DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP SLOVENIA

Brdo, June 17-20, 1998

MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING

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 Brdo, Slovenia from 17 to 20 June 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 has been supported by the Ministry of Environment and Physical Planning. It was prepared by the Country Project Coordinator Mr. Mitja Bricelj and National Team Leader Mr. Boris Kompare, with the assistance of the facilitators Mrs. Irena Rejec Brancelj and Mrs. Natalija Vrhunc. A team of national experts, who elaborated National Review Reports, was present to guide the participants in scientific and technical matters.

The National Planning Workshop was attended by participants from various sectors. There have been representatives of state administration at national and local level, representatives of academic institutions as well as representatives of non-governmental organizations. The list of participants is attached to this report in Annex 6.

The present report was prepared by Mrs. Gordana Beltram, Mrs. Irena Rejec Brancelj, Mr. Janez Kimovec (Financial Expert), Mr. Boris Kompare (Water Quality Data Expert), Mr. Uroš Kranjc (Water Engineering Expert), Mr. Ivo Kresnik, Mr. Marjan Ravbar (Socio-Economic Expert), Mrs. Nataša Vodopivec and Mrs. Sabina Žaja. It is based on ideas, expert opinions and results of discussions from the workshop.

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


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

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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 Slovene 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 of Slovenia 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 at Brdo, Slovenia, from 17 to 20 June 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.

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 activities, industrial activities and the municipal sector. Based on the sector analysis, it has been identified as core problem **"Inadequate human activities in the catchment area".** Direct causes of the core problem were described as "improper agricultural practices", from the agricultural sector, "environmentally inappropriate industrial activities" from the industrial sector and "inadequate waste water treatment" from the municipal sector. Inadequate human activities in catchment area have immediate effects, which are surface and ground water pollution by nutrients and pesticides, pollution of ground water, soil and water bodies, deterioration of water quality, deterioration of environment, eutrophication of water, negative impact on the quality and quantity of hydrological regime.

Considering the result of the problem analysis, the program objective was defined as **"Improvement of water quality in the Slovenian part of the Danube River Basin"**, which will contribute to the overall goal of the UNDP/GEF Danube Pollution Reduction Programme: **"Achievement of Sustainable Development in the DRB"**.

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

In the sector **Agriculture** as the main causes of improper agricultural practices the insufficient land and water resources management, inadequate use of pesticides and fertilizers in agriculture, inappropriate fish farm management and inadequate treatment of animal farm wastes have been identified.

In order to achieve sustainable agricultural development and conservation of natural resources it is required to:

- ***apply integrated land use and water resources management*** through introduction of sustainable agriculture (management, planning, implementation, etc.); improvement of co-operation between various sectors and rehabilitation of the "hot spots".
- ***achieve appropriate use of pesticides and fertilizers*** by implementation of the legal provisions for use of pesticides and fertilizers; introduction of sustainable agricultural practices; training farmers and agricultural advisers to improve farming practices and raising public awareness about sustainable agriculture.
- ***adopt appropriate fish farm management*** by undertaking measures for construction and maintenance of fish farms; defining species to be bred in fish farms and training fish farm managers.

- ***implement appropriate animal waste management*** through introducing sustainable livestock breeding; improvement of control and planning of waste water discharge from animal farms and reinforcement of control of the implementation of regulations in manure management.

In the sector **Industry, Tourism and Transport** as the main causes of environmentally inappropriate industrial activities the insufficient waste water treatment, inadequate use, transport and disposal of industrial and hazardous waste, inadequate tourism and transport have been identified.

In order to develop and implement sustainable industrial production, it foreseen to:

- ***achieve adequate waste water treatment*** by undertaking measures for the construction and maintenance of adequate industrial and combined WWTP; implementation of the existing legislation, draft missing legislation; ensuring the monitoring of emissions and ambient water quality; introduction of efficient control by inspectors and civil society and reinforcement of education and raise the awareness of experts and common people.
- ***achieve appropriate treatment of industrial and hazardous wastes*** by undertaking measures for implementing existing legislation and drafting legislation; enforcement of efficient control through inspectors and civil society; introduction of technologies producing min. amounts of final waste; implementation of international agreements and conventions and constructing appropriate dump sites (industry, hazardous waste).
- ***introduce appropriate production technologies*** through introducing industries according to the level of technology -international conventions, PPP; providing adequate planning, operation and maintenance of HEPP, TEPP and NPP; application of relevant financial instruments (national/foreign sources and fines/incentives) and implementation of appropriate measures for water management.
- ***establish appropriate tourism and transport*** through implementation of legislation, providing of international contracts and conventions and responsible behavior; construction, operating and maintenance of collection, discharge and WWT facilities; limitation of tourism and traffic in overloaded or vulnerable areas and supporting tourism and transport forms which are more suitable for the environment.

In the sector **Municipality** as the main causes of inadequate wastewater treatment, the inadequate and insufficient wastewater treatment, inadequate waste disposal and inadequate sewage system have been defined.

In order to reduce negative impact of municipal wastewater disposal, it is required to:

- ***apply appropriate waste water treatment*** through building national consensus for waste water treatment; facilitating the mobilization of financial resources through appropriate financial mechanisms; assuring building of new WWTP using appropriate technology and appropriate operation of existing WWTP (rehabilitation, expansion completion).
- ***optimize municipal waste management*** through assuring the rehabilitation of old dumping sides (legal, and illegal); supporting investments in waste management (separate waste collection, recycling...); construction of new regional centers according to to-date standards (recycling..) and raising awareness with regard to waste disposal.
- ***optimize management of sewer system*** by undertaking measures for increasing local communities involvement; assuring maintenance of new and existing sewage system networks; construction of WWTPs together with sewage systems and reinforcement of inspection control.

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

In the **agricultural sector**:

- training for CMP (catchment management planning)
- introduction of good agriculture practices and sustainable agricultural production on pilot farms

In the **industry, tourism and transport sector**:

i. construction:

- Paper mill and pulp industry in general, with plants: Radece, ICEC Videm Krsko, and Paloma Sladki vrh
- Dairy industries in general with plants in Murska Sobota, Maribor, Ljubljana
- Leather factory IUV Vrhnika
- treatment of water from roads

ii. institutional:

- introduction of ecological compensation (rent)
- assurance of adequate financial funds and dynamics in harmonization phase to EU legislation

In the **municipal sector**:

- establishment of priority list for the construction of new WWTPs and provision of financial resources
- introduction of WW treatment in small settlements (alternative technology).

1. Introduction

1.1. Background

The basin covers 81% of the Slovene territory, hosting 80% population. Located upstream, this represents about 2% of the entire Danube drainage basin. In Slovenia, the water of the Danube' s tributaries is used as drinking water, and also for industrial (process and cooling waters) and agricultural (irrigation) purposes. Several large cities are located along these tributaries. Together with industry (pollution equivalent over four million inhabitants before 1990) they are responsible for large wastewater discharges (chapter 5), flowing out thorough Croatia, Bosnia and Herzegovina, Yugoslavia, Hungary, Romania, Bulgaria and Ukraine.

In the late 80s, the water quality of the Danube and its tributaries deteriorated sharply. Therefore, in 1991 the Danube Environmental Programme was set up. It covers monitoring, data collection and assessment, emergency response, and pre-investment activities. It also supports institutional strengthening, capacity building and NGO activities. The Programme' s first step was to analyze the environmental situation of the Danube river Basin in each of the 17 riparian countries, including non-point sources of pollution and the state of biological resources. Its Strategic Actin Plan sets targets to be met within 10 years, i.e. by 2005, and defines a series of actions to reach them. Each country is committed to preparing its national plan to identify needed actions and investments. As Slovenia did not become actively involved until later, it should now achieve both the short-term and medium-term objectives. A proposal for the national medium-phase priority tasks was submitted in early 1996.

To increase the safety of the riverside population and protect drinking-water resources from accidental pollution which would have transboundary effects, effective monitoring and a Danube Accident Emergency Warning System have been developed since 1993. An essential feature of the system is that it complies with the relevant multilateral conventions and declarations, as well as existing bilateral agreements between the neighboring countries of the river basin.

Monitoring and standard analyzing procedures equivalent to those of the EU already existed in Slovenia before the Programme, but the interpretation of the results was poor, and the methodology applied differed from that in neighboring countries. Now Slovenian data are comparable to data collected in Austria and Italy, however the interpretation and use of the results in planning remain to be improved. The equipment and training of the professionals are being harmonized. In 1995, 10 two-day training courses in field of monitoring were financed by PHARE and taught by the International Center of Water Studies of the Netherlands. Intercalibration of laboratories is regularly carried out. Maps on water quality have been established long ago.

The priority is now to reduce the pollution loads from the industrial sector into the Danube River and its tributaries. Because of their limited financial resources allocated to investments, countries in transition have focused in particular on the use of low-cost cleaner techniques (see chapter 9). Under Strategic Action Plan, nine demonstration pilot projects have been selected for Slovenia. They started in 1997, with financial support from the World Bank.

Out of the Danube Basin' s total of 160 hot spots responsible for transboundary water pollution, 12 have been identified in Slovenia. Nine could be eliminated by installing wastewater treatment plants, for an estimated overall nominal capacity of 1,720.000 person’s equivalents. Another high priority task is reducing nutrients in the Slovenian Streams[1].

[1] Environmental Performance Reviews, Slovenia. Economic commission for Europe, Committee on environmental Policy. UN NY and Geneva, 1997, page 27, 28.

1.2. Planning approach

General context of planning approach

The organization of the National Planning Workshop in Slovenia 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.

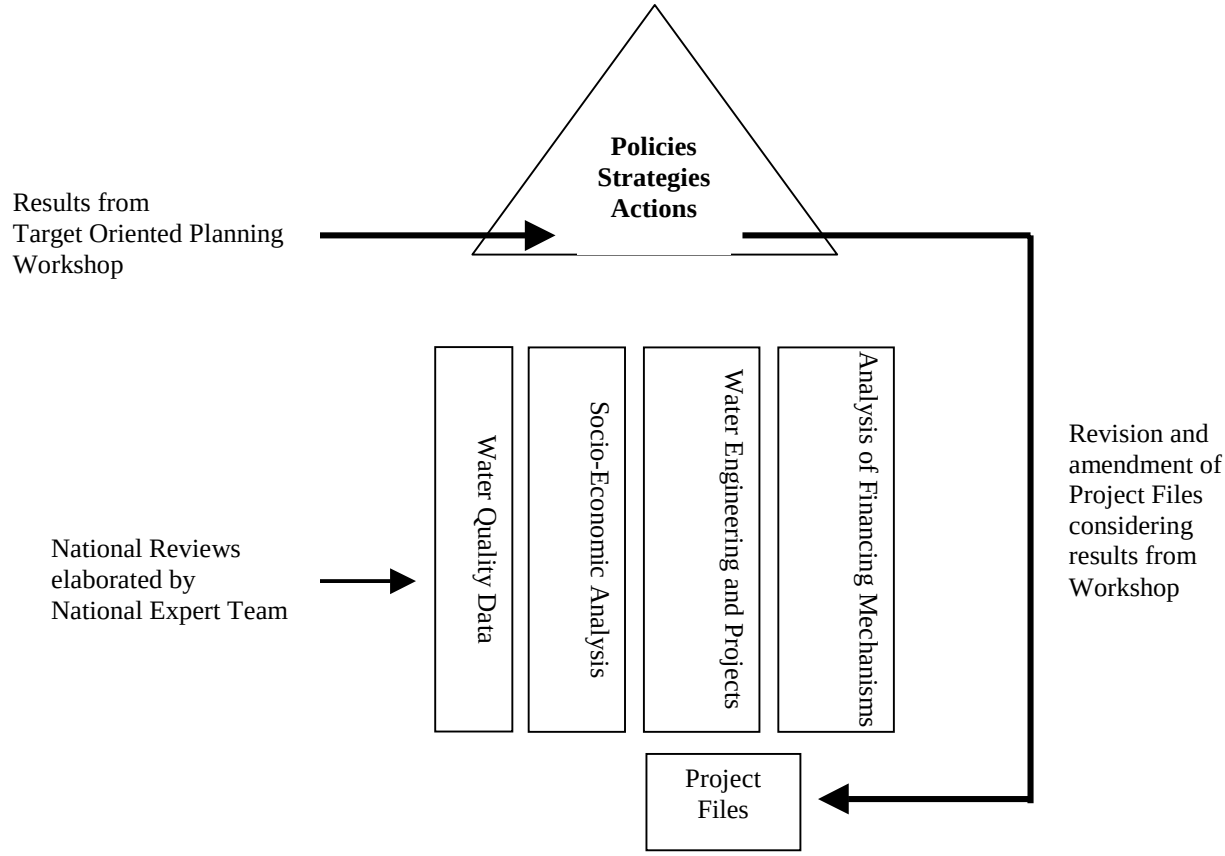
The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects 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 the Environment and Physical Planning, 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 Gozd Martuljk from 22 to 23 May 1998. At this occasion, the Non-Governmental Organizations have discussed common strategies and priority measures for pollution reduction and designated their participants for the National Planning Workshop, as well as for the forthcoming regional meeting of the Danube Environmental Forum (regional NGO with the participation of all Danube countries).

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

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

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

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

2. General frame of analysis

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

Danube River Basin on the territory of Slovenia includes Sava (11.734 km^2), Drava (3.253 km^2) and Mura (1.376 km^2) river catchment areas. Watershed between Black Sea and Adriatic Sea river basin in Slovenia passes from north-west, beginning on the highest slopes of the Julian Alps, northern parts of Subalpine Hills and continues on Dinaric-karst plateaus to Slovenian-Croatian border on the south part of Slovenia.

Main part of watershed runs on the carbonaceous rocks, what is the reason for domination of karstical underground watershed. General characteristic of the biggest river basins in Danube catchment area are common: river sources are in alpine, highly precipitated area, courses continuing through subalpine and hilly land into plains world. Water streams usually leave the Slovenian territory in one day or two, after 100 km long course, what only underlines water characteristics due to transition and river sources area. Length of surface water streams in Danube river basin is 22.600 km, density of river network is 1,38 km/km^2. (Density of river network - according to more than 40% of karst area - is big, basically due to high precipitation). Black Sea catchment area comprises 98% of dynamic stores of ground water, caught in gravel aquifers, and 85% of all dynamic stores of ground water in Slovenia.

Ecosystem characteristics of Danube river basin are the result of transitional geographical position, where alpine, subalpine, dinaric-karst and sub-panonial characteristics are intermingled. Bio-climatically Danube river basin is designated by transition from humid climate of alpine and dinaric part of the river basin to humid climate of central part of Sava river basin and further to semihumid and partially semiarid climate of Drava and Mura river basin. Almost the whole area of Danube river basin potentially belongs to forest ecosystem, but which has been deforested. Extent of forest area exceeds on half of Slovenian territory. Regarding the forestation Slovenia belongs in the very top of European countries. In last 40 years forest area has grown for approximately 10%, but because of illnesses and air pollution, damage of trees is present in great extent.

Within identification of river basin areas the following river basins have been characterized in particular from the point of view of physical-geographical characteristics, demographic characteristics, transboundary effects as perceived and human/economic activities in the basin:

- The Sava River Basin
- The Drava River Basin
- The Mura River Basin

(i) The Sava River Basin

Physical-Geographical Characteristics

Only Sava river basin has its river source in Slovenia. It extents on 11.734 km^2 or 58% of Slovenia. It embraces the following landscape units: high mountainous, mainly karstical area (The Julian Alps, Savinja Alps and Karavanke), extensive, mainly karstical subalpine region with basins (Ljubljana and Celje basin, with ground water areas), part of dinaric-karstical land (Ljubljanica, Krka and Kolpa river basin) and minor part of sub-panonic world (Sotla river basin).

