substances (result of water erosion in the river basin) containing pollution are transported down the river stream. While a majority such a solid substances in the Dyje River basin are caught in water reservoirs especially in the Nové Mlýny water reservoir, in the Morava River Basin there are no reservoirs and the way for sediments abroad is open.

- **Transport of dangerous substances from dump sites in case of floods**
  Extreme floods in summer of 1997 showed the hazard of transportation of dangerous substances not only from industrial dumpsites but also directly from afloat industrial areas.
- **Impact on ground and surface water in border area of mining in Hodonín and Bzenec**
  Lignite, oil and gas mining is operated in the surroundings of Hodonín near the Slovak border. Oil and gas mining is in operation both in The Czech republic and Slovakia and groundwater horizons are mutually connected. The impact is reversible.

3.2.2. Sector Problem Analysis

3.2.2.1. Core Problem

The following core problem has been identified in this sector:

"DETERIORATION OF AQUATIC ECOSYSTEMS AND WATER QUALITY DUE TO POLLUTION FROM INDUSTRY AND MINING"

Industrial and mining activities and their consequences impact on water quality and water regime in a negative way. Water pollution and unfavorable changes of water regime can cause disruption of ecosystems, health risks and limit possible use of water. All these negative changes lead to decrease in quality of life.

3.2.2.2. Causes Leading to Environmental Problems

There are many direct and indirect causes leading to environmental problems. Used technologies, way of operations as well as the whole social and economic milieu was necessary to take into account. All the mentioned causes act in concrete natural conditions together with impacts of agriculture, municipal operation and other human activities and create common synergetic effect.

The following direct causes of deterioration of aquatic ecosystem and water quality due to pollution from industrial production and mining have been identified:

- Negative impact of industry on the environment
- Inappropriate industrial waste management
- Negative environmental consequences of mining activities

These problems have other direct causes. An explanation of each of these problems together with their cause-effect relation will be given below:

(i) Negative impact of industry on the environment

The main contribution to this problem has the inadequate treatment in industrial wastewater, industrial technologies not responding to ecological requirements and gaps in regulatory mechanisms.

a) Inadequate treatment of industrial wastewater

Due to many exceptions in water law in the past and insufficient enforcement of law at the present time, some industrial enterprises do not treat their wastewater adequately. The feature is connected with used technologies and with social milieu not forcing environmental requirements sufficiently. Industrial wastewater is very often emitted to municipal wastewater treatment plants, which are not constructed for industrial pollution.

b) Industrial technologies not responding to ecological requirements

The feature follows mostly from the age of technological equipment in Czech enterprises, which was extremely unfavorable at the end of socialist period. Since 1990, lack of financial sources for modernization does not enable to improve the situation quickly. The problem is connected not only with technologies in production processes themselves but also with technologies of storage of raw materials, technologies of treatment of industrial wastewater etc. Bad technological discipline follows from gaps in regulatory mechanisms.

c) Gaps in regulatory mechanisms

Insufficient state and public control**, lack of information channels between industry, authorities and the public, gaps in legislation system** and insufficient enforcement of law are the most important problems of regulatory mechanisms. Public interest is low. Legal as well as moral pressure on producer hardly fulfils their role. From it follows that treatment of wastewater and application environmentally friendly technologies do not belong among high priorities of entrepreneurs. On the contrary, export of ecologically problematic productions from western countries menaces.

(ii) Inappropriate industrial waste management

Environmental threat from old dumpsites, inappropriate disposal of industrial wastes and because production of wastes exceeds the bearing capacity of the environment are the main causes of inappropriate industrial waste management.

a) Environmental threat from old dumpsites

Old industrial dumpsites perform potentially a timing bomb in the basin. In the past, criteria of production were much more important than waste management. That is why its control was very weak. Many of old dumpsites have not been identified till this time. Some dumpsites are covered with houses, industrial or business facilities or gardens. Potential hazard from old dumpsites consists in spilling of harmful substances including chemical and radioactive ones, among others.

b) Inappropriate disposal of industrial wastes

Dumping of industrial wastes is problematic also at the present time. Although the law of waste management is in operation, waste dumping is no priority for producers. The control and enforcement of law is insufficient.

c) Production of wastes exceeds the bearing capacity of the environment

Due to overproduction of wastes, the natural bearing capacity of the environment is exceeding in some cases. Separation of industrial wastes is unusual and recycling of materials and substances in the production is insufficient. Squandering happens. The problem is connected with gaps in legislation to encourage limitation of wastes and with lack of financial sources (no priority) for modernization.

(iii) Negative environmental consequences of mining activities

The problem of negative environmental consequences of mining activities is due to contamination of tailings and landfills with hazardous substances, inadequate gravel and sand quarrying and contamination of water in quarries/mines.

a) Contamination of tailings and landfills with hazardous substances

Impact of waste banks of old and abandoned mines on the water system is the problem. After the mining is finished, attention paid to the monitoring and operation of old waste banks and lagoons is usually less intensive. This induces high risks of leakage of harmful substances to the water medium. Intended finish of uranium mining in Dolní Rožínka can perform special problems connected with radioactivity.

b) Inadequate gravel and sand quarrying

Mining (quarrying) activities disturb the landscape including flood plains. Decreasing of flood plains leads to unfavorable changes of water regime. Land-use-planning is not able to hinder the market interests of entrepreneurs.

c) Contamination of water in quarries/mines

Water in quarries and mines is often contaminated by harmful substances. Their disposal to water contributes to water pollution from other branches.

3.2.2.3. Environmental Effects

The direct consequences of degradation of aquatic ecosystems and water quality due to pollution from industry and mining are:

- **Changes of water regime**

  Considerable industrial consumption of water (including cooling water) which is not returned into water streams as well as landscape changes provoked by mining and quarrying change complex water regime. Quantity of water in streams is closely connected with water quality because it influences the self-purification ability of water.

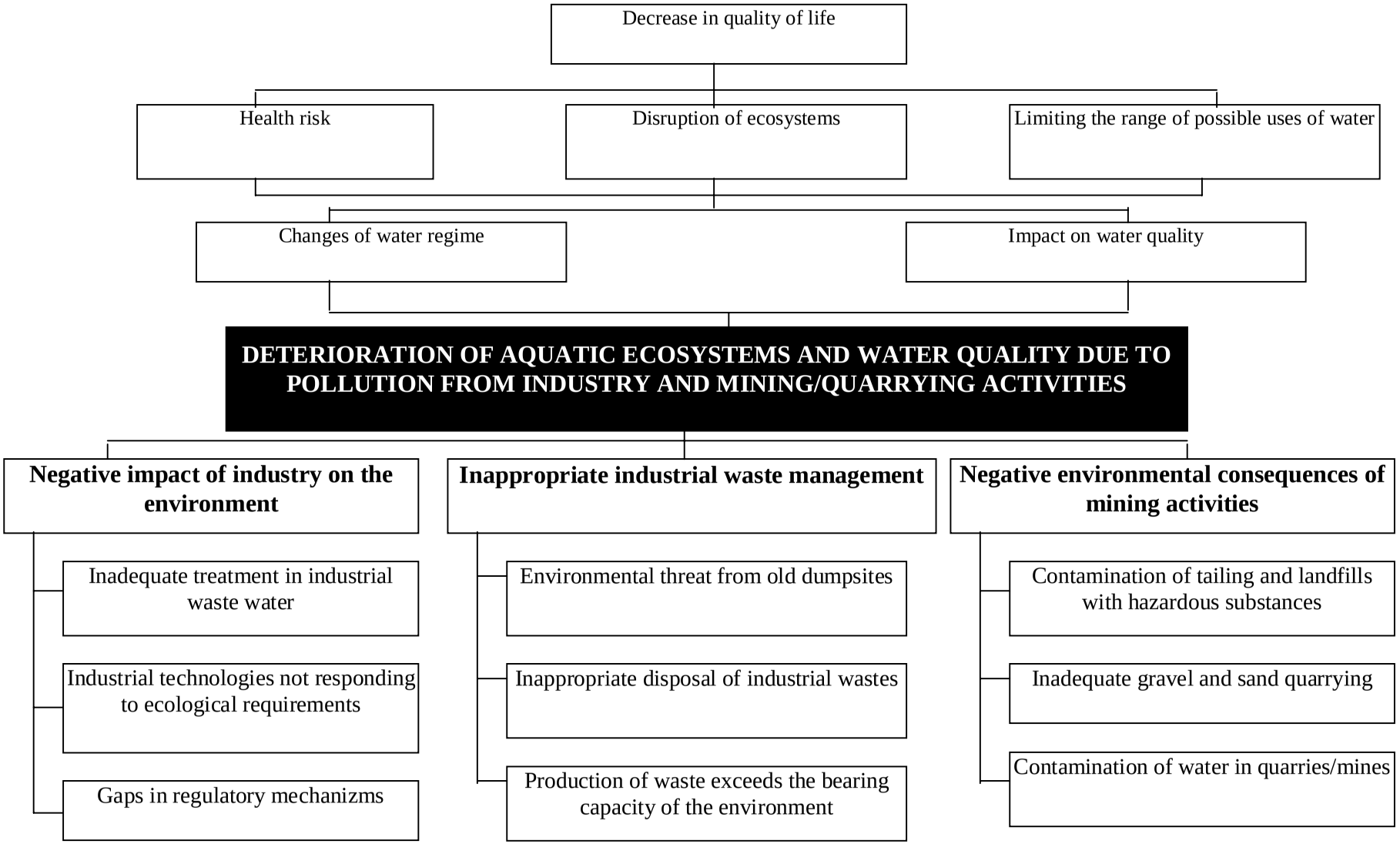
- **Impact on water quality**

  Water pollution of all kinds change water quality negatively. Only a short part of upper water streams is of a good quality suitable for drinking and bathing purposes. Industry and mining impacts on water quality consist on emission of hazardous substances (chemicals of various kinds according to the technological process), emission of sewage, thermal pollution etc. The predominant problem for surface waters in the Morava River Basin is the presence of nutrients (e.g. nitrogen and phosphorus compounds) which are transportable over long distances and cause the eutrophication. The occurrence of organic pollutants - both biodegradable and chemically degradable ones - is also very abundant. Some streams are polluted by heavy metals, for example mercury. Water quality and water regime are two sides of one coin and impact together.

These direct consequences are reflected in the following environmental effects on human, living environment and economy:

- **Health risk**
  Health risk is a direct environmental effect of deterioration of water quality and water regime on man. Although hazard of infectious diseases from drinking water is imperceptible, other risks can play their role: various kinds of allergic reactions from bathing, consequences of long-term exposure to water of low quality (especially high content of nitrates and other) etc. Also odor belongs to this category.
- **Disruption of ecosystems**
  Water is substantial component of ecosystems. Each deterioration of water quality or quantity can cause disruption of ecosystems including plants and animals. The connection can be direct (consequences of using polluted water by living organisms) but often indirect (changes of water regime, soil conditions and climate). Eutrophication is one of the most serious phenomenons in localities with high load of nutrients (nitrogen and phosphorus).
- **Limiting the range of possible uses of water**
  Polluted water and changed water regime can cut down water using for drinking, bathing or other (irrigation, food industry etc.) purposes. To tell it more precisely, the price of treating polluted water is too high to compare it with desirable purpose.

PROBLEM HIERARCHY
2. Industry and Mining



3.2.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective have been identified:

"SIGNIFICANT REDUCTION OF POLLUTION GENERATED FROM INDUSTRY AND MINING/QUARRYING ACTIVITIES"

It is obviously insufficient to adopt passive measures for limiting of pollution consequences, especially in the case when such measures are in contradiction with market efficiency of production. That is why best complex practices taking into account both economy and environment are to be implemented to improve the situation.

In order to achieve significant reduction of pollution generated from industry and mining/quarrying activities the following results are foreseen:

- Adoption of best available practices
- Implementation of appropriate waste management
- Application of environmentally friendly practices in mining/quarrying

(i) Adoption of best available practices

To adopt best available practices means implementation of measures in the fields of technology, organization of the whole industrial process and in economic and social framework for industrial production. It is necessary to turn the attention from only technological improvements (construction and modernization of WWTPs) to complex ones.

In order to adopt best available practices, it will be necessary to complete several activities in the following fields:

- best available technologies
- social control
- wastewater treatment

It is necessary to:

- **implement the best available technologies.** In conditions of private ownership, it is necessary to find economic and moral instruments of enforcement environmental principles in industrial production as well as ensure financial resources. Introducing ISO 9000 and ISO 14000 standards (including their massive application and general acceptance) can be such stimulation. By means of it, up-to-date technologies of industrial production should be implemented. Conditions for market regulation with respect to environment have to be created.

  Furthermore, training and education of workers (staff) should be performed in order to improve technological discipline and control, as well as keep order and discipline in workplaces.

  Implementation of best available technologies includes also necessity to ensure sustainable storage of raw materials and reduction of risk of industrial accidents.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - In 1991 started the "Project of the Morava River Basin" which has been supported by Czech Ministry of Environment. An examination of 50 municipal sources of pollution (mostly with a high share of industrial pollution) was conducted in terms of key water

quality parameters BOD_5, COD_{Cr}, undissolved and dissolved compounds of nitrogen, dissolved oxygen, dissolved solids, suspended solids, metals as Fe, Mn, Hg, Cd, Pb, Zn etc. The examination of industrial sources of pollution was focused on key localities or regions, which have caused the water contamination in the Morava River Basin. Seven key hot spots in the Morava River Basin have been chosen and for these "priorities" have been prepared upgraded projects dealing with proposals of water pollution reduction downstream given "hot spots".

Planned Project(s)

- National Action Plan for the Morava River Basin is a complex project following the project MORAVA for improving the environmental situation in the basin. It was elaborated in more versions but none of them has been approved by Czech government till this time.

Proposed Project(s)

- A project dealing with Assistance of the Association of Industry in introducing ISO (information, assistance, and advertising) would be suitable to help producers and to create favorable common conditions for it.
- After the experience with the 1997 floods, a project of drafting a system of preventive measures against floods, which would include also industrial and mining aspects, is suggested as a project.

➢ **undertake measures for applying adequate social control instruments and measures.** It is important to create and support such a social and economic milieu, which is able to enforce environmental principles in industry. Market regulation with respect to environment is to be implemented. Conditions for capital investments have to be created and economic tools improved. In this context, it is important also to introduce mechanisms for facilitating application and enforcement of legislation and environmental law.

Factories have to be located optimally with respect to water resources and land-use planning. Suitable construction technologies and suitable operation of structures have to be applied and ISO 9000 and ISO 14000 standards have to be introduced.

Concrete steps have to be undertaken with respect to stimulation - raising of public interest. Information and links between industry, civil service and the public have to be improved. Environmental education has to be promoted e.g. through NGOs activities, media. Sustainable products and technologies have to be advertised and promoted as well.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- Projects of environmental education at schools as well as environmental education of adults (within Ministry of Education, Youth and Physical Training) are in operation.

Planned Project(s)

- Water management training and information center is to be established by the Ministry of Environment to improve knowledge and know-how of people engaged in the field

Proposed Project(s)

- To set up a lobby for promoting environmental measures (as an informal project) is necessary for improvement the legislation and policy in the field.

- **ensure suitable wastewater treatment.** Treatment of wastewater is very necessary with a consideration for present technologies. In spite of expected limitation of wastes, certain amount of wastes will be certainly produced also in the future.

  It is necessary to upgrade industrial WWTPs, to construct industrial WWTPs with sufficient capacity, to ensure sufficient efficiency of WWTPs, to eliminate treatment of specific industrial wastewaters in municipal WWTP and to monitor industrial wastewaters discharges.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Project Remedying Measures in Area of Company "Fosfa Poštorná" is directed to its 2nd stage (1998-2002). Its targets consist in improvement of water quality conditions in the Dyje River and in alluvial aquifers. The project has an important transboundary effect: Fosfa Poštorná (part of the town Breclav) is very close to the border between Czech Republic and Austria and nearby the boundary between Slovakia and Austria.
  - Municipal wastewater treatment plants of some important Moravian towns (Znojmo, Breclav, Zlín, Prerov, Prostejov) with treatment of an important share of industrial wastewater are in construction.

  Planned Project(s)

  - The aim of the project Intensification of Wastewater Treatment Plant Kozeluzny Otrokovice (tannery) is the improvement of present unfavorable state of water quality related to outflow from the WWTP and to water quality requirements in surface waters.
  - Industrial WWTP Hamé Babice as well as municipal WWTP of large Moravian cities with a great share of industrial wastewater (Hodonín, Uherské Hradište, Kromeríz) are under preparation.

  Proposed Project(s)

  - Project of testing the efficiency of industrial WWTPs (and municipal WWTPs with an important share of industrial wastewater) by the Czech Environmental Authority is suggested.

(ii) Implementation of appropriate waste management

Not only liquid but also solid wastes are a part of industrial outputs. Appropriate waste management (dealing with industrial wastes) means to limit industrial waste production, to prevent from negative impacts of dumpsites to water and to solve the problem of old industrial dumpsites.

In order to achieve the implementation of appropriate waste management, it is necessary to undertake measures in the following areas:

- old dump sites
- storage facilities for industrial waste
- industrial waste production

It is foreseen to:

- **remedy old dumpsites.** It is necessary to identify old dumpsites through detailed survey. Their impact on surface water and groundwater has to be monitored and priority should be defined, taking into account financial aspects. Consequently, the dangerous old dumpsites, settling pits (lagoons) and sludge beds are to be decontaminated. Economical

tools have to be improved with regards to envir4onmental protection. It would be also important to improve education of adults in terms of harmfulness of old dumpsites.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- There are some remedies of industrial dumpsites in operation. Let us mentioned PRECHEZA Prerov, FOSFA Poštorná (Breclav), Prerov Steelworks, lagoon in Rohatec, Hluk dump site and a dump site of Colorlak Co. Staré Mesto (including PCP)
- Remedy program for old dumpsites is granted by National Property Fund and Ministry of Environment.

Planned Project(s)

- The National Property Fund grants remedy of old dumpsites and other old loads in industrial enterprises. To ensure comparable conditions for new owners is the sense of the project.

Proposed Project(s)

- There are two important dumpsites remedy of which would have a high proposed priority: the dumpsite at the confluence of the Olšava and Morava rivers (unidentified industrial waste) and the Bzenec dump site.

- **make available appropriate storage facilities for industrial wastes.** Through evaluation and monitoring existing dumpsites, appropriate management of dumpsites should be introduced. Remedy of sludge beds and treatment leakage waters are the main elements of improvement measures. Measures have to be undertaken to modify economic rules. Desirable behavior of industrial producers has to be motivated and public awareness raised form suitable social and economic framework for mentioned activities. It is also planned to monitor dumpsites.

  For this activity, the following projects have been identified:

  Existing/Ongoing Project(s)

  - There is remediation program for old dumpsites (National Property Fund + Ministry of the Environment).

  Planned Project(s)

  - Two important acts are under preparation: Information Act and Waste materials Act (act on utilization of secondary raw materials).

  Proposed Project(s)

  - To implement environmental tax is proposed.

- **minimize industrial waste production.** Implementation of optimum industrial technologies minimizing waste production is the key issue. Separation the waste according to final disposal and support maximum recycling and reuse or raw materials are important to minimize industrial waste production. It is also required to create suitable social milieu not preferring a consumption approach and stimulating voluntary modesty. These are important parts of social framework to realize this activity.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- ***Any existing project was identified but some projects have been implemented (PRECHEZA Prerov, Colorlak Staré Mesto, Hluk dumpsite remediation and information system on wastes)***

Planned Project(s)

- ***Packaging*** Technology Act is under preparation.

Proposed Project(s)

- No projects were proposed; the problems are closely connected with the question of technology updating and suitable social framework for waste management described above.

(iii) Application of environmentally friendly practices in mining/quarrying

The issue concerns both old abandoned and operating mines and quarries. There are two main groups of impact on water which are to be limited: consequences of substantial landscape changes including water and water regime and water pollution by mining.

Application of environmentally friendly practices in mining/quarrying will require several activities in the following fields:

- abandoned mines
- sustainable mining and quarrying
- mining and quarrying activities

It is necessary to:

- **remedy abandoned mines.** Identification and evaluation of old abandoned mines is the necessary pre-condition of the issue. Decontamination and remediation of mines and spoil banks are the main measures.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - End-of-operation programme for uranium mine in Dolní Rožínka is very important from the viewpoints of possible radioactive pollution and especially perception of the danger by local people.

  Planned Project(s)

  - From the project mentioned above follow prepared project directed on remedy measures following uranium mining in the basins of the Svratka and Oslava rivers.

  Proposed Project(s)

  - Similar projects would be prepared for remedial measures following black coal mining in the Rosice - Oslavany locality and for lignite mines in the surroundings of Hodonín.

- **implement sustainable mining and quarrying.** Responsible preparation of mining (quarrying) by means of E.I.A. and other procedures within limits in the governmental raw material strategy defined precisely in land-use plans is to be enforced before the starting the activities. Application of sustainable technologies in mining and treatment of wastewaters from mines is necessary. Protection mines against floods is a special topic.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Raw materials surveys in individual districts are elaborated within the authority of the Ministry of Environment

  Planned Project(s)

  - Existing land-use plans (the so-called plans of large territorial units) are revised and re-evaluated step-by-step.

  Proposed Project(s)

  - It is very necessary to prepare, approved and enforced on the governmental level state energy policy and raw materials strategy.

- **monitor and evaluate mining and quarrying activities.** Efficient monitoring system is necessary for application of environmentally friendly practices in mining/quarrying. It consists of scientific evaluation of mining activity impacts on water bodies, monitoring abandoned mines, monitoring of discharges of mine wastewaters and evaluation of efficiency of mines rehabilitation.

  For this activity, the following projects have been identified:

  Proposed Project(s)

  - It suggested formulating a programme for the monitoring of consequences of mining activities within Czech Mining Authority.

From all the projects mentioned above, there are two of the **highest priority**:

- **Remedy Measures in Area of Company "Fosfa Poštorná"** among existing projects
- **Intensification of Wastewater Treatment Plant Kozeluzny Otrokovice** among planned projects

3.2.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lies 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.

Industry and mining exist in certain milieu formed by political, economic, natural, social, legal and other conditions, which present complex synergetic framework. Czech industry is formally private sector what means that direct interventions of state administration in the branch are limited. Nevertheless, it is necessary to ensure some external assumptions in order to reach ”significant reduction of pollution generated from industry and mining/quarrying activities”. Probability of fulfilling the mentioned assumptions is relatively high but the problem is their application in concordance with the goal of the project. That is why the way of fulfilling following assumptions is to be monitored and influenced.

In particular, the following assumptions have been identified at the **activities** level to achieve the sector results:

- **Public financial sources are effectively allocated**
  To define priorities in allocation of public financial sources and to preclude profusion is the assumption of using public money for the aims of the program.
- **Depreciation politics is changed for the benefit of financial sources for modernization**
  To mobilize private financial sources is possible by change of depreciation politics in order to gain money for modernization of industrial technologies.
- **Water act is approved and enforced**
  In spite of series of acts concerning the relations among industry, water and environment approved till 1990, the water act needs substantial upgrading. It is an assumption for the real complex water management. It would be suitable to manage the entire basin by one regional authority. New law including connected regulations and decrees would respect new administrative dividing of the country.
- **Environmental information is declassified and used**
  Information about concrete impact of individual industrial plants on environment is not generally available with a reference to economic secrecy. Declassification and common use of environmental information is a basic assumption of public control.
- **Act of wastes is amended and effectively applied**
  In spite of more modifications of the act of wastes in last years, its further updating is under preparation. It is an assumption for sustainable waste management in industrial and mining enterprises.
- **Exploitation of ore and mineral deposits and mining and quarrying areas is re-evaluated**
  It is probably possible to decrease mining and quarrying activities by means of re-evaluation of ore and mineral deposits from both economic and environmental viewpoints.
- **Civil service act concerning waste management is amended and effectively applied**
  A new version of the act would regulate problems of waste management in municipalities, regions, due to separation and recycling of wastes and respect new administrative dividing of the country.

For the **results/outputs** the following assumptions have been considered:

- **Producers are pressed through legislation and moral principles**
  Wide liberalization of entrepreneur activities was the main motivation after 1990. Now, it is necessary to apply legal and moral principles to press the producers in order to implement sustainable practices in industry and mining/quarrying. In other case, the producers would prefer their own profit in exclusively economic sense.
- **Regional authorities and self – governments are created**
  In The Czech republic, regional level of state authorities and self-governments is missing. This level can be reasonable for application of many of the measures directing to the goal of the program. Central government usually searches for macro-economic criteria at the first place while local governments do not have sufficient power to solve problems exceeding extent of one municipality. New administrative division of the country should enter into operation in 2000. Future authorities of regional institutions are not known till this time.

- **Economic tools for environmental protection are enforced**

  A complete system of economic stimulation and penalties directed to environmental protection is missing. Existing measures are weakly enforced. Resistance of producers, who argue with ”protection from free enterprise”, is intensive. The situation is to be changed to create conditions for implementing sustainable practices in industry and mining.
- **Civil service act is approved and effectively implemented**

  Many environmental problems are caused by insufficient civil management including control. To reach improvement of civil service is possible only through approval and effective implementation of civil service act (and other laws connected with the matter). The act would bring higher professionalism of clerks and officials.
- **Results of environmental education are implemented in practice**

  Environmental education is a fashion in all levels (from primary school to universities) at the present time. But it is of a very different level, often unilateral, preferring selected problems only etc. It limits efficient implementation of its results in practice. Improvement of the situation is necessary assumption for creation of public interest and following public activities.

3.2.5. Impact Indicators for Sector Results

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

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

- **Production according to ISO 9000 and ISO 14000 will be implemented by 80% of products in the Morava River Basin till 2005**

  Level of implementing of ISO standards indicates updating and application of new environmentally friendly technologies, operations and ways of thinking both producers and consumers.
- **Emission limits will not exceed the standards downstream any point industrial source in the Morava River Basin in 2005**

  The indicator concerns water pollution from industrial plants and other point sources. It means that any point source will not exceed the standards (according to governmental decree No. 171/1992 Coll.) of dangerous substances emitted into water streams.
- **Immission limits in water courses will not exceed the standards downstream any mine, quarry, dumpsite, and old environmental load in the Morava Basin in 2005**

  The indicator concerns water quality in streams. It means that any mentioned facility will not debase water quality above the standards (according to governmental decree No. 171/1992 Coll.). It reflects the problem of both active and abandoned mines / quarries and dumpsites in the basin.

The application of mentioned indicators would depend on persistent monitoring, evaluation and information system by state authorities.

3.3. Municipality

3.3.1. Situation Analysis

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

In the year 1996 in the Czech part of the Morava River Basin lived 2,778,168 inhabitants which is 26.9 % of all inhabitants in the country (in 1996 it was 10,321,344 inhabitants). The average population density in the region was 131 inhabitants per km^2. This density is the same as the average population density in the Czech Republic.

There are three big towns in the Morava River Basin Brno, Olomouc and Zlín. These towns are the largest consumers of water and producers of wastewater. There are another three towns with approximately 50,000 inhabitants and thirteen towns with the number of inhabitants between 20,000 up to 50,000 in the region. In rural areas there is a relatively great number of small settlements with less than 5,000 inhabitants. The town population is approximately 60 % of total number of inhabitants in the Morava River region.

The typical industries in region machinery, foodstuff, tanneries, wood processing and building are mostly located in towns. During the socialist period the heavy industry, e.g. metallurgical and chemical industry, penetrated also into small towns. The industrial enterprises are frequently connected to the municipal sewerage system and wastewater treatment plant.

The following towns with a population over 20,000 inhabitants are located in the Czech part of Morava River Basin:

Brno	390,000	Kroměříž	30,000
Olomouc	105,000	Hodonín	29,000
Zlín	83,000	Valašské Meziříčí	28,000
Jihlava	52,000	Uherské Hradiště	28,000
Přerov	51,000	Břeclav	27,000
Prostějov	50,000	Vyškov	23,000
Třebíč	40,000	Blansko	21,000
Znojmo	37,000	Otrokovice	20,000
Vsetín	31,000	Hranice	20,000
Šumperk	31,000		

The land in valleys in Morava River Basin is excellent for agricultural purposes. During the socialist period the agriculture expanded also to mountainous areas. This is one of the reasons why the number of 391,756 inhabitants live in villages with less than 500 inhabitants which is 14.3 % of total number in the region.

From the water sector point of view, the number of inhabitants living in a municipality is not the major factor. The level of technical infrastructure and the level of equipment in dwellings are also important parameters. The differences between towns and rural areas can be quite small. The greatest differences can be recognized in the settlements with less than 500 inhabitants because below this number of inhabitants the construction of traditional water supply systems, sewerage networks and wastewater treatment plants is not economical.

In general it can be stated that the region is relatively well equipped with infrastructure systems for water supply, wastewater collection and wastewater treatment.

The system of institutions responsible for water protection, licensing of discharges and supervision compliance with license condition has three levels in the Czech Republic. First competent authority is represented by the district offices (in chosen cities municipal offices) and their departments of environment. District offices belong to the sphere of competence of the Ministry of Interior. Higher competent authority, Regional Departments of the Ministry of Environment, resolves appeals of the parties from unsuccessful negotiations at the lower level. The highest authority responsible for ground and surface water protection is the Ministry of Environment itself. According to the Act No. 272/1996 Coll. some competencies in water management are given to the Ministry of Agriculture. The Czech Inspection of Environment, which is divided in four divisions, incl. the division for water protection, has control tasks and it is able to give penalties in the same extent as the district offices. River Basin Authority for Morava River Basin is a joint stock company, which takes care in almost all water management problems in the whole basin, incl. underground water.

Public water supply, water collection and wastewater treatment is under management of the Ministry of Agriculture and private Water Supplying Companies execute supply service. Hygienic insurance in public water supply appertains to competent sphere of the Ministry of Health.