Average river runoff for Sava is 290 m^3/s, runoff coefficient is 60,2% and average annual flow at exit of the country is 319 m^3/s. In upper stream of the river nival-pluvial water regime with emphasized runoff maximum in late spring and primal minimum in winter is characteristic, which after Ljubljana passes in pluvial-nival regime with two equivalent maximums (spring and autumn) and emphasized minimum in summer months. Larger tributaries have the character of combined water regime (Savinja). Kolpa and Krka have the characteristics of Mediterranean variant of pluvial-nival regime with little more emphasized autumn maximum and distinctive summer minimum.

Dynamic stores of ground waters are estimated to 11,7 m^3/s or 62,2%. Areas of quantitatively rich ground waters are: Kranj field, Sora field and Ljubljana field, smaller quantities of ground waters are found on Skaručna-Vodice field, along Kamniška Bistrica, on Ljubljansko barje, on Krško field, Brežice and Čatež field and in Savinja valley, where dynamic stores of each area doesn't exceed 1,0 m^3/s. In Sava river basin is 67% of all dynamic stores of ground water, 25% of these are in upper part of Sava stream, 24% are in middle stream, including Ljubljanica, 10% are in Savinja and Sotla river basin and 8% are in lower stream, including Krka.

Socio-Demographic Characteristics

In Sava river basin live 1,2 Mio. inhabitants or 60% of all Slovenian population in more than 4.500 settlements (70%), what is the indicator for large dispersity of settlements. Density of population, with 103 inhab./km^2 is above average. Between valley and mainly plain and riverside area (at the same time ecologically the most vulnerable land), where the population density is 307 inhab./km^2 and hilly, sub-alpine or mountainous land, which is almost eight times less inhabited (42 inhab./km^2) are big differences. Especially high density of population is on Ljubljana field, Velenje and Novo mesto basin, Selško basin, Central Savinja basin, Upper Sava valley, including Dežela, where population density exceeds 500 inhab./km^2. Urbanization rate is 61%. But even Ljubljana with more than 300 000 inhabitants is hardly compared with agglomerations in foreign countries. In Sava catchment area only Kranj and Celje agglomerations have over 50.000 inhabitants. These three cities are followed by the group of towns: Velenje, Novo mesto, Škofja Loka and urban areas (Kamniško-Bistriška plain, Revirji, Upper Gorenjska and Krško-Brežice field), where the number of inhabitants together with urban areas counts between 20 and 50.000. The rest are urbanized countryside settlements. In these areas also the biggest water pollution, especially of surface and ground water, is present.

In Sava river basin 1,083.712 inhabitants or 84% of Slovenian or 71% of Black Sea catchment area were in year 1996 connected to public water supply system, which is under supply of municipal enterprises. In urban settlements almost all inhabitants are connected to larger water supply systems, while on countryside smaller water supply systems prevail and part of population is supplied from their own sources. Average water use from public water supply systems per inhabitant in Slovenia in year 1995 was 127 l/daily or 46.355 m^3/annualy. Data about water use per inhabitant for private supply systems are not available, but according to estimations there are not big discrepancy present. In urban settlements water use in households is little bigger, in the countryside to lower water use is added water use for livestock.

According to data from Ministry of Environment and Physical Planning 30% of country population is connected to municipal waste water treatment plants, according to other sources only about 20%. At municipal wastewater treatment plants in Slovenia mainly wastewaters from combined sewage systems are treated, including waters from households, industry and others sources. According to available data 599.035 (50,6%) inhabitants of Sava river basin are connected to public sewage system, from this 226.536 (19,1%) to waste water treatment plants. In Sava River basin is 32 supplied systems with 23.602.000 m^3 of wastewaters and 50,4% share of population is connected to sewage system regarding the whole Danube river basin. Trbovlje supply system, where almost 95%

inhabitants are connected, is covered the best with sewage system. In water systems of Ljubljana, Kranj, Hrastnik and Celje more than two thirds of population release its wastewaters in sewage system. With 10,5% Mozirje supply system has the lowest share of connected population, fewer than 40% is also in Šmarje pri Jelšah, Ribnica and Trebnje. It is delightful, that settlements on majority of fields are relatively good equipped with sewage system, because under them larger quantities of ground water are deposited (Ljubljana, Kranj and Celje field), but on Brežice - Krško field the situation is worse, because only about 30% of inhabitants are connected to sewage network. Essentially more serious is supply on karst area, because there is no supply system, which would cover half of inhabitants. Poor self-purification abilities are characteristic for karst, what is the reason that the consequences of uncontrolled leaking into underground are even more threatening.

Basic structure of human activities represent 58 employment centers with more than 1000 working places. In Sava catchment area Ljubljana is distinctively dominating. Otherwise Ljubljana-Gorenjska-Kamnik employment area (with 40% of all working places) and Celje-Velenje area are dominating. Smaller employment centers or groups of centers are the following: Novo mesto, towns in Zasavje and Postojna. Along these there is a set of smaller industrial places, with one or two industrial branches in average.

Transboundary Effects as Perceived

In the Sava river Basin significant transboundary effects are caused by hot water discharges from Krško nuclear power plant, reduced input of suspended particles and biological pollution, eutrophication due to construction of hydro-power plants, heavy metals in river sediments etc. Introduction of alien species of fauna and flora can have also transboundary effect. Further more, the Sava River infiltrates in ground water providing supply for Zagreb in Croatia.

Human/Economic Activities

Within agriculture, in Sava river basin area were identified some economical activities leading to pollution, like: intensive plant production (hops), discharges from fish farms (eutrophication, inadequate waste water treatment), introduction and breeding of alien / exotic species, convection of wetlands into fish farms, uncontrolled use of slurry in protected water zones, inadequate manure disposal, inadequate use of pesticides and fertilizers in agriculture, unplanned and uncontrolled abstraction of water for irrigation purposes, dispersed pollution, damage of wetland areas, etc.

Within industry, energy and other economic activities the following activities leading to water pollution have been identified: discharge of industrial waste water into the river without proper treatment, leaking from industrial dump sites, no-treatment of rainfall runoff waters from highways, inappropriate disposal of solid and dangerous waste, construction and operation of impoundments for hydroelectric power plants (HEPP), discharge of heat from thermoelectric power plants (TEPP) and nuclear power plant (NPP) into water courses, (road) transport of dangerous matter, excessive tourist pressure, etc.

In municipal sphere the main activities leading to water pollution are discharge of waste waters into the river without proper treatment, leaking from dump sites, no-treatment of rainfall runoff (precipitation) waters, inappropriate disposal of solid waste and discharge of waste water from hospitals, inadequate sewage system, numerous permeable cesspits and manure pads, etc.

84% of households in the Sava River Basin are connected to the water supply system and 50,4% of households to municipal wastewater treatment system. In the Sava River Basin the total pollution load (calculated from river water quality) on the border with Croatia amounts to 49,348 t/per year of BOD5, 187,109 t/ per year of COD, 15,740 t/ per year of inorg. Ntot and 2.416 t/ per year of inorganic Ptot.

(ii) The Drava River Basin

Physical-Geographical Characteristics

Drava river basin surface, with river originated in Austria, covers 3253 km2 or 16% of Slovenian area. According to ecosystem characteristics we can divide Slovenian part of Drava river basin to mainly alpine and karst Meža river basin, subalpine and non-karstical area of smaller tributary's basins from Pohorje and Kozjak (impermeable metamorphic and magmatic rocks), subalpine and sub-panonic river basin of Dravinja with Dravinjske gorice and Haloze, smaller water streams river basins from Slovenske gorice and plain and graveled Drava - Ptuj field (ground water area).

Average annual runoff for Drava is 59 m3/s, average annual flow at Ormož is 325 m3/s and runoff coefficient is 50,1%. Nival-pluvial regime is characteristic. The most important aquifers are Drava field, Vrbanski plateau near Maribor and Ptuj field. In Drava catchment is all together 28,5% of Slovenian dynamic underground stores.

Socio-Demographic Characteristics

In Drava river basin live 415 000 inhabitants or 21% of Slovenian population, settled in approximately 800 settlements, which is also the indicator for big dispersity of settlements. Population density, with 121 inhab./km2 is above average. Large differences occur between valley and mainly plain and riverside area (and at the same time ecologically the most vulnerable land), where population density is 280 inhab./km2 and hilly, subalpine and mountainous area, which is four times less inhabited (66 inhab./km2). Especially high population density is in Mežica, Mislinja and Central Drava valley, where population density exceeds 500 inhab./km2. Urbanization rate with 46% is, compared to Central Slovenia lower. Only Maribor, with about 160 000 inhabitants is hardly compared to foreign agglomerations. Besides Maribor more important agglomerations are only Ptuj and urban areas in Slovene Carynthia, where number of population together with urban areas amounts 20.000. Others are smaller urbanized countryside settlements.

In Drava River Basin, 73,3 % of population are connected to public water supply system, supplied by municipality enterprises.

According to available data 157.639 (38%) inhabitants of Drava River Basin is connected to public sewage system, from these 16.580 (4%) to waste water treatment plants. Through sewage system 6.211.000 m3 of waste waters flows annually. With 70,3% covering Ravne - Prevalje supply system is the most ordered sewage system and Slovenske Konjice system, with 60,0% is solid too. Two largest urban settlements on Drava - Ptuj field, Maribor (42,9%) and Ptuj (24,4%) have together with their surroundings less than half of population connected to sewage system.

Basic structure of economy present 17 employment centers, greater than 1000 working places. In Drava river basin Maribor is strongly dominating, followed with smaller employment centers: in Sthyria urban areas of industrial centers (Slovenj Gradec-Dravograd-Ravne-Mežica) and Ptuj. In these towns are more than 10 000 working places, from these one quarter in industry.

Transboundary Effects as Perceived

In the Drava river Basin some transboundary effects are perceived from accumulation of heavy metals in sediments, deterioration of water quality (from 2 to 3 quality class at discharge to Croatia) and consequent effect on the water ecosystem. Transboundary effects are related also with transport of N, P, BOD, COD and pathogens from Austria and to Croatia.

The main source of water supply in Croatia is underground water, which is supplied from Sava and Drava River, thus pollution originated in Slovenia may have effect on water supply in Croatia.

Human/Economic Activities

In the Drava River Basin area some human activities leading to pollution and sources of pollution were identified in agriculture sector, like: excessive use of mineral fertilizers, inappropriate use of plant protection substances, waste water discharge from fish farms, untreated waste water discharges from farms, large number of animals per hectare, inappropriate irrigation, inappropriate hydromeliorization solutions in terms of environment, etc.

In the industrial field several activities which result in pollution were distinguished: insufficient wastewater treatment, not treated waste waters, inadequate use of grave-pits (dumping of waste, growth of toxic algae), uncontrolled emissions of heavy metals: Pb, Cu, oils (machinery), solvent, detergents, etc. The most polluting industries are old lead mine and storage of used car batteries Mežica, aluminum producing industry with its solid waste in Kidričevo, pesticides factory Pinus with inadequate storage in Rače, etc.

From municipalities the most important polluting human activities and pollution sources are hospitals, gravel abstractions, traffic infrastructure, army polygons, insufficient wastewater treatment, non-treated wastewaters, etc.

73% of households in the Drava River Basin is connected to the water supply system and 21% households to municipal waste water treatment system. In the Drava River Basin (Slovenian contribution, calculated from river water quality) the yearly pollution load contributed by Slovenia is 11,416 t of BOD5, 8,230 t of COD, 4,445 t of inorganic nitrogen and 25 t of inorganic reactive phosphorus.

(iii) The Mura River Basin

Physical-Geographical Characteristics

Mura river basin area, with river originating in Austria, is 1376 km2 or 7% of Slovenian territory. Slovenian part of Mura catchment area comprises mainly agriculture sub-panonic landscape ecosystem of plains and hills, with domination of terciar impermeable rocks and pleistocen gravel sediments. On young gravel and sand sediments riverside or mineral soils are dominating. Main, but in flow weak tributaries are Ledava and Ščavnica, which include water streams from terciarry, hilly part of Mura river basin.

Average annual runoff from part of Mura catchment is 10 m3/s, runoff coefficient is 28,3%, average annual flow at Gornja Radgona is 157 m3/s. For Mura catchment area nival-pluvial water regime is characteristic. Dynamic stores of ground waters in Mura catchment area amount to 1,5 m3/s or 3%. The most important aquifers are Mura, Prekmurje and Apače field.

Socio-Demographic Characteristics

In Mura catchment area live 120 000 inhabitants or 6% of Slovenian, settled in approximately 350 settlements, what is the indicator for dispersed settlement. Population density, with 97 inhab./km2 is under average. Differences between valley and mainly plain and riverside area, where the population density is 127 inhab./km2 and hilly area (59 inhabit. /km2) are not remarkable. Urbanization rate, with only 24% is, compared to the rest of Slovenia, the lowest. Only Murska Sobota with about 20 000 inhabitants can place among more important agglomerations. Urban centers, which count less than 10 000 inhabitants are: Lendava, Ljutomer, Radgona and Radenci. The rest are relatively big countryside settlements.

In Mura river basin 62.825 inhabitants or 67% of Slovenian or 4% of total Black Sea catchment area were in year 1996 connected to public waterworks, supplied by municipality enterprises.

According to available data 27.381 (23,2%) of inhabitants are connected to public sewage system, from these 26.000 (22,1%) to waste water treatment plants. Share of connected population in Murska Sobota does not reach 30%, in Ljutomer is only 13,8%. The result is that annual release of wastewater is only 1.079.000 m3. Ground water on Mura and Prekmurje field is shallow under the surface, what only increases the potential threat of pollution with municipal wastewaters, agriculture, industry. Basic structure of economy present 7 employment centers greater than 1000 working places. Among them Murska Sobota, with 44% share of employed in industry is strongly dominated.

Transboundary Effects as Perceived

The quality of water in the Mura River considerably improved in last years due to construction of WWTPs in Austria. Slovenian pollution contribution has also diminished due to recession in industry. However, transport of N, P, pathogens, BOD, COD from Austria and Slovenia causes deterioration of water quality in Croatia. Bad smell from the pig farm Podgrad spreading to the health resort in Radkesbourg - Austria have been identified as one of transboundary effects.

Human/Economic Activities

In Mura river basin area some human activities leading to pollution and sources of pollution were identified in agricultural sector, like: inappropriate slurry disposal and application, waste waters from pig farms are discharged without proper treatment, excessive use of pesticides and slurry in agriculture (Mursko polje, Apaško polje), etc.

Within industry, important activities leading to pollution and pollution sources are: illegal dumpsites, expanding tourism (spas, hiking), international traffic, etc. Furthermore inappropriate location of landfills (situated above aquifers), discharge of thermal water from spa into the Lipnica stream, insufficient water treatment on WWTPs, highly loaded environment with low buffer capacity with food processing industry (pig and poultry farms, slaughter houses, dairy farms and industry, etc.).

From municipalities the important pollution sources and activities leading to water pollution are illegal dump sites, rapid development of health resorts without considering environmental capacities, low buffer capacity, insufficient waste water treatment, etc.

67% of households in the Mura River Basin are connected to the water supply system and 23% of households to municipal waste water system. Most industry is in urbanized areas, but still, some discharges go directly to the streams. Contribution of Slovenia to total pollution in Mura River Basin is estimated (according to water quality of Mura) to yearly 247 t BOD5, 27,445 t of COD, 1,275 to of inorganic nitrogen and 13 t of inorganic reactive phosphorus.

WATERS OF SLOVENIA

2.2. Problem analysis

2.2.1. Core Problem

On the basis of plenary discussions, groups work and knowledge the core problem for the program was defined:

"INADEQUATE HUMAN ACTIVITIES IN THE CATCHMENT AREA"

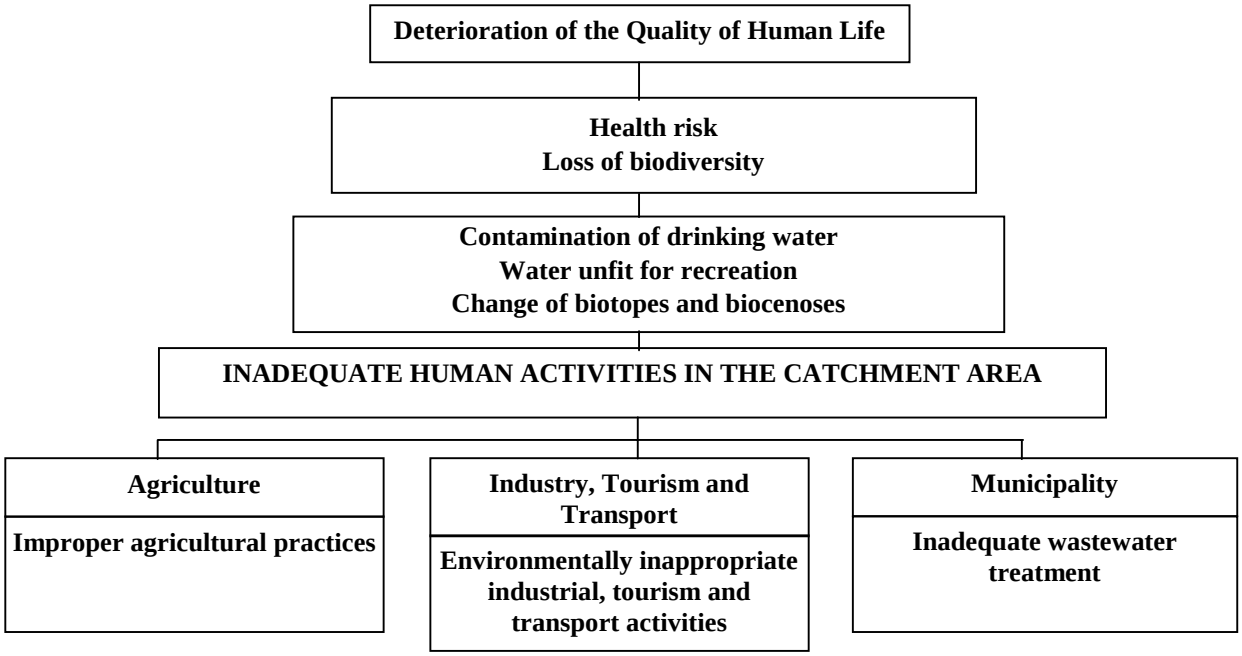
Inadequate human activities in all three sectors lead to water pollution and deterioration. In the frame of this core problem groups work could continue with detailed specification of causes for problems for each sector.

2.2.2. Direct Causes of the Core Problem

Three direct causes leading to the core problem were identified:

- **Improper agricultural practices** caused by insufficient land and water resources management, inappropriate fish farm management, inadequate use of fertilizers and pesticides in agriculture and inadequate treatment of animal farm wastes.
- **Environmentally inappropriate industrial, tourism and transport activities** due to insufficient waste water treatment, inadequate use, transport and disposal of industrial and hazardous waste, inadequate process technologies and weaknesses of tourist and transport activities.
- **Inadequate wastewater treatment** caused by insufficient wastewater treatment, inappropriate wastewater treatment in landfills and weaknesses of sewage system network.

Scheme of Problem



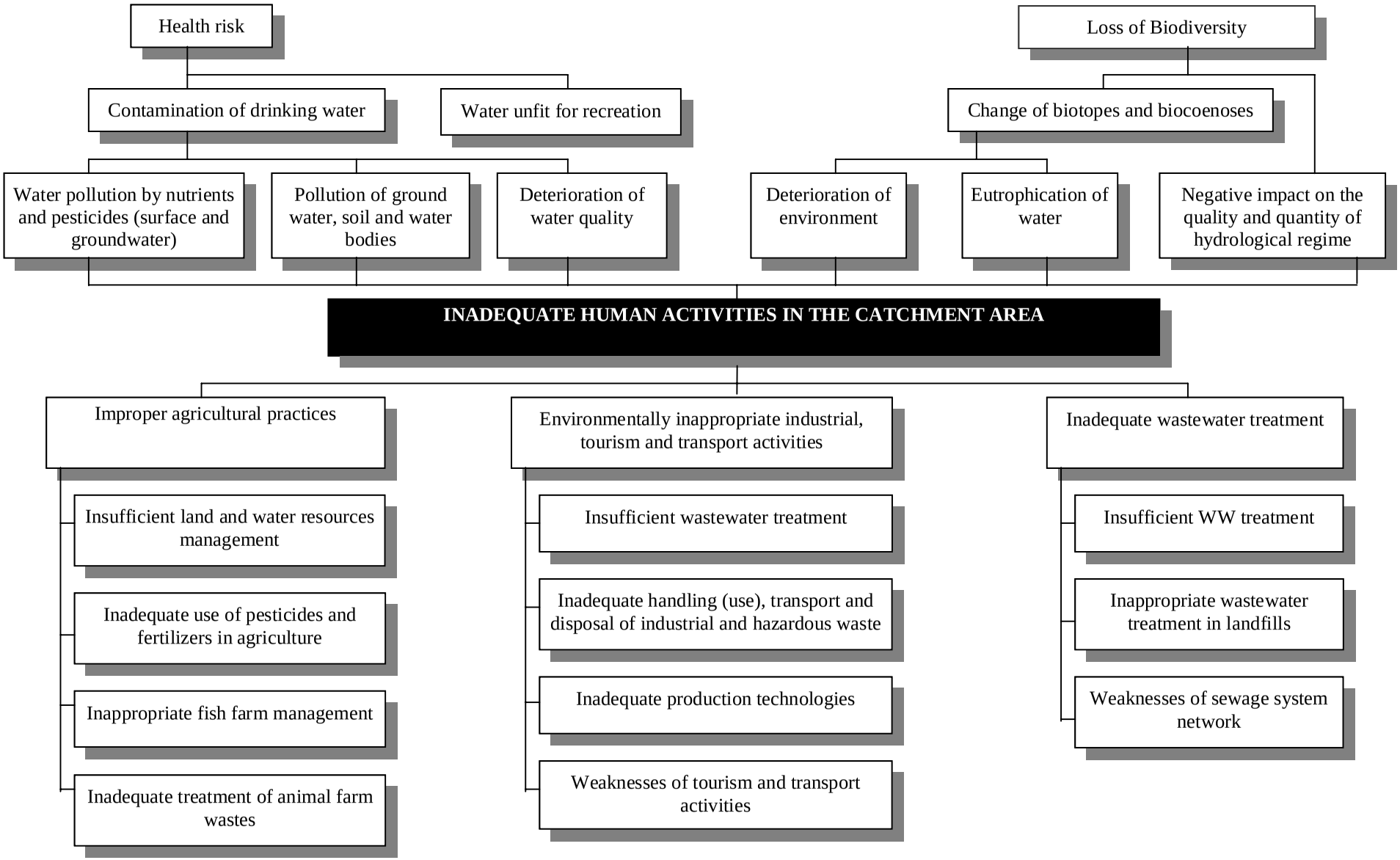
2.2.3. Effects of the Core Problem

Six direct effects of inadequate human activities in the catchment area, which have immediate effects, were identified:

- **Surface and ground water pollution by nutrients and pesticides**
  Effects of inadequate use of pesticides and fertilizers are increase in pesticides and nitrates content in surface waters and groundwater, accumulation of toxic substances in food chains and negative impact on human health
- **Pollution of groundwater, soil and water bodies**
  Bad industrial practices, inadequate use of agrochemicals and inadequate wastewater treatment effected groundwater, soil and water bodies.
- **Deterioration of water quality**
  Inadequate human activities in all three sectors lead to water pollution and deterioration of water quality.
- **Deterioration of environment**
  Inappropriate agricultural and industrial activities with excessive production of waste and wastewater cause these effects with pollution of ground soil, air, water, and change or destruction of biotopes.
- **Eutrophication of water**
  This is an effect of inadequate human activities in all three sectors in catchement area.
- **Negative impact on the quality and quantity of hydrological regime**
  All three sectors cause environmental effects with negative impact on hydrological regime especially to water quality and quantity.

All these results in drinking water contamination, water unfit for recreation and in changes of biotops and biocenoses as well. The final consequences of inadequate human activities in the catchment area, which with "Danube Environmental Pollution Prevention Programme" we try to avoid, are health risk one side and loss of bio-diversity on the other.

GENERAL PROBLEM HIERARCHY



2.3. Analysis of Objectives and Identification of Priority Sectors

2.3.1. Description of Objectives

The following program objective was defined in Slovenia:

"IMPROVEMENT OF WATER QUALITY IN THE SLOVENIAN CATHCMENT AREA"

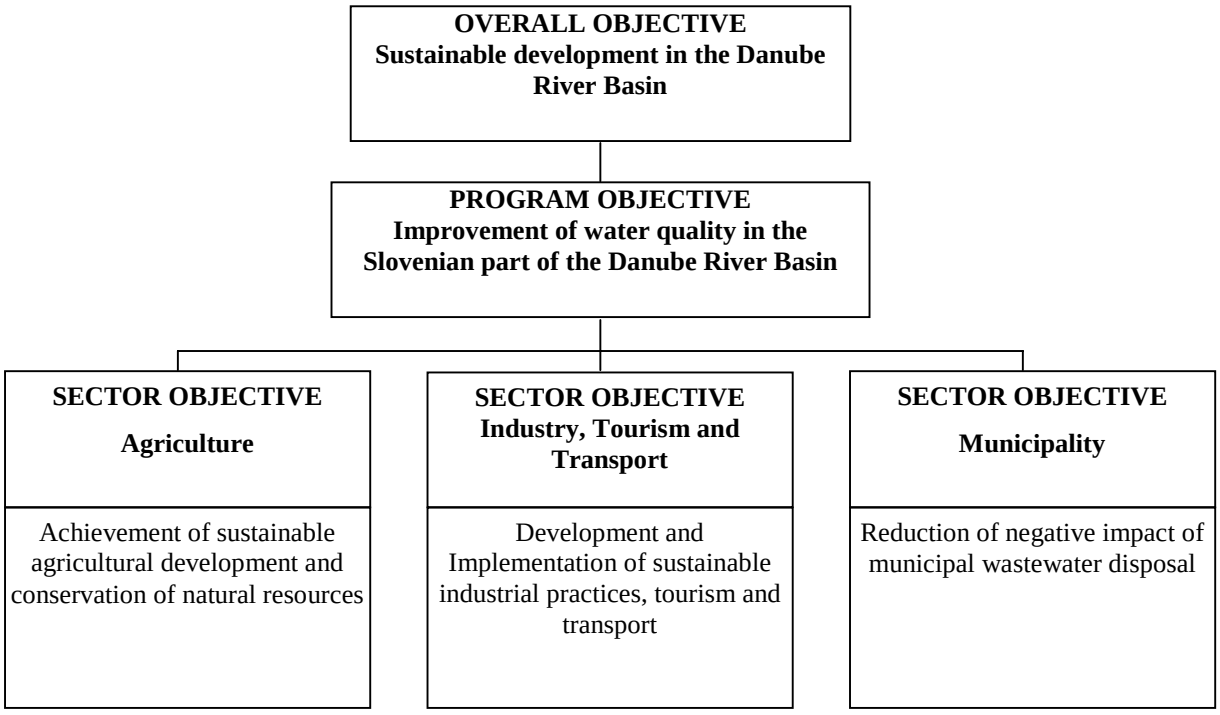
This program objective contributes to the overall objective of the UNDP/GEF Danube Pollution Reduction Program, which was defined as follows:

"SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN "

In order to assure the improvement of water quality and water ecosystems in the Slovenian catchment area, specific objectives have been identified for the following sectors:

- **Agriculture:** Achievement of sustainable agricultural development and protection of resources
- **Industry, Tourism and Transport:** Development and implementation of sustainable industrial practices, tourism and transport
- **Municipality:** Reduction of negative impact of municipal waste water disposal

Scheme of objectives



2.3.2. Identification of Priority Sectors

Considering the core problem, its causes and effects the program objective has been identified. In order to achieve this program objective, the measures have to be undertaken in the following priority sectors:

a) Agriculture

Concerning Agriculture, in order to achieve sustainable agricultural development and protection of resources it is required to:

- implement proper animal waste handling
- adopt proper fish farm management
- use pesticides and fertilizes appropriately
- apply integrated land use and water regime management

b) Industry, Tourism and Transport

In this sector in order to achieve development and implementation of sustainable industrial practices, tourism and transport, it is necessary to:

- **apply adequate waste water treatment**
- **achieve proper management of industry and hazardous**
- **introduce appropriate technologies and industrial processes**
- **undertake appropriate measures for sustainable development on tourism and transport**

c) Municipality

Regarding the Municipal sector, the immediate objective is to reduce negative impact of municipal wastewaters. To obtain this objective, it is required to:

- apply appropriate waste water treatment
- optimize municipal waste management
- optimize management of sewage system

2.3.3. Important Assumptions for Program and Sector Objectives

The objective identification was assisted by considering important assumptions. These are 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 important assumptions at the **sector objective** level are necessary to achieve the program objective:

- **Funds in the national budget are ensured in the long-term**

  To introduce the sustainability principles agricultural policy needs to support small-scale production (on highland farms), promote native varieties of livestock and crops, promote mixed farming systems, reduce chemical use and apply natural fertilizers. An overall aim should be flexibility to supply the market and provide support to sustainable farming.

- **Communication and common understanding between sectors achieved**

  To date, sector co-operation is still scattered on individual initiatives or requirements and it can be considered at different levels.

- **Environmental protection has high priority for Slovenian government**

  This assumption was identified on basis of the fact, that in the past and at present the percentage of GNP, which is devoted to environment, is not sufficient. Also the foreseen percentage of 1.5% GNP seems to be half of the needed. Therefore, the Government will have to reconsider the priority of the environmental problems and suitably devote sufficient part of the State's budget for the environment.

- **Ensured budgetary financing**

  Appropriate financing was defined as one of the key conditions, which must be met to achieve sector objective. National Plan for Environmental Protection assumes that over 70% of funds for financing water protection programs and projects would be public funds. Failure to ensure budgetary financing will endanger achievement of sector objective or at least postpone it.

- **Successful lobbying**

  In each country, there are several development, environmental, socio-political and other problems to be solved. However, the time and the resources are limited. Therefore lobbying to promote environmental problems in municipality sector is necessary. Without successful lobbying, we can expect that solving municipal wastewater problems will be postponed on the account of other problems.

- **Politicians co-operate**

  The co-operation of politicians on local or state level is an important assumption. Decisions such as, passing new laws or decrees, adoption of state or local budget that is favorable to environmental projects, are made by politicians. The politicians are involved decision making process therefore their co-operation is mandatory.