The main activities contributing to water pollution in the sector are:

- **Production of municipal solid waste**
- **Production of municipal wastewater**
- **Urban traffic**

The municipal solid waste produced in the Morava River Basin is disposed mainly on landfills and partly incinerated. Not protected landfills can seriously influence the quality of surface and groundwater. In the year 1992 the number of 8,536 landfills and dump sites were identified in the Czech Republic with different level of security, of which 2900 were in the Morava River Basin.

A lot of fault landfills was closed, only some of them on the basis of special conditions were left in operation, although only 6% were in compliance with existing legislation and operation rules. In accordance with the §15 of the Act No. 238/1991 Coll. the operation of every not well secured landfill in the Czech Republic was stopped in the year 1996. At present only controlled landfills are officially in operation. In 1996 there were 83 dumpsites in the Morava River Basin which were in accordance with technical parameters set for safe operation.

It is guessed that on the same area there are about 3,000 old dump sites which still represent the serious danger for soil, ground layers and surface and underground waters. The survey of these dumpsites is continuously running but the systematic records about construction of landfills and composition of deposited materials are not available. It is obvious that the main danger comes from the stopped dumpsites to which industrial and other hazardous and toxic materials were deposited. Step by step, all the closed dumpsites must be rehabilitated, recultivated and decontaminated.

Production of municipal wastewater is closely connected to public water supply level.

About 86 % of inhabitants in Morava River Basin are connected to public water supply networks. The rest is supplied individually, mostly from private wells.

The new political situation after 1990 led to significant changes in consumption of drinking water. The economical transformation caused the gradual recovery of a value and cost system. These have brought the enormous growth of water price and the significant reduction of water consumption. The intakes for water supply have the decreasing tendency all the time. In 1995 the intakes were only 70.9 % of intakes in 1990.

The data for the Morava River region give the following figures:

Year	1990	1991	1992	1993	1994	1995
Drinking water supplied and charged to inhabitants (million m^3)	111.9	102.2	99.3	87.9	84.6	79.3

The differences in specific consumption per inhabitant between towns and rural areas are not too significant. The consumption of water is higher for inhabitants connected to public supply networks.

Starting 1990 the water consumption has been changing so rapidly that it is difficult to predict the future development. It is not possible to extrapolate the values and make conclusions based on the actual development because the average value of population reproduction has a changing tendency, too.

For the year 2015 the prognosis of drinking water production gives the following figures:

Value	unit	upper limit	bottom limit	average
Specific water consumption of inhabitants	l/cap/day	170	150	160
Specific water production (water produced for water supply purposes)	l/cap/day	373	282	328
Total number of inhabitants	million	2.78	2.70	2.74
Number of inhabitants supplied with water from public networks	million	2.40	2.29	2.345
Intakes of water for inhabitants	million m^3	149	125	137
Water produced by water works	million m^3	327	236	281

The above data indicate that intakes of water for public water supply in 2015 will be approximately on the same level as in 1980. That means that the sources of water should remain sufficient also for future 20 years under condition that they are not deteriorated.

73 % inhabitants in Morava River Basin are connected to public sewerage systems, of which 85 % of wastewater is treated. All 47 municipalities with more than 10,000 population equivalents and 82 % of 33 municipalities with population equivalent 5,000 - 10,000 are connected to wastewater treatment plants. Nevertheless, many old installations require intensification, extension or reconstruction to improve efficiency especially nutrient removal. In many cases also a reconstruction of sewerage networks is necessary.

The available information about the wastewater discharged to watercourses in the Czech part of Morava River Basin in 1990 - 1995 is as follows:

Year	1990	1991	1992	1993	1994	1995	1996
Wastewater discharged into water courses (million m^3)	358.1	345.3	338.5	311.1	299.3	256.4	263.3

The discharges of wastewater into the surface water show the decreasing tendency all the time. In 1995 only 71.6 % of quantity in 1990 was discharged. This value is in close relation to water consumption development.

Also the total load on recipients is decreasing as follows:

Year	1990	1991	1992	1993	1994	1995	1996
BOD_5 (thousand tons/year)	24.3	29.7	25.8	24.3	17.5	16.2	6.6
COD_{Cr} (thousand tons/year)	76.0	72.0	71.2	70.0	56.0	45.5	23.9
Suspended solids (thousand tons/year)	31.3	30.0	29.3	17.2	24.5	20.0	10.8

In balances it is assumed that the number of inhabitants connected to wastewater treatment plants will achieve 80 % in 2015 and that the total production of wastewater related to inhabitants will be 102 million m^3.

The municipal wastewater discharges include both the wastewaters from inhabitants and industrial wastewaters discharged to municipal sewerage systems.

The **urban traffic** is a rapidly developing sector due to changes in economic activities in municipalities and to a growing standard of living of inhabitants. Many inhabitants and companies prefer car traffic because of its flexibility and simplicity, e.g. the number of passenger cars in the Czech Republic increased from 1991 to 1996 by 36%, the number of persons transported by urban public transport decreased by 24%. Brno is an important international center at crossroads of two motorways. Břeclav is an important center of railway transport located near the Austrian and Slovakian border. The extensive discussion about environmental consequences of traffic load and promotion of railway transport is at present held in the Czech Republic. According to the statistics the number of persons transported by railway decreased from 1991 to 1996 by 26%, the amount of goods carried dropped by 20%. Shipping is not developed in the region.

The major danger represents accidents during transport of hazardous and toxic materials as well as oil products.

3.3.1.2. Current Strengths/Assets

Regarding the production of **municipal solid waste**, the following assets have been identified:

- **Waste separation at households**

  Household waste separation has been introduced during last several years especially in larger towns. The level and extend of separation varies in different municipalities. The household solid waste separation has been introduced in the region of Prostějov, in the towns of Uherské Hradiště, Vsetín. Partly, the system is in operation in Břeclav. In other towns the separation is orientated especially to glass. In Brno the collection of the chemical waste from inhabitants is regularly organized, centers for the voluminous waste has been established and collection of glass supported.

- **Technological (know-how) of waste disposal**

  After political changes starting 1990 the know-how of waste disposal was introduced in the Czech Republic by several foreign companies, which are offering their services in this field. Also Czech companies were forced to adopt the appropriate know-how to become competitive. This is valid both for landfills and incinerating plants.

  Up till now landfilling has been prevailing because of economical reasons.

- **Existing law regulation for waste disposal**

  On January 1, 1998 came into force the Act No. 125/1997 Coll. regulating waste treatment and disposal. The act determines the duties of inhabitants and companies related to collection, salvage, separation, manipulation and transport, storage, reuse, disposal. The Act involves also basic regulations regarding manipulation and management of packages.

  The Act also determines responsibilities of municipalities and state authorities in the field of waste disposal.

  There were four decrees issued on December 11, 1997 related to the Act:

  - No. 337/1997 Coll. Catalogue of wastes
  - No. 338/1997 Coll. Details on waste handling
  - No. 339/1997 Coll. Evaluation of hazardous properties of waste
  - No. 340/1997 Coll. Financial reserve for recultivation, care and remediation after finishing the landfill operation

Concerning the production of **municipal wastewaters**, the following assets were defined:

- **Technological discipline**

  After privatization in water sector a great attention is paid to the technological discipline in wastewater collection and treatment. However the monitoring of existing wastewater treatment plants has shown that some of them can achieve better treatment efficiencies when more properly operated.

- **Observing regulation**

  The level of wastewater treatment and effluent standards are regulated by Decree No. 171/1992 Coll. the limits of which are in some way comparable with EU legislation in this field. Low capacity, old civil and/or mechanical and electrical part etc. of some wastewater treatment plants can cause non-compliance with limits. The new regulation being compatible with EU legislation is in preparation.

- **Availability of subsidies from the State Fund for the Environment**

  The State Environmental Fund was established on the bases of Act No.388/1991 Coll. as an important financial resource to support the protection and improvement of environment. It is one of the basic economical tools of the State Environmental Policy. The Fund is administrated by the Ministry of Environment.

  The basic approach for granting of subsidies and loans is defined by the Directive of the Ministry of Environment. The forms and subjects of financial supports are every year precized through annexes to the Directive.

  Except of the State Environmental Fund which grants subsidies, advantaged loans and guaranties the following resources and allowances for financing demands of water management in the Czech Republic are used:

  - State budget - through the mediation of resort budgets or directly through subsidies and guaranties
  - Municipal budgets - through subsidies
  - Own resources of organizations
  - Commercial loans from inland banks
  - Commercial loans from foreign banks
  - Foreign subsidies and loans from international institutions and from foreign governments

- **Awareness rising exists**

  The education of inhabitants and other producers of wastewaters connected to public sewerage systems and wastewater treatment plants to avoid discharges of hazardous, toxic and heavily polluted waters has been started. It was recognized that this education is not systematic up till now and the results are not satisfactory. The process of awareness rising must continue starting with basic school education.

- **Application of the EMAS system for municipalities**

  This program focuses on establishing systems of management in the field of environment (Environmental Management System and Audit Scheme).

  In July,1998 the Government of the Czech Republic approved the National Program of EMAS Implementation. There are still big reserves in EMAS system application in the Morava River Basin.

- **Education of WWTP operators exists**

  Operating companies are aware of necessity of permanent education of their operating staff. The courses are offered e.g. by associations of professionals or specialized private companies.

Regarding the **urban traffic**, the following assets have been considered:

- **Technical standards for construction and operation of gasoline stations**
  Technical standards for construction and operation of gasoline stations are on sufficient level in the Czech Republic. If some problems appear they are caused mainly by accidents on old installations and failures of human factor.
- **Technical control for cars and roads safety**
  All means of transport and roads have to undergo the regular tests of their technical state. In spite of it the present situation in the Czech Republic is worse compared with EU average situation. The average age of vehicles is quite high with the high risk of oil leakage and accidents. However the number of 135,000 cars equipped with catalysts in the year 1993 increased to 580,000 in 1996.
- **Existence and application of use of land-use plan**
  The implementation of land use plans is well developed in the Czech Republic. Each municipality land use plan has to include the annexes regulating traffic.
- **Application of risk analysis and EIA**
  Act No.244/1992 Coll. is regulating the environmental impact assessment of proposed structures, reconstruction activities, processes, development plans and programs. The Act is fully valid for traffic structures and it enables the participation of inhabitants, governmental and non-governmental organizations in the process of assessment.
- **Existence of well organized public transportation**
  The Czech Republic traditionally used to have a well organized and dimensioned public transportation which preferred trams, trolley-buses and other environmental friendly means of transport. Unfortunately this system was partially reduced and replaced by buses. Many people also prefer the daily use of their private or company cars. These changes increase the risks of environmental pollution.
- **Technical standards for operation of railway stations and freight transport**
  Technical standards for construction and operation of railway stations exist. Also other standards regarding water protection are relevant. The implementation of EU legislation and standards related to influence of transport on environment as well as introduction of criteria and conditions given by the international transport organizations as the fundamental assumption for integration of the Czech Republic to EU can also highly contribute to the improvement of the present state.

3.3.1.3. Analysis of Transboundary Effects

All rivers in the Czech Republic rise in the country so that as regards surface waters no pollution is transported to the country from other states. The municipalities with all their human activities represent point sources of pollution, which can endanger the quality of water. The pollution in the stream can then be transported far from its source without regard to the border location.

As the consequences of production of **municipal solid waste** the following transboundary effects have been identified:

- **Potential risk of endangering water by leached hazardous pollutant**
  At present only environmentally safe landfills are operated - according to the Act No. 238/1991 Coll. from July 31, 1996. If properly operated no leakage can occur.
  The potential risk comes from old landfills, which are not well protected. The hazardous pollutants usually are not removed by the self-cleaning processes in rivers, can be transported far from the source and so endanger the quality of transboundary waters.

- **Reduced use of water including recreation activities**

  The pollution leaked from solid waste disposal sides can affect the whole range of water use sectors e.g. water intakes for drinking purposes, industrial use, irrigation, recreation.

- **Risk of surface and ground water pollution in boundary reaches**

  The knowledge about old dumps is not satisfactory, the systematic monitoring was started recently. The real risk of water pollution and its contribution to the total pollution of boundary waters can be evaluated after several years of monitoring.

- **Risk of loss or change of biodiversity in boundary reaches**

  Water ecosystems are sensitive on content of hazardous and toxic pollutants in waters. The landfills and dumps can be the typical sources of such pollutants.

Regarding production of **municipal wastewaters** the following transboundary effects have been considered:

- **Negative impact at border locations**

  All rivers in the Morava River Basin start in the Czech Republic. There are only several negligible exceptions along Austrian border. There are no existing large untreated municipal wastewater discharges. All towns and also many small municipalities are already equipped with wastewater treatment plants. The pollution at border is in fact the summary of upstream discharges with respect to self-cleaning ability and water bearing of rivers. The actual level of pollution in different parameters is the result of the efficiency of treatment in existing wastewater treatment plants. Of course many parameters are influenced also by industrial and/or agricultural sources.

- **Limitation of movement of migrating water species**

  The polluted water is not acceptable environment for many sensitive organisms. At present the different pollution levels along the rivers do not permit the natural migration of species which results in fact that many species have left their former locations and because of pollution they do not migrate to upstream or downstream parts.

- **Loss or changes of biodiversity in protected area**

  Near the Austrian border an important European bio-center is located as well as wetlands protected according to Ramsar Convention. The biodiversity of this area is extremely valuable and must be well protected.

- **Reduced use of transboundary water resources**

  The pollution from municipal wastewater discharges can affect the whole range of water use sectors e.g. water intakes for drinking purposes, industrial use, irrigation, recreation.

Concerning **urban traffic** the following transboundary effect have been defined:

- **Transfer of insoluble substances and oil products after rain periods**

  The risk and the level of permanent contamination by insoluble and soluble substances and oil products from urban areas are relatively low compared with accidents, disasters and pollution discharged from industrial enterprises. In the year 1996 from total number of accidents in the Czech Republic 15% were caused by transportation and 7% by wrong operation of gasoline stations.

- **Risk of accidents and disasters in boundary localities**

  The risk of accidents and disasters in boundary localities exists because of dense and frequent road and railway transport near the border with Slovakia and Austria.

3.3.2. Sector Problem Analysis

3.3.2.1. Core Problem

For this sector the following core problem has been identified:

"MUNICIPAL POLLUTION"

In municipalities there is concentrated a large number of inhabitants, industries, services and other human activities. It is necessarily the cause of pollution production. That is why the municipalities are one of the important point pollution sources. With the growth of standard of living and other activities the anthropogenous pollution is increasing. If not adequately treated the load of environment is also growing. Experts have identified four key Hot Spots in the Morava River Basin regarding the surface water pollution from municipal wastewater treatment plants: Brno, Zlín, Uherské Hradiště and Hodonín.

3.3.2.2. Causes Leading to Environmental Problems

Because of the high concentration of population and its activities on a small area the municipalities has become the hot spots of environmental pollution.

The following direct cause of municipal pollution have been defined

- **Inadequate solid waste disposal**
- **Weaknesses in municipal wastewater management**
- **Pollution from urban traffic**

These problems have other direct causes. An explanation of each of these problems together with their cause-effect relation will be given below:

(i) Inadequate solid waste disposal

Problem of inadequate solid waste disposal is caused by the improper manipulation with municipal solid and liquid waste and insufficiently controlled old loads (PCBs, oil products, and heavy metals).

a) Improper manipulation with municipal solid and liquid waste

By July 1996 the operation of not protected landfills with **improper dumping of waste** was stopped, nevertheless they remain as a load for the environment. **Insufficient control of dump sites from the water management point of view** leads to non-compliance of these landfills with legislation and to leakage to ground layers and ground and surface waters. It is technically and financially demanding to bring all these landfills to compliance with legislation within a short time. It is realized in steps sometimes with not sufficient co-ordination and financing. In past this resulted in **improperly realized recultivation** in some cases.

Improper behavior of inhabitants is due to **insufficient education** of inhabitants in the field of environmental consequences of waste production and disposal, their **insufficient motivation for using recyclable materials** and due to **imperfect legislation** regarding package management. In the Act No.125/1997 Coll. regulating waste treatment and disposal there is a basis for the collection of used packages by producers and importers. The details of collection rules will be determined by a following Government Decree, which is now in preparation.

Enormous production of waste, insufficient separation of waste and **improper manipulation of waste from consumers,** e.g. use of illegal dump sites and **illegal disposal of liquid waste** into sewerage or rivers are caused also by **improper behavior of inhabitants.**

b) Insufficiently controlled old loads (PCBs, oil products, heavy metals)

Use of old not secured landfills has been already stopped. These landfills can contain both municipal and industrial waste. The records about dumped materials usually are not available which results in **lack of information about existing old loads**. In 1998 the Ministry of Environment started the three-year project "Evaluation of environmental risks from closed landfills, establishment of classification register with the proposal of remedy measures and determination of priorities". This will improve the previous situation of **insufficient inventory and monitoring of existing old loads**.

In practice the legal status of landfills is often not explicit which results in **unclear management responsibilities**.

The immediate recultivation of all old loads would be very expensive, the sufficient **financial resources are not available** at present. The recultivation of old landfills will be a long time process based on priorities and responsibilities determination. A present **insufficient legislation** is a limiting factor for defining of legal statute of landfills.

(ii) Weaknesses of municipal wastewater management

Inappropriate wastewater discharge, behavior of inhabitants and discharging of polluted industrial wastewaters not in compliance with sewer system rules are the main causes of the above mentioned problem.

a) Inappropriate wastewater discharge

The extreme case of inappropriate wastewater discharge is when **discharge of untreated wastewater** occurs. These discharges are exceptional and usually occur only in small municipalities. Frequently these municipalities have water supply system and no or **incomplete sewer system.** Under such conditions the inhabitants in some cases dispose their wastewater inadequately (directly into groundwater, into the stream or into the rain drainage) which causes **illegal discharges from municipalities**.

Poor level of management of wastewater treatment plants causes **poor maintenance of wastewater treatment plants**, which also heavily contributes to low efficiency of wastewater treatment plants. The frequent case is the **low efficiency of wastewater treatment plants**. It has more possible reasons, which differ for different wastewater treatment plants. Typical shortcomings are **obsolete wastewater treatment plants technologies** and **inadequate capacity of wastewater treatment plants**.

Poor state of sewer system is in particular due to **old sewer systems** and **poor maintenance of sewer system**.

In the Czech Republic wastewater collection and treatment has a historical tradition. There are many old sewer systems especially in historical centers of towns. During the socialist period only insufficient operation and poor maintenance of sewer systems was carried out by municipalities and operating companies.

To the above mentioned problems contribute also **unfavorable framework conditions** which are **insufficient financial resources** and **insufficient control of wastewater collection and treatment**. The municipalities are dependent in greater part on support

from state sources (state budget and State Environmental Fund) because they often have not enough own sources. The municipalities can apply for financing from state sources but the legal right for granting does not exist. Insufficient control has more attributes e.g. low education and qualification of operating staff and investors, low technological discipline, shallow technical audits.

b) Inappropriate behavior of inhabitants

In the Czech Republic is relatively low level of awareness about environmental impact of inappropriate behavior of inhabitants. This results in **excessive detergent use in households** and **use of phosphate detergents** even when environmental friendly products are available. Inhabitants do not know and that is why they do not follow the sewer system rules. Occasionally this is due to **low compliance to wastewater discharge - sewer system rules**.

c) Discharging of polluted industrial wastewaters not in compliance with sewer system rules

The majority of industrial enterprises located in municipalities discharge their wastewaters into the public sewerage systems and wastewater treatment plants. These wastewaters frequently contain additional pollutants not common for typical household wastewaters.

Not using best available technologies in industry both in production of goods and wastewater management can cause the serious damages to sewerage systems and wastewater treatment processes. The majority of companies tend to follow the sewer system rules but the **inappropriate control of discharged wastewater** enables exceptions, which can negatively influence the whole sewerage systems.

(iii) Pollution from urban traffic

The pollution from car traffic and risk of oil products leakage from railway stations are the main causes to the pollution from urban traffic.

a) Pollution from car traffic

Pollution from car traffic is due to higher **intensity and concentration of traffic**, which requires the **construction of hard surface on large areas** with undesirable fast runoffs. These together cause **higher hydraulic load of wastewater treatment plants during rain periods** which leads to decrease of treatment efficiency and consequently to deterioration of effluent.

Runoffs of hazardous substances and oil products to wastewater treatment plants or directly into streams is caused by **bad technical conditions of means of transport, operating of old gasoline stations** in unacceptable technical state and consequences of **accidents**. The probability of accidents is increasing together with the growth of local and international truck transport through the Morava River Basin. Although the ADR agreement is valid also for the Czech Republic an **insufficient legislation on administration control (penalties in water management) regarding international forwarders of substances harmful to water** can increase the damages caused by accidents.

b) Risk of oil products leakage from railway stations

The risks are caused mostly by freight transport and transport of hazardous materials and oil products. There were identified three main sources of risks:

- Lack of technical discipline during manipulation with hazardous substances
- Risk of accidents during transport
- Bad technical condition of engines and tanks

3.3.2.3. Environmental Effects

The following direct causes of pollution from municipalities are:

- **Higher load of streams by heavy metals**

  Main sources of heavy metals are industrial wastewaters connected to the municipal sewerage systems or directly discharged into the rivers and leakage from landfills. Minor part is created by runoff from roads and hard surfaces. When the threshold concentrations are exceeded heavy metals can become toxic or can inhibit bioprocesses in water environment and negatively influence the use of water.

- **Increased load of streams by oil products**

  The content of oil products is becoming a big problem of many streams, rivers and lakes in Morava River Basin, endangered are especially upper parts of streams. This pollution originates mainly from industry and traffic, frequently from accidents and not environment friendly technologies. Higher content of risk substances

- **Organic pollution**

  Organic pollution is one of the most serious damages of water environment because of direct influence on oxygen regime. The modern wastewater treatment plants can reach an excellent effluent quality but still when discharged to receiving bodies with low rate of flow it can threaten the living organisms in water.

- **Higher content of P, N**

  The high content of phosphorus originates mainly from municipal discharges and partially from agriculture. On the contrary the major part of nitrogen usually originates in agriculture and smaller part from municipalities. The main consequence is the eutrophication which itself is the source of the big range of undesirable effects on surface waters. These effects include e.g. deterioration of oxygen regime, growth of biodegradable material, production of toxic compounds, changes of color, odor problems, aesthetic problems.

- **Higher content of risk substances**

  There is a big range of substances, which can cause deterioration of the river water quality. These substances can either influence the water environment or limit the use of water for human consumption, agriculture and industrial utilization. Obviously it would be more economical to remove these substances before discharge into the waters than to treat the water prior to further use.

These direct consequences are further reflected in:

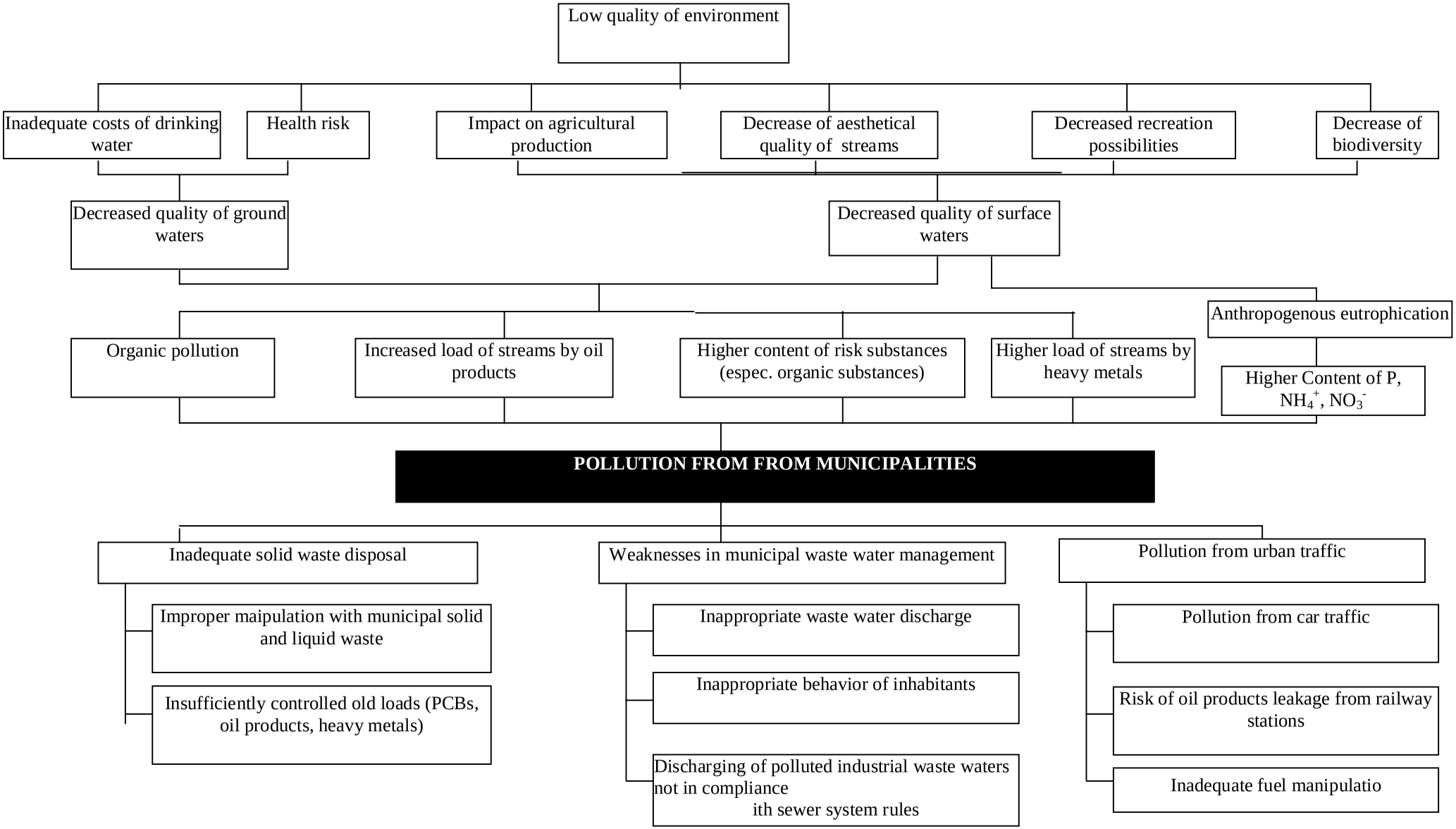
- **Decreased quality of ground waters**

  In Morava River region approximately 65% of drinking water is abstracted from ground water resources. The pollution of groundwater directly influences the economy of water treatment, which is expressed in **higher cost of drinking water**. About 14% of inhabitants are at present supplied with water from private wells. The pollution of these wells can cause the **health risk** for theirs users, e.g. the contents of nitrates in the agricultural area around Brno.

- **Decreased quality of surface waters**

  Decreased quality of surface water influences all fields of water use and the **decrease of biodiversity** is observed. The low quality of water has **impact on agricultural production** especially from quality point of view. Also the **recreation possibilities are decreased** in case of water pollution. Typical example is eutrophication in summer time. In past small attention was paid to **degradation of aesthetic quality of streams** which is now becoming more important in connection with growing standard of living.

PROBLEM HIERARCHY
3. Municipality



3.3.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective has been identified for the sector Municipality:

"SIGNIFICANT REDUCTION OF POLLUTION GENERATED FROM MUNICIPAL ACTIVITIES"

The following three results were identified to achieve this objective

- **Achievement of adequate management of solid waste disposal**
- **Implementation of efficient wastewater management**
- **High reduction of pollution from urban traffic**

(i) Achievement of adequate management of solid waste disposals

In order to achieve adequate management of solid waste disposals, several activities will have to be completed in the following fields:

- manipulation of municipal solid waste
- behavior of inhabitants
- sanitary conditions of old dumpsites

It is necessary to:

- **provide proper manipulation for municipal solid waste.** At present the Act No. 127/1997 Coll. is valid. There are some shortcomings regarding payments and their collection.

  The above mentioned Act enables municipalities through the Municipal Intimation to **create conditions to sort waste from residents** which is one of basic assumptions for proper manipulation with solid waste together with **creating conditions for reuse and recycling of separated waste**.

  It is expected that the **decrease of the waste production by passing law on packages** will bring the significant improvement in this field. The Decree forcing manufactures and importers to collect back the used packages is now being prepared. All goods will have to follow this Decree three years after its coming into force.

  It is discussed that **new technologies of waste disposal are given advantage, e.g. composting**. These technologies have more advantages, they are relatively cheap and environment friendly.

  The idea of **increasing fees on waste dumping at dump sites** is discussed to reduce the waste production but it is felt that this approach can lead to starting new illegal dumps if the service provided is too expensive.

  It is recommended that responsible authorities **support major pilot projects on waste disposal by the most ecologically safe way (including recultivation)**. The idea is to give a good example of proper waste disposal to attract other municipalities and investors.

  It was found that it is necessary to **create a system of continuous education for state administration employees,** which will help to improve their decision making.

  For all non-compliance with the existing regulations it is necessary to insist on **strict application of sanctions and penalty fees** (e.g. illegal dumping, improper sorting of waste, inadequate dumping).

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- **Project Morava, task No.5** is focused on monitoring of closed dumpsites with regard to the state and development of protection of ground waters used for human consumption.
- **"Protected Workshop" - recycling (MESYT - UHEKO)** which is one of Czech educational programmes.
- The municipalities **create networks of centers collecting sorted or recyclable waste from public or small enterprises** on the basis of the Act No.125/1997.
- Under the umbrella of the Ministry of Environment is carried out the project **Ecologically Friendly Product**. Manufacturers can qualify for labeling their products with the special sign if they fulfil conditions stated by the Directives issued by the Ministry of Environment.

Planned Project(s)

- As stated before wastes act amendment is involved in legislative work planes.
- Project "Clean Production" for municipalities (healthy city of Brno) is prepared by environmental protection department of City Authority in Brno.

Proposed Project(s)

- Lobbying for package technology act (Green Circle) is one of expected activities of local NGOs.
- Network of users of material sorted from waste will promote reuse and recycling of separated waste to save the resources of raw materials.

➢ **promote proper behavior of inhabitants.** The municipalities organize the separation of household waste and collect related payments. It is upon them **to give advantage to residents sorting household waste** to promote more convenient behavior of residents.

Present legislative regulation is not efficient enough in the field of inspection and/or supervision of landfills in operation and it would be helpful to **amend the law regarding penalty for not permitted waste and liquid waste manipulation.**

Awareness of inhabitants about protection and preservation of nature is in the Czech Republic low. To improve the situation it is recommended to **support ecological education at schools.** There is a good experience with education of children towards electricity saving. For the same reason it is necessary to **ensure education and information system on suitable manipulation with wastes** for adults.

Another important element is to **popularize the waste sorting by TV, press etc.** with contests or public inquiries.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- There are more running projects which inform and educate children and adults in the field of waste management, e.g. "Recycling Mill" pilot project of citizen group in Slatina for children and A.S.A. city borough of Slatina, "Health city of Šumperk" project of Municipal Authority of Šumperk, "Green Phone Line" project in Brno, organized by the ecological advise center VERONICA and City Authority of Brno.
- There are centers of ecological education programs in the region: LIPKA Brno, Žabka Uherské Hradiště, center of ecological education Olomouc, Vila Doris Šumperk, ALCEDOKONTAKT Vsetín, CHALOUPKY, KOSENKAVAL Club, Chrpa Brod.

- Non-governmental organization LIPKA - Brno is focused on the work with children with regard to environmental protection. It also organizes system of ecological education for teachers of basic schools.
- Precious contribution to the better awareness of people are postgraduate courses in environmental protection organized by the Faculty of Natural Sciences Masaryk University in Brno and Palacký University in Olomouc which have very good professional level.
- To improve the quality of education of children postgraduate courses in environmental protection at Faculty of Arts at Masaryk University in Brno for teachers of basic schools are organized.

Proposed Project(s)

- Because the present results and efficiency of existing education of public are not sufficient it is recommended to prepare **program on improvement of ecological education**. This program should be organized on national level with active participation of all involved organizations, e.g. NGOs, media, schools, and ministries.

➢ **improve sanitary conditions of old dumpsites.** It is recommended **to complete legislative regulations regarding old loads disposal**. According the existing regulation the following rules are valid:

If the offender is known he is obliged to pay the disposal and recultivation of dumpsite.

If the offender is known but he is not attainable in the Czech Republic and can not ensure the disposal then it is done on his expenditures by the district authority.

If the offender is not known the law prescribes the duty to dispose old dumpsite to the landowner. If the owner proves that he has done his best to avoid the wrong dumping to protect the land and environment the cost of disposal will be financed by the district authority. The trial initiation is up to district authority.

This system sometimes does not lead to early and efficient dumpsites disposal and recultivation.

It is necessary to continue in **mapping and monitoring of conditions of old loads.** The systematic research was initiated by the Ministry of Environment in the year 1998 result of which will be the register, classification and determination of priorities.

It is required to **introduce permanent monitoring of leaches from potentially dangerous old dump sites** which is in close relation to the above mentioned systematic research.

On the basis of activities mentioned in previous text **design and implementation of local and regional information system** will be created.

There is still existing some discrepancy between the statement of the law and the real practice result of which is the necessity to solve some problems, e.g. to **clear up the responsibility for old loads, give priority order for gradual sanitation of old loads, ensure way of financing of sanitation of old loads.**

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- The project **sanitary condition improvement (remediation) of industrial waste and solid municipal waste dumps in Hluk** is a good example of cooperation between municipal authorities and the industrial enterprise towards implementation of responsibilities according to the law.

Planned Project(s)

- The city authority of Brno prepares recultivation of municipal waste dump in Brno-Černovice, which is the biggest municipal waste dump in Brno region.
- Another big projects under preparation in Morava River region are recultivation of dumpsite in Grygov, improvement of sanitary condition (remedy) of solid municipal waste dump in Uherský Brod, remediation of dump site in Hulín, monitoring and proposals of remediation of old loads in Brno.
- Continuously are many projects supported by National Property Fund and State Environmental Fund. The National Property Fund focuses on most serious environmental problems, which are especially industrial loads. State Environmental Fund contributes to financing of remediation and recultivation of old dumpsites especially with municipal waste.

Proposed Project(s)

- The Ministry of Environment supports **Project** Morava, which is realized by the Water Research Institute in Brno**.** The **IIIrd stage 2000-2003** is supposed to include among others the task regarding the **monitoring and priority setting for remediations of dumpsites** representing the danger for ground water sources.

(ii) Implementation of efficient wastewater management

In order to achieve this result, it is required to undertake measures in the following fields:

- treatment of wastewaters
- behavior of inhabitants
- pre-treatment of industrial wastewaters

It is foreseen to:

- **maximize treatment of wastewater. Construction of new WWTP** focuses on municipalities with number of population equivalent 3,000 up to 10,000 because all bigger municipalities are already served by existing WWTPs. When these plants are built the municipalities with more than 2,000 PE will be solved in accordance with EU legislation. As the Morava River Basin is a typical sensitive area asking for higher protection also small municipalities (with less than 2,000 PE) discharging to protected zones and recipients used for water supply should be equipped with the WWTPs.

  In many cases the **reconstruction of existing WWTPs** is required. The WWTPs built in 60ies, 70ies and 80ies were designed for basic biological treatment and should be extended for nutrient removal. Also the mechanical, electrical and civil part must be improved according to present know-how to get the best available and cost effective results of wastewater treatment processes.

  It is necessary to support **reconstruction and maintenance of existing sewers** because the present state is frequently bad. The bad state of sewers contributes to uncontrolled discharges to surface and ground waters. All sewage must be conveyed to the WWTPs and the leakage of ground water to the sewerage systems must be prevented.

  Even if the municipalities are equipped with WWTPs there are still parts of towns and villages, which are not connected to the sewerage network and it is asking for **construction of new sewers.**

It was recommended to **concern state administration in water management to ensure efficient application of appropriate best available technologies for planned WWTPs structures.**

In the Czech Republic there is at present a common practice to **apply best available technologies for wastewater treatment** from technical and economical point of view. New WWTPs are designed to provide high efficiency of biological treatment, including nitrogen removal by nitrification and denitrification processes and also phosphorus removal in most cases.

To support the effort in construction of new WWTPs and reconstruction of existing WWTPs it is necessary to continue in **providing sufficient financial resources on municipal and national level** on the basis of priority statement.

As there are many types of small wastewater treatment plants systems offered to customers with different efficiencies, investment and operation costs, it is recommended to **update regularly list of small WWTPs recommended to construction,** to prevent not efficient solutions.

To ensure the proper decision making on all authority levels it is recommended to **form a system of continual education of state administration employees.**

As the typical WWTPs with activated sludge process and top efficiency are expensive it is useful to **support alternative wastewater treatment** especially in very small municipalities, **where suitable** and acceptable.

In connection with future admission of the Czech Republic to the EU **new water act, and connected law regulations, including regulations on state administration concerning water management** will be adopted.

For better orientation of non-professionals, e.g. mayors, deputies, it was recommended to **form system of state guaranteed consulting agencies.**

It is necessary to curry out **efficient control of wastewater disposal** to ensure that all installations are well operated in compliance with legislation and licenses.

Some WWTPs do not have the efficiency corresponding to their design parameters and equipment. Frequently it is caused by the lack of knowledge of their operators. This can be solved by establishing the **system of additional education for WWTP operators and management.**

It is recommended to **promote state administration in connection with introducing of EU standards and their control.**

To have sufficient information about the water quality in the stream **monitoring of water quality on selected profiles** in appropriate frequency and range of observed parameters is required.

Self-purification processes are very important for river water quality and environment in general. **Enhancing self-purification processes in municipal** and rural **watercourses** is very important.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- Brno is the biggest producer of wastewaters in the region. **Brno sewer system master plan update** must be prepared because the last version was elaborated in 1983 and is out-of-date. Some activities have already started.
  The **study on construction of sewer system and wastewater treatment in Uherské Hradiště district** will suggest the solution of construction of new sewerage systems and expansion existing sewerage systems and construction of new WWTPs and

upgrading of existing WWTPs. The same studies based on the methodology of the Ministry of Agriculture are prepared for all districts in Morava River Basin.

- Because of requirement to improve wastewater treatment efficiency many projects in Morava river region are running, e.g. **reconstruction of WWTP Šumperk, construction of WWTP Bílovice, construction of WWTP Bojkovice, reconstruction and intensification of WWTP Prostějov, intensification of WWTP Zlín, reconstruction of WWTP Přerov, construction of WWTP Hluk, construction of WWTP Boršice.**
  There are **85 projects supported by the State Environmental Fund.**
  Water Research Institute in Brno works on the **Project Morava,** which involves 8 tasks. The task No. 1,3 and 6 are closely connected to the subject of municipal wastewater treatment and its assessment.

Planned Project(s)

- The following WWTPs have to be reconstructed or intensified to upgrade the efficiency and especially to start with nutrient removal: **reconstruction of WWTP Brno, reconstruction of WWTP Uherské Hradiště, intensification of WWTP Olomouc, intensification of WWTP Břeclav.**
- Another big projects are **draining wastewaters from Bánov, Veletiny, Drslavice, Hradčovice and Vlčnov into WWTP Uherský Brod** and **connection of sewer system in Kunovice to WWTP in Uherské Hradiště.**
- The municipalities have submitted **applications for support on 28 projects to the State Environmental Fund.**
- **Regional water supply and sewer system development programmes "PRVKUC"** are the studies based on methodology of the Ministry of Agriculture mentioned before.
- The draft of **National action plan** will be updated.

Proposed Project(s)

- It is proposed to establish the project for continuous education and examination of WWTP operators.
- The new water act is in preparation.
- Project for continuous education of state administration in the environmental field would improve the decision making process on all levels of state authorities.

➢ **promote proper behavior of inhabitants.** The wastewater treatment is influenced by the quality and composition of the influent to the WWTPs, which can be highly affected by the approach of inhabitants and industries. That is why it is necessary that producers **ensure good information of customers about character of products** especially regarding the water quality consequences.

Introduction of complete system of education of general public can influence behavior of inhabitants.

One of tools of water protection could be to **give economical advantage** to the producer of ecological friendly products and **promotion advertising** of ecologically friendly products.

For this activity, the following projects have been identified:

Existing/On-going Project(s)

- **ECOFILM** is a festival of environmentally oriented films. It is a project running more than 20 years.
- **Days on ecology in Olomouc** is a project organized by the NGO Slunákov. NGO Veronica tries to influence **ecological behavior of consumers** in its Ecological Advise Center.
- **Festival of ecologists and state administration representatives "TS TTT"** is the activity of Regional department of Ministry of Environment and local authorities in Uherské Hradiště.

Proposed Project(s)

- It is proposed to prepare complete system of environmental education of citizens supervised by the Ministry of Education and the Ministry of Environment.
- It is proposed to develop a system of economical advantages for producers of ecologically friendly products.

➢ **facilitate in-situ pre-treatment of industrial wastewaters.** At present the Intimation of former Ministry of Forest and Water Management No 144/1978 is valid. It was recommended to **accept the law on water supply and sewer sy**stems to adapt the regulations to changed present conditions.

Industrial discharges into the sewerage systems can heavily influence the wastewater treatment plants performance. That is why it would be important to **give advantage to those industrial factories, which pre-treat or treat industrial wastewaters in-situ.**

To prevent discharges of non-acceptable wastewaters into the sewerage systems it is necessary to **supervise producers of industrial wastewaters how they perform wastewater pre-treatment.**

Because there is a rapid development in all industrial sectors bringing into existence many new technologies and new compositions of wastewaters it is suggested to **issue licenses for discharging pre-treated or treated wastewaters for limited time.**

Because manufacturers tend to exceed the limits for discharging their wastewaters into the sewerage systems both in quantity and quality it is necessary to **monitor water quality at selected profiles** especially as regards toxic and hazardous substances.

For this activity, the following projects have been identified:

Proposed Project(s)

- It was proposed to establish **supervising activity program of Czech Inspection of the Environment regarding check of industrial plants connected to WWTPs and to start project for continuous education of state administrative in the environmental field**

(iii) High reduction of pollution from urban traffic

In order to fulfil this result, it is required to undertake several activities in the following fields:

- environmental friendly car traffic
- railway stations

It is necessary to:

- **undertake measures for facilitating environmentally friendly car traffic**. It is planned to facilitate environmentally friendly car traffic through **improvement of check in order to control technical state of vehicles**.

  In this context, it is also important to introduce strict demanding and checking of application of ecological strew material as well as strict checking and penalizing forwarders of hazardous materials. It is also required to introduce demand catch-pits construction by large parking lots and to supervise car repair activities in order to ensure environmentally friendly car traffic.

  Development of public transport should be supported as well as its electrification and gasification. Measures have to be undertaken to supervise transporters, how do they keep the ADR system.

  Regulations for construction and operation of gasoline stations have to be enforced. Draining water from housing estates, hard surfaces and roads (vegetative strips, vegetative cinder blocks) has to be considered in land-use planning.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - All municipalities are preparing their **land use planning documentation** involves also the traffic part.
  - **Transport policy of Brno** has been adopted.

  Planned Project(s)

  - In the future it is considered to solve public transport problems in Brno by the construction of **North-East Diameter (underground rail in Brno)**.

- **eliminate risk of oil products leakage from railway stations.** Elimination of risks from railway stations and railway transport in general comprises improvement of control of repumping stations at railways. It is necessary to check technical condition of engines and tanks against leakage and in the same time to solve technical insurance of railroad beds against leakage. Better education system of hazardous material transporters has to be implemented.

  For this activity, the following projects have been identified:

  Existing/On-going Project(s)

  - Implementation of the **State Transportation Policy** adopted by the government of the Czech Republic on the 17th June 1998, which is focused on the protection of environment.

The following high priority projects were identified:

1. **Extension of municipal wastewater treatment plant for the city of Brno.** The target of the project is an improvement of water quality to meet limits 2004/2005 stated by the Government Decree No. 171/92 Coll., main problems identified are $N\text{-}NH_4$ and P_{TOT} effluent concentrations.
2. **Extension and intensification of wastewater treatment plant in Zlín.** The target of the project is an improvement of water quality to meet limits 2004/2005, including nutrients.
3. **Reconstruction of the technology in wastewater treatment plant Uherské Hradiště.** The target of the project is an essential improvement of water quality to meet limits 2004/2005 in all-important parameters including nutrients.
4. **Intensification and extension of wastewater treatment plant Hodonín**. The main target is the compliance with the limits 2004/2005 in all-important parameters, including nutrients.

3.3.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lies 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.

In particular, the following assumptions have been identified at the **activities** level to achieve the sector results:

- **Waste act amendment passed**

  On the day 1st of January 1998 came into force the new Act No. 125/1997 regulating waste treatment and disposal. The Act governs among others also system of payments for waste disposal from inhabitants. The practice has shown that this solution has still weaknesses and can be improved. The respective amendment is in preparation.

- **Effective penalization of offenders**

  This requirement applies to all activities connected with wastewater collection and treatment and solid waste management. In the period when awareness and knowledge of citizens and companies are on low level the important tool for enforcing the law is the system of penalization.

- **Packaging technologies act passed**

  The detailed regulation governing packaging technology is absent. The basic requirements are given in Act No.125/1997 Coll. The new regulation is expected to decrease amount of solid waste and to improve its composition from the environmental point of view.

- **A law banning phosphate products passed**

  The main load of phosphorus in wastewater treatment plants effluent comes from phosphate products used in households. The ban of production of such products would improve the situation resulting in lowering the phosphorus load on environment.

- **Document "State Transportation Policy" approved**

  This document has been already approved in June 1998. Generally it promotes the means of transport which do not deteriorate the environment.

- **Appropriate legislation related to old risks and wastewaters approved**

  The necessary condition for admission of the Czech Republic to the EU is full approximation of the Czech legislation to the EU regulations. This will involve approval of appropriate legislation related to old risks and wastewaters.

For the **results/outputs** the following assumptions have been considered:

- **Sufficient funding for studies, inventories and projects implementation provided continually**

  This assumption is related to the first two results identified. Towns and communities are at present dependent in greater part on support from state sources because they have not enough own funds. In smaller scale they use own sources and commercial loans, they stand for them by property of the community. Some active towns and communities intensively use international support, which is sometimes the main source of incomes for financing wastewater treatment plants and decisive part of sewerage system. Leasing contracts can be used for construction of wastewater treatment plants only in small scale for buying technological equipment.

- **Continuation of government policy supporting public transport**

  The State Transportation Policy has been adopted in July 1998. The Policy supports development of the environmentally friendly transport in general. It is based on the fact that the negative environmental influence of transport is not only national but also transboundary problem. One of the main goals of the Policy is to make the public and especially track transport more attractive and to support its development.

3.3.5. Impact Indicators for Sector Results

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

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

- **According to risk analysis, by 2005 all (100%) the most hazardous dump sites in the Morava River Basin removed**

  The Ministry of Environment has started in the year 1998 the three-year project ”Evaluation of environmental risks from closed landfills, establishment of classification register with the proposal of remediation measures and determination of priorities”. The most hazardous landfills identified on the basis of the project will be removed by the 2005 if the assumption of sufficient funding will be fulfilled.

- **Total pollution discharged from municipal wastewater treatment plants indicated by COD will decrease by 5%, by P_{TOT} by 20%, by $N_{inorgTOT}$ by 25% till 2005 in the Morava River Basin**

  All larger municipalities in Morava River Basin have already their WWTPs. Most of them are efficient enough as regards BOD_5 and COD removal. Their intensification focuses on nutrient removal that is why the different percentage in improvement of effluent quality is stated as indicator.

- **Consequences of leakage of hazardous substances from accidents and disasters will drop by 50% by 2005 provided the traffic intensity remains at the 1998 level in the Morava River Basin**

  Majority of hazardous substances from traffic deteriorating the environment comes from transport accidents. Through implementation and enforcement of relevant measures the number of them can be highly reduced.

Annexes

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

Annex 1. Identification of the Morava River Basin Area

Physical-Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the Basin
Character of the river basin area ➢ south-eastern part of CR ➢ fan-shaped ➢ river basin area 21,119 km2 = 26,8 % of area of CR ➢ altitude 148 – 1491 m above sea level ➢ 3 Ramsar wetlands ➢ 1,4 % water area ➢ 1,5 % urbanized area ➢ 54 % agricultural area ➢ 34 % forests ➢ 9 % other areas ➢ regional systems of ecological stability: - regional - above-regional - especially protected areas ➢ high erosion threat of the area ➢ runoff of water from landscape (runoff coefficient….) ➢ decreased retention capacity of the area and decreased infiltration coefficient: ➢ different character of two main parts of the river basin: - the Dyje (Thaya) River - the Morava River ➢ from the point of view of : - geomorphology - availability of equipment for discharges manipulation - location on the state territory (partly in Austria)	**Character of settlement** ➢ 2,7 mill. inhabitants ➢ 47 settlements with IE 10,000 inhabitants ➢ 27 % of population of CR ➢ 33 towns with 10,000 inhabitants ➢ 2 cities with 1000,000 inhabitants ➢ 4 cities with 50,000 - 100,000 inhabitants ➢ the most stable population in Czech Republic ➢ settlements with 500 inh.= 14,3 % 200 inh.= 4,2 %	➢ Floods ➢ Pollution and accidents ➢ Insurance of agreed water discharges ➢ Common protected areas : - National Park Podyjí-Thayatal - Pálava-Záhorie-Marchauen	**Agriculture and landscape** ➢ large-area and large-capacity agriculture ➢ crop production (weeds) ➢ irrigation ➢ dewatering ➢ growing of wide row growing cultures ➢ application of artificial fertilizers ➢ application of pesticides ➢ breeding of livestock animals ➢ concentrated livestock farming ➢ handling with livestock fertilizers ➢ extensive forestry ➢ soil erosion – washout with consequent high concentration of insoluble substances ➢ insufficient hygiene of environment ➢ complex reallocation of land ➢ territorial protection of future anthropogenic activities (transportation, mining and building of houses) ➢ sport fishery and fish breeding ➢ building on streams, regulation of streams

Physical-Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the Basin
Character of the stream : ➢ the Morava River represents a stream of 2nd order ➢ length of the main stream : 353 km ➢ runoff from Czech Republic : 20,8 % ➢ tributaries : - the Dyje (Thaya) River - the Becva River ➢ Qa 109 m^3/s – the Morava River downstream of the border of the Czech Republic ➢ erosion of banks and river beds ➢ large extent of river regulations ➢ only 4 % of streams are of natural character ➢ app. 50 % of streams are of …torrent character ➢ 50% of streams is completely denaturalized ➢ 45% of streams have different level of denaturalization **Climate :** ➢ average precipitation 635 mm ➢ temperatures	**Infrastructure** ➢ Connection to public network is lower than average in the Czech Republic ➢ 80 % of inhabitants is connected to water supply systems ➢ 71 % of inhabitants is connected to sewerage system ➢ 17 % of settlements with 500 inhabitants is connected to WWTP ➢ 35 - 90 % of settlements with 500 - 10,000 inhabitants is connected to WWTP ➢ most of WWTP operates without removal of N and P		**Industry** ➢ energetics and heating ➢ industrial wastewaters ➢ services e.g. fuel , photo... ➢ navigation ➢ transportation ➢ dumping sites - old loads ➢ restructuralization of industry- limiting all the emissions ➢ dumping of wastes ➢ activities within industry ➢ water withdrawals ➢ mining (production) of raw materials

Physical-Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the Basin
Water resources : ➢ low capacity of groundwater sources 5 - 7 m^3/s ➢ groundwater sources : - alluvium - chalk ➢ runoff of groundwater from the area ➢ surface sources – mainly reservoirs ➢ 34 reservoirs ➢ capacity of reservoirs 659 mill.m3 ➢ low improvement of discharges from reservoirs especially in the Morava River basin (only cca 1,7 % of total annual runoff) ➢ pollution COD, insoluble substances, NO2, NH4, P, Zn, Hg, organic substances ➢ vulnerability of sources during floods and accidents ➢ different ensurance of drinking water sources ➢ different hygienical ensurance of groundwater sources	**Environmental characteristics:** ➢ 7 % of inhabitants lives in the area ranged into the 5th class of water quality of streams ➢ 33,5 % of inhabitants lives in the area of the 4th class of water quality of streams ➢ 17,5 % of inhabitants lives in the area of the 3rd class of water quality of streams		**Municipalities:** ➢ consumption of proteins ➢ production of wastes ➢ production of wastewaters ➢ use of detergents containing phosphates ➢ use of cars ➢ water for recreational purposes ➢ water recreation and water sports

Annex 2. Situation Analysis of Activities Leading to Water Pollution in Specific Areas

2.1. Agriculture, Forestry and Land Management

2.2. Industry and Mining

2.3. Municipality

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Animal husbandry	➢ existing legislation for agriculture and soil management ➢ existing information and education material on agriculture and soil management ➢ financial mechanisms to support farming activities ➢ state agricultural strategy ➢ international trade relationships ➢ consumption patterns for agricultural products ➢ scientific-technical research potential ➢ engagement of NGOs in agriculture and resources management ➢ transition to private land ownership ➢ international experience and progressive adoption of EU technical standards	➢ ground and surface water pollution from intensive animal production practices ➢ degradation of water ecosystems		➢ storing of manure, silage in leaking containers or directly on the ground	➢ store manure and silage properly
				➢ large-scale livestock operation	➢ evaluate and promote adequate degree of animal concentration in given localities
				➢ unsuitable buildings for animal husbandry	➢ modernize buildings for animal husbandry with respect to appropriate capacity
				➢ disrupted traditions in animal husbandry	➢ promote measures for renewal of traditions in animal husbandry

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Plant production	➢ existing legislation for agriculture and soil management ➢ existing information and education material on agriculture and soil management ➢ financial mechanisms to support farming activities ➢ state agricultural strategy ➢ international trade relationships ➢ consumption pattern for agricultural products ➢ scientific-technical research potential ➢ engagement of NGOs in agriculture and resources management ➢ transition to private land ownership ➢ international experience and progressive adoption of EU technical standards ➢ ecological and integrated agriculture	➢ pollution of ground and surface waters due to application of chemicals ➢ soil erosion in sloppy areas ➢ degradation of water ecosystems ➢ soil degradation ➢ disturbance of water regime	➢	➢ removal of natural obstacles of surface runoff	➢ introduction of measures within the river basin to prevent erosion
				➢ high rate of arable land	➢ ensure appropriate rate of arable land
				➢ removal of river and brook valley meadows in flood plain areas	➢ restore meadows in flood plains
				➢ inappropriate farming practices and soil management (down-the-hill ploughing) - excessive ploughing to the edge of the river banks - fields too large - inappropriate sloping of land (no terraces or grass strips) - inappropriate crop structure	➢ apply proper farming and soil management practices
				➢ inappropriate agrotechnics: - heavy machines - using chemicals nondegradable or containing hazardous residuals - application of chemicals and manure insufficiently focused - exceeding land capacity to apply manure	➢ implement proper agrotechnical measures ➢ regulate quantity and quality of applied chemical fertilizers ➢ respect land capacity for application of manure
				➢ uncontrolled storage and inappropriate disposal of old herbicides and other pesticides	➢ develop and apply application of technical standards for manipulation with pesticides and appropriate agreotechniques ➢ substitution of chemical plant protection by biological processes
				➢ application of inappropriate sludges from WWTP on agricultural land	➢ apply safe sludges from WWTPs
				➢ disrupted traditions in agriculture (land owning traditions) and transformation of ownership rights	➢ promote measures for renewal of traditional relations to soil and plant production ➢ implement measures to solve ownership rights ➢ adopt financial incentives and subsidizing policy

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Forestry	➢ existing plans for forest exploitation ➢ wood industry	➢ ground and surface water pollution in forestry practices ➢ soil erosion and degradation due to forestry practices	➢	➢ Improper technology for forest exploitation	➢ Application of ecologically sustainable methods in forest exploitation
				➢ Inadequate composition of species	➢ Introduction of environmentally appropriate species
				➢ Removal of small woods in the country	➢ Increasing of the share of interactive forest elements in landscape (renewal of small woods)
				➢ Unsolved ownership rights in forestry	➢ Implementation of measures to solve ownership rights in forestry
				➢ Insufficient forest management, oriented mostly to excessive exploitation of wood by new owners	➢ Introduce effective measures to decrease excessive exploitation by new owners ➢ Promote non - wood forest products and functions

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Use of land and water resources	➢ integrated bioindication of ecological situation in river basin and for monitoring of accident situation of water quality ➢ economical plans of activities in smaller river basins ➢ existence of land use plans and river basin management plans	➢ water pollution and change of regime from infrastructure and economic activities ➢ decrease of biodiversity of water organisms communities, mainly fish, increase of number of endangered species ➢ decrease of volume of fish production, decrease of consume quality of fish meat ➢ health risk due to accumulation of allochtonous substances in fish	➢ changes of regime and sediment loads of the Morava and Dyje River ➢ decrease of water quality ➢ negative effect on water quality in case of flood ➢ change of river beds of the Morava and Dyje River	➢ Improper water courses training, structures and amelioration ➢ Building of access roads that cause erosion	➢ Rehabilitation of river systems and restoration of wetlands ➢ Adopt strategies to eliminate impacts of land erosion due to roads
				➢ Removing of wetlands	➢ Rehabilitation of wetlands
				➢ Slow processes of transformation of owners rights	➢ Promotion of measures to solve owners rights
				➢ Unsuitable recreational activity ➢ Bad discipline of country users	➢ Introduction of adults education for sustainable environmental management ➢ Introduction of repressive measures for ecological violations ➢ Improvement of conditions for recreation activities
				➢ Disbalance between rural and urban population distribution ➢ Inefficient system of financial incentives	➢ Define policies and measures for population distribution under ecological consideration for the rural and urban sectors ➢ Implement efficient economic incentives in land use
				➢ Insufficient maintenance of water reservoirs and ponds (sediment removal)	➢ Assure efficient maintenance of water reservoirs and ponds
				➢ Insufficient land use planning	➢ Application of effective land-use planning
				➢ Insufficient ecological monitoring	➢ Develop and implement monitoring programme, for ecological indicators

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Significant pollution coming from industrial production	➢ Progressive implementation of low waste production technologies ➢ Existence of efficient monitoring system for discharged waters ➢ Rehabilitation activities for river networks ➢ Change in production patterns (closing of production facilities) ➢ Existing mechanisms for legislation, control and decision-making processes	➢ Destabilization of water ecosystem ➢ Decrease of water quality ➢ Eutrophication ➢ Decrease of quality of sediments ➢ Decrease of esthetical quality of streams ➢ Increase of water temperature ➢ Health risk and limitation of recreation activities ➢ Pollution discharges above acceptable ecological limit for biota (MVE)	➢ accidents in border areas ➢ transfer of pollution to downstream part of river basin	➢ Insufficient treatment of industrial wastewaters ➢ improper treatment of industrial wastewater in municipal WWTP ➢ bad technological discipline ➢ improper (insufficient) technologies of wastewater treatment ➢ leakage of dangerous substances (leaky joints, fittings) ➢ pollution of open-areas of industrial companies (soil, ground water pollution ➢ Ecologically unsuitable technology in production processes ➢ lack of information on cleaner production processes (or not accessible) ➢ discharging large quantities of wastewaters, peak discharges ➢ uncontrolled storage of raw materials ➢ improper operation of (peak) hydro power plants, mainly on small derivation channels ➢ Unfavorable framework conditions ➢ Insufficient state control (lobbying) ➢ Insufficient public control (lack of public interest) ➢ Lack of information channels between industry, authorities and the public ➢ inappropriate land-use planning and location of production facilities in relation to water resources ➢ Inappropriate construction activities	➢ modernization of industrial enterprises and their facilities (information, warning systems) ➢ implementation of ISO 9000 and ISO 14000 ➢ optimization of treatment systems ➢ Modernization + construction of efficient WWTP ➢ decontamination of contaminated soils in industrial enterprises, dumpsites, lagoons etc. ➢ technological discipline and control ➢ permanent education of staff ➢ proper maintenance, sealing of joints, fittings ➢ implementation of permanent monitoring system ➢ implementation of measures for identification and provision of financial resources ➢ amendment and enforcement of legislation ➢ improvement of function of state administration ➢ economic stimulation for appropriate wastewater treatment ➢ mutual public control through media, NGO, scientific institutions ➢ information between enterprises and the state administration ➢ public awareness raised and antipropagation campaign ➢ water withdrawals permit below wastewater effluent