2.3.4. Impact Indicators for Program and Sector Objectives

Objectively verifiable indicators were developed for the program objective, the sector objectives and the sector results. They define the contents of the objectives and result in operationally measurable terms (quantity, quality, target groups, partner institution, 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.

Objectively verifiable indicators were developed during the workshop to evacuate the accomplishment of the program and sector objectives.

The **program objective:** improvement of water quality in the Slovenian part of the Danube river basin can be measured with the following indicator:

- **By the year 2010 the water quality improved for one class in 80% of the Sava river basin and the water quality of the Drava and the Mura river basins maintained at the same level as it enters into the state (including border stretch with Croatia).**

The following impact indicators for **agriculture sector** have been identified:

- **Introduction of sustainable farming in compliance with the standards and regulations of EU in the 50% of farms by 2010 and at the same time reduction of water pollution from agriculture beyond the MAC.**

  Joining the EU, Slovenia will have to accomplish several requirements in agricultural and environmental policies and practices that will considerably reduce water pollution generated from the agriculture sector.

The following impact indicators for **industry sector** have been determined:

- **The pollution of groundwater and surface water due to industry is reduced beyond 80% regarding year 1998 by 2010, or to meet MAC (EU, national) in groundwater - whatever option applies**

For the **municipality sector** the following indicator have been identified:

- **In the catchment area costs for treatment of surface and ground water decreased and at the same time improvement of surface water quality up to 2. class is noticed by the year 2010.**

Program Planning Matrix

Summary of Objectives and Results	Impact Indicators	Important Assumptions
Overall Objective: Sustainable development in the Danube River Basin		
Program Objective: Water quality in the Slovenian part of the Danube River Basin improved	➢ By the year 2010, the water quality has improved for one quality class in the 80% of the Sava river basin while the water quality of the Drava and the Mura river basins in Slovenia is the same as it has at the border with Austria. (PO)	
Sector Objectives: **1 Agriculture:** Sustainable agricultural development and conservation of natural resources achieved **2 Industry, Tourism and Transport:** Sustainable industrial practices developed and implemented **3 Municipality:** Negative impact of municipal WW disposal highly reduced	➢ 1. Introduction of sustainable farming in compliance with the standards and regulations of the EU on the 50% of farms by 2010 and at the same time water pollution from agriculture is reduced and maintained within the "MAC" (maximum allowed concentration). (SOA)	➢ Funds in the national budget ensured in long-term (SOA) ➢ Communication and common understanding between sectors achieved (SOA) ➢ Environmental protection has high priority for Slovenian government (SOITT) ➢ Politicians co–operate (SOM) ➢ Successful lobbying (SOM) ➢ Ensured budgetary financing (SOM)
Results/Outputs: **1. Agriculture** 1.1 Integrated land use and water resources management applied 1.2 Appropriate use of pesticides and fertilizers achieved 1.3 Appropriate fish farm management adopted 1.4 Appropriate animal waste management implemented **2. Industry, Tourism and Transport** 2.1 Adequate waste water treatment achieved 2.2 Appropriate treatment of industrial and hazardous wastes achieved 2.3 Appropriate production technologies introduced 2.4 Appropriate tourism and transport established **3. Municipality** 3.1 Appropriate waste water treatment applied 3.2 Municipal waste management optimized 3.3 Management of sewer systems optimized	➢ 2. The pollution of groundwater and surface water due to industry is reduced ≥ 80 % regarding year 1998 by 2010, or to meet II. quality class of surface water, or to meet MAC (EU, national) in groundwater (whichever option applies) (SOITT) ➢ 3. In the catchment area costs for treatment of ground and surface water decreased and at the same time improvement of water quality duo to 2. class is noticed by the 2010 (SOM)	(These assumptions will be described within the sector strategy)

PO - Program Objective SOA - Sector Objective Agriculture SOITT - Sector Objective Industry, Tourism and Transport SOM - Sector Objective Municipality

3. Sector Strategies

3.1. Agriculture

3.1.1. Situation/Stakeholders Analysis

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

Agriculture sector in Slovenia covers different activities, including crop production, livestock and fish farming. In 1995, according to the Ministry of Agriculture, Forestry and Food (1997), agriculture represented 4.3 per cent of the GDP and agricultural areas covered about 39 per cent of the surface area. At the national level, the Ministry of Agriculture, Forestry and Food is responsible for the sector development planning, policy and law making and implementation.

According to its character, Slovenian agriculture has a two-fold impact on the water resources mainly deriving from:

- non-point sources, particularly small farms which predominate and are scattered all over Slovenia as well as intensive crop production in the lowlands;
- point sources, mainly large livestock and fish farms.

The problem is critical in agricultural regions without public water supply system (for example in the north - eastern part of Slovenia). Uncontrolled pollution from agricultural sources is an existing or potential threat to water resources (surface and ground water).

The main problems derived from agricultural activities are due to inappropriate use of fertilizers and pesticides causing alterations in nitrogen balance and increase in residuals of pesticides in the soil and water. Regulation on the input of toxic substances and nutrients ("Uredba o vnosu nevarnih snovi in rastlinskih hranil v tla" (UL RS ŠT. 68)) spells out the principles of control by state bodies and local authorities as well as obligations to the polluters. It also includes provisions, which are comparable to the EU Directive on Nitrates (91/676/EEC) and Code of Good Agricultural Practice.

Agricultural activities cause serious environmental problems in the Slovenian part of the Danube river basin. The situation analysis has actually pointed out four main causes leading to pollution:

- inappropriate land and water resources management;
- inadequate use of pesticides and fertilizers;
- inappropriate fish farm management;
- inadequate treatment of animal farm wastes.

Although agricultural activities cause similar problems in the whole Slovenian part of the Danube river basin some particular problems have been stressed in the three main catchment areas.

These activities have further led to dispersed pollution and eutrophication of surface and ground waters, decline of wetland areas and insufficiency of water resources due to extensive water abstraction for irrigation purposes in addition to other human uses.

3.1.1.2. Stakeholders Involved

Consequently, the stakeholders involved are policy and decision-makers, planners and researchers, polluters, as well as people in general and local inhabitants in particular affected by the environmental consequences of inadequate agricultural practices. Altogether, the stakeholders can be considered in three groups of organizations, participating in the decision making process, polluters and affected stakeholders.

Organizations

The **Ministry of Agriculture, Forestry and Food** (MAFF) is responsible for preparation and implementation of policy guidelines and legislation, including determination of standards for farm construction and regulation on the input of toxic substances and nutrients (Regulation 68/96). In this context, it has to define the role of land ownership and support introduction of sustainable technologies in agriculture, introduction of rotation of crops, introduction of organic farming and convenient distribution of agricultural land. It also has to provide an efficient Agriculture Advisory Service and, where necessary, a good Forecasting Irrigation Service as well as organize training courses for farmers (specialized schools).

Ministry of the Environment and Physical Planning (MEPP) is responsible for implementation of EIA (environmental impact assessment) and environmental measures, international conventions and other treaties. It also has to provide standards for planning construction and management of fish farms. Both Ministries (for agriculture and for the environment) are responsible for law enforcement, improvement of economic policy, implementation of the EIA and co-operation between sectors.

The **Slovenian Government** is responsible for introducing favorable conditions supporting intersector co-operation (MEPP-MAFF). While the **Inspectorates** have to control the use of fertilizers and pesticides or other chemical compounds used in agriculture.

Polluters

Polluters, include large private farms, household crop and animal farms, fish farms, which are based on intensive production and lack knowledge of appropriate use and negative effects of chemical compounds.

Affected

The group of affected by the environmental consequences includes population in intensively used agriculture areas and visitors to these areas (especially due to pollution of drinking water) and the farmers themselves who depend on the local water resources.

However, due to agricultural pollution also plants and animals of the affected ecosystems are endangered (especially water and wetland dependent species). Pollution further causes health risks and decline of amenity values of these areas.

3.1.1.3. Current Strengths/Assets

The main causes leading to the current situation include the development policy focusing on and supporting intensive and quantitative production; lack of control of agricultural practices and lack of adequate knowledge.

In the situation analysis for agriculture the following favorable conditions or assets were identified:

- Implementation of the Regulation on the input of toxic substances and nutrients (Uredba o vnosu nevarnih snovi in rastlinskih hranil v tla, 68/96)
- Provision of standards for planning, construction and management of farms (livestock and fish)

- Implementation of EIA (environmental impact assessment)
- Introduction of sustainable technologies in agriculture
- Implementation of ratified international conventions and treaties, especially the Convention on Biodiversity (CBD)
- Promotion of training of farmers (specialized schools)
- Development of intersector co-operation, particularly the established official co-operation between MEPP and MAFF in implementation of the CBD
- Improvement of distribution of agricultural land and land ownership
- Agriculture Advisory Service
- Introduction of rotation of crops
- Introduction of organic farming
- Improvement of Forecasting Irrigation Service

Adopted legislation and approved policy development can provide for implementation of the ratified international treaties and convention. The approximation process and harmonization of national legislation with the EU legislation and regulations, particularly the agro-environmental provisions can assist in building and promoting sustainable agricultural practices, adequate knowledge and trained human capacities.

3.1.1.4. Analysis of Transboundary Effects

Decline in water quality due to agricultural practices in Slovenian part of the Danube river basin can lead to transboundary effects. On the one hand, these can be seen in changes of water quality and quantity, and on the other hand, in alterations of downstream ecosystems and species.

As it will be described later in the situation analysis, we have found out that agricultural activities leading to pollution have some undesirable transboundary effects. For example, increase in water pollution in Slovenia can have an impact on the water quality in Croatia as well.

The main expected transboundary environmental consequences could be due to:

- introduction of alien species and competition with local species
- deterioration of biocenoses
- accumulation of harmful substances in food chains / negative impact on human health, water and wetland ecosystems
- increase in pesticides and nitrate contents in surface and groundwater
- changed water quality and quantity
- increase in content of toxic substances
- downstream pollution and overloading of water and wetland ecosystems

It has to be taken into consideration, that pollution generated in Slovenia can have negative impact on the water quality in Croatia if adequate treatment of wastewater from farms and reduced pollution of surface and ground water are not achieved. Like in Slovenia, the main source of water supply in Croatia is underground water of the Drava and Sava river basins. If the environmental problems are not considered and resolved effectively, tensions between the two countries can occur.

3.1.2. Sector problem analysis

3.1.2.1. Core Problem

Based on earlier discussions and information obtained during the workshop, especially the results of the working group dealing with agriculture, the Core Problem affecting the environmental quality and ecological character of water ecosystems was identified as follows:

"IMPROPER AGRICULTURAL PRACTICES"

The Core Problem summarizes the current situation of a number of the environmental problems resulting from application of improper agricultural practices in Slovenia. Recognition of the core problem helped guiding subsequent discussions of the working group towards identifying some more specific problems for each source of pollution.

Management of land is not adequate, due to the following factors: inappropriate land-use, neglecting of landscape diversity and inadequate irrigation management. Fish farms are the special agricultural problem with roots in inappropriate locations, inappropriate selection of species, as well as feeding practices and not sufficient treatment of wastewaters. Because legislation is not respected enough crop production is too intensified which contribute to inadequate application of pesticides and fertilizers. Problems connected with farms as inappropriate size of livestock farms, inadequate locations and inappropriate waste water and manure disposal from farms, contribute to inadequate treatment of wastes from farms.

3.1.2.2. Causes leading to Environmental Problems

In addition to other problems, water quality of the Slovenian part the Danube River Basin is declining due to improper agricultural practices, of which the following four have been focused upon:

- inappropriate land and water resources management
- improper use of pesticides and fertilizers in agriculture
- inappropriate fish-farm management
- inadequate treatment of animal farm wastes

Each of the four main direct causes has a number of sub-causes shown in the Problem Tree and briefly explained hereafter.

(i) Inappropriate land and water resources management

Inadequate use of pesticides and fertilizers has three main reasons, which are:

a. Inappropriate land use

Inappropriate distribution of land and fragmentation of agricultural land can be among the main social factors of inappropriate land use, which cause decline in water quality.

b. Neglecting of landscape diversity

Current agricultural practices have neglected the functional importance of rich landscape and biological diversity. Sector planning has been sector oriented, very often without environmental knowledge due to lack of environmental education. In addition to insufficient co-ordination between sectors and non-systematic approach in preparation of regional plans also the background studies have been lacking. Such a narrow approach has lead to canalization of water streams and clearance of riparian vegetation. Furthermore, land reclamation and land consolidation brought substantial changes in the lowland rural areas.

c. Inadequate irrigation management practices

Some parts of Slovenia, especially its sub-Mediterranean and sub-Panonnian areas are in the growing season water deficient. At the same time, these are agriculturally important areas. As a consequence of the above mentioned practices, irrigation was never controlled. Sector approach in planning and implementation of irrigation practices caused overuse of available water resources. This was partly due to lack of information exchange as well as due to application of high water consumption and out-of-date technologies.

(ii) Improper use of pesticides and fertilizers in agriculture

Misuse of chemical substances in agriculture causes major environmental problems. It is the principal cause of non-point source pollution in the rural areas. There are three main reasons for improper use of pesticides and fertilizers.

a. Inadequate application of pesticides and fertilizers

On the one hand, due to ignorance of users, and on the other hand, due to insufficient control and non-compliance with regulations overuse and misuse of pesticides and fertilizers is a common practice. Additionally, ignorance and negligence of natural laws as well as lack of environmental awareness stipulate use of chemical substances in agriculture. When combined with uncontrolled irrigation and high water consumption technologies the use can have degrading effects on the quality of water and its biota.

b. Intensive crop production

Current agricultural practices support intensive agricultural production. Such a production is highly mechanized and harvest depends on crop selection as well as extensive application of fertilizers and pesticides.

c. No respect of legislation

Becoming aware of environmental consequences of intensive agricultural practices the new legislation and policy orientation needs to consider these problems (Regulation 68/96). However, due to lack of environmental knowledge and short-term profit oriented production, farmers violate the laws, control is insufficient and sanctions are not applied.

(iii) Inappropriate fish-farm management

Increasingly, inappropriate fish farm management has become a critical point source causing pollution of water resources. Four main reasons for inappropriate fish-farm management occur.

a. Inappropriate feeding practices

Lack of environmental awareness and concern can very often result in application of inappropriate feeding practices.

b. Inappropriate location of fish farms

Lack of environmental awareness often also leads to construction of fish farms at inappropriate locations. Consequently, a number of wetlands have been converted into fishponds causing degradation and loss of natural ecosystems.

c. Inappropriate selection of species

Additionally, high and intensive production is based on introduced alien species, which often compete with native species.

d. Inadequate waste water treatment

However, all these impacts cumulate. The local environmental carrying capacity, uncontrolled discharge of waste water and lack of management control due to the over-sized fish farms cause eutrophication and biocenosis decline in stream waters.

(iv) Inappropriate management of animal farm waste

Inappropriate management of waste on some large livestock farms in the eastern part of Slovenia has already caused several environmental problems locally and in the catchment area. The main reasons for inappropriate management of waste from animal farms is the following:

a. Inappropriate waste water disposal from animal (pig) farms

Large pig farms are causing serious water pollution problems. This fact is largely due to lack of information about animal farms and their technologies and lack of wastewater treatment facilities. Ineffective control and inspection as well as no punitive action encourage violation of the law.

b. Insufficient management and unsuitable location/size of animal farms

Inappropriate analysis of the environment and lack of information on the state of environment contribute to neglecting of environmental characteristics and inappropriate location and size of the farms. Lack of sector co-ordination in land use and short-term financial benefits further stipulate development of animal farms.

c. Inadequate manure disposal and management

The main cause of water pollution is related to inappropriate manure management. Lack of knowledge about manure management causes, on the one hand, construction of inadequate manure pads and lack of wastewater treatment facilities, and on the other side, inappropriate handling and application of manure in the agricultural areas.