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ waste dumping	➢ monitoring and setting of priorities for remediation ➢ existence of legal frame for separation, recycling and use of wastes ➢ existence of regulations for monitoring of waste dumps (in competence of industrial enterprises) ➢ existence of research programmes, development of new methods for waste processing	➢ destabilization of significant effect on ecosystem in surrounding of waste dumps ➢ negative environmental effects through concentration of dangerous substances under waste dumps ➢ pollution of ground and surface waters ➢ decrease of water quality through leaks from waste disposals ➢ inappropriate use of space for waste dumps	➢ transport of dangerous substances from dump sites in case of floods	➢ potential risk from old waste dumps ➢ potential spill of harmful substances from old deposits ➢ problem of unidentified waste dumps ➢ insufficient remediation of old waste dumps ➢ problematic dumping of industrial wastes ➢ waste dumping is not priority for producer ➢ breaking of law on waste management ➢ non separation of wastes ➢ uncontrolled waste dumping and insufficient control ➢ overproduction of wastes ➢ lack of financial resources for modernization ➢ gaps in legislation to encourage limitation of waste ➢ low public interest	➢ identification and evaluation of old waste dumps ➢ improve practical waste management and control ➢ stricter penalties for violations of legislative prescriptions for waste management ➢ permanent monitoring of waste dumps (leaches) ➢ harmonization of legislation with EU ➢ use of economic incentives to improve waste operating and recycling ➢ provide safety control of waste dumps

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ consequences of mining activities	➢ existence of projects for appropriate recultivations of abandoned mining areas ➢ existence of land-use plans taking into account installation of mining activities ➢ legislation for exploitation of natural resources	➢ disturbance of regime and composition of ground waters by mining ➢ contamination of soil and water by oil substances ➢ increase of sedimantation and impact on chemical composition ➢ decreased area of flood plains ➢ negative influence on landscape and irreversible changes through extraction of row materials	➢ impact on ground and surface water in border area of mining in Hodonín and Bzenec	➢ impact of waste banks from of old and abandoned mines ➢ effects of sand-gravel and stone extraction ➢ disposal of wastewaters containing harmful substances ➢ inappropriate control of lagoons	➢ treatment of waters from mines and quarries ➢ monitoring ➢ rehabilitation of mining areas ➢ taking protective measures for mines against floods ➢ setting limits for territory use for mining activities (land-use planning) ➢ long term monitoring and evaluation of recultivation measures

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Production of municipal solid waste	➢ Household waste separation at households ➢ Technological (know-how) of waste disposal (e.g. Hg, fluorescent tubes) ➢ Existing law regulations for waste disposal	➢ Surface and ground water pollution from old and non secured dump sites ➢ Potential risk of water pollution with hardly degradable hazardous pollutants ➢ Reduced use of water for drinking purposes ➢ Endangering biodiversity by occasional runoffs from not safely controlled waste dumps ➢ Potential health risks from contact with water and fish consumption	➢ Potential risk of endangering water by leached hazardous pollutant ➢ Reduced use of water including recreation activities ➢ Risk of surface and ground water pollution in boundary reaches ➢ Risk of loss or change of biodiversity in boundary reaches	➢ Not safely controlled old loads PCBs, insoluble substances, oil products, heavy metals	➢ Design and implementation of local and regional information systems ➢ Monitoring of old dump sites concerning toxic leachates and hazardous waste
				➢ Improper manipulation, storage and disposal of waste	➢ Strict application of sanction measures (e.g. higher penalty fees) ➢ Improvement of waste separation, composting, incineration and recycling ➢ Introduced incentives for use of returnable or degradable packing materials
				➢ Extensive production and unsuitable composition of produced waste	➢ Reducing of waste production
				➢ Improper manipulation of drinking water treatment plant slugs	➢ Control dump sites of WWTP

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Production of municipal waste water	➢ Technological discipline ➢ Observing regulations ➢ Availability of subsidies from the state fund for the environment ➢ Awareness rising activities exist ➢ Application of the EMAS System for municipalities ➢ Education of WWTP operators exists	➢ Ground water pollution ➢ Eutrophication and low oxygen level ➢ Biodiversity loss ➢ Increased sedimentation in river beds ➢ Decrease recreation possibilities along water bodies ➢ Potential health risks from contact with water and eating fish	➢ Negative impact at border locations ➢ Limitation of movement of migrating water species ➢ Loss or changes of biodiversity in protected area ➢ Reduced use of transboundary water resources	➢ Untreated and insufficiently treated wastewater	➢ Treatment of the wastewater in compliance with legislation and environmental needs ➢ Building of new sewer system and their reconstruction ➢ Construction of new WWTP, reconstruction and upgrading existing WWTP ➢ Harmonization of Czech legislation with the EU ➢ Increase involvement of independent consulting companies in advising municipalities for establishment and operation of WWTP ➢ Regularly update list of small WWTP recommended for construction ➢ Preferable conditions for domestic manufacturers of chemical products with lower content of pollutants
				➢ Inappropriate management of sludge at WWTP	➢ Improvement of training for WWTP operators
				➢ Inadequate equipment of recreation centers along water bodies	➢ Enhancing self-purification processes in river – rehabilitation
				➢ Poor state of repairs and in adequate maintenance of server system	➢ Improve maintenance of sewer system
				➢ Obsolete technologies of municipal WWTP	➢ Application of the best available technology
				➢ Excessive use of inappropriate detergents and phosphates	➢ Comprehensive system of education and information dissemination for inhabitants
				➢ Discharging untreated industrial wastewater to sewer system	➢ Monitoring of water quality at selected profiles ➢ Separated treatment of industrial wastewater at the place of origin ➢ Increase control of producers of wastewater

Activities leading to water pollution	Current Strengths and Assets	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ Urban traffic	➢ technical standards for construction and operation of gasoline stations ➢ technical control for cars and roads safety ➢ existence and application of use of land-use plan ➢ application of risk analysis and EIA ➢ existence of well organized public transportation ➢ technical standards for operation of railway stations and freight transport	➢ increase pollution through runoff from traffic surfaces ➢ endangering of surface and ground waters by accidents and disasters ➢ accidental pollution by transport of toxic material and oil products ➢ decrease of rain water infiltration on traffic surfaces and increase of runoff coefficient	➢ transfer of insoluble substances and oil products after rain periods ➢ risk of accidents and disasters in boundary localities	➢ use of old and technically unsafe vehicles	➢ strengthening of control of state of vehicles ➢ implementation of EU technical standards in transport
				➢ increased intensity and concentration of traffic	➢ promote electrification of public transportation
				➢ increased load of WWTPs during rain because of building of hard surface areas ➢ runoffs of insoluble substances and oil products to WWTP or directly into stream	➢ appropriate drainage of from large parking lots and roads
				➢ chemical treatment of roads in winter	➢ strict requirements and checking of application of ecological strew material (grid)
				➢ inappropriate operation of gasoline stations	➢ enforce application of regulations for construction and operation of gasoline stations
				➢ defects in technical conditions and improper operation and maintenance of railways	➢ increase safety of repumping stations at railways
				➢ inappropriate transport of oil and toxic material	➢ reinforce educational systems for persons transporting hazardous products ➢ strict keeping the ADR regulation

Annex 3. Problem Analysis

3.0. General Problem Hierarchy

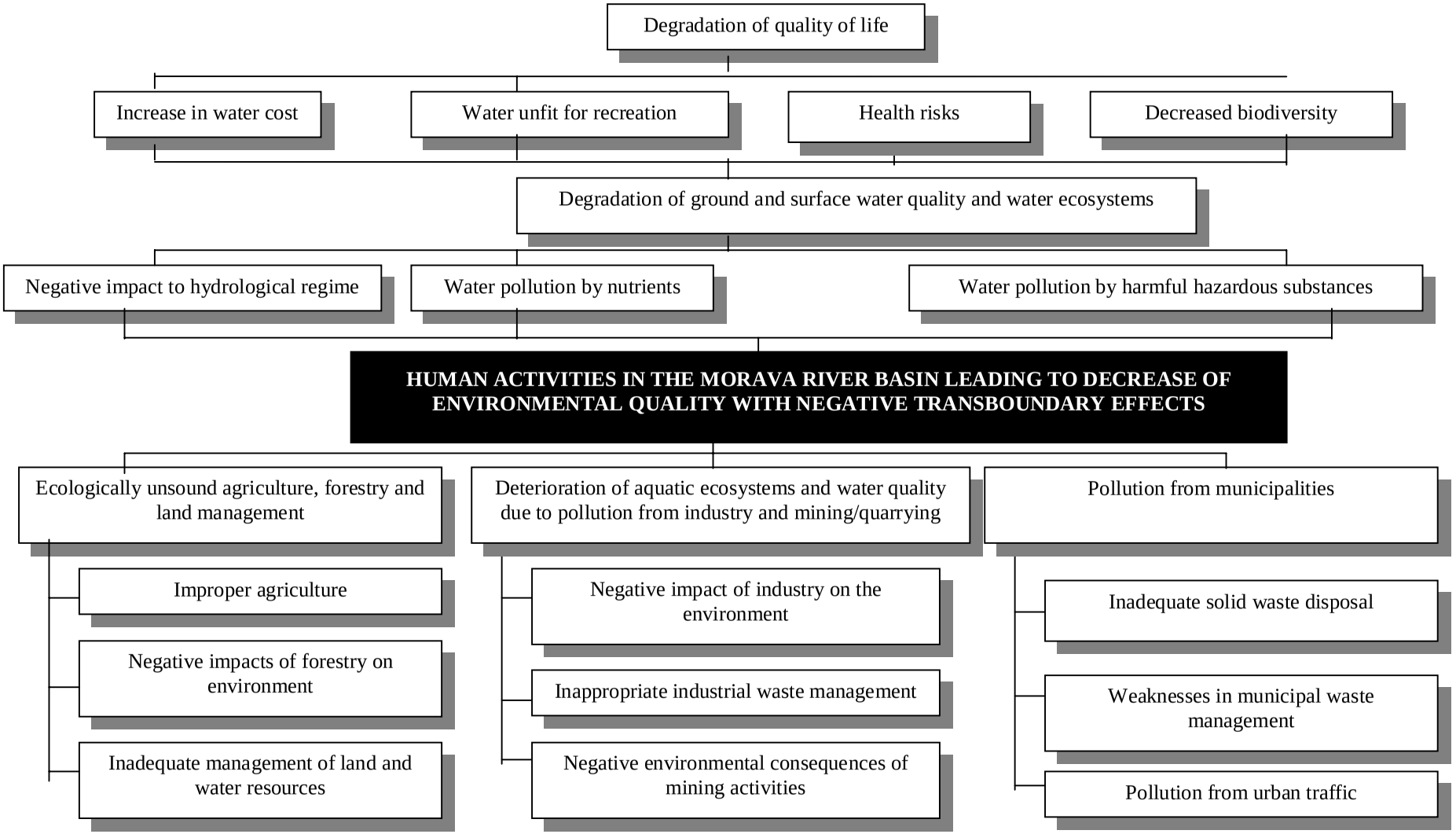
3.1. Agriculture, Forestry and Land Management

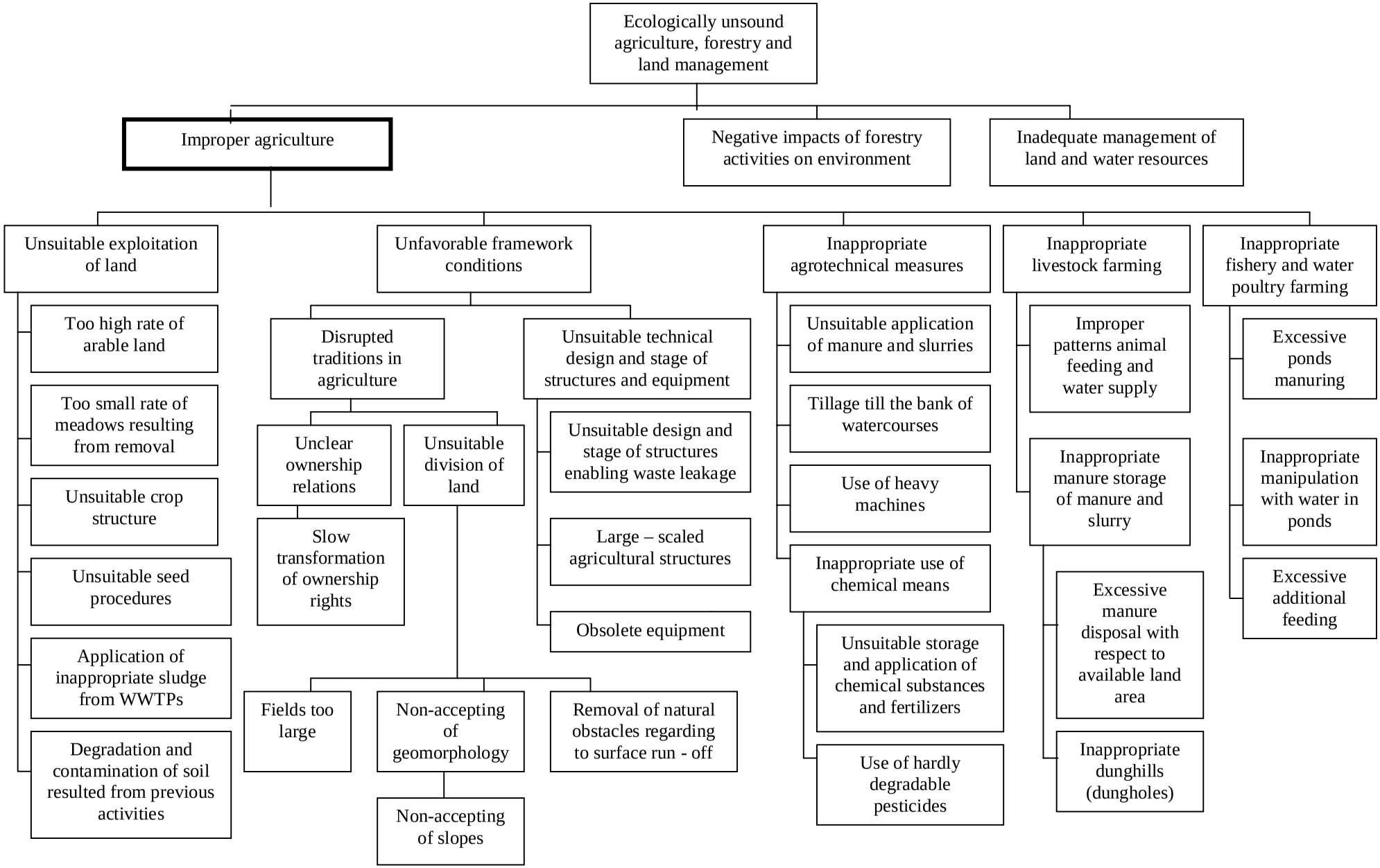
3.2. Industry and Mining

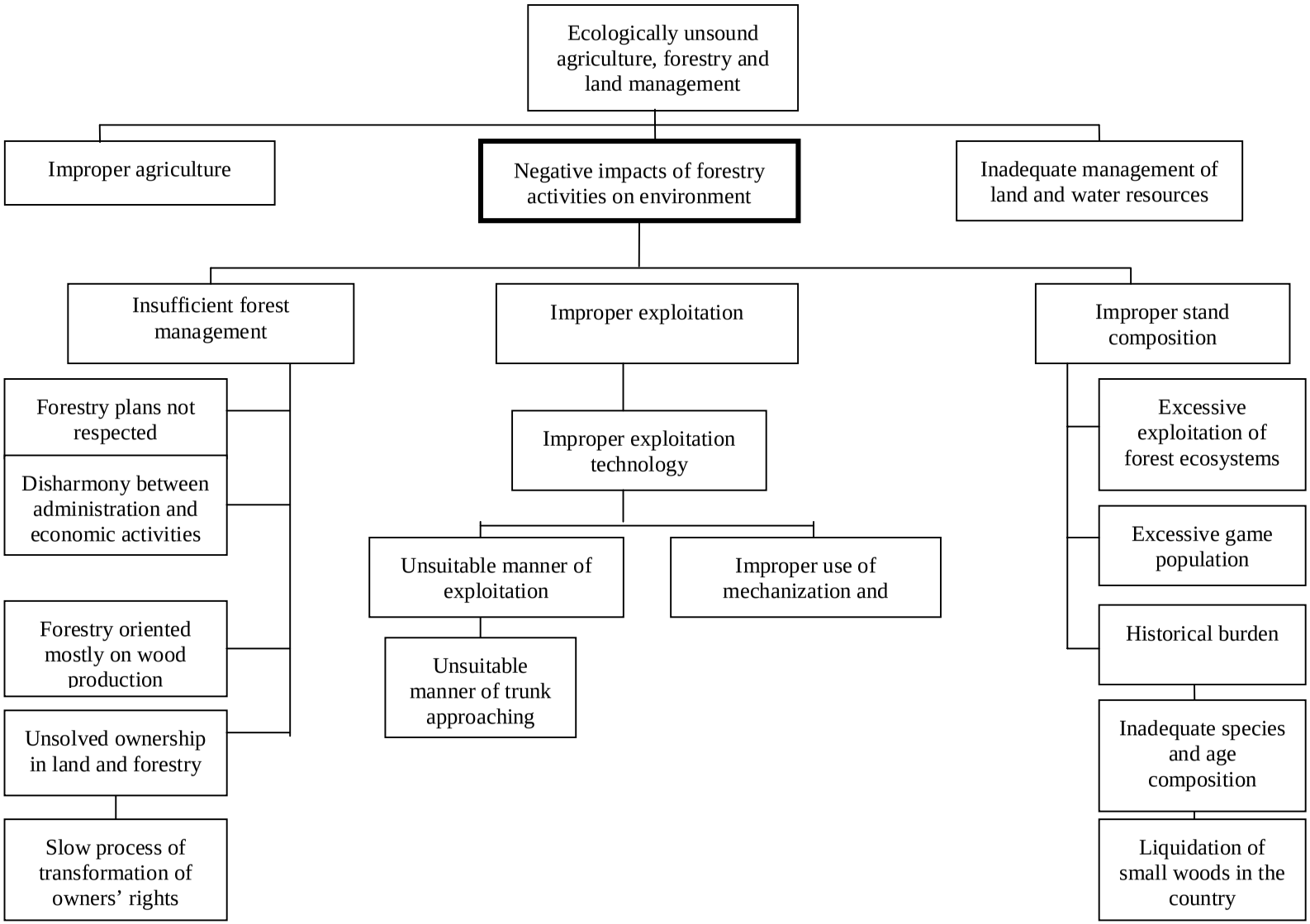
3.3. Municipality

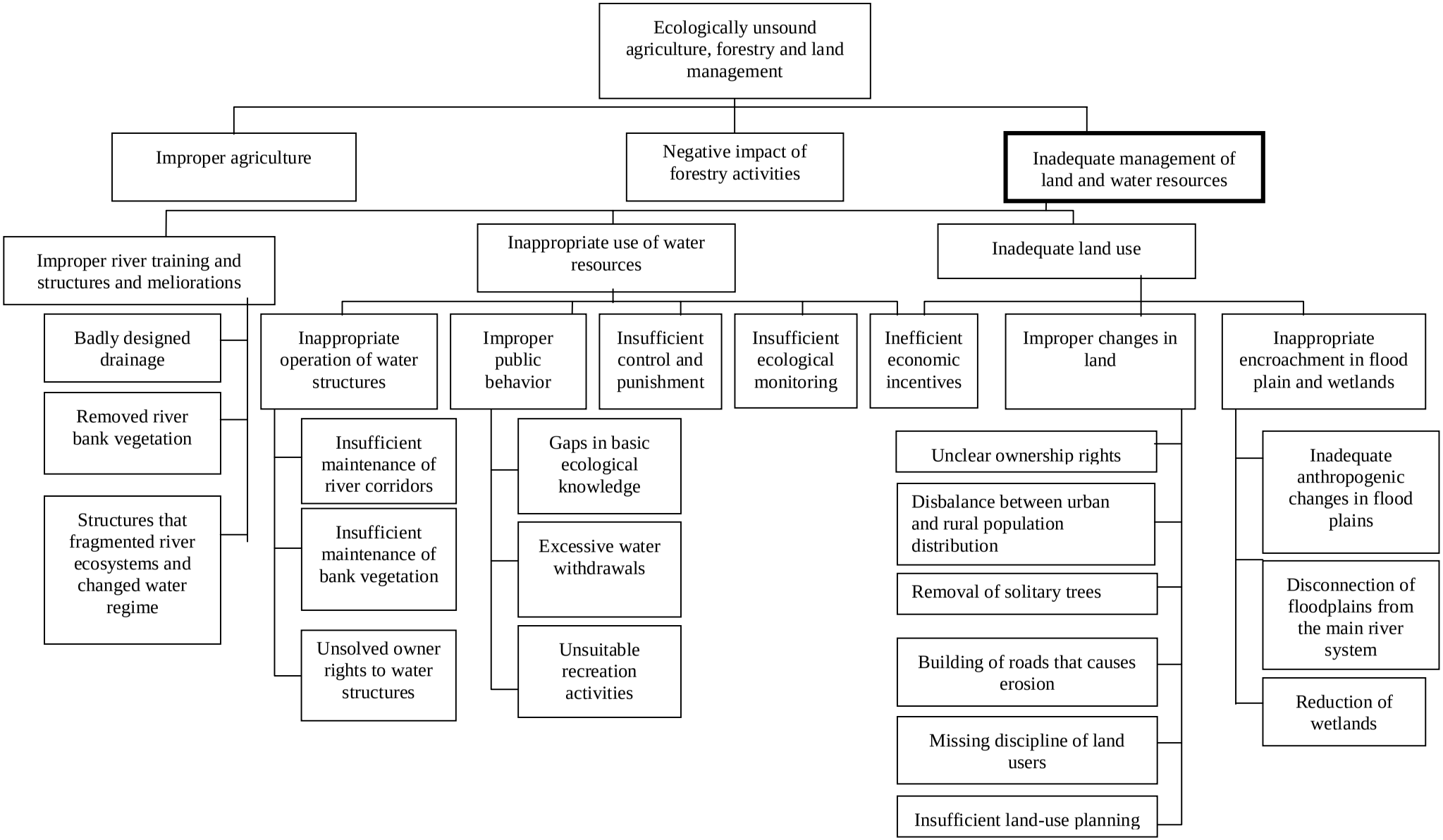
General Problem Hierarchy

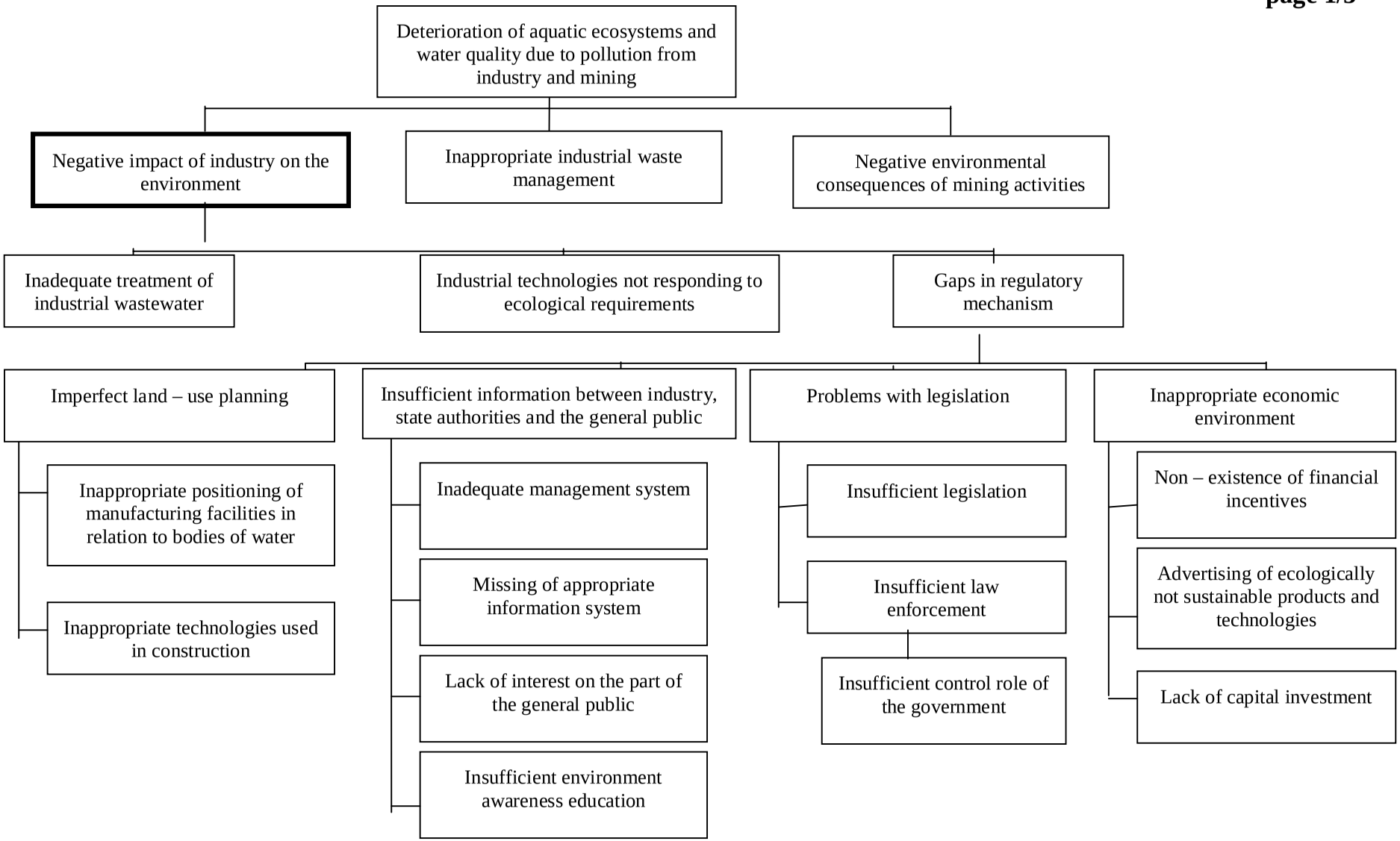
Annex 3.0.

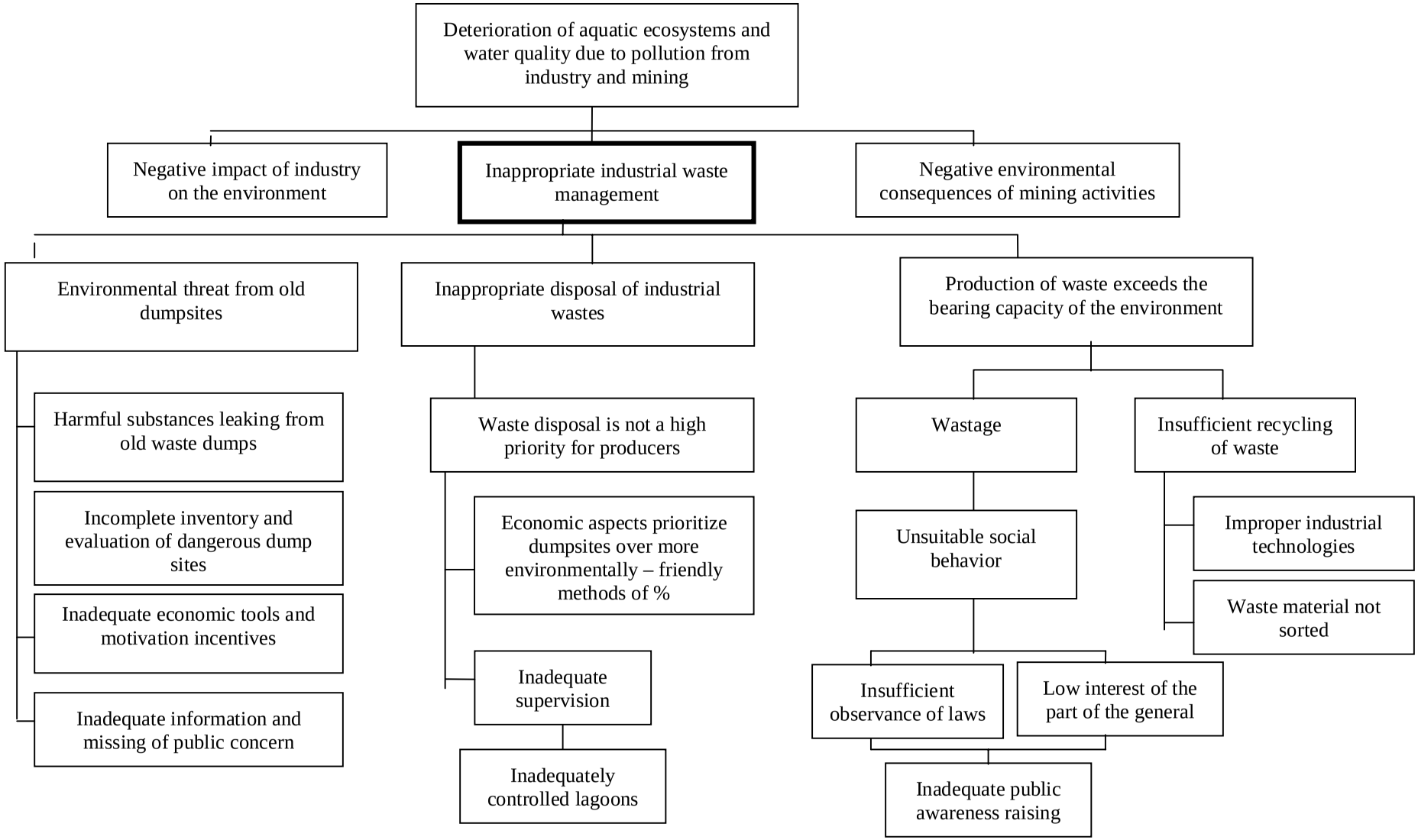


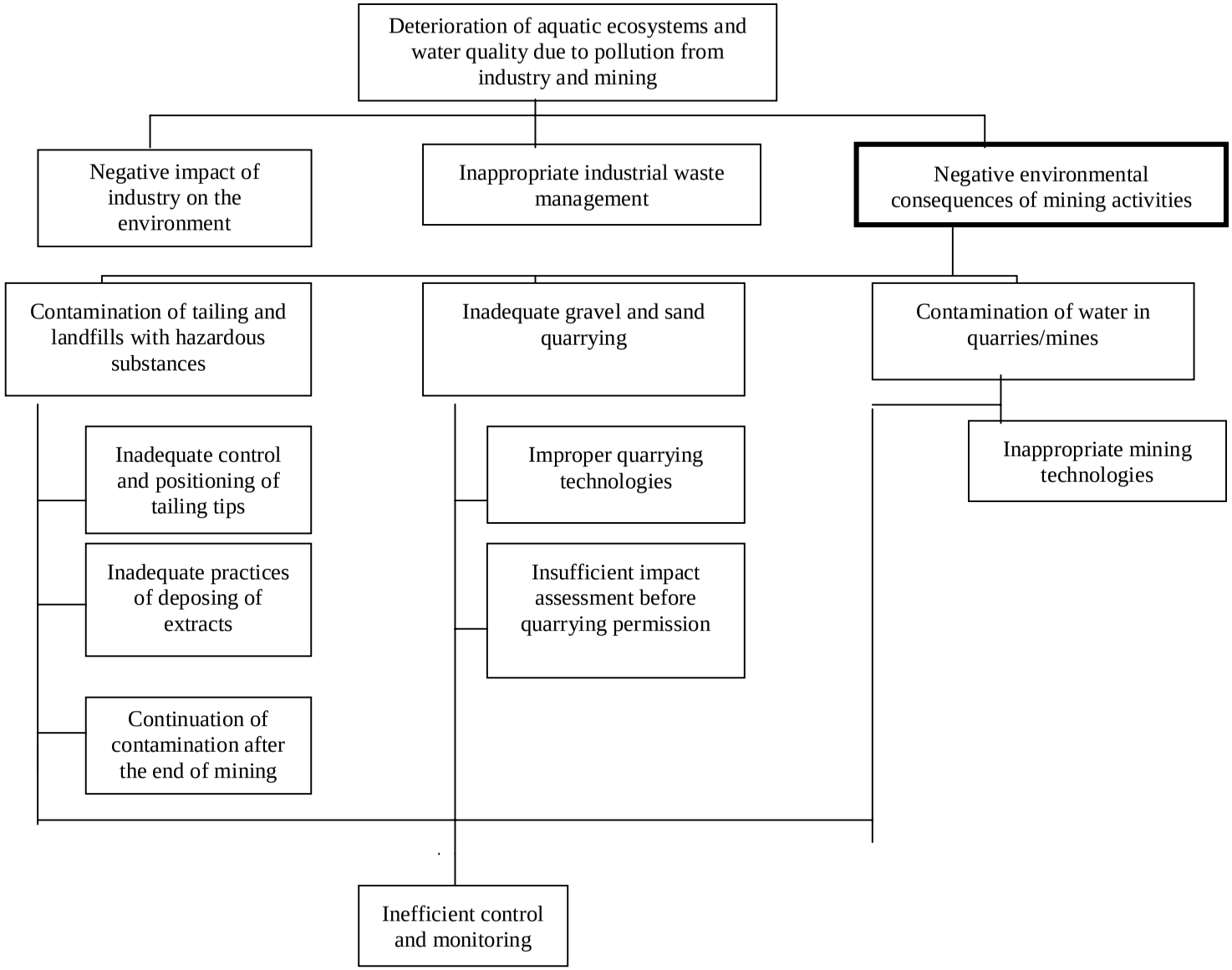

Ecologically unsound agriculture, forestry and land management
Improper agriculture
Negative impacts of forestry activities on environment
Inadequate management of land and water resources
Unsuitable exploitation of land
Too high rate of arable land
Too small rate of meadows resulting from removal
Unsuitable crop structure
Unsuitable seed procedures
Application of inappropriate sludge from WWTPs
Degradation and contamination of soil resulted from previous activities
Unfavorable framework conditions
Disrupted traditions in agriculture
Unclear ownership relations
Slow transformation of ownership rights
Unsuitable division of land
Fields too large
Non-accepting of geomorphology
Non-accepting of slopes
Unsuitable technical design and stage of structures and equipment
Unsuitable design and stage of structures enabling waste leakage
Large – scaled agricultural structures
Obsolete equipment
Removal of natural obstacles regarding to surface run - off
Inappropriate agrotechnical measures
Unsuitable application of manure and slurries
Tillage till the bank of watercourses
Use of heavy machines
Inappropriate use of chemical means
Unsuitable storage and application of chemical substances and fertilizers
Use of hardly degradable pesticides
Inappropriate livestock farming
Improper patterns animal feeding and water supply
Inappropriate manure storage of manure and slurry
Excessive manure disposal with respect to available land area
Inappropriate dunghills (dungholes)
Inappropriate fishery and water poultry farming
Excessive ponds manuring
Inappropriate manipulation with water in ponds
Excessive additional feeding

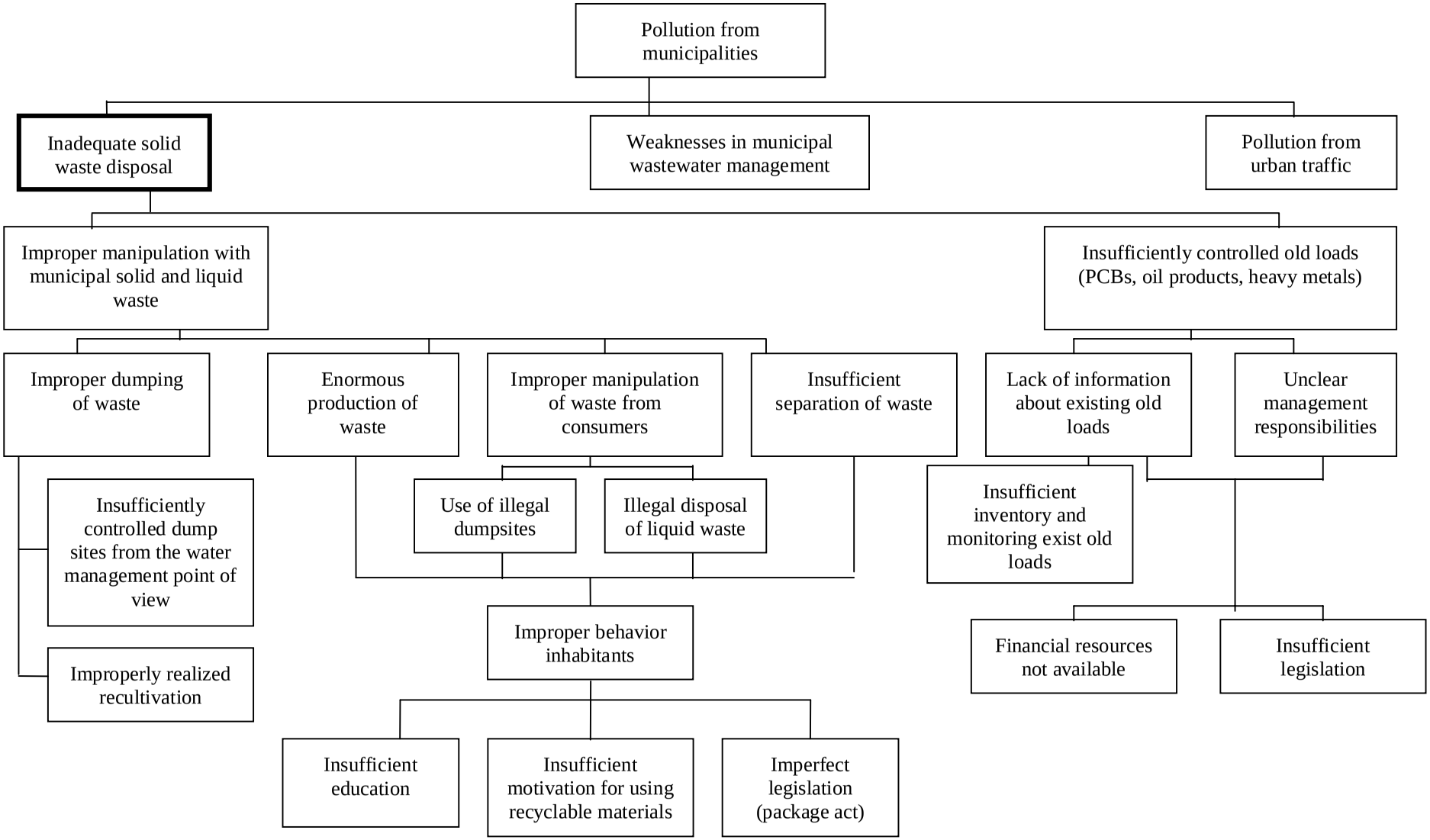

Ecologically unsound agriculture, forestry and land management
Improper agriculture
Negative impacts of forestry activities on environment
Inadequate management of land and water resources
Insufficient forest management
Improper exploitation
Improper stand composition
Forestry plans not respected
Disharmony between administration and economic activities
Forestry oriented mostly on wood production
Unsolved ownership in land and forestry
Slow process of transformation of owners' rights
Improper exploitation technology
Unsuitable manner of exploitation
Improper use of mechanization and
Unsuitable manner of trunk approaching
Excessive exploitation of forest ecosystems
Excessive game population
Historical burden
Inadequate species and age composition
Liquidation of small woods in the country

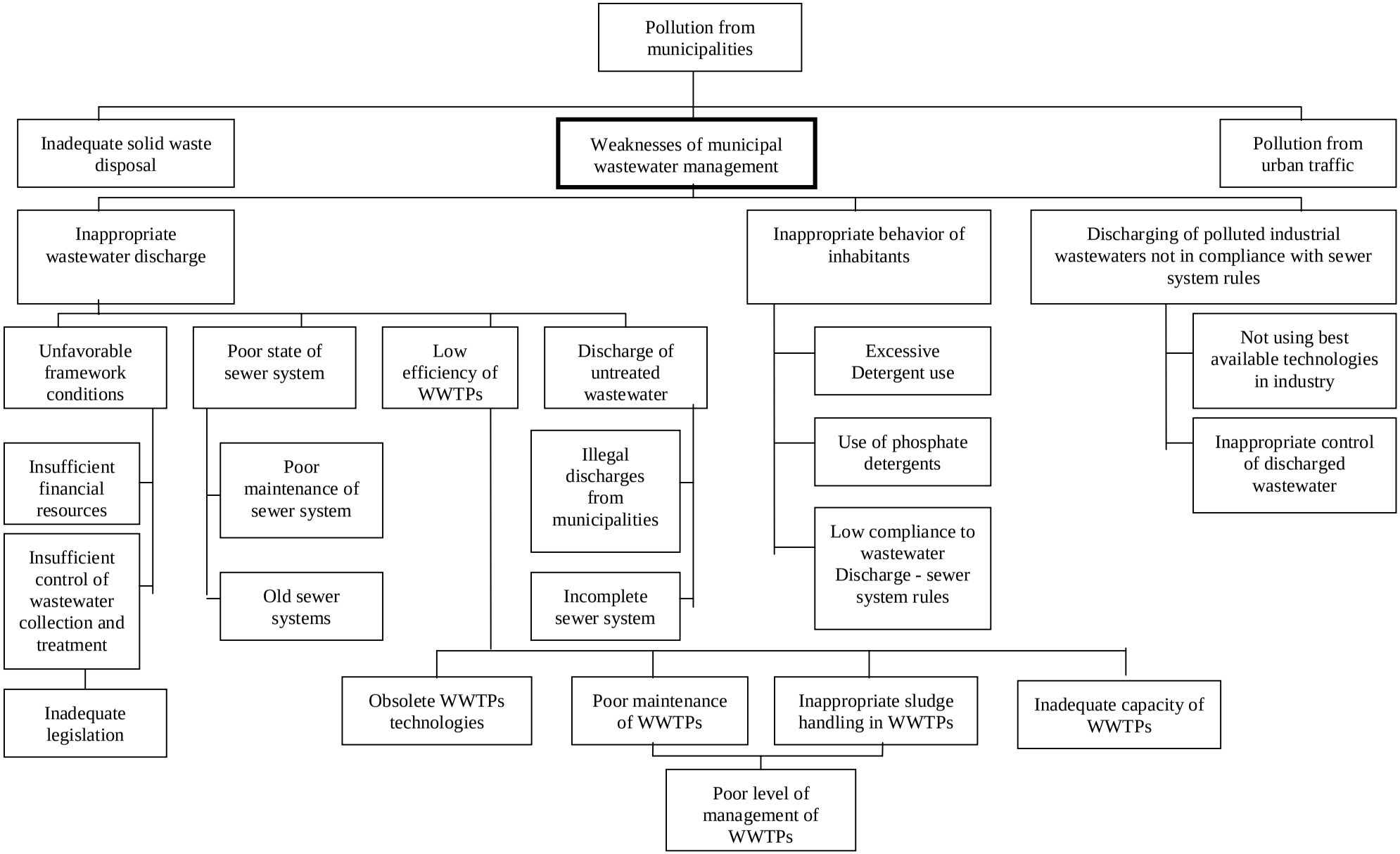

Ecologically unsound agriculture, forestry and land management
Improper agriculture
Negative impact of forestry activities
Inadequate management of land and water resources
Improper river training and structures and meliorations
Inappropriate use of water resources
Inadequate land use
Badly designed drainage
Removed river bank vegetation
Structures that fragmented river ecosystems and changed water regime
Inappropriate operation of water structures
Improper public behavior
Insufficient control and punishment
Insufficient ecological monitoring
Inefficient economic incentives
Improper changes in land
Inappropriate encroachment in flood plain and wetlands
Insufficient maintenance of river corridors
Insufficient maintenance of bank vegetation
Unsolved owner rights to water structures
Gaps in basic ecological knowledge
Excessive water withdrawals
Unsuitable recreation activities
Unclear ownership rights
Disbalance between urban and rural population distribution
Removal of solitary trees
Building of roads that causes erosion
Missing discipline of land users
Insufficient land-use planning
Inadequate anthropogenic changes in flood plains
Disconnection of floodplains from the main river system
Reduction of wetlands

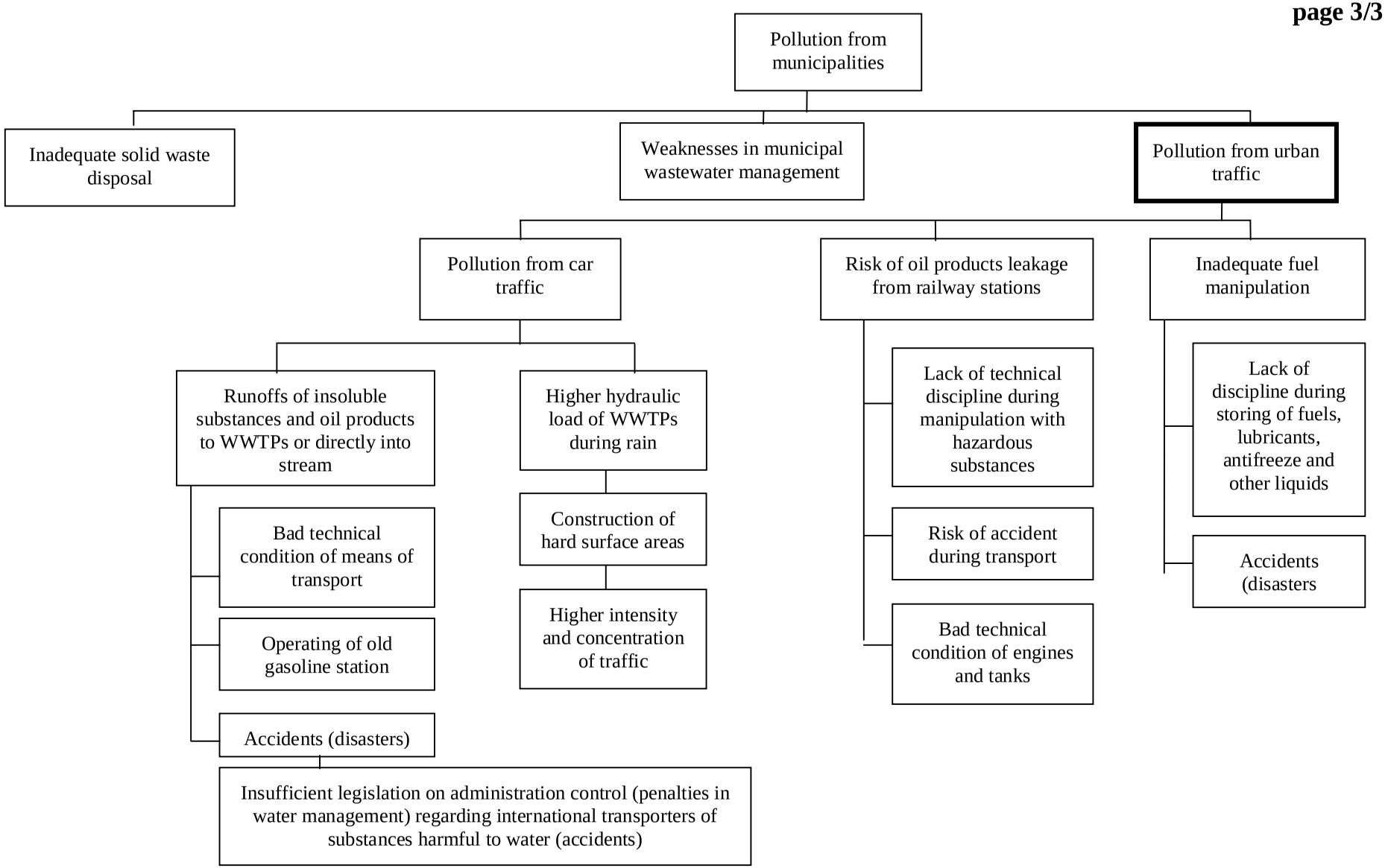

Deterioration of aquatic ecosystems and water quality due to pollution from industry and mining
Negative impact of industry on the environment
Inappropriate industrial waste management
Negative environmental consequences of mining activities
Inadequate treatment of industrial wastewater
Industrial technologies not responding to ecological requirements
Gaps in regulatory mechanism
Imperfect land – use planning
Insufficient information between industry, state authorities and the general public
Problems with legislation
Inappropriate economic environment
Inappropriate positioning of manufacturing facilities in relation to bodies of water
Inappropriate technologies used in construction
Inadequate management system
Missing of appropriate information system
Lack of interest on the part of the general public
Insufficient environment awareness education
Insufficient legislation
Insufficient law enforcement
Insufficient control role of the government
Non – existence of financial incentives
Advertising of ecologically not sustainable products and technologies
Lack of capital investment


Deterioration of aquatic ecosystems and water quality due to pollution from industry and mining
Negative impact of industry on the environment
Inappropriate industrial waste management
Negative environmental consequences of mining activities
Environmental threat from old dumpsites
Inappropriate disposal of industrial wastes
Production of waste exceeds the bearing capacity of the environment
Harmful substances leaking from old waste dumps
Incomplete inventory and evaluation of dangerous dump sites
Inadequate economic tools and motivation incentives
Inadequate information and missing of public concern
Waste disposal is not a high priority for producers
Economic aspects prioritize dumpsites over more environmentally – friendly methods of %
Inadequate supervision
Inadequately controlled lagoons
Wastage
Insufficient recycling of waste
Unsuitable social behavior
Improper industrial technologies
Waste material not sorted
Insufficient observance of laws
Low interest of the part of the general
Inadequate public awareness raising


Deterioration of aquatic ecosystems and water quality due to pollution from industry and mining
Negative impact of industry on the environment
Inappropriate industrial waste management
Negative environmental consequences of mining activities
Contamination of tailing and landfills with hazardous substances
Inadequate gravel and sand quarrying
Contamination of water in quarries/mines
Inadequate control and positioning of tailing tips
Improper quarrying technologies
Inappropriate mining technologies
Inadequate practices of deposing of extracts
Insufficient impact assessment before quarrying permission
Continuation of contamination after the end of mining
Inefficient control and monitoring


Pollution from municipalities
Inadequate solid waste disposal
Weaknesses in municipal wastewater management
Pollution from urban traffic
Improper manipulation with municipal solid and liquid waste
Insufficiently controlled old loads (PCBs, oil products, heavy metals)
Improper dumping of waste
Enormous production of waste
Improper manipulation of waste from consumers
Insufficient separation of waste
Lack of information about existing old loads
Unclear management responsibilities
Insufficiently controlled dump sites from the water management point of view
Use of illegal dumpsites
Illegal disposal of liquid waste
Insufficient inventory and monitoring exist old loads
Improperly realized recultivation
Improper behavior inhabitants
Financial resources not available
Insufficient legislation
Insufficient education
Insufficient motivation for using recyclable materials
Imperfect legislation (package act)


Pollution from municipalities
Inadequate solid waste disposal
Weaknesses of municipal wastewater management
Pollution from urban traffic
Inappropriate wastewater discharge
Inappropriate behavior of inhabitants
Discharging of polluted industrial wastewaters not in compliance with sewer system rules
Unfavorable framework conditions
Poor state of sewer system
Low efficiency of WWTPs
Discharge of untreated wastewater
Excessive Detergent use
Use of phosphate detergents
Low compliance to wastewater Discharge - sewer system rules
Not using best available technologies in industry
Inappropriate control of discharged wastewater
Insufficient financial resources
Insufficient control of wastewater collection and treatment
Inadequate legislation
Poor maintenance of sewer system
Old sewer systems
Illegal discharges from municipalities
Incomplete sewer system
Obsolete WWTPs technologies
Poor maintenance of WWTPs
Inappropriate sludge handling in WWTPs
Inadequate capacity of WWTPs
Poor level of management of WWTPs


Pollution from municipalities
Inadequate solid waste disposal
Weaknesses in municipal wastewater management
Pollution from urban traffic
Pollution from car traffic
Risk of oil products leakage from railway stations
Inadequate fuel manipulation
Runoffs of insoluble substances and oil products to WWTPs or directly into stream
Higher hydraulic load of WWTPs during rain
Lack of technical discipline during manipulation with hazardous substances
Lack of discipline during storing of fuels, lubricants, antifreeze and other liquids
Bad technical condition of means of transport
Construction of hard surface areas
Risk of accident during transport
Accidents (disasters
Operating of old gasoline station
Higher intensity and concentration of traffic
Bad technical condition of engines and tanks
Accidents (disasters)
Insufficient legislation on administration control (penalties in water management) regarding international transporters of substances harmful to water (accidents)

Annex 4. Objective Analysis

4.0. General Objective Hierarchy

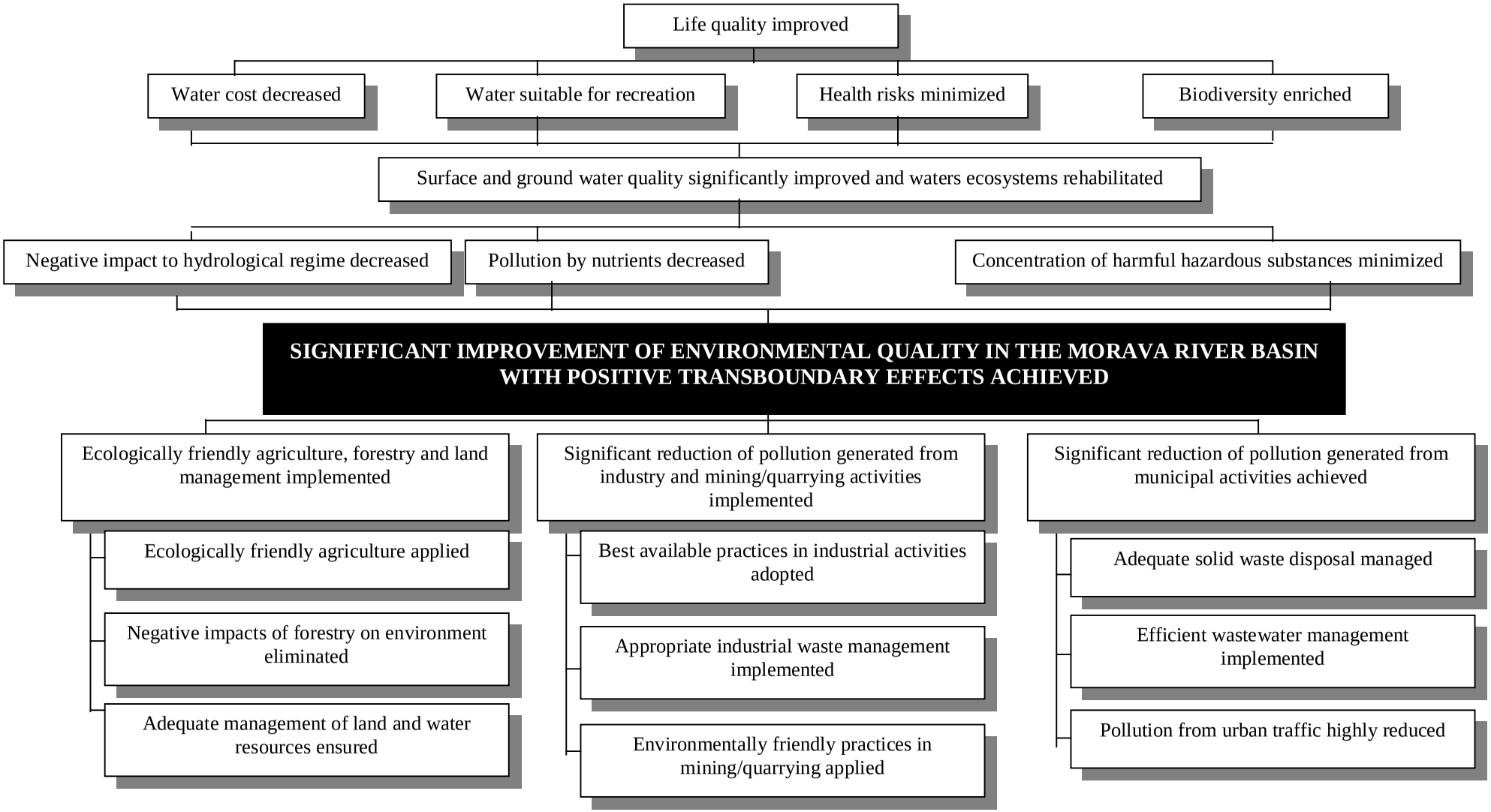
4.1. Agriculture, Forestry and Land Management