3.1.2.3. Environmental Effects

The environmental consequences of inappropriate actions are the following:

- **Negative impact on the quality and quantity of hydrological regime**

  Inappropriate land and water resources management resulted in loss of fertile soil, fluctuations in groundwater level (especially during summer season) and fluctuations of water level in the surface reservoirs and alteration of hydrological properties.

- **Changes in river dynamics**

  Above mentioned negative impacts of inappropriate land and water resources management are consequently reflected in changes of river dynamics.

- **Negative impact on water (+wetland) ecosystems**

  Inappropriate fishfarm management is responsible for release of nutrients into stream waters, eutrophication, occurrence of alien species which often compete with local species and biocenoses decline causing considerable impact on the source area of water streams.

- **Loss of biological diversity**

  Negative impacts on the quality and quantity of hydrological regime result in decline of crop production and generally increase risk in production and loss of biological diversity. The later is especially evident in degradation of wetlands, loss of wetland-dependant species and reduction of their ecological functions.

- **Water pollution by nutrients and pesticides (surface and ground waters)**

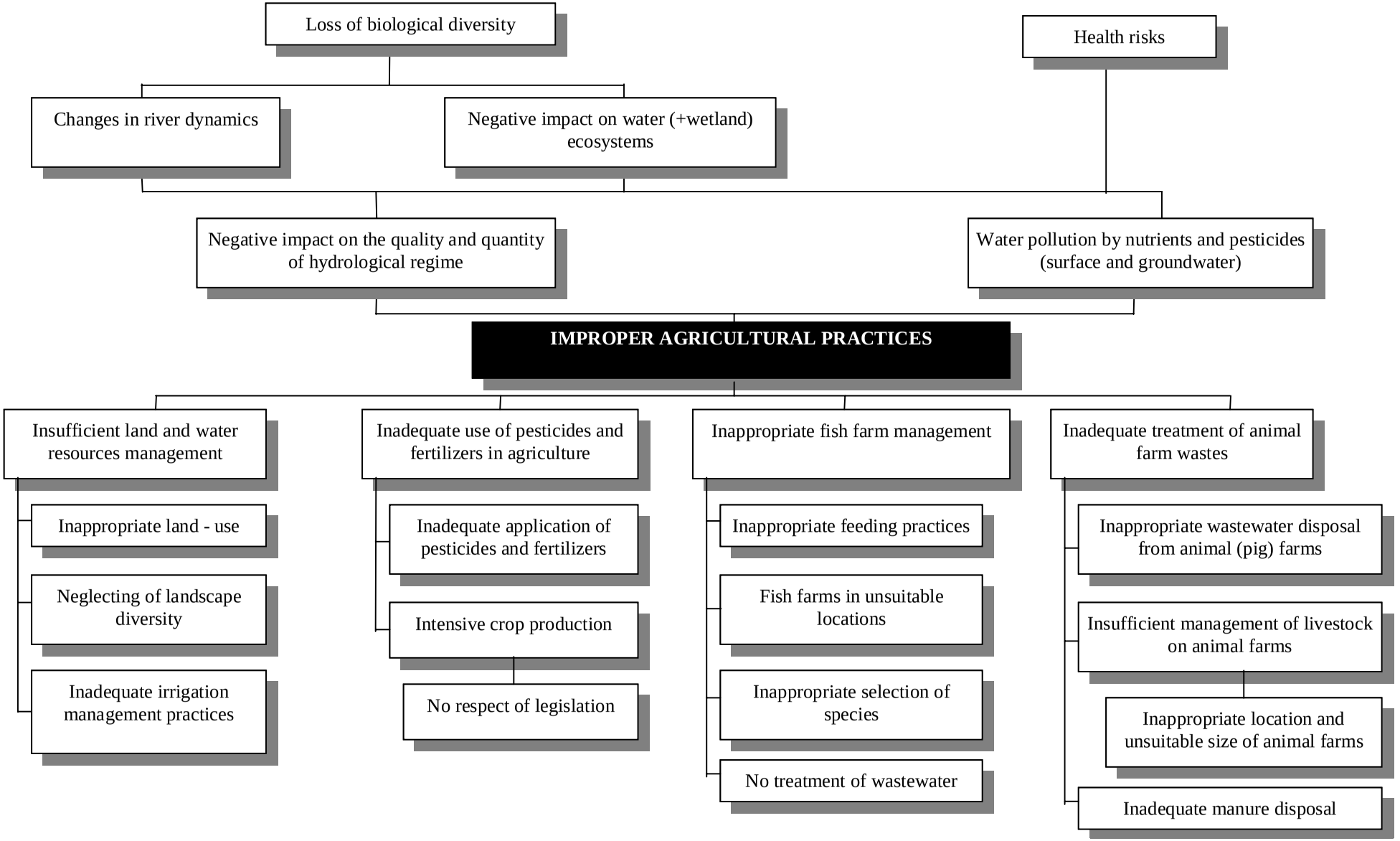
  The major consequences of inappropriate management of wastes from animal farms include leakage of substances from inadequately managed manure pads (from animal farms) into soil, groundwater, flowing and stagnant waters as well as bad small, especially during specific weather conditions.

- **Health risk**

  Increased level of pesticide residuals and nitrates content in surface waters and groundwater, and accumulation of toxic substances in food chains leads to negative impacts on human health.

Problem Hierarchy

1. Agriculture



3.1.3. Objectives, Expected Results, Actions and Related Projects

Analysis of the situation has brought up the sector objective, which has been identified as:

"SUSTAINABLE AGRICULTURAL DEVELOPMENT AND CONSERVATION OF NATURAL RESOURCES".

Achieving this objective can contribute to accomplishment of the programme objective, i.e., **"Improvement of water quality in Slovenian part of the Danube River Basin"**.

Sustainable development has to become more than a statement of the Rio Conference (1992) and thus, it has to be incorporated and carried out nationally and locally by all sectors and in all activities.

Therefore, for achieving sustainability in agriculture development and conservation of natural resources four outputs have to be accomplished:

- application of integrated land and water management;
- achievement of appropriate use of pesticides and fertilizers;
- adoption of appropriate fish farm management;
- implementation of appropriate animal waste management.

(i) Application of integrated land and water management

In order to achieve integrated land and water management the three main activities have to be undertaken related to sustainable agriculture, intersector co-operation and the "hot spots" in the following fields:

- agricultural practices
- cooperation among sectors
- hot spots

Consequently, it is anticipated to:

- **introduce sustainable agriculture practices**, particularly management planning and implementation of sustainability principles. For this purpose, it is necessary to identify key ecological, landscape and human induced processes (erosion, flooding). Furthermore it is crucial to introduce appropriate regional planning and elaborate maps, integrate land and water regime management as well as include sustainable agriculture into development priorities of agriculture sector. For practicing sustainable agriculture the importance of breeding and utilizing autochthonous breeds has to be stressed. This action has to support those traditional farming practices that are sustainable and introduce sustainable technologies. However, it also has to conserve or establish ecological corridors in order to maintain and conserve rich diversity of native species and ecosystems (biodiversity).
- **improve co-operation between various sectors**. Sustainability requires intersector co-operation, therefore all involved sectors have to consider the principles of sustainable development and the natural characteristic of a catchment area. For an effective sector co-operation conditions need to be defined. In the international conventions and agreements the basic principles and provisions have been set which have to be elaborated and implemented through national legislation as well as national and local environmental plans (Agenda 21).
- **rehabilitate "hot spots"**. Although Slovenia still has quite well preserved natural and semi-natural ecosystems, certain areas have been seriously affected due to the "hot spots" of pollution. To assure achievement of the above mentioned objectives we have to

elaborate and implement rehabilitation programmes, particularly in the affected areas and prevent occurrence of new "hot spots" due to current agricultural practices. To lessen the impact of fertilizer and pesticide use on the water quality buffer zones have to be conserved or reintroduced. Practically, this means to conserve riparian vegetation and wetlands and conserve the original riverbeds and river dynamics. Improvement of agriculture practices, however, is necessarily based also on controlling the use of chemical fertilizers and pesticides and introducing Integrated Pest Management (IPM).

The following project(s) have been identified for this activity:

Existing/On-going Project(s)

Some existing projects are already running which deal with the preparation of relevant legislation and policy. Currently, the Water Law, Regional Planning Law, Nature Conservation Law, National Environmental Programme and the National Biodiversity Strategy and Action Plans (NBS&AP), are the most important documents in preparation. For practical implementation of legislation and policy measures preparation of the National Wetland Inventory, listing new Ramsar sites and carrying out the National Programme of Protected Areas (nature parks) are equally important as are the preparation of groundwater protection model for the arable areas, project on ecologically sustainable manure disposal and smell pollution abatement project on the pig farm Podgrad (Phare D7). Integrated management of catchment areas and integrated evaluation of surface waters will considerably contribute to implementation of integrated land and water resources management.

Proposed Project(s)

Some proposed projects that can help to improve the situation include preparation of a training course for catchment management planning (CMP), defining buffer zones (area, size) for agricultural areas and practical application of the functional analysis of floodplain wetlands in the Slovenian catchment area of the Danube basin. For better use of water resources establishing of a system of irrigation stations working with the Hydro-meteorological Institute could be useful.

(ii) Achievement of appropriate use of pesticides and fertilizers

To achieve appropriate use of pesticides and fertilizers four main activities are required in the following fields.

- legal provisions for pesticides and fertilizers use
- agricultural practices
- education of farmers and advisors
- public awareness

It is necessary to:

- **implement the legal provisions for pesticide and fertilizers use**. To assure implementation of legal provisions several elements have to be considered and refer to knowledge and use of chemical products. For the purpose, implementation legislation has to be harmonized with the EU standards and amended Regulation 68/96 (shorter moratorium period). Providing that supervision on the distribution of mineral fertilizers and chemical substances includes consideration of ecological conditions dosage and application of these substances will be better controlled. Sale and use can also be controlled by establishment of stimulative price policy and good monitoring system. An essential element for achieving any one of the discussed objectives is, however, raising environmental awareness and technical knowledge of farmers and users in general.

- **introduce sustainable agriculture practices**. Introduction of sustainable agricultural practices will also require subsidized investments for sustainable agricultural production and sustainable farming. Sustainable farming methods can be introduced by implementation of various pilot projects on sustainable farming and introduction of trade marks for products of integrated agricultural production. The results of the applied research have to be evaluated to consider the follow up of such pilot projects.
- **educate farmers and Agriculture Advisors to improve farming practices**. It will be necessary to organize awareness courses for potential users of government subsidies and capacity building schemes. In this context, NGOs can be of great help. All services and actors have to introduce environmental considerations into their planning and management activities. Farmers need to have a better technical knowledge of alternative techniques, e.g., IPM practices.
- **raise public awareness on sustainable agriculture**. Raising public awareness is an important process contributing to development of sustainable agriculture and appropriate pesticide use. It can be achieved through media (TV, radio, newspapers, etc.), publications and leaflets. Organizing campaigns on application of organic fertilizers as well as meetings and workshops for educating farmers on "green fertilizing" practices can help considerably to achieving their full co-operation. Raising public awareness of environmental problems is very important. Without public awareness and support the achievement of the results will be hindered.

  For this activity the following project(s) have been identified:

  Existing/On-going Project(s)

  In addition to preparation of local Agendas 21, an important existing project is referring to implementation of the Regulation N^{o} 68/96.

  Proposed Project(s)

  Workshop participants, however, suggested some new projects dealing with introduction of "catch crops", monitoring the ecological impacts of fertilizers and pesticides in irrigated areas, environmental education of the local agriculture advisors and introduction of sustainable agricultural production on pilot farms.

(iii) Adoption of appropriate fish farm management

Fish farms are an integral element of production, as well as water and landscape use. To adopt appropriate fish-farm management, it is crucial to undertake actions in the following fields:

- construction and maintenance of fish farms
- species to be bred in fish farms
- training of fish-farm managers

It is foreseen to:

- **undertake measure for construction and maintenance of fish farms**. The most important elements in undertaking measures for construction and maintenance of fish farms are related to legal provisions, planning and construction practices. It is necessary to provide compliance with standards and legislation, improve planning and expertise (suitable location and appropriate stock capacity, technology and maintenance) as well as to introduce compulsory monitoring of fish farm functioning and discharge of effluents as well as provide regular checking of inspection services. Rehabilitation of inappropriate fish farms is an integral component of any plan aiming at improving the current situation.

- **define species to be bred in fish farms**. It is necessary to raise awareness of fish farmers. In this context, breeding native species and complying with standards and regulations (use punitive measures, incentives and disincentives) is of critical importance. Indirectly breeding autochthonous species could be also promoted if the locally bred fish were used for local tourist consumption.
- **train fish farm managers**. An additional way to improving the situation is by training the fish farm managers. It is necessary to determine minimal technical skills and to provide continuous education and training (provided by agriculture advisors and training courses). For running education and training courses and establishing monitoring schemes state subsidies need to be provided at an early phase.

For this activity the following project(s) have been identified:

Existing/On-going Project(s)

Supporting breeding of local species and wastewater management on fish farms in Slovenia are the two currently existing projects.

(iv) Implementation of appropriate animal waste management

Livestock farms being one of the main causes of the point source pollution need to implement appropriate animal waste management. For achieving this aim the main activities are in the following areas:

- livestock breeding
- waste water discharges from farms
- regulations in manure management

It is necessary to:

- **introduce sustainable livestock breeding**. Sustainable animal farming incorporates several elements. The most important have been recognized in, on the one hand, determining incentives for sustainable livestock breeding, including research institutes (research possibilities, technologies), training farmers and agricultural advisors, assisting small farms in introduction of sustainable livestock breeding. On the other hand, legal provisions have to be strengthened and standards for environmentally sound farm production better defined and upgraded. Additionally, the areas where surface and underground waters are threatened by livestock breeding have to be mapped and monitoring provided. It is also critical to start research and consultation on optimal size of animal farms and determine standards according to the size of farm.
- **improve control and planning of wastewater discharge from farms**. Improving discharge of wastewater requires some remedial action mainly referred to the "hot spot" sources of pollution. On the one hand, it requires an inventory of “hot spots”, and on the other, better inspection and monitoring, and implementation of punitive measures (fines) for polluters. Establishment of information system, rehabilitation of inappropriate manure pads and construction of WWTP on animal farms can greatly improve the present critical situation.
- **reinforce control on implementation of the regulations in manure management**. For reinforcing control it is necessary to plan application of manure (criteria: plant demand for nitrates), train livestock managers (farmers) on manure management possibilities and introduce new technologies for manure handling. Crucial again is education at all levels of society and general public, monitoring and providing effective inspection services.

For this activity the following projects have been identified:

Existing/On-going Project(s)

Although there is an existing project on management of animal waste produced on pig farms in Slovenia, there is a need for projects that would consider particular types of pollution more in depth.

Planned Project(s)

Projects in preparation are on defining eligibility criteria for subventions and subsides for sustainable breeding of livestock, preparation of an inventory (register) of polluters, and management of the manure and construction of WWTPs for the agriculture co-operative “Rakican” and pig farm “Ihan”.

Proposed Project(s)

There are three additional proposed projects: preparation of a programme for raising awareness and knowledge of farmers, introduction of good agriculture practices on pilot farms and rehabilitation of inappropriate manure pads.