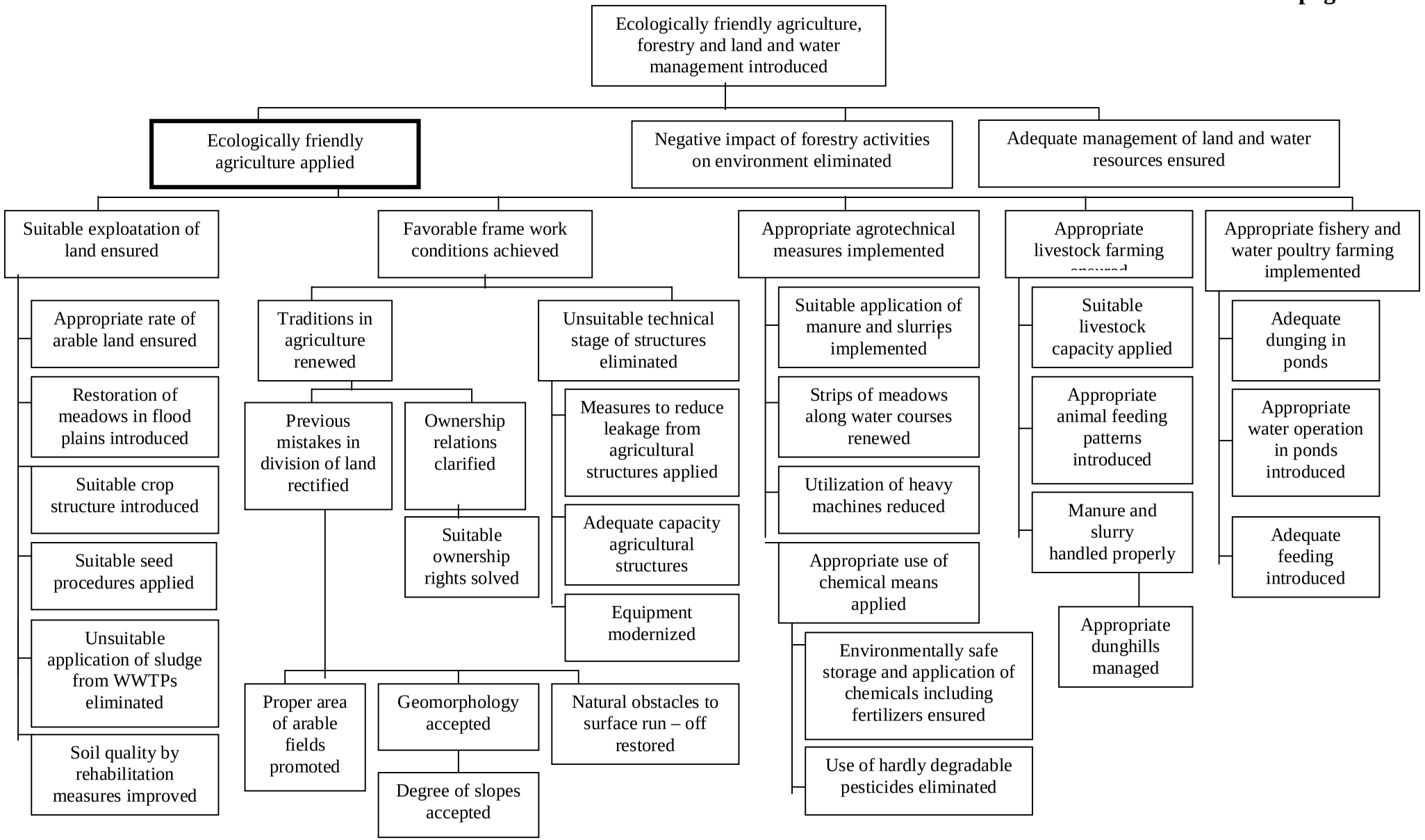
4.2. Industry and Mining

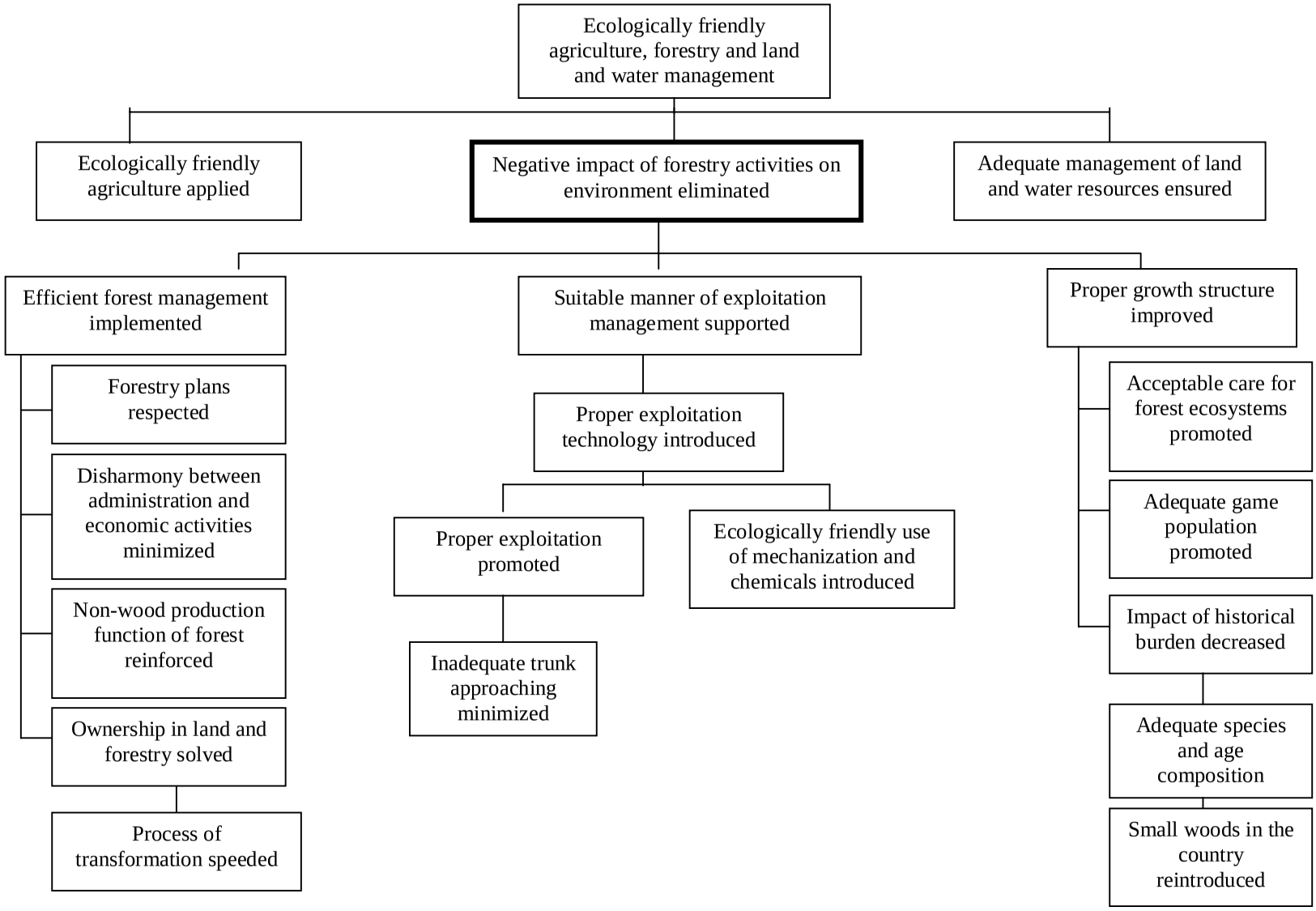
4.3. Municipality

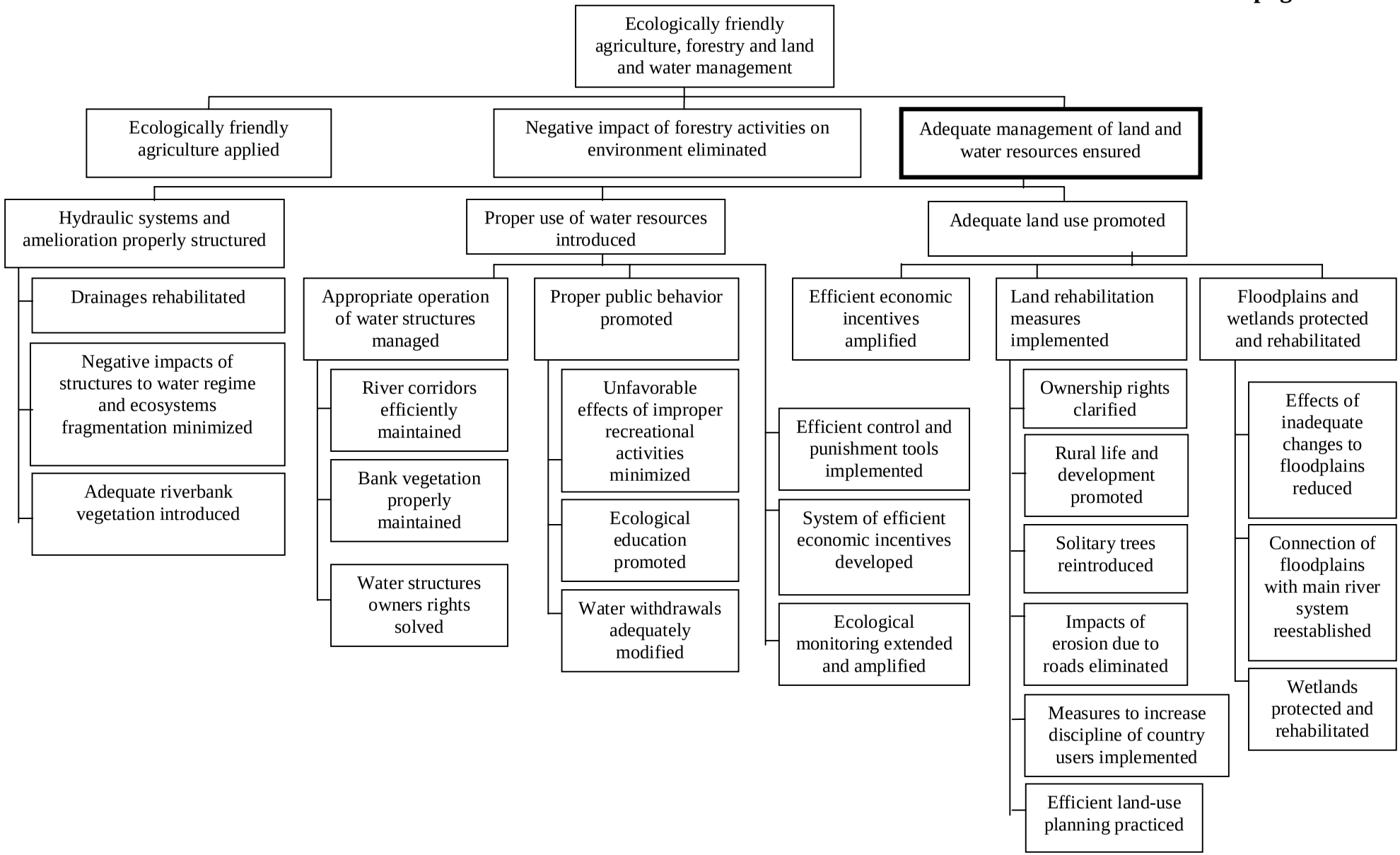
Global hierarchy of objectives

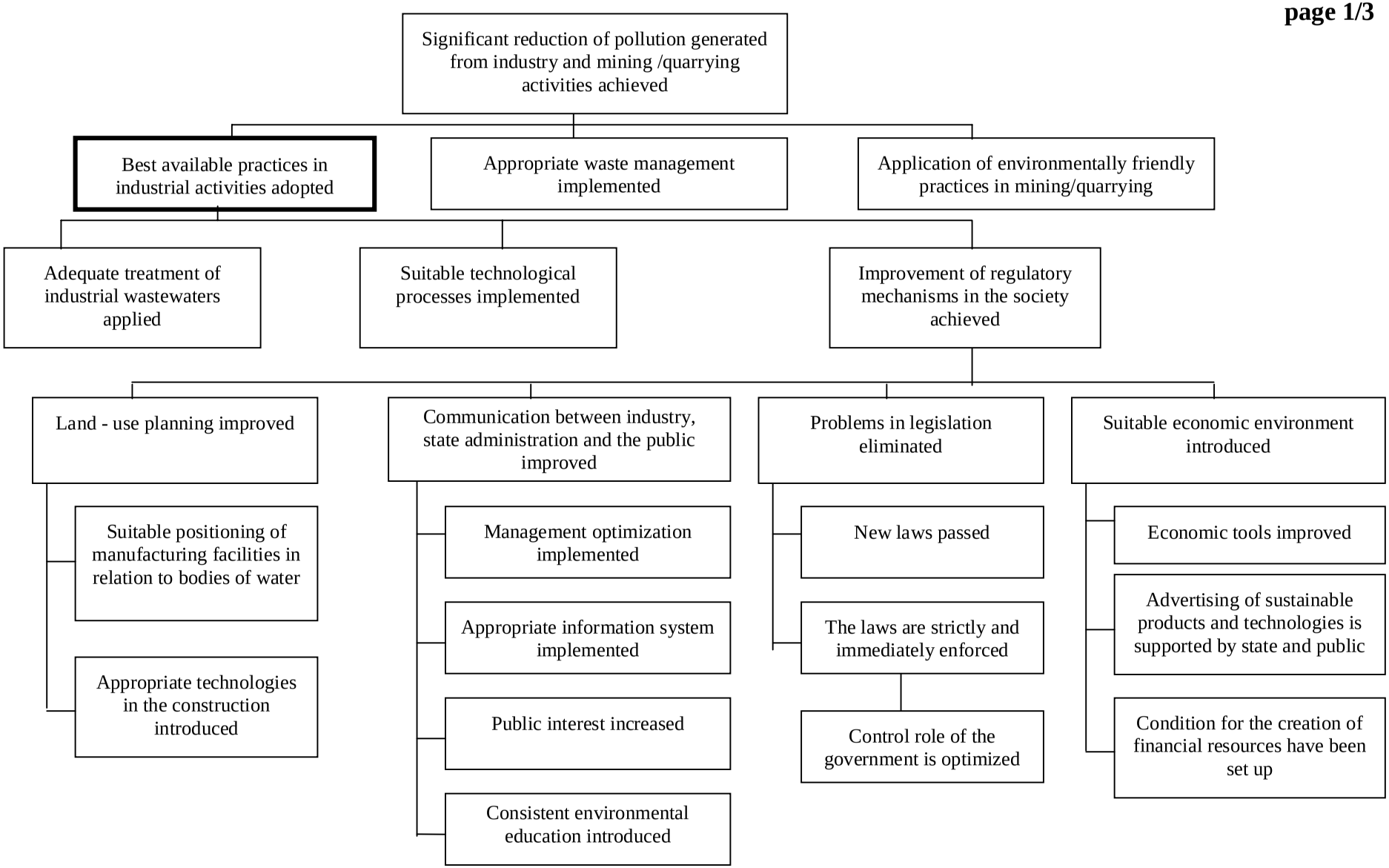
Annex 4.0.

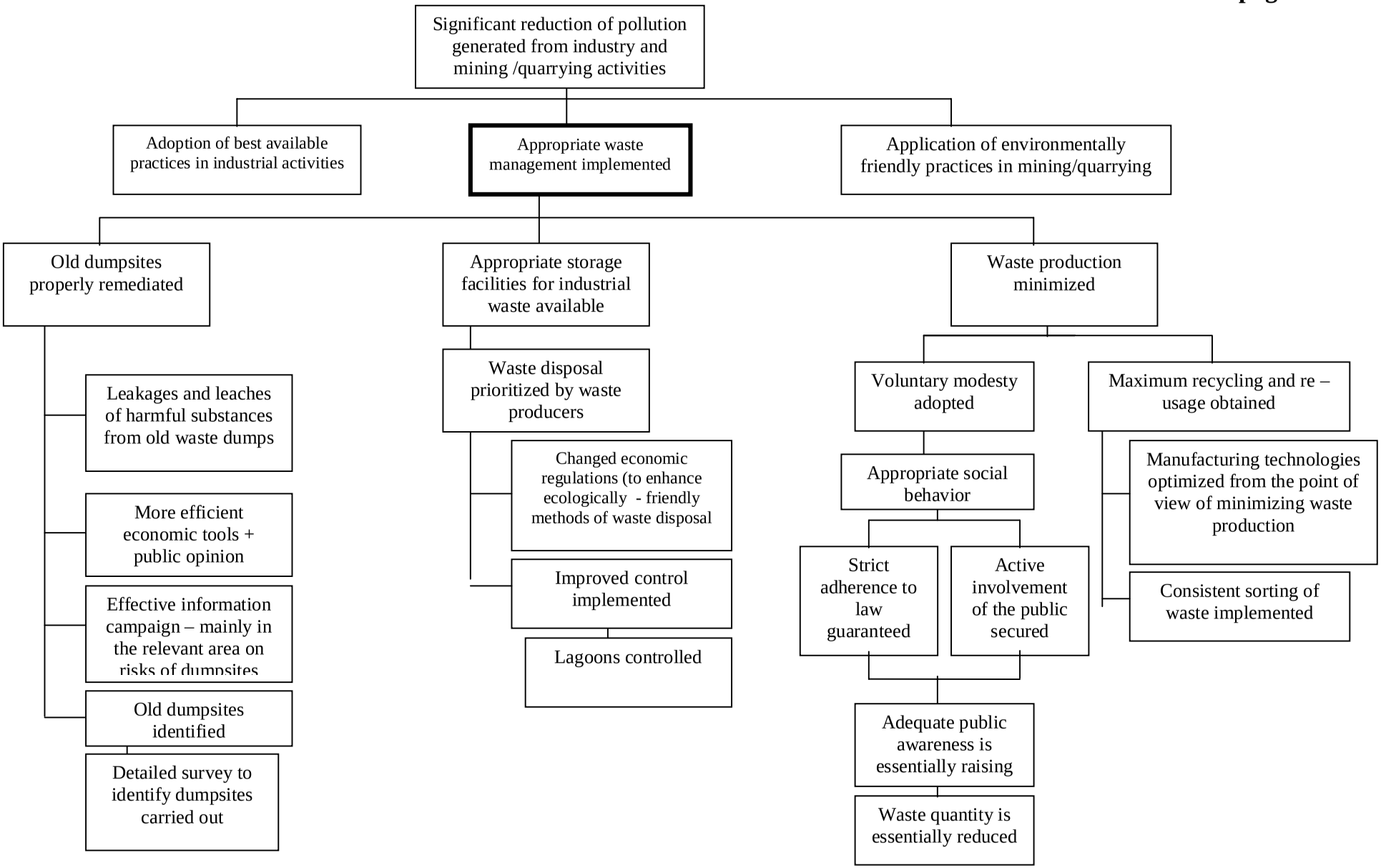


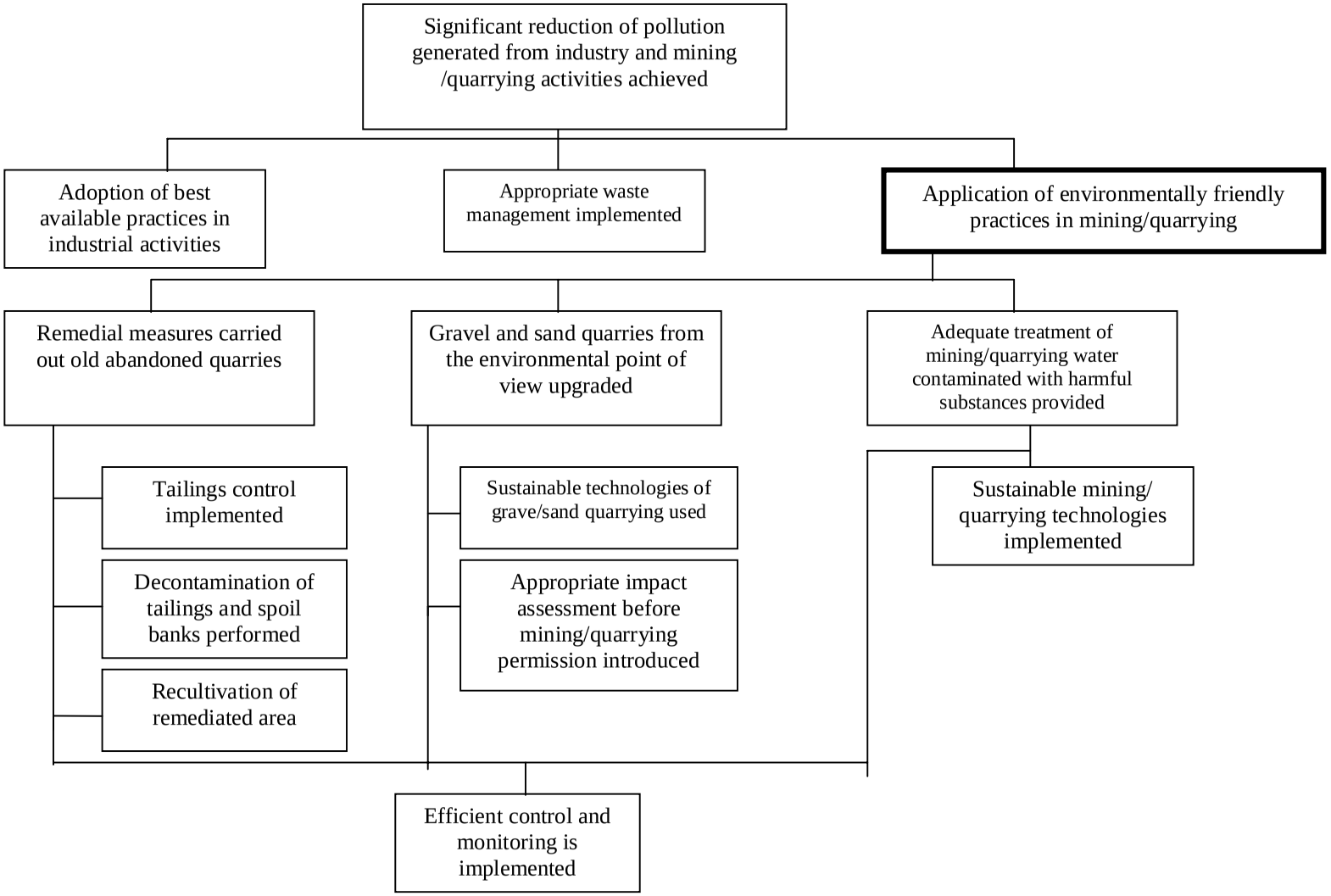

Ecologically friendly agriculture, forestry and land and water management introduced
Ecologically friendly agriculture applied
Negative impact of forestry activities on environment eliminated
Adequate management of land and water resources ensured
Suitable exploatation of land ensured
Favorable frame work conditions achieved
Appropriate agrotechnical measures implemented
Appropriate livestock farming
Appropriate fishery and water poultry farming implemented
Appropriate rate of arable land ensured
Restoration of meadows in flood plains introduced
Suitable crop structure introduced
Suitable seed procedures applied
Unsuitable application of sludge from WWTPs eliminated
Soil quality by rehabilitation measures improved
Traditions in agriculture renewed
Unsuitable technical stage of structures eliminated
Previous mistakes in division of land rectified
Ownership relations clarified
Suitable ownership rights solved
Measures to reduce leakage from agricultural structures applied
Adequate capacity agricultural structures
Equipment modernized
Proper area of arable fields promoted
Geomorphology accepted
Degree of slopes accepted
Natural obstacles to surface run – off restored
Suitable application of manure and slurries implemented
Strips of meadows along water courses renewed
Utilization of heavy machines reduced
Appropriate use of chemical means applied
Environmentally safe storage and application of chemicals including fertilizers ensured
Use of hardly degradable pesticides eliminated
Suitable livestock capacity applied
Appropriate animal feeding patterns introduced
Manure and slurry handled properly
Appropriate dunghills managed
Adequate dunging in ponds
Appropriate water operation in ponds introduced
Adequate feeding introduced

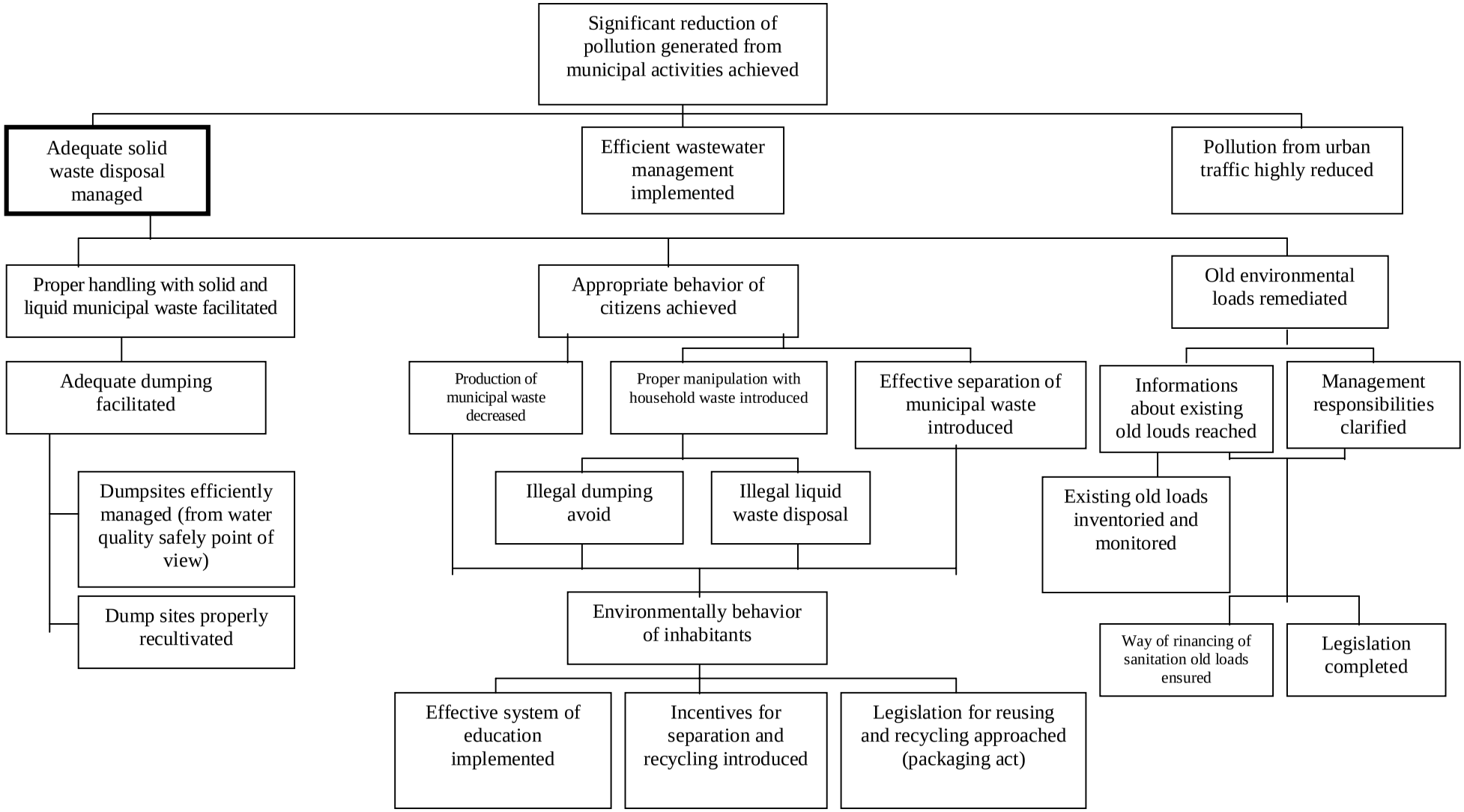

Ecologically friendly agriculture, forestry and land and water management
Ecologically friendly agriculture applied
Negative impact of forestry activities on environment eliminated
Adequate management of land and water resources ensured
Efficient forest management implemented
Suitable manner of exploitation management supported
Proper growth structure improved
Forestry plans respected
Disharmony between administration and economic activities minimized
Non-wood production function of forest reinforced
Ownership in land and forestry solved
Process of transformation speeded
Proper exploitation technology introduced
Proper exploitation promoted
Ecologically friendly use of mechanization and chemicals introduced
Inadequate trunk approaching minimized
Acceptable care for forest ecosystems promoted
Adequate game population promoted
Impact of historical burden decreased
Adequate species and age composition
Small woods in the country reintroduced

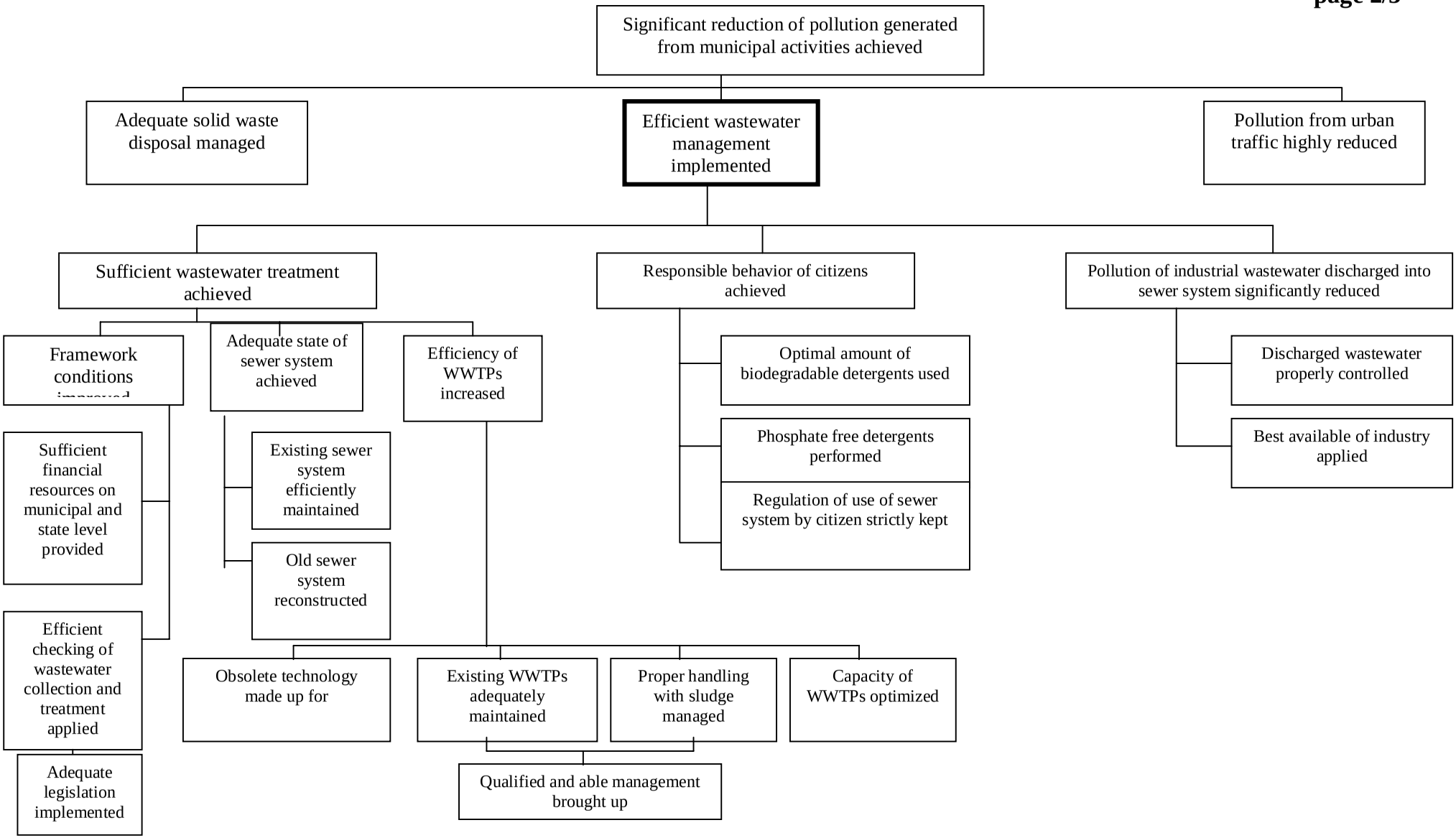

Ecologically friendly agriculture, forestry and land and water management
Ecologically friendly agriculture applied
Negative impact of forestry activities on environment eliminated
Adequate management of land and water resources ensured
Hydraulic systems and amelioration properly structured
Drainages rehabilitated
Negative impacts of structures to water regime and ecosystems fragmentation minimized
Adequate riverbank vegetation introduced
Proper use of water resources introduced
Appropriate operation of water structures managed
River corridors efficiently maintained
Bank vegetation properly maintained
Water structures owners rights solved
Proper public behavior promoted
Unfavorable effects of improper recreational activities minimized
Ecological education promoted
Water withdrawals adequately modified
Efficient control and punishment tools implemented
System of efficient economic incentives developed
Ecological monitoring extended and amplified
Adequate land use promoted
Efficient economic incentives amplified
Land rehabilitation measures implemented
Ownership rights clarified
Rural life and development promoted
Solitary trees reintroduced
Impacts of erosion due to roads eliminated
Measures to increase discipline of country users implemented
Efficient land-use planning practiced
Floodplains and wetlands protected and rehabilitated
Effects of inadequate changes to floodplains reduced
Connection of floodplains with main river system reestablished
Wetlands protected and rehabilitated