3.1.4. Important Assumptions for the Sector

Some external factors or assumptions are critical for reaching the sector objective, "Sustainable agricultural development and conservation of natural resources", and for successfully carrying out the programme. Although being outside its scope these assumptions can affect the outcome of the programme. Important assumptions must be considered if the objectives defined at a higher level are to be achieved.

For achieving the four major results or outputs the following four assumptions have to be accomplished at the **activity** level:

- **Agro-environmental legislation together with sufficient inspection services is efficiently implemented.**

  In the approximation process this legislation has to be drafted at the national level and agriculture and environment sectors will have to work together to implement it efficiently.

  Due to lack of control and often violation of the law in the past, it is necessary to provide regular inspection. This can have a two-fold effect, stimulate those who do respect the law and urge the others. Altogether, inspection can overview implementation, help people understand the legal measures and considerably help in achieving the overall goal.

- **Incentives for sustainable animal husbandry are provided on time.**

  Part of this is maintaining the local breeds of sheep, pigs, poultry, cattle and horses. There is a need to support those farmers who keep the local biodiversity of natural and cultural landscapes and maintain autochthonous species of livestock and their gene pools.

- **Effective co-operation between ministries and common agreement between sectors is obtained in the long-term.**

  Co-operation was neglected in the past. Some steps have been undertaken between MEPP and MAFF which should be further developed and go beyond the preparation of implementation legislation, for example, regulation on use of chemicals and fertilizers in agriculture, to common implementation of EIA in the plans for land reclamation and improvement of agricultural land, etc. To date, sector co-operation is still scattered on individual initiatives or requirements and it can be considered at different levels.

- **Reconstruction of the "hot spots" is ensured or provided.**

  Rehabilitate the degraded agricultural areas (intensive agricultural production) is one of the necessities not only for improving the water quality and quantity in Slovenia, but also for achieving the programme goal.

Consequently, the agriculture sector goal can only be reached if the following assumption at the **result** level is fulfilled:

- **Sustainable agriculture considered the priority issue for inter-sector co-operation.**

  Altogether, Slovenian agriculture has still to consider how to incorporate the sustainability and biodiversity principles into its implementation policy. The aim of sustainable agriculture should go beyond consideration of sector development and consider the inter-sector interests.

3.1.5. Impact indicators for Sector Results

Impact indicators are used to define the contents of the sector objectives and sector results in measurable terms (referring to quantity, quality, target group, partner institution, time period and place).

The following four impact indicators were identified for the results or outputs.

For the result 1.1:

- **By the year 2010, integrated management of the Sava, Drava and Mura river basins achieved by inter–sector co-operation and implementation of the environmental legislation providing the EU directives have been fully incorporated into implemented legislation.**

  Many problems derive from lack of integrated catchment management. Integrating land-use and water resources management in inter-sector planning for the entire catchment will contribute to more efficient use of water, allocation of development and improvement of natural and semi-natural ecosystems.

Result 1.2:

- **By the year 2002, the use of fertilizers and protective substances (pesticides) decreased by 10% on 50% of the arable land in the Pomurje and Podravje region and the Savinja valley reducing the contamination of ground water by nitrogen and pesticides residuals.**

  One of the main sources of pollution is application of fertilizers and pesticides in Slovenian lowland areas where intensive agricultural production is an important economic activity. Decreasing application of the chemical substances in agriculture and supporting the IPM will contribute to improvement of lowland ecosystems (particularly wetlands and waters) and environment in general.

Result 1.3:

- **By the year 2005, all fish farms in the Slovene part of the Danube river basin have introduced management in compliance with the criteria for construction, operation and maintenance of fish farms and at the same time decreasing pollution of the surface water by nitrogen.**

  Nitrogen is one of the pollutants that are generated also from the fish farms. Implementation of new laws and improved construction of fish farms and their operating schemes will considerably help in lowering pollution levels of nitrogen.

Result 1.4:

- **By the year 2005, in the Slovene part of the Danube river basin, pollution of waters with animal waste has decreased at least to the "MAC" levels of allowed concentration and in compliance with the "GAP.**

  In addition to fish farms, animal farms are one of the main of point sources of pollution from agricultural activities. To reduce the pollution better planning and improved legislation are needed. Law implementation and compliance, however, is crucial to meet the international standards.

3.2. Industry, Tourism and Transport

3.2.1. Situation/Stakeholders Analysis

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

Industry (including tourism and transport) belongs to the main anthropogenic sources of water pollution. The quantity and quality of wastewater generated by the different polluters in industry are not fully controlled by authorities. According to Slovenian legislation, only bigger polluters (around 680) have to establish monitoring of their waste water which is done by independent laboratories accredited by the MoEPP (Ministry of the Environment and Physical Planning). Pollution from tourism is generally not monitored, as it sinks into the municipal sewerage systems (in cities) or is let into the environment (in the country). The same is valid for the traffic, although due to new guidelines for highway construction, runoff from paved surfaces must be pretreated before let to the environment. This pretreatment involves sedimentation and retention tanks that are capable of caching the first "flushing wave", or spills of dangerous substances (oil – 20 m^3).

Pollution caused by industry has decreased over recent years partly as a result of reduced economic activities in certain key sectors (many of the heavy metal industrial companies have ceased operation since 1990), partly as a result of the approximation process to EU and other international legislation and market conditions.

Industry is typically connected to municipal sewerage, or has its own direct outlets to recipients (mostly rivers). The overall treatment performance on municipal WWTPs (WasteWater Treatment Plants) is rather low, as secondary (biological) and tertiary treatments are not extensively developed. At present there are no official (reliable) data available on the pollution load generated, nor on the pollution eliminated in the wastewater treatment facilities[1]. Still, studies and assessments exist where this loads and efficiencies are estimated by experts on present state of monitoring and experiences gained. It is expected that from this year (i.e. 1998) MoEPP will have a reliable cadaster on polluters, pollution sources (emissions into the environment) and efficiencies of treatment on industrial, as well as municipal WWTPs.

The Environmental Protection Act (EPA) of 1993 and the national water resources strategy are the two fundamental statements of objectives for water policy and management. The EPA - including its implementing regulations - concentrates on the control of water pollution from point sources. It sets out the principles of control by the State, local authorities and polluters, of liabilities for pollution and damage, and of public access to relevant information.

The National Programme for Environmental Protection (NPEP) along with water resources strategy is in preparation by the MoEPP. It will aim at ensuring sufficient and sustainable water supply for all users. Drinking water supply is a priority, although environmental issues have very high priority.

Regulations required by the EPA focus on emission limits for wastewater discharges and all aspects of monitoring. They were adopted through various decrees since 1996. The intention is to regulate discharges from industry in agreement with the EU water quality legislation. Detailed decrees regulating calculations of charges and fees and on EIA are also required.

[1] Source: Environmental Performance Reviews, Slovenia (published by United Nations: New York and Geneva, 1997)

Roughly, half of the collected wastewater is treated on WWTPs. Only some industrial plants have their own pretreatment of wastewater before inlet to municipal sewerage, or to environment. These are usually the ones with high COD/BOD ratio, toxic, or dangerous substances. The industries with lower COD/BOD ratio and total BOD loads are usually directly connected to municipal sewerage.

3.2.1.2. Stakeholders Involved

The stakeholders involved in water pollution problems in the sector can be divided into three main groups of governmental and non-governmental organizations, polluting organizations and affected organizations.

Organizations

Ministry of Environment and Physical Planning (MoEPP) has the responsibility to (or give permission to) plan, execute, monitor and prosecute the development of activities, which deal with natural resources, spatial (physical) change or occupation, and environment in general. The preservation of the environment along with the sustainable development are its main tasks. The ministry is also responsible for legal aspects, e.g. introduction and execution of environmental legislation.

Ministry of Health, contributes the most by setting standards of environmental quality (pollution loads) and monitoring the environment and public health. The ministry is responsible for introduction of legislation concerning pollutant concentration in food, and human-living environment.

Ministry of Education and Sport can contribute through proper education at all stages and for all profiles in schools, and after the school, i.e. at the workplace, free-time, sports, etc.

Local authorities have their plans for development and use of natural resources, pollution reduction, environmental protection, can assure funding, etc.

Ecofund is granting or lending money for ecologically sound projects in cooperation with MEPP, so in this way it directs money to be spent more efficiently

Public companies mainly those for public services, e.g. water, wastewater, wastes, etc. They shall endeavor to reduce the costs of pollution reduction, reduce the costs of environmental protection and optimize (maximize) the effect by treating more and more pollution.

Non-governmental organizations (NGOs) have a role of counter-balance to governmental organizations and represent the voice of the local people. They can be a nice partner to the Ministry of Education and Sports in educating people, raising environmental awareness, engaging people in active work for environmental protection (e.g. interpreting the environmental data from different sources), etc.

Polluters

Industry connected to public sewage system usually has no pre-treatment, although the waste-waters might not be suitable for release into the municipal sewerage – thus also municipal waste water is affected and finally treatment efficiency at WWTP's decreased. Here, cooperation among the industrial and municipal sector is crucial.

Industry with direct outlet of sewage water to environment is most evident polluter of the water and consequently all environments. Municipal sector and also agriculture might be involved in solving the problem.

Industry with solid and/or dangerous waste can pollute soil, water and air with improper handling, processing, and storage or final disposition of these sorts of waste.

Transportation companies and individual transporters pollute mostly with combustion engines that use oil or gasoline and produce CO, NO_x, add to photochemical smog, increase toxic concentrations of O_3, release of mineral oil from engines, brake systems, etc. But also pollution due to accidental spills of transported matter, dangerous to the environment, is not rare.

Organized tourist sites (hotels, spas, recreation areas, etc.) and individual tourists pollute through their activities and also due to low level of environmental culture, partly due to economic interest and lack of proper control and prosecution. Cooperation with municipal sector is crucial to reduce pollution.

Affected

Affected stakeholders include population living in Slovenian part of the Danube River Basin, especially ones living close to watercourses and lakes (natural and artificial). Transboundary stakeholders are populations along the Sava, Drava and Mura Rivers along with the Danube River until the Black Sea.

Population is affected in several ways, but mainly with increased charges for drinking water treatment, degraded water-courses and environment in general, loss of bathing waters and recreational areas, losses in fishery, etc.

Agriculture can be also affected by polluted water in the way that the water is not suitable for irrigation of crops, or is not suitable for animals, etc. Commercial fisheries have losses due to fish kills, or reduced catch, bad quality of fish, extinction of certain sorts of fish, etc.

3.2.1.3 Current Strengths/Assets

The following assets and achievements have been identified for the sector industry, tourism and transport (and are also very much the same as for the sector municipality):

- Existing legislation and the one in preparation
- Various Technologies
- Taxes and incentives
- Existence of suitable funds (ECO Fund)
- Concessions
- Privatization process in public owned enterprises
- Education and raising awareness
- Monitoring, control, inspection
- Experts and institutions which deal with industry and environment

These assets are explained below in more details:

- **Existing legislation and the one in preparation**

  Ministry of Environment and Physical Planning (MoEPP) has developed new environmental legislation in the past few years. MoEPP is paying special attention to harmonize new legislation with European Union Legislation. The Environmental Protection Act (EPA) is fundamental law for environmental policy. It is the basis for the preparation of other legal instruments in the field of environmental legislation. Water Law is in preparation. On the other hand existing legislation enables carrying out measures, which are leading to improved environmental and more specifically, water quality. Besides legislation, planning measures are also developed, or given permission at/by MEPP. It is expected that local communities will be organized on the regional (catchment) level and thus enable introduction of CMP (Catchment Management Plan) practice. This reorganization is not foreseen to be dictated by legislation.

- **Various Technologies**

  To improve water quality, EU standard emission limit values and best available technology (BAT) are the guiding principles for the MEPP. Existence and knowledge of various technologies that are in accordance with specific conditions in Slovenia regarding financial capability and state of environment can contribute to quicker improvement of water quality. Open European market and international competition along with the strict control over ecological dumping already now dictates that Slovenian industry restructures along the mainstream in EU. That's why BAT principle is not imposed by law, but has come by itself due to market conditions.

- **Taxes and incentives**

  The Decree on water pollution tax says that all polluters including the inhabitants should pay the tax proportional to the volume of pollution loads of the wastewater discharged. The tax will be paid to the state budget. The present ordinance gives a possibility to all who are liable to taxation to be exempt from it if the revenues collected are used to fund the projects aimed at reducing water pollution (waste water treatment plants, sewerage systems...). By implementing this ordinance the purpose of encouraging the polluters to reduce the pollution to permitted levels was achieved. Instead of paying the tax, the collected money is functioning as an incentive for remedial actions. In the transition period, until Slovenia is fully harmonized with EU legislation and standards, a lot of money will be needed for the improvement of the environment, of which the majority will go for waste-water collection and treatment. Several research programs are running considering this issue, being elaborated by Slovenian and international experts (DISAE, PHARE, GEF, etc.)

- **Existence of suitable funds (ECO Fund)**

  Eco-fund, which is a special institution originating from MEPP, can contribute to financing ecological projects, e.g. pollution reduction in industries. It works in accordance with the Ministry of Environment and Physical Planning and thus enables optimal use of available funds for the top priority projects. Slovenian banks are also prepared to finance ecologically sound projects.

- **Concessions**

  One of the main activities for improvement of water quality is construction of wastewater treatment plants. This is directly linked with the financing problems. One of the means of financing construction of wastewater treatment plants is by granting concessions. Existing regulations enable to grant concessions for building and also operating wastewater treatment plants. One of the first BOT projects in constructing WWTP is under way in Maribor on the Drava River. It will serve also for many industries, which are connected to municipal sewerage system (more than half of load is from industry). It is expected that concessions will help attract private money for public infrastructure and thus reduce pressure on State's and local authorities' budgets. Still, due to the fact that concessions were not known in former economy of Slovenia, there is a certain concern about the quality of the service, possibilities of public (customers') control, fate of the infrastructure after the concession ceases, etc. Concessions for commercial purposes (e.g. electricity production) are thus even more strictly inspected.

- **Privatization process in public owned enterprises**

  Practically all industry was publicly owned before 1991, when privatization process started. Now the process is almost finished, except for the companies, which are in red numbers and are under special surveillance of the State Agency. A lot of companies have also bankrupted. These were mostly the bigger polluters (steel industry, paper mill and pulp industry, chemical factories, wood processing, etc.) Other have changed technologies to be more competitive on the EU and World market, which has led to

reduced pollution emissions and immediate improvement of the environment, water in first place. From the PPP (Polluter Pays Principle) point of view it is a lot easier to prosecute a private, than a publicly owned industry (e.g. due to the socialization of the problems). It is expected that Slovenian industry will follow now the legislation and environmental standards more strictly, what improve the status of the environment.

- **Education and raising awareness**

  Slovenia has relatively long tradition in the field of environmental education. NGO's have very important role in education and raising of awareness by organizing educational and training programs, nature protection actions, ecological summer camps, etc. Slovenia has joined the European program "Eco Schools". The program is supported by the Ministry of Education and Sports and it aims at involving pupils in elementary schools, their teachers and parents in a predetermined environmental activity every year. An additional action is repeated each year, entitled Water Detective, which asks the pupils to investigate certain water pollution problems in their neighborhood. Environmental engineers are developed at Universities in Ljubljana and Maribor and postgraduate University in Nova Gorica (Faculty of Environment). Topics in environmental pollution and preservation shall be included in (at least) university curricula for faculties, which develop engineers or technologists for industry. We also expect a significant role of NGO's in environmental education and awareness rising.

- **Monitoring, control, inspection**

  All bigger industrial and municipal polluters must monitor their emissions to the environment. The monitoring is executed by accredited laboratories and by inspectors. At present, the most stress is given to monitoring of wastewater releases to the municipal sewerage or to the environment (watercourses), although also air emissions are monitored along with noise, ionizing and non-ionizing radiation, and material balances (e.g. bookkeeping of waste). We anticipate that the inspection will get more efficient with bigger authorization and that prosecution of polluters will be improved, too.

- **Experts and institutions which deal with industry and environment**

  There are a few governmental organizations (faculties, institutes) and private companies, which can give consultations and/or can design technologies and facilities for (industrial) pollution reduction and mitigation (old sites, etc.). Ministry of Environment and Physical Planning together with the Ministry of Science and Technology are regularly funding basic and applied research & development in the field of environmental protection.

3.2.1.4. Analysis of Transboundary Effects

Industrial, touristic and transportation activities leading to pollution have also some undesirable transboundary effects. Namely, pollution from Slovenia has an impact on environment in Croatia, as well as to the rest of the Danube River Basin (DRB). Besides our transboundary load we also listed load, which reaches us from Austria.

Main expected effects in Croatia are deterioration of surface water quality with possible effect on drinking water (Zagreb), flow of waste materials across borders, concentration of pollutants in water and in sediments (heavy metals from Austria), esthetical impairment due to changed appearance (color, drifted and floating matter, etc.), raising of water temperature due to cooling, possibility of radioactive pollution from nuclear power plant, etc.

Transboundary migration of exhaust gasses and fly-ashes of TEPP (Thermo-electric power plants) and traffic can have negative impact on environment and especially on water quality in Croatia, Austria, Hungary, etc., although up to now it was not explicitly reported.

The main source of water supply in Croatia is underground water, which is in some parts of Croatia supplied mostly by the Drava and Sava River. As unpleasant consequence, tension among countries due to unsolved environmental problems can occur.

Import and export of industrial and other hazardous wastes, which took place in past and left some long-term consequences is now regulated (The Basil Convention).

3.2.2. Sector Problem Analysis

3.2.2.1. Core Problem

The core problem for industrial sector is identified as follows:

"ENVIRONMENTALLY INAPPROPRIATE INDUSTRIAL, TOURISM AND TRANSPORT ACTIVITIES"

Environmentally inappropriate industrial, tourism and transport activities outline the situation of the environmental problems in Slovenia, steaming from industry, tourism and transport.

Wastewaters can not be adequately treated if the treatment of wastewater doesn't exist at all or WWTP are not adequately operating and the framework conditions are unfavorable. Industrial waste disposal, because of technology and site is not environmentally sound and the industrial processes in general, do not consider the natural elements enough. Big problem also causing the environmental inappropriate industrial activities are outdated technologies, unsustainable constructed dams and unfavorable cooling systems.

3.2.2.2. Causes Leading to Environmental Problems

Four main causes of the core problem were identified:

- insufficient waste water treatment
- inadequate use, transport and disposal of industrial and hazardous wastes
- inadequate production technologies
- weaknesses of tourism and transport activities

(i) Insufficient waste water treatment

Insufficient wastewater treatment is reflected in non-existence of treatment of wastewater, inadequately operating WWTPs and unfavorable framework conditions.

a. Non-existing treatment of waste water,

There are many big cities and industries in Slovenia without suitable waste water treatment plants or any, like in: The Sava River Basin (Celje - 75,000 PE, Laško - 75,000 PE, Ljubljana -300,000 PE, Novo Mesto -50,000 PE, Vrhnika -150,000 PE); Drava River Basin (Maribor -200,000 PE and in the Mura River Basin (Murska Sobota - 42,000 PE).

Non existence of treatment of wastewater is because of inefficient inspection control and not complying with legislation and international treaties (conventions).

Inefficient inspection control is repeating throughout all the identified main problems. The situation in Slovenia is maybe specific in the fact that we have quite advanced and elaborate legislation, which is close or already compatible to the one of EU, but the punitive measures are not always executed. This is mostly due to the social factor, i.e. if an industry is asked to pay for pollution, they have no money, so the workers will suffer – or even worse, the factory will have to shut down. Another problem with inspection is that the inspectors need to be additionally trained in some environmental issues and in integrated concept of pollution prevention.

Not complying with legislation and international treaties (conventions) results in mixing of municipal and industrial waters, what can lead to lack of discipline. Industrial water, which has not the characteristics of municipal water should be treated separately. This, of course raises the costs of production which are reflected in the cost of end product. To be competitive, Slovenian industry has in past omitted wastewater treatment (i.e. ecological dumping). Now, due to international market constraints, and especially the EU legislation, the situation is improving.

b. Inadequately operating WWTPs

For improper treatment of specific waste water from industry, tourism and transport we found several reasons; especially discharging waste water directly to watercourse or sewage system network, none or improper treatment of thermal and bathing water what leads to harmful consequences in water environment. Bathing water is highly polluted with oil, grease (suntan protective fluids), nutrients, chlorine (strong oxidizing agent, used for disinfection purposes) and needs pre-treatment at the site of origin.

Inadequately operating WWTPs is due to inefficient inspection control, outdated technologies of WWTPs, bad maintenance of existing WWTPs and not complying with legislation and international treaties.

Concerning the inefficient inspection control and non-compliance to legislation and international treaties, they are already described above.

The **outdated technology** of the WWTPs and the **bad maintenance of existing WWTPs** are closely correlated and they are due to:

- inadequate planning at all levels
- lack of knowledge of diverse groups, i.e. professionals, administration and common people (involved society)

This means that the most pronounced causes for unsatisfactory (low efficiency) waste water treatment are mostly due to human factor, i.e. due to non trained personnel at the WWTPs, or lack of knowledge, skills, information etc. at all levels of designing, building, operating and maintaining, and developing the treatment plants. Of course, not respecting the domestic and EU legislation, including monitoring, is the common source of these problems.

c. Unfavorable framework conditions

One of the direct causes of unfavorable framework is the **improper cooperation among ministries and segments**. General problem is that ministries do not cooperate, as also do not cooperate different sectors, e.g. water-management and industry. This fact was clearly seen also on our workshop where only one person from Ministry of Economic Affairs was present, and no representatives from the Ministry of Agriculture, Forestry, and Food attended the workshop. There were also no representatives from the sectors of tourism and transport.

Furthermore, the **incomplete process of privatization** represents an important problem, because the privatization process is not finished yet because some companies are in red numbers and that the part in the ownership of the society is not known. Before these companies can be sold and thus privatized, they must get into positive balance. Until that time they are supervised and managed by a special governmental agency.

Besides, the **inadequate price for water and sewerage** contributes also to unfavorable framework conditions. Water prices (drinking water as well as disposal and treatment of waste water) in lot of Slovenian municipalities do not reach economic prices – rather, they are subsidized by the State, or municipal services can not fill any funds for reconstruction or new investments. Typically, all investments go from the municipal and other funds and budgets. It is only for one year that the prices were released from the State control and can now gradually reach economic levels. We expect that real prices for procurement of drinking, or technological water, and its subsequent treatment and disposal after it is used in the industry, will force industry to implement closed loops, less water demanding technologies, and less waste water producing technologies.

In addition to the above mentioned problems, there are also **political causes**. At present, diverse political parties have diverse points of view and scope for environmental protection. An efficient environmental protection framework with the consensus of all parties is hardly possible. The environmental policy might change overnight due to change in political constellation among parties.

(ii) Inadequate use, transport and disposal of industrial and hazardous waste

The inadequate use, transport and disposal of industrial and hazardous waste is due to insufficient consideration of elements and processes in the natural environment and inadequate industrial waste disposal regarding technology, site and NIMBY syndrome

a. Insufficient consideration of elements and processes in the natural environment

Although majority of industrial waste is at this time dumped to municipal waste sites (which is going to be prohibited), the **contents of these industrial waste is not known**. This fact seriously affects the operation of the municipal landfills from many points of view: danger for the operators, for the machinery, to the process of decay in landfill, to the quality of leachate, etc. It is evident that special waste, which is not inert or compatible with municipal waste, shall not be deposited at municipal landfills. The composition of waste received at a landfill is often governed by the disposal needs of the community. It serves instead the principles of the landfill management (the composition of waste is taken for granted – was not considered that composition of landfills waste is an important factor to control the degradation processes).

Another reason for the insufficient consideration of elements and processes in the natural environment is the **neglecting of environmental conditions at preparation of plans of production**. A lot of industries have been located at certain locations from political (social) reasons, without any consideration of influences to people or environment in general. The consequences are today too polluted environment with exhausted self-purification capacity (buffer capacity), and consecutively also impact on human health and living conditions. Slovenian EPA (Environmental Protection Act) from 1993 brought the demand for EIA (Environmental Impact Assessment). Still, the precise contents of this EIA analysis is not yet defined, so industrial lobbies can relatively easy “overlook” the possible impact of existing or planned industry on the environment.

Furthermore, one of the crucial causes leading to environmental pollution is the **inadequate or insufficient inspection and control** (final disposition), due to the lack of knowledge of: experts, administration, common people and because they are not complying with legislation and international treaties (conventions).

b. Inadequate industrial waste disposal regarding technology, site and NIMBY syndrome

We identified this cause of environmental problems as a result of numerous examples given and discussed at the workshop. There is similar attitude also at the governmental level, as a special legislation that will regulate industrial and hazardous waste is under preparation. At present we have only one site for hazardous waste (Metava near Maribor), which capacities are limited and also can not take all kinds of special waste. There were discussions in past whether to buy 1 or 2 incineration plants, but the conclusions were that incineration causes probably even more environmental problems if it is not the pyrolitic combustion at high temperatures. Due to green movements in the past, people are not willing to accept dump sites (land-fills) in their vicinity – the so called NIMBY (Not In My Back Yard) syndrome. Many efforts will have to be spent to change this attitude.

The main problem is unawareness of public and administrative authorities for problems in solid waste and wastewater treatment management. If public isn't aware of harmful impacts of illegal disposal (pollution of groundwater, etc.) it won't react or behave in environmental sound manner.

Inadequate industrial waste disposal is reflected in **lack of market approach** (while the waste can be used as secondary raw material). The produced waste can go two ways, (1) either it is really waste and goes to final disposal in a land-fill, and thus costs money to dispose off, or (2) it becomes an input to another process and can be sold, i.e. produce money. Our industries too seldom consider this fact.

Furthermore, **unavailability of adequate disposal sites** contributes to the inadequate industrial waste disposal. As was said already before, in Slovenia exist only one dumpsite (landfill) for special (industrial) waste, which is constructed and operated according international standards, i.e. Metava near Maribor. At least 2-3 more regional centers for managing and final disposal of industrial waste are needed in Slovenia. In fact, because industrial waste can not be put on a municipal landfill, much more industrial landfills are needed. Or, according to the lack of market approach, industrial wastes are not used as an input for another process.

For **inadequate location of dump-site** the following reasons were identified:

- lack of users of secondary raw materials (mentioned above)

  This is the problem in Slovenia, but it is not directly connected to location of dumpsites. There are not enough secondary raw materials users in Slovenia, there are no incentives for collecting and reuse of secondary raw materials. Finally, the quantity of solid waste is decreased if solid wastes are collected separately at the source of their origin. Consecutively, the adequate surface for landfill location could be smaller. On the other hand if we build regional centers for solid waste management, it would be nice to have users of secondary raw materials close to the location of the regional center.
- unplanned dump-site location

  The landfill has to be located far from groundwater table and/or far from groundwater abstraction wells in low permeably soil (In the past it happened that site location was not a result of studying the hydro-geology of the area or considering important natural and artificial facts).
- undefined criteria for planning and designing the site location

  Criteria for planning and designing the site location were not adopted yet, actually the draft directive is in preparation these months.
- illegal dump-sites

  Inhabitants of dispersed non-urban settlements used to dispose off their wastes illegally in hillsides of the forests, pits, etc. in the past. There are many thousands of illegal dumpsites in Slovenia. Some of the industries followed the same way, e.g. storage of radioactive waste in an abandoned house in woods near Godovič (karstic area).

The above listed cause(s) are due to:

1. **Inadequate technologies of final disposal**

   If separation of industrial and hazardous waste was in operation, a lot of industrial waste could have been recycled, e.g. metals, glass, plastics, paper, textile, old batteries, solvents, dyes, oils, pesticides, etc. To our knowledge very little is done at the site, i.e. in the industries to recuperate useful matter from their waste. Still, this field is developing, e.g. oil is recuperated at petrol stations and in industries, solvents are sometimes distilled, precious metals are

collected, etc. The present technologies of burying together in the land-fill all waste that comes, without any separation or treatment, makes problematic also recuperation of valuable matter from the land-fill in some future time.

The problem of inadequate final disposal rises another sources of problems, which are uncollected **leachate from landfills** and improper and illegal landfills.

Leachate from landfills contains a vast number of specific compounds, in particular specific organic compounds in micro-amounts, the quality and quantity of leachate is varying with time in the same landfill. If they are not collected they pollute environment, in particular groundwater and surface water. The landfill leachate problem accompanies landfill from its beginning to many decades after closure (long after the last amount of waste was disposed).

The problem in Slovenia is that there are **improper landfills**, which are less or not at all engineered and managed as the modern landfills should be. It is meant in terms of treatment of landfill leachate and landfill gases. Majority of our landfills are old-fashioned and also not at all controlled dumps.

2. **Lack of incentives**

   Concerning the lack of incentives, financial resources, educational and organizational efforts do not exist. This significantly contributes to the unavailability of adequate disposal sites.

(iii) Inadequate production technologies

There are many technologies which use great amounts of water and cause big pollution, and there are also some indirect effects of water use, e.g. mostly in damming for hydroelectric power plants (HEPP's), heat discharge in thermoelectric (TEPP) or nuclear electric (NEPP) production, or simply neglecting environmental constraints (ecological dumping).

The direct causes of inadequate production technologies are inadequate (outdated) technology, unfavorable cooling systems, unsustainable construction and operation of dams and insufficient consideration of environment in regulatory interventions.

These direct causes are explained below in relation with indirect related causes and reasons:

a. **Inadequate (outdated) technology**

   Outdated technologies that use lot of water and release it heavily polluted into the environment are unfortunately still quite common in Slovenia. The main cause for this unfavorable situation was economic crisis in former Yugoslavia in 1980-ties, and after the separation in 1991 lost of Yugoslav markets and inevitable restructuring. Some of the industries did not survive this process, some did, and still have outdated technologies, some were lucky and have already redesigned their technology to be more competitive on the EU and World market and in the same time less polluting, i.e. more environmentally friendly.

   The ones, which still heavily pollute do that because of **lack of financial means and willingness to rehabilitate the existing situation.** As said above, the heavily polluting industries have outdated technologies, which means lower productivity with relatively higher costs, so the final consequence is unfavorable position on World's competing market. Consequently, there is not enough money to restructure the production process, i.e. to buy new technology and equipment needed. That is why external willingness for remediation and external funds are needed.

It is necessary to underline the **use of inadequate process materials,** e.g. solvents, glues among the causes related with the problem of outdated technology. Sometimes the technology needs to be just slightly changed with no or very low investment, e.g. production of wooden plates with inadequate glues (containing formaldehyde). Or intermediate or final products, which contain banned materials as for instance asbestos, lead, quicksilver, etc. Or, in agriculture use of fertilizers with high contents of metals (chromium), etc. Or, using coal with high sulfur contents for burning in TEPP's, or even for domestic use.