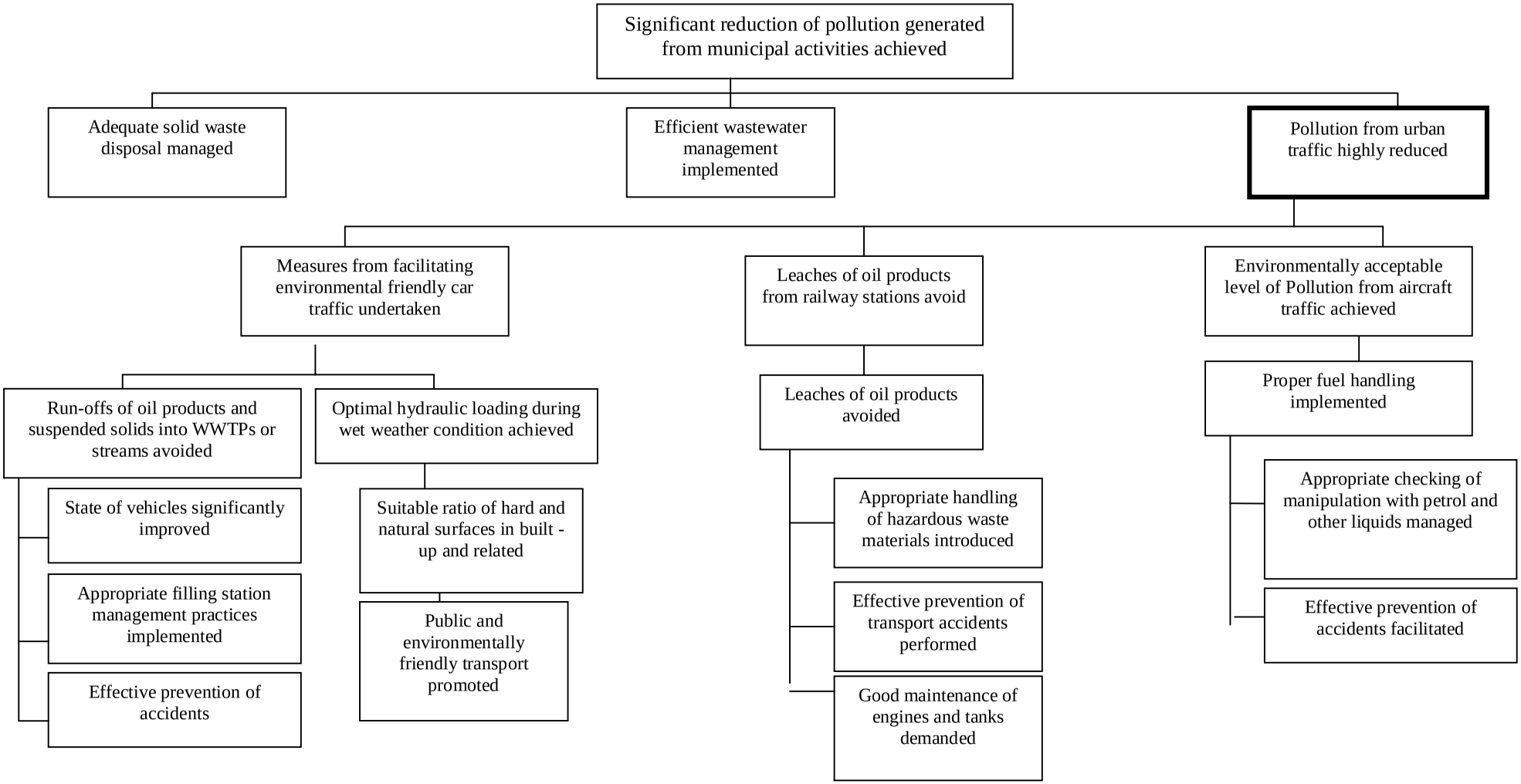

Significant reduction of pollution generated from industry and mining /quarrying activities achieved
Best available practices in industrial activities adopted
Appropriate waste management implemented
Application of environmentally friendly practices in mining/quarrying
Adequate treatment of industrial wastewaters applied
Suitable technological processes implemented
Improvement of regulatory mechanisms in the society achieved
Land - use planning improved
Suitable positioning of manufacturing facilities in relation to bodies of water
Appropriate technologies in the construction introduced
Communication between industry, state administration and the public improved
Management optimization implemented
Appropriate information system implemented
Public interest increased
Consistent environmental education introduced
Problems in legislation eliminated
New laws passed
The laws are strictly and immediately enforced
Control role of the government is optimized
Suitable economic environment introduced
Economic tools improved
Advertising of sustainable products and technologies is supported by state and public
Condition for the creation of financial resources have been set up


Significant reduction of pollution generated from industry and mining /quarrying activities
Adoption of best available practices in industrial activities
Appropriate waste management implemented
Application of environmentally friendly practices in mining/quarrying
Old dumpsites properly remediated
Appropriate storage facilities for industrial waste available
Waste production minimized
Leakages and leaches of harmful substances from old waste dumps
More efficient economic tools + public opinion
Effective information campaign – mainly in the relevant area on risks of dumpsites
Old dumpsites identified
Detailed survey to identify dumpsites carried out
Waste disposal prioritized by waste producers
Changed economic regulations (to enhance ecologically - friendly methods of waste disposal
Improved control implemented
Lagoons controlled
Voluntary modesty adopted
Maximum recycling and re – usage obtained
Appropriate social behavior
Manufacturing technologies optimized from the point of view of minimizing waste production
Strict adherence to law guaranteed
Active involvement of the public secured
Consistent sorting of waste implemented
Adequate public awareness is essentially raising
Waste quantity is essentially reduced


Significant reduction of pollution generated from industry and mining /quarrying activities achieved
Adoption of best available practices in industrial activities
Appropriate waste management implemented
Application of environmentally friendly practices in mining/quarrying
Remedial measures carried out old abandoned quarries
Gravel and sand quarries from the environmental point of view upgraded
Adequate treatment of mining/quarrying water contaminated with harmful substances provided
Tailings control implemented
Decontamination of tailings and spoil banks performed
Recultivation of remediated area
Sustainable technologies of grave/sand quarrying used
Appropriate impact assessment before mining/quarrying permission introduced
Sustainable mining/ quarrying technologies implemented
Efficient control and monitoring is implemented


Significant reduction of pollution generated from municipal activities achieved
Adequate solid waste disposal managed
Efficient wastewater management implemented
Pollution from urban traffic highly reduced
Proper handling with solid and liquid municipal waste facilitated
Appropriate behavior of citizens achieved
Old environmental loads remediated
Adequate dumping facilitated
Production of municipal waste decreased
Proper manipulation with household waste introduced
Effective separation of municipal waste introduced
Informations about existing old louds reached
Management responsibilities clarified
Dumpsites efficiently managed (from water quality safely point of view)
Illegal dumping avoid
Illegal liquid waste disposal
Existing old loads inventoried and monitored
Dump sites properly recultivated
Environmentally behavior of inhabitants
Way of rinancing of sanitation old loads ensured
Legislation completed
Effective system of education implemented
Incentives for separation and recycling introduced
Legislation for reusing and recycling approached (packaging act)


Significant reduction of pollution generated from municipal activities achieved
Adequate solid waste disposal managed
Efficient wastewater management implemented
Pollution from urban traffic highly reduced
Sufficient wastewater treatment achieved
Responsible behavior of citizens achieved
Pollution of industrial wastewater discharged into sewer system significantly reduced
Framework conditions
Adequate state of sewer system achieved
Efficiency of WWTPs increased
Optimal amount of biodegradable detergents used
Phosphate free detergents performed
Regulation of use of sewer system by citizen strictly kept
Discharged wastewater properly controlled
Best available of industry applied
Sufficient financial resources on municipal and state level provided
Existing sewer system efficiently maintained
Old sewer system reconstructed
Efficient checking of wastewater collection and treatment applied
Adequate legislation implemented
Obsolete technology made up for
Existing WWTPs adequately maintained
Proper handling with sludge managed
Capacity of WWTPs optimized
Qualified and able management brought up


Significant reduction of pollution generated from municipal activities achieved
Adequate solid waste disposal managed
Efficient wastewater management implemented
Pollution from urban traffic highly reduced
Measures from facilitating environmental friendly car traffic undertaken
Leaches of oil products from railway stations avoid
Environmentally acceptable level of Pollution from aircraft traffic achieved
Run-offs of oil products and suspended solids into WWTPs or streams avoided
Optimal hydraulic loading during wet weather condition achieved
Leaches of oil products avoided
Proper fuel handling implemented
State of vehicles significantly improved
Appropriate filling station management practices implemented
Effective prevention of accidents
Suitable ratio of hard and natural surfaces in built - up and related
Public and environmentally friendly transport promoted
Appropriate handling of hazardous waste materials introduced
Effective prevention of transport accidents performed
Good maintenance of engines and tanks demanded
Appropriate checking of manipulation with petrol and other liquids managed
Effective prevention of accidents facilitated

Annex 5. Sector Planning Matrix

5.1. Agriculture, Forestry and Land Management

5.2. Industry and Mining

5.3. Municipality

Sector Planning Matrix 1. Agriculture, Forestry and Land Management Annex 5.1.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Significant improvement of environmental quality in the Morava River Basin with positive transboundary effects	➢ (PO)	
➢ **Sector Objective:** Ecologically friendly agriculture, forestry and land and water management implemented	➢ By implementation of ecologically friendly measures in agriculture, forestry and water management diversity of river system biota will be enriched by 3-5 fish species and at the same time number of endangered fish species will decrease by 2-3 while utilizable fish production will increase by 15% till 2005 comparing to 1996 (SO-AFLM)	➢ Existence of authorities responsible for integrated management of water quality in respective river basins (SO-AFLM)
➢ **Results/Outputs:** 1.1 Ecologically friendly agriculture applied 1.2 Negative impacts of forestry activities on environment eliminated 1.3 Adequate management of land and water resources ensured	➢ 1.1 By adoption of ecological and integrated agriculture in important regions from view of water management total nitrogen concentration emitted by agriculture will decrease by 30% till 2005 compared to level of 1996 ➢ 1.1 Volume of suspended sediments in defined important profiles will decrease by 40% in 2005 (in comparison to 1996) as result of implementation of agrotechnical and organizational measures to decrease erosion at 80% of agricultural land	➢ Consistent control and punishment of environmental law infractions (1.1 to 1.3) ➢ Achievement of final state of ownership relations(1.1 to 1.3) ➢ Legislation amendment in sectors of agriculture, forestry and land and water protection (1.1 to 1.3)
➢ **Activities:** 1.1.1 Undertake measures for suitable exploitation of land 1.1.2 Introduce appropriate agrotechnical practices 1.1.3 Facilitate favorable framework conditions for agriculture 1.1.4 Ensure appropriate livestock farming 1.1.5 Implement appropriate fishery and water poultry farming 1.2.1 Introduce efficient forest management 1.2.2 Support suitable manner of wood exploitation management 1.2.3 Improve ecological stability by adequate growth structure 1.3.1 Manage properly river training and structures 1.3.2 Undertake measures for facilitating appropriate use of water resources 1.3.3 Ensure environmentally sustainable management of land-use activities	➢ 1.2 40% of forests managed by joint-stock companies within Morava River Basin will be managed with respect to principles of environmentally sound forestry till 2005 ➢ 1.3 At 15% of trained watercourses in Morava River Catchment will be implemented rehabilitation measures till 2005	➢ Adequate areas of plots and pieces of land (1.1.1 to 1.1.3) ➢ Ecologically friendly mechanization (1.1.2) ➢ Taking account of geomorphological conditions and slope gradient (1.1.3) ➢ Efficient division of work between authorities and forest companies with respect to forest management plans (1.2.1) ➢ Appropriate structure of forest stands and of game stock (1.2.3) ➢ Proper maintenance of hydraulic structures river and brook beds, banks and parallel vegetation (1.3.1 to 1.3.2)

PO - Program Objective SOAFLM- Sector Objective of Agriculture, Forestry and Land Management

Sector Planning Matrix — 2. Industry and Mining — Annex 5.2.

Summary of Objectives and Activities	Indicators	Important Assumptions
➢ **Program Objective:** Significant improvement of environmental quality in the Morava River Basin with positive transboundary effects	➢ (PO)	
➢ **Sector Objective:** Pollution generated from industry and mining/quarrying activities significantly reduced	➢ Industrial emissions to water bodies in the Morava river basin will be reduced to 40% till 2005 (SOIM)	➢ ISO standards are accepted and applied in wide area (SOIM) ➢ Authority responsible for holistic water management in natural river basins is established (SOIM)
➢ **Results/Outputs:** 2.1 Best available practices in industrial activities adopted 2.2 Appropriate waste management implemented 2.3 Environmentally friendly practices in mining / quarrying applied	➢ 2.1 Production according to ISO 9000 and ISO 14000 will be implemented by 80% of products in the Morava river basin till 2005 ➢ 2.2 Emission limits will not exceed the standards downstream any point industrial source in the Morava river basin in 2005	➢ Producers are pressed through legislation and moral principles 2.1,2.2, 2.3 ➢ Regional authorities and self – governments are created 2.1,2.2, 2.3 ➢ Economic tools for environmental protection are enforced 2.1,2.2, 2.3 ➢ Civil service act is approved and effectively applied 2.1,2.2, 2.3 ➢ Results of environmental education are implemented in practice 2.1,2.2
➢ **Activities:** 2.1.1 Implement the best available technologies 2.1.2 Undertake measures for applying adequate social control instruments and mechanisms 2.1.3 Ensure suitable wastewater treatment 2.2.1 remediated old dump sites 2.2.2 Make available appropriate storage facilities for industrial waste 2.2.3 Minimize industrial waste production 2.3.1 remediated abandoned mines 2.3.2 Implement sustainable mining and quarrying 2.3.3 Monitor and evaluate mining and quarrying activities	➢ 2.3 Immission limits in water courses will not exceed the standards downstream any mine, quarry, dumpsite, and old environmental load in the Morava river basin in 2005	➢ Public financial sources are effectively allocated (2.1.1) ➢ Depreciation politics is changed for the benefit of financial sources for modernization (2.1.1) ➢ Water act is approved and enforced (2.1.2, 2.1.3, 2.3.3) ➢ Environmental information is declassified and used (2.1.2; 2.2.1, 2.3.1, 2.3.2) ➢ Act of wastes is amended and effectively applied (2.1.2, 2.2.1) ➢ Exploitation of ore and mineral deposits and mining and quarrying areas is over evaluated (2.3.2) ➢ Civil service act concerning waste management is amended and effectively applied (2.1.2, 2.1.3, 2.2.2, 2.2.3, 2.3.3)

PO - Program Objective SOIM - Sector Objective Industry and Mining

Sector Planning Matrix 3. Municipality Annex 5.3

Summary of Objectives and Activities	Indicators	Important Assumptions
➢ **Program Objective:** Significant improvement of environmental quality in the Morava River Basin with positive transboundary effects		➢ …. (PO)
➢ **Sector Objective:** Significant reduction of pollution generated from municipal activities achieved	➢ Water quality in two main watercourses (the Morava and Dyje Rivers) improved from IV. And V. class to at least III. Class (oxygen regime) by 2005 at all monitored profiles with exception of the extreme flows.	➢ Entity responsible for comprehensive care of water quality in hydrological units within the basin established (SOM)
➢ **Results/Outputs:** 3.1 Adequate solid waste disposal managed 3.2 Efficient wastewater management implemented 3.3 Pollution from urban traffic highly reduced	➢ 3.1 According to risk analysis, by 2005 all (100%) the most hazardous dump sites in the Morava river basin removed	➢ Sufficient funding for studies, inventories and projects implementation provided continually .3.1, 3.2 ➢ Continuation of government policy supporting public transport .3.3
➢ **Activities:** 3.1.1 Provide proper manipulation for municipal solid waste 3.1.2 Promote proper behavior of inhabitants 3.1.3 Improve the sanitary conditions of old dumpsites 3.2.1 Maximize treatment of wastewater 3.2.2 Promote proper behavior of inhabitants 3.2.3 Facilitate in situ pretreatment of industrial wastewater 3.3.1 Undertake measure for facilitating environmental friendly car traffic 3.3.2 Eliminate risk of oil products leakage from railway stations	➢ 3.2 Total pollution discharged from municipal wastewater indicated by COD, P, N will decrease by 30% till 2005 in the Morava River Basin ➢ 3.3 Consequences of leakages of hazardous substances from accidents and disasters will drop by 50% by 2004 provided the traffic intensity remains at the 1998 level in the Morava river basin	➢ Waste act amendment passed…(3.1.1) ➢ Effective penalization of offenders…. (3.1.2) ➢ Packaging technologies act passed….(3.2.1) ➢ A law banning phosphate products passed…(3.2.2) ➢ Document “State transport policy” approved 3.3.1, 3.3.3 ➢ Appropriate legislation related to old risks and wastewaters approved 3.1.1 – 3.1.3

PO - Program Objective SOM - Sector Objective Municipality

Annex 6. Activities, Important Elements and Projects

6.1. Agriculture, Forestry and Land Management

6.2. Industry

6.3. Municipality

Result 1.1.: Ecologically friendly agriculture applied

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 1.1.1 Undertake measures for suitable exploitation of land	➢ Assure appropriate rate of arable land ➢ Restore meadows in floodplains ➢ Promote initiatives for development of ecological farming ➢ Apply suitable seed procedures ➢ Promote application of environmentally safe sludges from WWTPs ➢ Promote optimal crop structuring ➢ Find tools and mechanisms for soil rehabilitation	➢ Ecological Agriculture Development in Czech Republic ➢ Integrated Sites reallocation ➢ Agro-Environmental EC Programme in Czech Republic ➢ Morava Project ➢ Programme of Restructuralization of Agriculture ➢ Subsidiary Program (Ministry of Agriculture)	➢ Integrated Sites Reallocation (design organizations) ➢ Morava River Basin National Action Plan (Env. Ministry + Water Research Institute Brno)	➢ Biomonitoring program aimed at integrated evaluation of changes in the basin (Agency for landscape and nature conservation + Academy of science of Czech Republic) ➢ Consulting system (in hydrology) for small farms
➢ 1.1.2 Introduce appropriate agrotechnical practices	➢ Reduce use of heavy machines and introduce suitable agricultural machinery ➢ Respect capacity of fields for manure and slurry application ➢ Optimize agricultural chemicals application ➢ Fertilize with environmentally friendly fertilizers ➢ Reintroduce non-cultivated strips along water courses ➢ Promote use of biological crop protection ➢ Use biodegradable chemicals			➢ Definition of obligatory agrotechnical and organizational measures for erosion reduction ➢ Harmonization of standards for agrochemicals with standards of EC

Result 1.1.: Ecologically friendly agriculture applied

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.1.3 Facilitate favorable framework conditions for agriculture	➢ Reestablish traditional relation of farmers to land and soil ➢ Introduce effective system of ecological education for farmers ➢ Create and maintain obstructions of surface water run – off and erosion ➢ Clarify privatization of amelioration structures and equipment ➢ Clarify privatization of state land ➢ Clarify ownership rights and relations ➢ Prepare and pass adequate legislation ➢ Eliminate unsuitable technical state of agricultural structures ➢ Liquidate unsafe field dunghills ➢ Modernize agricultural equipment ➢ Assure adequate capacity of agricultural structures ➢ Apply measures to reduce leakages from agricultural structures ➢ Rehabilitate land with respect to geomorphology			➢ Consulting system (in hydrology) for small farms ➢ Definition of obligatory agrotechnical and organizational measures for erosion reduction ➢ Harmonization of standards for agrochemicals with standards of EC

Result 1.1.: Ecologically friendly agriculture applied

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.1.4 Ensure appropriate livestock farming	➢ Define and retain acceptable capacity of livestock farming ➢ Prefer extensive cattle pasturing ➢ Introduce new technology of feeding and giving water to animals ➢ Prevent leakages from silage and manure storages (dunghills) into soil and water ➢ Apply adequate technologies producing less waste ➢ Implement appropriate field storages of manure and slurries		➢ Dubnany pig farm rehabilitation ➢ Milotice pig farm rehabilitation ➢ Tesnovice pig farm rehabilitation and solution of wastewater treatment within municipal WWTP	➢ Minimization of output of harmful substances from animal husbandry farm (excrements, pharmaceutical substances, operation) (Veterinary Research Institute) ➢ Specifying of limits and forms of animal husbandry – harmonization with EU standards ➢ Rehabilitation of priority pig farms ➢ Evaluation of animal husbandry and meat production demands in Czech Republic
➢ 1.1.5 Implement appropriate fishery and water poultry farming	➢ Rationally utilize fish production from natural waters with respect to principles of sustainability and conservation of nature ➢ Properly manipulate with water in ponds ➢ Optimize number of kept ducks and fish with respect to capacity of ponds ➢ Apply adequate manners of feeding ➢ Apply adequate dunging of ponds			➢ Reestablishment of fish community constitution and development sustainable fishery transboundary strategy for the Morava River (Academy of Sciences of CR) ➢ Revision of operational guides of ponds (operational subjects)

Result 1.2.: Negative impacts of forestry activities eliminated

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.2.1 Introduce efficient forest management	➢ Reinforce the role of state administration in forest care ➢ Strengthen the non – wood production function of forests ➢ Respect environmentally sound forestry plans ➢ Asses composition of forest stands with respect to ecology and economy ➢ Optimize exploitation of forest ecosystems ➢ Solve and speed up transformation of ownership rights	➢ Forest management plan ➢ Forest hydraulic reclamation	➢ Forest hydraulic reclamation	➢ Harmonization of productional and non-productional functions of forests (Mendel Agriculture and Forest University Brno, Faculty of Forestry) ➢ Harmonization of forestry practices with environmental interests ➢ Assessment of acidification consequences in forest areas ➢ Program of forest control and zoning with respect to stand, gene resources and functions
➢ 1.2.2 Support suitable manner of wood exploitation management	➢ Use environmentally friendly forestry mechanization ➢ Use of ecologically friendly methods of trunk approaching ➢ Use of ecologically friendly chemicals ➢ Control handling and disposal of chemicals to prevent water pollution ➢ Use environmentally sound manners and mechanization for wood exploitation			➢ Harmonization of forestry practices with environmental interests
➢ 1.2.3 Improve ecological stability by adequate growth structure	➢ Asses composition of forest cultures with respect to ecology and economy ➢ Find ways and tools for transition from monocultural wood production to environmentally favorable cultures ➢ Keep acceptable game population ➢ Keep adequate species and game composition ➢ Promote ecologically sound care for forest ecosystems ➢ Reintroduce small woods and game refugees to the country			➢ Introduction of natural regeneration of forests ➢ Harmonization of forestry practices with environmental interests

Result 1.3.: Adequate management of land and water resources ensured

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 1.3.1 Manage properly river trainings and structures	➢ Renew the river ecological continuum ➢ Create a state land funds for ecological activities in country ➢ Rehabilitate amelioration systems ➢ Introduce vegetation strips by water courses and reservoirs ➢ Review water structures operation guides and schedules ➢ Harmonize economical and ecological functions of river systems ➢ Develop effective system of regional water management competencies division	➢ Program of rehabilitation of fluvial system (Ministry of Environment +Morava River Basin Administration) ➢ PHARE: Rehabilitation of Flood Plains and Fish Habitat Restoration in Lower Dyje/Morava Rivers (Morava River Basin Administration + Academy of Science) ➢ Optimization of water management system in the Dyje River basin during floods	➢ Nove Mlyny Hydraulic Structure – revision of operation rules (Morava River Basin Administration + Aquatis Brno)	➢ Optimal reconstruction of an irrigation system with regard to ecology and economy (Amelioration and Soil Protection Research Institute Brno) ➢ Optimal operation of water management system at periods of extreme discharges (Water Research Institute Bmo, Technical University Brno, Civil Engineering Faculty) ➢ Negative effects of river continuum fragmentation on natural ecological relation in the river and proposals of their decreasing at example of the Dyje River (Masaryk University Brno, Faculty of Natural Sciences + Water Research Institute Bmo) ➢ Rehabilitation of important trained water courses ➢ Ecologically acceptable discharges in relation to operation of small hydropower plants (Brno University + ÚBO Institute Academy of Sciences Brno) ➢ Definition of ecologically justified minimal discharges downstream water uptakes objects (Water Research Institute Brno + Water Protection IKM) ➢ Revision of operational guides of storage reservoirs and ponds (operation organizations)

Result 1.3.: Adequate management of land and water resources ensured

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 1.3.2 Undertake measures for facilitating appropriate use of water resources	➢ Develop effective system of regional water resources competencies with respect to environment protection ➢ Emphasize solution of water resources management in the amendment of water act under preparation ➢ Maintain minimal ecological discharges and harmonize demands of water managers with ecological demands ➢ Maintain properly river corridors including bank vegetation ➢ Rehabilitate river systems ➢ Re–establish – connection of flood plains and wetlands with main streams ➢ Ensure ecologically satisfactory regime of hydropower plants on head races ➢ Apply efficient land-use planing ➢ Rationalize non – returnable water uptakes ➢ Clarify ownership relations to water management structures ➢ Allocate adequate finances for management and maintenance of water courses and river bank vegetation ➢ Accomplish ecological monitoring system ➢ Introduce efficient system of economic incentives ➢ Introduce efficient system of legislation ➢ Ensure effective system of control and penalties ➢ Carry out effective ecological education ➢ Minimize unfavorable effects of recreational activities	➢ Environmental protection program (State Environmental Fund) ➢ Wetland inventory according to Ramsar Convention ➢ Project Morava (Ministry of the Environment + VÚV Brno) ➢ Program of rehabilitation of fluvial system (Ministry of Environment + Morava River Basin Administration) ➢ PHARE: Rehabilitation of Flood Plains and Fish Habitat Restoration in Lower Dyje/Morava Rivers (Morava River Basin Administration + Academy of Science) ➢ Optimization of water management system in the Dyje River Basin during floods ➢ Biomonitoring program aimed at saprobity conditions in Morava River Basin (Water Research Institute Brno)	➢ Rehabilitation of wetlands (Ministry of Environment) ➢ Revision of sanitary protection areas of water resources (Morava River Basin Administration) ➢ The Morava River Basin National Action Plan ➢ Analytical ecological study of the Morava River and its historical and present relation to alluvial plain (Faculty of Natural Sciences University Olomouc)	➢ Definition of water management interests in the region as a basis for integrated sites reallocation ➢ Harmonization of competitions for water use in the Morava River Basin ➢ Education in ecological relationship in system water/landscape (VERONICA) ➢ Study of erosion, its causes and proposals of measures to decrease erosion (Soil Protection and Amelioration Institute Brno) ➢ Quality and quantity optimization of fluvial network (Technical University Brno, Faculty of Civil Engineering) ➢ Documentation of disturbed ecological relations between the Morava River and its alluvial plain and rehabilitation proposals (ecological department of Olomouc University, Faculty of Natural Sciences + Academy of Science Brno) ➢ Evaluation of retention and infiltration capacity in Morava River Basin

Result 1.3.: Adequate management of land and water resources ensured

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 1.3.3 Ensure environmentally sustainable management of land-use activities	➢ Ensure effective system of control and penalties ➢ Carry out effective ecological education ➢ Protect and rehabilitate wetlands ➢ Implement a territorial system of ecological stability of land ➢ Utilize complex reallocation of land ➢ Implement efficient economic incentives in land-use ➢ Clarify ownership rights ➢ Promote measures for development of rural life ➢ Reintroduce solitary trees ➢ Adopt strategies to eliminate impacts of land erosion due to roads ➢ Implement measures to increase discipline of country users ➢ Practice efficient land-use planning ➢ Reduce effects of inadequate changes to floodplains ➢ Reestablish connections of main rivers with floodplains and wetlands ➢ Adopt measures for effective wetland protection and rehabilitation	➢ Territorial system of country ecological stability ➢ Rehabilitation of landscape in river basins (design agency) ➢ Landscape care project ➢ Rural areas restoration project ➢ Environmental protection program	➢ Land trusts ➢ Landscape rehabilitation in river basins ➢ Morava River Basin National Action Plan	➢ Biomonitoring program aimed at integrated evaluation of changes in the basin (Agency for landscape and nature conservation + Academy of science of Czech Republic) ➢ Regional landscape plans (project organizations)

Result 2.1.: Best available practices in industrial activities adopted

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.1.1. Implement the best available technologies	➢ modernize technologies of industrial production ➢ introduce ISO 9000 and ISO 14000 standards ➢ ensure sustainable storage of raw materials ➢ keep order and discipline in workplaces ➢ reduce risks of industrial accidents ➢ training and education of workers (staff) ➢ secure financial resources ➢ improve technological discipline and control ➢ create conditions for market regulation with respect to environment	➢ research and development programs in industry (grants from the Ministry of Labor and Trade) ➢ 1997 flood assessment project ➢ PROJECT MORAVA ➢ amendments of water management legislation	➢ National Action Plan for the Morava River basin	➢ assistance from the Association of Industry in introducing ISO ➢ drafting a system of preventive measures against flooding

Result 2.1.: Best available practices in industrial activities adopted

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.1.2. Undertake measures for applying adequate social control instruments and mechanisms	➢ introduce ISO 9000, ISO 14000 standards ➢ place (situate) factories with respect to water resources ➢ apply suitable construction technologies and suitable operation of structures ➢ improve information and links between industry, civil service and the public ➢ perform land-use planning ➢ control and optimize state and local authorities ➢ promote environmental education ➢ improve economic tools ➢ promote sustainable products and technologies ➢ introduce mechanisms for facilitating application of legislation ➢ support suitable economic milieu ➢ stimulate - raise the public interest ➢ create conditions for capital investments ➢ enforce legislation and environmental law ➢ advertise for sustainable products and technologies	➢ Projects of environmental education at schools as well as environmental education of adults (within Ministry of Education, Youth and Physical Training) are in operation.	➢ Water management training and information center is to be established by the Ministry of Environment to improve knowledge and know-how of people engaged in the field	➢ To set up a lobby for promoting environmental measures (as an informal project)
➢ 2.1.3. Ensure suitable wastewater treatment	➢ upgrade industrial WWTPs ➢ construct industrial WWTPs with sufficient capacity ➢ ensure sufficient efficiency of WWTPs ➢ support the use of optimal technologies in WWTPs ➢ eliminate treatment of specific industrial wastewaters in municipal WWTP ➢ monitor discharges of industrial wastewaters	➢ FOSFA Breclav WWTP for industrial wastewater ➢ Municipal wastewater treatment plants of some important Moravian towns with treatment of an important share of industrial wastewater ➢ WWTP Znojmo ➢ WWTP Bøeclav ➢ WWTP Zlín ➢ WWTP Prerov ➢ WWTP Prostejov	➢ WWTP Hame Babice ➢ WWTP Hodonín ➢ TOMA Otrokovice - WWTP - nitrification/denitrification ➢ TOMA Otrokovice -recycling wastewater treated ➢ TOMA Otrokovice - sludge management - monitoring ➢ WWTP Uherské Hradištì ➢ WWTP Kromìrí ➢ FOSFA - industrial waste processing, decontamination station	➢ Project of testing the efficiency of industrial WWTPs (and municipal WWTPs with an important share of industrial wastewater) by the Czech Environmental Authority

Result 2.2.: Appropriate waste management implemented

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 2.2.1. Remediated old dump sites	➢ identify not known old dump sites through detailed survey ➢ remediated settling pits (lagoons)and sludge beds ➢ control remediation of old dump sites ➢ improve economic tools with regard to environmental protection ➢ improve education including adults (in terms of harmfulness of old dump sites) ➢ thorough survey of hitherto unidentified old dump sites	➢ remediation of dump site and ground water at PRECHEZA Prerov ➢ remediation of FOSFA waste dump ➢ Rohatec lagoon remediation ➢ Pøerov Steelworks premises remediation	➢ old dump sites program of the National Property Fund	➢ dump site at the confluence of the Olšava and the Morava (unidentified industrial waste) ➢ Bzenec dump site remediation
➢ 2.2.2. Make available appropriate storage facilities for industrial waste	➢ evaluate existing dump sites ➢ introduce appropriate management of dump sites ➢ remedy sludge beds ➢ treat leakage waters ➢ modify economic rules ➢ motivate desirable behavior of industrial producers ➢ raise public awareness ➢ monitor dump sites	➢ remediation program for old dump sites (National Property Fund + Ministry of the Environment)	➢ Information Act ➢ Waste materials Act (act on utilization of secondary raw materials)	➢ Environmental Tax
➢ 2.2.3. Minimize industrial waste	➢ optimize industrial technologies to minimize waste production ➢ separate the waste according to final disposal ➢ support maximum recycling and reuse of raw materials ➢ stimulate voluntary modesty ➢ create suitable social milieu not preferring a consumption approach	➢ information system on wastes ➢ remediation of dump site and premises (including PCP) of Colorlak Company, Staré Mesto ➢ Hluk dump site remediation	➢ Packaging technology Act	

Result 2.3.: Environmentally friendly practices in mining/quarrying applied

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 2.3.1. Remediated abandoned mines	➢ identify and evaluate old mines deposits ➢ rehabilitate old mines and closed mines ➢ perform decontamination ➢ remediated spoil banks	➢ end-of-operation program for uranium mine at Dolní Rozínka (DIAMO) ➢ remediation program following metal mining at Horní Mesto	➢ remediation measures following uranium mining in the basins of the Svratka and Oslava Rivers Basins	➢ remedial measures following black coal mining in the Rosice-Oslavany area ➢ remedial measures for lignite mines ➢ a study of waste heat use
➢ 2.3.2. Implement sustainable mining and quarrying	➢ apply EIA before starting mining ➢ set extraction limits in the governmental raw material strategy ➢ precise extraction limits in land-use plans ➢ apply sustainable technologies in mining ➢ protect mines against floods ➢ treat wastewaters from mines	➢ raw materials surveys in districts (Ministry of the Environment)	➢ revision of existing land-use plans (big land plots)	➢ energy policy in the government ➢ raw materials strategy of the government
➢ 2.3.3. Monitor and evaluate mining and quarrying activities	➢ evaluate mining activity impacts on water bodies ➢ monitor abandoned mines ➢ monitor discharges of mine wastewaters ➢ evaluate efficiency of mine rehabilitations			➢ program for the monitoring of the consequences of mining activities (to be implemented by Czech Mining Authority)

Result 3.1.: Adequate solid waste disposal managed

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 3.1.1 Provide proper manipulation for municipal solid waste	➢ amendment of law on waste regard municipal waste ➢ create conditions to sort waste from residents ➢ create conditions for reuse and recycling of separated waste ➢ decrease the waste production by passing law on packages (covers) ➢ give advantage to new technologies of waste disposal (composting) ➢ increase fees on waste dumping at dump sites ➢ support major pilot projects on waste disposal by the most ecologically safe way (including recultivation) ➢ create a system of continuous education for state administration employees ➢ strict application of sanctions and penalty fees	➢ PROJECT MORAVA task No. 5 ➢ „Protected Workshop“ -recycling (MESYT- UH EKO) ➢ create a network of centers collecting sorted or recyclable waste from public or small enterprises ➢ ecologically friendly product (Project of the Ministry of the Environment)	➢ wastes act amendment in legislative work planes ➢ project „Clean Production“ for municipalities (healthy city of Brno) environmental protection department of City Authority in Brno	➢ lobbying for package technology act (Green Circle) ➢ network of users of material sorted from waste

Result 3.1.: Adequate solid waste disposal managed

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 3.1.2 promote proper behavior of inhabitants	➢ give advantage to residents sorting household waste ➢ amend the law regarding penalty for non permitted waste and liquid waste manipulation ➢ support ecological education at schools ➢ ensure educational and information system on suitable manipulation with wastes ➢ popularize the waste sorting by TV, press etc. (contests, public inquiries)	➢ „Recycling Mill“ pilot project of citizen group in Slatina for children, A.S.A. city borough of Slatina ➢ „Healthy City of Šumperk“ project ➢ „Green Phone Line“ project in Brno, ecological advise center VERONICA + City Authority of Brno ➢ center of ecological education programs: LIPKA Brno, ABKA Uh. Hradištì, center of eco-education Divoky, Sluòákov Olomouc, Vila DORIS Šumperk, ALCEDOKONTAKT Vsetín, CHALOUPKY, KOSENKAVAL Club, CHRPA Brod ➢ System of ecological education for teachers of basic schools (LIPKA Brno) ➢ Postgraduate courses in environmental protection, Faculty of Natural Sciences Masaryk University in Brno, Palacký University in Olomouc ➢ Postgraduate courses in environmental protection at Faculty of arts at Masaryk University in Brno for teachers of basic schools		➢ program on improvement of ecological education

Result 3.1.: Adequate solid waste disposal managed

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 3.1.3 improve the sanitary condition of old dump sites	➢ complete legislative regulations regarding old loads disposal ➢ mapping and monitoring of conditions of old loads ➢ introduce permanent monitoring of leaches from potentially dangerous old dump sites ➢ design and implement local and regional information system ➢ clear-up the responsibility for old loads ➢ give priority order for gradual sanitation of old loads ➢ ensure way of financing of sanitation of old loads	➢ sanitary condition improvement (remediation) of industrial waste and solid municipal waste dumps in Hluk (municipal authorities + AUTOPAL)	➢ recultivation of municipal waste dump in Brno-Cernovice (City Authority of Brno) ➢ recultivation of dump site in Grygov ➢ improve sanitary condition (remediation) of solid municipal waste dump in Uh. Brod (Municipal Authority of Uh. Brod) ➢ remediation of dump site in Hulín ➢ monitoring and proposals of remediation of old loads in Brno (City Authority of Brno) ➢ projects supported by National Property Fund and State Environmental Fund	➢ PROJECT MORAVA III stage 2000-2003, priority in remediation of dump sites (Ministry of the Environment - Water Research Institute)

Result 3.2.: Efficient wastewater management implemented

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 3.2.1 Maximize treatment of wastewaters	➢ construction of new WWTPs ➢ reconstruction of existing WWTPs ➢ reconstruction and maintenance of existing sewer ➢ construction of new sewers ➢ concern state administration in water management to ensure efficient application of appropriate best available technologies for planned WWTP structures ➢ application of best available technologies for wastewater treatment ➢ provide sufficient financial resources on municipal and national level ➢ update list of small WWTP recommended to reconstruction ➢ form a system of continual education of state administration employees ➢ support of alternative wastewater treatment, where suitable ➢ amendment of water act , law on state administration concerning water management and connected laws and regulations ➢ form system of state guaranteed consulting agencies ➢ efficient control of wastewater disposal ➢ system of additional education for WWTP operators and management ➢ promote state administration in connection with introducing of EU standards and their control ➢ monitoring water quality on selected profiles ➢ enhancing self-purification processes in municipal water courses	➢ Brno sewer system master plane update (Brno water supply and sewer system co.) ➢ Study on construction of bewer system and wastewater treatment in Uherské Hradiste county (county authority and water supply and sewer system co.) ➢ Reconstruction of WWTP Sumperk ➢ Construction of WWTP Bílovice (local authority of Bílovice ➢ Construction of WWTP Bojkovice (local authority of Bojkovice ➢ Reconstruction and intensification of WWTP Prostejov ➢ Intensification of WWTP Zlín ➢ Reconstruction of WWTP Prerov ➢ Construction of WWTP Hluk (municipal authority in Hluk) ➢ Construction of WWTP Borsice u Buchlovic (local authority of Borsice) ➢ Project Morava, task no.1, 3, 6 ➢ Project supported by the state environment fund (85 projects)	➢ Reconstruction of WWTP Brno (municipal authority of Brno) ➢ Reconstruction of WWTP Uherské Hradiste (water supply and sewer system co. Uherské Hradiste) ➢ Intensification of WWTP Hodonín ➢ Intensification of WWTP Olomouc ➢ Intensification of WWTP Breclav ➢ Draining of wastewaters from Banov, Veletiny, Drslavice, Hradèovice and Vlènov into WWTP in Uherský Brod (water supply and sewer co. in Uherský Brod and local authorities) ➢ National action plan (the Morava River Basin ➢ Regional water supply and sewer system development programme “PRVKUC” (counties Zlín, Uherské Hradiste – county authorities, water supply sewer system co., ministry of agriculture) ➢ Application for support on 28 projects from the fund of Ministry of Environment ➢ Connection of sewer system in Kunovice to the WWTP in Uherské Hradiste (municipal authority Kunovice)	➢ Project for continuous education and examination of WWTP operators (Ministry of Agriculture) ➢ Amendment of water act and regulations ➢ Project for continuous education of state administration in the environmental field (Ministry of interior and Ministry of environment)

Result 3.2.: Effective wastewater management implemented

Activities	Important Elements	Projects		
		Existing	**Planned**	**Proposed**
➢ 3.2.2 Promote proper behavior of inhabitants	➢ Ensure good information of customers about character of products ➢ to introduce complete system of education of general public ➢ giving economical advantage to the producer of ecologically friendly products ➢ to promote advertising of ecologically friendly products	➢ ECOFILM (Ministry of the Environment ➢ Days on ecology in Olomouc (NGO Slunákov) ➢ Ecological behavior of consumers (Ecological advise center Veronica) ➢ Festival of ecologists and state administration representatives “TS TTT” (Ministry of Environment, county authority + municipal authority in Uherské Hradiste		➢ Prepare complete system of environmental education of citizens (Ministry of Environment, Ministry of Education) ➢ System of economical advantages for producers of ecologically friendly products
➢ 3.2.3 Facilitate in situ pre-treatment of industrial wastewaters in situ	➢ accept the law on water supply and sewer systems ➢ give advantage to those industrial factories, which pre-treat or treat industrial wastewaters in city (on site of origin) ➢ supervise produces of industrial wastewaters –how do they do wastewater pre-treatment ➢ issue licenses for discharging pre-treated or treated wastewaters for limited time (maximal validity of licenses 5-10 years) ➢ monitoring of water quality at selected profiles			➢ Supervising activity program of Czech inspection of the Environment – check of industrial plants connected to WWTPs ➢ Project for continuous education of state administrative in the environmental field (Ministry of Interior and Ministry of Environment)

Result 3.3.: Pollution from vehicle traffic highly reduced

Activities	Important Elements	Projects		
		Existing	Planned	Proposed
➢ 3.3.1 Undertake measures for facilitating environmentally friendly car traffic	➢ improve check of technical state of vehicles ➢ strict demanding and checking of application of ecological strew material (grid) ➢ strict checking and penalizing transporters of hazardous materials ➢ demand catch-pits construction by large parking lots, car repair services, and in other reasonable cases (to protect water sources) ➢ support of development of public transport ➢ supervising transporters how do they keep the ADR system ➢ enforce application of regulations for construction and operation of gasoline stations ➢ electrification and gasification of public transport ➢ consider draining water from housing estates, hard surfaces and roads (vegetative strips, vegetative cinder blocks) in land –use planning	➢ land use planning documentation ➢ transport policy of Brno	➢ North-East Diameter (underground rail in Brno)	
➢ 3.3.2 Eliminate risk of oil products leakage from railway stations	➢ improve control of repumping stations at railways ➢ better educational system of hazardous material transporters ➢ check of technical condition of engines and tanks against leakage ➢ solve technical ensurace of railroad beds against leaking		➢ state transportation policy	

Annex 7. Workshop Organization

7.1. Agenda of the Workshop

7.2. List of Participants

7.3. Evaluation of the Workshop

7.4. Opening Speech of the Minister

GEF- Danube Pollution Reduction Program
National Planning Workshop
2-5 September 1998, Brno

Wednesday

10.00-11.00	Plenary	Opening ceremony (Mr. Bedřich, Mr. Musil, deputy of Environmental Ministry)
		Introduction to the workshop, its background aims and objectives (Mr. Andy Garner)
		Presentation of participants (Mr. Bedřich)
		Introduction to the agenda, methodological approach (facilitators)
11.00-12.30	Plenary	Presentation of results of national experts reports
		Definition and description of river basin
12.30-14.00	*BOBY*	*Lunch*
14.00-15.00	Plenary	Situation and Stakeholder Analysis – explanation, example
		decision on sectors, breaking into working groups
15.00-16.00	Groups	Situation and stakeholder analysis for sectors
16.00-16.30		Coffee break
16.30-17.00	Groups	Situation and stakeholder analysis for sectors – finishing of groups work
17.00-18.30	Plenary	Presentation of the results, discussion on the result of groups

Thursday

8.30 -9.30	Plenary	Problem analysis – theory and steps involved
9.30-10.00	Plenary	problem analysis, drawing the problem tree (causes and effects)
10.00-10.30		*coffee break*
10.30-12.30	Groups	problem analysis, drawing the problem tree (causes and effects)
12.30-14.00	*BOBY*	*lunch*
14.00-15.00	Plenary	end of work in groups
15.00-16.00		presentation of working group results and discussion
16.00-16.30		Coffee break
16.30-16.45	Plenary	Objectives analysis – steps involved + example
16.45-18.00	Groups	Objectives analysis – drawing the objective tree for sectors
18.00-18.30	Plenary	Presentation of working group results

Friday

8.30-9.00	Plenary	Planning Matrix – structure of PM, example
9.00-10.00	Plenary	Discussion on alternatives, strategies and policies and decision about the objectives
10.00-10.30		*coffee break*
10.30-10.45	Plenary	Sector planning matrix, definition of activities to achieve objectives
10.45-12.30	Groups	Sector planning matrix, definition of activities to achieve objectives
12.30-14.00	*BOBY*	*lunch*
14.00-14.30	Plenary	Indicators and important elements – explanation
		list of projects leading to water quality improvement
14.30-16.00	Groups	Indicators and important elements
		list of projects leading to water quality improvement
16.00-16.30		coffee break
16.30-18.30	Plenary	presentation of working group results (planning matrix for sectors) and discussion on proposed

Saturday

8.30-9.00	Plenary	Indicators and important assumptions –explanation
9.00-10.30		Indicators and important assumptions for sectors
10.30-11.00		*coffee break*
11.00-12.15	Plenary	review of objectives, important elements, indicators and important assumptions to achieve the objectives
12.15-12.30	Plenary	Conclusion
12.30	*BOBY*	*lunch*

GEF - DANUBE POLLUTION REDUCTION PROGRAM
National Planning Workshop
2-5 September 1998, The Czech Republic, Brno
List of participants

no.	Name	Organization
1.	**Ing. Ilja Bernardová**	*Water research Institute, branch Brno*
2.	**RN Dr. Ladislav Bíža**	*Fond of National Property*
3.	**Ing. Libuše Deylová**	*Ministry of Environment of CR*
4.	**Ing. Ondřej Dušek**	*DUIS Brno*
5.	**Ing. Michal Franek**	*Foundation for survival of meadow landscape*
6.	**Ing. Miroslav Hájek**	*Ministry of Environment of CR*
7.	**Doc. Ing. Petr Hlavínek, CSc**	*Technical University, Faculty of Civil Engineering*
8.	**Ing. Jaroslav Hrabec**	*Natural science club Uherske Hradiste*
9.	**Ing. Rudolf Jelínek**	*Centroprojekt Zlín*
10.	**Ing. Miloš Kolda**	*Ministry of Transport*
11.	**Doc. Ing. Svat. Korsuň, CSc**	*Technical University, Faculty of Civil Engineering*
12.	**RN Dr. Taťána Petrůjová**	*Czech Hydrometeorological Institute*
13.	**Prof. RN Dr. Fr. Kubíček**	*Natural Sciences Faculty of Palacký University Olomouc, Department of Ecology*
14.	**Ing. Karel Landa**	*State Fund for Environment*
15.	**Ing. Karel Mrázek**	*IKM Water Protection*
16.	**Ing. Doubravka Nedvědová**	*Ministry of Environment of CR*
17.	**Ing. Ladislav Pavlovský, CSc**	*Morava River Basin Administration,*
18.	**Ing. Milan Peňáz, DrSc**	*Academy of Sciences, Institute of vertebrates biology*
19.	**Ing. Evžen Polenka**	*VUV TGM Brno*
20.	**Ing. Jan Pražák**	*Ministry of Agriculture*
21.	**MU Dr. Libuše Prokopová**	*Ministry of Health*
22.	**Ing. Pavel Rotschein**	*Czech Association of civil engineers + Morava River Basin Authority*
23.	**Ing. Oldřich Sasínek**	*District Office Breclav*
24.	**Ing. Pavel Spitz, CSc**	*Soil reclamation protection research institute VUMOP, branch Brno*
25.	**Ing. Josef Švejda**	*Ministry of Environment, Territorial Department, region Olomouc*
26.	**Ing. Jaroslav Ungerman, CSc**	*Union for the Morava River – NGO*
27.	**RN Dr. Antonín Vaishar, CSc**	*Academy of Science of CR, Institute of Geonica*
28.	**Ing. Irena Zbytovská**	*Ministry of Industry and Trade*
29.	**Ing. Josef Žák**	*Ministry of Environment, Territorial Department, region Brno*
30.	**RN Dr. Karel Hudec**	*IUCN*

Evaluation of the Workshop

Organization	Method	Results
• Good organization of workshop itself, • It would be good to get more information about method in advance	• Interesting, depends on presence of representatives of the institutes during the whole time of workshop	• Usable
• Very good	• Excellent	• Hopefully useful
• Very good	• Not usual, I would need more information about the objective	• Very good supplementation of other strategic activities
• Can be evaluated positively	• Very effective, • It is not good to interrupt participants during their speech	• I believe that usable
• Excellent	• Transparent, very time consuming	• Good, rather intuitive
• Very good, it is not good to work during weekends	• Not usual, it would be good to get more printed information about method beforehand	• Responding to 4-days effort
• Technically very good, little information about objectives of workshop, explanation only in evaluation speech	• Good, it would be good to get more printed information about method beforehand, it would be more effective	• I do not know what they will be used for
• Good, time stated in agenda not fulfilled on Saturday	• There should be a pause between analytical and synthetical work	• Results (projects, indicators) rather hectic
• Good in given conditions, better would be in “isolation“	• Missing connection to other projects focused at Morava River in the frame of association with EC	• The report will indicate more about results

OPENING SPEECH

by Mr. Oldrich Musil
Viceminister of Ministry of the Environment

Ladies and Gentlemen,

I would like to welcome you at a four-day Pollution Reduction Programme Workshop organized as a part of GEF activities. I would also like to welcome the GEF staff present at the workshop. The aim of the Pollution Reduction Programme is to provide support to institutional and financial measures for an effective environmental management in the Danube River Basin, to create funds necessary to achieve improvements in the environment in the Danube Basin and, consequently, to protect the Black Sea. Based on the Danube Basin and the Black Sea protection strategy, the outputs will consist of projects to reduce the pollution in the Danube Basin countries including the Czech Republic.

GEF, which stands for the Global Environment Facility, was founded in 1990 to promote sustainable development. Its aim is to provide technical, financial and organizational support to the resolution of the most serious environmental problems in countries with annual per capita GNP below 4,800 USD. GEF is funded from voluntary contributions from developed countries. The Czech Republic, too, has made its contribution. Generally speaking, GEF's tasks are related to the Agenda 21 (adopted at the 1992 UN Conference on the Environment and Development in Rio de Janeiro). The GEF programme is targeted to four areas, i.e. to the protection of (1) biological diversity, (2) the ozone layer, (3) the Earth from climatic changes, and (4) international water bodies, including protection against spreading desserts.

As a part of its water protection programme, the GEF is, together with the PHARE, the principal sponsor of the Environmental Programme for the Danube (EPD). The EPD was founded in 1992 on the initiative of the European Commission. At the beginning, 11 Danube Basin countries (Germany, Austria, the Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Bulgaria, Rumania, Ukraine, and Moldavia) participated in its activities together with the representatives of the GEF, PHARE, European Commission, non-government environmental groups and international financial institutions. Last year, they were joined by Bosnia and Yugoslavia. The Danube Basin countries are defined as any countries with a substantial part of hydrological basin of the Danube River (which covers an area exceeding 2,000 square km). The Czech Republic, whose Morava River Basin extends over an area of over 20,000 km^2, is by definition one of the Danube Basin countries.

Since the foundation of the EPD, a lot of work has been accomplished. The approaches, principles and objectives of the Strategic Action Plan for the Danube River Basin were approved by the Ministers of the Environment of Danube River Basin countries in December 1994. In spring 1997, a common warning system for the entire Danube Basin built with EPD money was put in operation. An international monitoring network has been set up in the Danube Basin, with National Reference Laboratories as a part of it. The equipment for the laboratories was paid for from the EPD budget. The Internet-based Danube Information System has also been established. And last but not least, a number of studies have been carried out. Recently, a programme to allow implementation projects identified by the SAP has been launched under the name of "Programme of Implementation of the Strategic Action Plan", with a major contribution from the PHARE.

The benefits of the EPD for the Czech Republic, and therefore for the Morava Basin, can be divided into "intangible" and tangible" ones. The former include:

1. A consortium of BCEOM (France) and Lahmayer Int. (Germany) has prepared a study on the environment in the Morava River Basin financed by the World Bank.
2. The Austrian consulting company ALLPLAN has prepared a study on the purity of water in the Dyje River paid for from the Austrian "Ostfond".
3. Training for the laboratory staff that will operate the equipment received free of charge from the EPD.
4. Training for the warning system staff (three groups for the area of analysis, communications, and decision taking).
5. Training for managers in trans-border monitoring strategy for the Danube Basin.
6. Training for employees from government authorities and specialized water management institutions on EU legislation and state-of-the-art wastewater treatment technologies.

The "tangible" benefits included:

1. Laboratory equipment, warning system and office equipment for the EPD co-ordination center worth almost 16 million Kč.
2. A gift from the Federal Chancellor of Austria of two automatic water-quality monitoring stations (Velké Němčice, Lanžhot) worth 9.25 million Kč.
3. The PHARE grant for the Wastewater Treatment Plant in Brno is being negotiated.

On 22 October this year, the Agreement on Co-operation in the Protection and Sustainable Use of the Danube River will take effect. The Agreement has been ratified by nine countries (Germany, Austria, the Czech Republic, Slovakia, Hungary, Slovenia, Croatia and Rumania). The Czech Republic signed and ratified the Agreement in 1995. The objective of the Agreement is sustainable water management along the entire Danube River Basin, with a particular attention to the maintenance of the general quality of life, continuous access to natural resources, prevention of permanent damage to the environment and protection of ecosystems. It is expected that the International Commission for the Protection of the Danube, which is the executive body of the Agreement, will continue in activities targeted to the protection of the Danube Basin, started by the EPD.

The Czech Republic has signed similar agreements for the Elbe and the Oder Rivers. That means that the entire territory of the Czech Republic is covered by agreements on co-operation in the protection of basins of three large European rivers. The oldest of the agreements is the Agreement on International Commission for the Protection of the Elbe River from 1992. Thanks to the Agreement, an essential improvement in the quality of water along the entire length of the river has been achieved. The Agreement on International Commission for the Protection of the Oder River was signed in April 1996 in Vratislav. The Commission, just like the International Commission for the Protection of the Danube, works on an interim basis until the Agreement has been ratified by all the parties. Its activity focuses mainly to the discharges of polluted water reduction, prevention of accidents and flood protection.

The Czech Republic has taken steps towards implementing the Agreement, which, at the same time, should facilitate the future entry of the Czech Republic in the EU. The steps consist mainly in passing new laws or amendments to the currently effective water management acts. In January 1998 it was the Act 14/1998 Sb., the amendment to the Water Act that deals with the issues of water resources protection zones, implementation of cleaning measures in the case of surface or ground water contamination, methods for the appointment of river supervisors, and sets the obligation to work out plans for the real property at risk during floods. A statute on the list of rivers

that form the state boundaries is being prepared, together with a statute setting out principles for the definition of, and changes in, protection zones and a drinking water reservoirs list. In March 1998, Act 58/1998 Sb. on Fees for the Discharge of Wastewater to Surface Water was passed. A statute specifying the implementation of that Act is being prepared.

Every year, the Czech Republic channels significant amounts of money to the protection of the environment, and water protection is an important part of its overall protection efforts. In 1997, a total of 3.8 billion Kč was invested in the construction of 346 water protection structures, which make up about 26% of all structures for the protection of the environment. And we should bear in mind that the construction costs in 1997 were the lowest since 1992. Thanks to the measures limiting the amounts of the waste discharged, the levels of discharged pollution registered have dropped significantly since 1990: the BOD, solid particles, dissolved inorganic salts and apparent alkalinity and acidity parameters have improved by about 76% (by 82% in the Morava River Basin), 36% (increase by 8% in the Morava Basin) and 87% (by 96.5% in the Morava River Basin) respectively.

The Morava River Basin population is about 3 million people, 80% of which are supplied with water from public systems. Over 70% of the population there are connected to the public sewer systems. All 47 towns with over 10 thousand equivalent and 82% of the 33 towns in the 5 to 10 thousand equivalent inhabitants range in the Morava Basin operate wastewater treatment plants. The efficiency of a number of older plants needs to be upgraded, some sewer systems need reconstruction and nitrogen and phosphorus removal must be prioritized. The question of diffused and areal sources of pollution that are responsible for about 40 to 60% surface water contamination with nutrients.

In July 1997, the Czech Republic suffered floods that are unparalleled in its modern history. Although the Morava River Basin was perhaps the worst hit, the Elbe and the Oder Basins were also hit very hard. Fifty people lost their lives, over 11 thousand people were left homeless, 1,621 houses were destroyed and 25 thousand damaged, the flood tore down 51 road and 15 railway bridges, and 1,217 km of rails were damaged. The total damage to private and public property has been estimated at 63 billion Kč. In the Morava River Basin, 30 people died, 7 major releases of harmful substances from industrial companies were recorded and 8 wastewater treatment plants were temporarily put out of operation. The government has paid almost 17 billion Kč to repair the damage, and insurance companies have paid almost 10 billion Kč to their policy holders.

Since 1997, the question of floods has been given a lot of attention and it has become the most frequent topic discussed at government meetings. The government project "Assessment of 1997 Floods" has been passed and implemented, and its results have been made available to the Czech Hydrometeorological Institute. A digital model of the upper and middle reaches of the Morava and Bečva Rivers has also been prepared. At present, a mathematical inundation model of that territory is being prepared in co-operation with the Danish Agency for the Protection of the Environment.

Ladies and gentlemen, I am glad that so many of you have accepted the invitation to come to this workshop that will hopefully help to further improve the situation in the Morava River Basin and reduce its negative trans-boundary effects. I hope that this GEF Workshop will thus contribute to achieving our final objective, that is to say a better environment for us all.