Furthermore, **concentration of animal production** i.e. food producing or processing is connected with outdated technology. Big pig or poultry farms can be seen as point sources of pollution and be thus considered in same context as industrial plants. The problem with these farms is (1) technology with flushing of stables, which gives a lot of wastewater, (2) too less adjacent agricultural land to dispose off the wastewater and manure. Closely related problem is slaughterhouses and subsequently leather factories. All these lead to environmental pollution with nitrates, BOD, and toxic metals (chromium from tanneries, zinc from animal food, copper from pest control, etc.)

b. unfavorable cooling systems

TEPP's and NEPP, and also some other industries, e.g. paper mills, need water as a cooling means. If enough dilution by the receiving water is not available, the heat discharge may negatively impact aquatic life (thermal tolerance of fish and other aquatic life depends on species, acclimation, period of exposure, presence of toxic materials, oxygen levels, etc.). This problem is emphasized at Krško nuclear power plant. The reason that the situation is not being solved is mainly in insufficient data accessibility to public and therefore, neither awareness of the problems in that area, nor suitable respond or public pressure exists. On the other hand, there is no convenient fund available for solving this problem.

These unfavorable cooling systems are **cheaper solutions**. Disposing off of the excessive heat is most economic with a carrier with high thermal capacity – for this purpose water is an ideal medium.

Furthermore, in comparison with cooling towers, where the excessive heat is exported to the atmosphere via water vapor (steam), heat discharge to water bodies brings **less change in local microclimate**. Especially in the winter, there is much more fog and frost if the heat is disposed off in the air.

c. unsustainable construction and operation of dams

Construction of dams brings a lot of positive effects, but negative effects are also inevitable. We have been discussing about problems during construction, about degradation or shift in ecosystem communities, about changed river regime with sedimentation in impoundments and erosion downstream of the dams, about obstacles migration of fish, etc.

During **construction of dams there are several negative impacts** on the environment, e.g. destruction of ecosystems, flooding of large areas, initial eutrophication of the impoundment due to remaining organic matter (plants, fertile soil) in the impoundment, etc. There are also possibilities of spillage of oil, gasoline, etc. from the constructing machinery.

The natural or original watercourse changes its hydraulic behavior and subsequently also its water quality. These facts lead to change in ecosystem communities – the change is usually seen as a **degradation of the ecosystem due to damming**, although it may bring positive potentials in the biotops diversity of the region (more stagnant water, improved water quality downstream, etc.).

Besides, due to construction of dams the **accumulation of heavy metals and chemicals in sediments** can occur. One of the mayor problems in impoundments is sedimentation of suspended and drifted matter. Already if it is only gravel (and mud), it still needs to be discharged downstream from time to time, which can cause heavy load to the environment – fish kills due to clogging of the gills. If there is organic matter in the sediments, or even toxic substances, fish kills and kills of other populations can occur due to oxygen depletion and establishment of toxic environment during flushing events. Right now is under study a scheme for rehabilitation of the Moste reservoir on the upper Sava River. One of the causes for accumulation of chemical, toxic matter etc. is settling in the reservoirs due to decreased drag force of water in impoundments.

Interrupted transport of sediments was already partly tackled in the previous point – here it should be stressed, that sedimentation in the reservoir means erosion downwards. So indeed two problems arise. The second issue is **interrupted migration of organisms (fish and other species)**, which might be detrimental to some species, e.g. salmon, which need upper river courses for reproduction. This problem is stressed in two sub-causes: the settling of suspended solids, drifted matter and the fish migration / reproduction disabled.

d. insufficient consideration of environment in regulatory interventions

The insufficient consideration of environment in regulatory interventions is mainly due to short term planning. The problem of **short term planning** is mostly in sub-optimal, local solutions, while integrated water resources management needs long-term regional planning. So different competing needs for water are not considered at the same time, but separately, which can lead to too simplified solutions, or to not enough consideration on the environment.

The **lack of knowledge of professionals, administration and common people** also contributes to the insufficient consideration of environment in regulatory interventions. This topic has already been described before. Again, the multiple appearances of the same issue (cause) clearly point out to the persistence and importance of the identified cause.

(iv) Weaknesses of tourism and transport activities

During the workshop several causes of inadequate tourism and transport have been identified, which are improper behavior of tourists & transporters, insufficient management of tourist sites, inadequate road infrastructure and inadequate transportation policy.

a. Improper behavior of tourists and transporters

One of the major causes of pollution from the tourism and transport is surely poor, or inadequate concern for the environment, which shows through the behavior of the tourists and transporters. It is due to the **lack of basic culture or behavior principles** and **the lack of environmental consideration.** Both identified topics are self-evident and practically need no further explanation. But an excuse for such kind of behavior can be the fact that there is a lack of suitable infrastructure (dustbins, toilettes, open fire-places,...), what means that if there were provisions made for keeping cleaner environment people would probably use them and slowly change their attitude to the environment.

b. Insufficient management of tourist sites

For Slovenia is typical that tourist resorts have very short peak season and a long dead season. Therefore **too much concentration of tourists in short time** contributes to the insufficient management of tourist sites. Examples are skiing resorts in mountains (a few winter months), or hiking, mountaineering and climbing paths in the hills and mountains (summer), or woods in the autumn (collection of mushrooms), bathing rivers' and lakes' banks (summer), etc.

Instead of having only a few well known tourist resorts, other localities, which are not so sensitive might be as well interesting – the problem is that these **less vulnerable sites are not known** (advertised) to the tourists.

A lot of **tourist activities are incompatible with the environment**. Massive mountaineering in summer leaves heaps of waste and human excrements all over the mountains. Bathing in oligotrophic (or even eutrophic) alpine lakes introduces suntan creams and fluids, which diminish oxygenation and increase eutrophication. Unequipped bathing sites (with toilettes) mean source of pollution with human excrements, eutrophication and bacterial pollution. Preparation of snow on skiing resorts needs a lot of nitrates, which cause pollution of surface- and ground water, etc.

c. Inadequate road infrastructure

Relatively bad status of our roads leads to diverse environmental problems**. Roads in bad conditions** lead to increased probability of accidents, as well as to increased probability of spills of dangerous substances, e.g. oil, petrol. The use of salt for defrosting streets contributes actively to the bad road conditions. Although the negative impacts of the salt on environment are known for long time ago, road-maintaining services still use ordinary salt for defrosting. Sometimes this salt is obtained as a by-product from technology (tanneries) and has high contents of oil, grease, heavy metals, etc.

It is only since recent few years and only for highways (motorways, autobahns) that special measures shall be taken to collect and treat wastewater from paved surfaces. **Structures to collect and treat water from roads are missing** in all other roads, so they pollute the surface and ground water with asbestos from brakes, lead from gasoline, oils and heavy metals from motors, etc.

A lot of aquifers that procure groundwater for drinking water purposes are not adequately protected. On some of them regional roads are constructed and the **heavy traffic on these vulnerable areas (groundwater)** permanently threats sources of drinking water. Again some of regional roads (highways) go in the middle of agricultural land, which means that nearby plots have products of reduced market and health value (maybe even dangerous to the health).

d. Inappropriate transportation policy

The inappropriate transportation policy is reflected in the **long-term trend of increasing road traffic**. Some studies point out that this is due to cheap fuel, bad habits of living, and lack of environmental concern. Of course, in the cities the public transportation is not adequate to reduce the above problem.

Furthermore, and immediately connected with the increase of road traffic is the fact that too few traffic is made via railway, although we all know its benefits.

Additionally to the above two causes, Slovenia is supporting international long-distance road transportation with lorries. These lorries at one hand destruct the roads at high rate and thus immediately lead to another, previously described causes, at the other hand heavy traffic pollutes environment.

3.2.2.3. Environmental Effects

The direct consequences of the industrial activities are excessive production of wastewaters and solid wastes, which in turn cause harmful environmental effects, like:

- **Deterioration of water quality (with possible eutrophication)**

  Deterioration of water quality happens due to untreated or poorly treated industrial waste water, due to badly maintained storages of waste (rain washout), due to not adequately managed landfills (uncontrolled leachate), due to excessive input of heat into streams, impounding, etc. In impoundments water quality generally improves due to self-purification capacity. But if the water is too much polluted, than the water quality in impoundments may deteriorate (less oxygenation than in free stream). Sedimentation problems are also an acute and chronic problem in impoundments and downstream, when these impoundments are being flushed. If industry releases organically degradable wastewater, besides oxygen depletion, also nutrients enrichment may occur. This enrichment with N and P may represent latent (hidden) eutrophication in the case of fast flowing streams, but can develop into true eutrophication in slowly flowing streams or in impoundments. Eutrophication, which is characterized with excessive growth of algae may cause problems for drinking water preparation or for bathers (toxic algae).

- **Deterioration of environment (with pollution of ground soil, air, water, and change or destruction of biotopes)**

  Polluted water in streams means a threat also for other compounds of the environment, i.e. soil, groundwater, air, biotopes, etc. Water in streams is usually in contact with adjacent groundwater and soils – thus streams pollution may progress to groundwater and soil as well. Vollatile substances are volatized into air and thus pollute the air, too. Change of water quality, and of environment in general, may cause shift (adaptation) of the ecosystem to polluted conditions. Some species may become endangered or even extinct. Pollution of the environment has also aesthetic component which renders environment less attractive for people (sports, living, …)

From these two above mentioned main (general) problems stem other more specific problems, like:

- **Water is unfit for recreation (polluted water bodies)**

  Bathing water must correspond to quite strict conditions, bacteriological or microbial quality being the most often offended. Toxic algae may also pose a threat for bathers and other water sports.

- **Water unfit for downstream users (polluted water)**

  In Slovenia drinking water sources are mainly groundwater. Aquifers lie in valleys, which are also densely populated, industrialized and with intensive agriculture. So polluted water in streams can enter groundwater and cause problems downstream. Water polluted with suspended solids, floating matter (cellulose), etc. may cause problems for downstream use for cooling, or energy production.

- **Loss in fisheries (both polluted water and deteriorated environment)**

  High quality fish also need high quality water. Polluted water thus immediately means loss in fisheries. Polluted environment can also add to the total impact on fisheries (e.g. polluted sites are not attractive for fishermen). Due to water training, or impoundments water regime (flow dynamics) changes which may obstruct reproduction cycle of certain fish species.

- **Change in biotopes and biocenoses (both polluted water and deteriorated environment)**

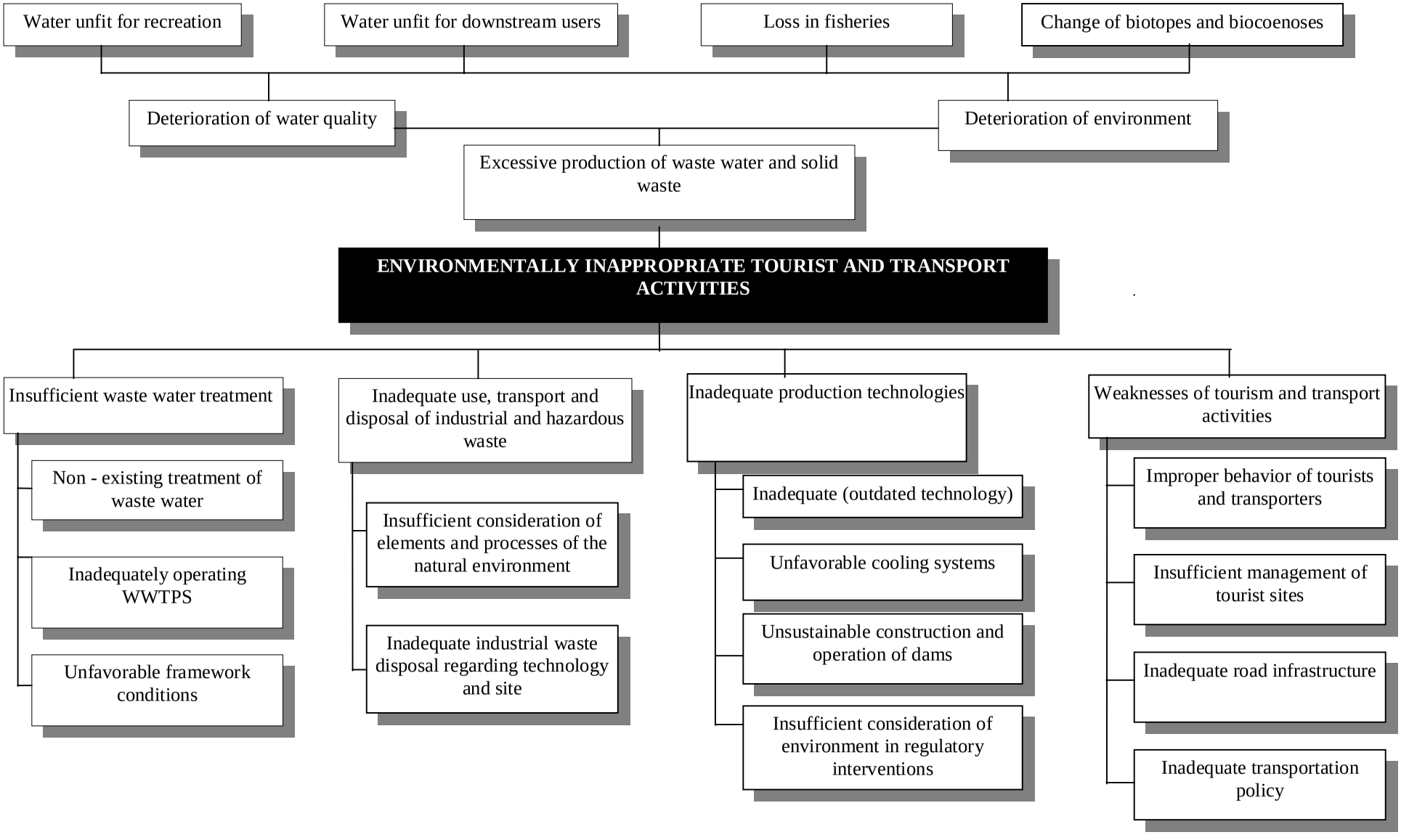
  Polluted or deteriorated water and environment cause shift in ecosystem populations composition. This shift might be positive, but usually it is negative, i.e. not desired. Degraded biotopes have reduced biodiversity, which leads to the key problem of sustainability – namely, the higher the biodiversity the higher the buffering capacity and thus more room for sustainability.

The above mentioned environmental effect can be a consequence of a single or multiple activity/ies (cause leading to environmental problems). That's why we have drawn our problem hierarchy tree in the way that everything goes through the focal point: environmentally inappropriate industry, tourist and transport activities.

Besides degrading the quality of water and environment, bad industrial practices and the state of environment now support the negative public attitude to governmental efforts in remediation of the situation. The NIMBY syndrome is very stressed and to overcome it, it will be needed massive amounts of human efforts, and money.

Problem hierarchy

2. Industry, Tourism and Transport



3.2.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective has been identified for the sector Industry, Tourism and Transport:

"DEVELOPMENT AND IMPLEMENTATION OF SUSTAINABLE INDUSTRIAL PRACTICES, TOURISM AND TRANSPORT"

The sector objective Development and implementation of sustainable industrial practices also contributes to the program objective "Improvement of water quality in the Slovenian part of the Danube River Basin". In order to fulfill the sector and program objectives, the four following results to be achieved were identified:

- Application of adequate waste water treatment
- Achievement of proper management of industrial and hazardous waste
- Adoption of appropriate production technologies
- Establishment of adequate tourism and transport

(i) Application of adequate waste water treatment

In order to apply adequate wastewater treatment, several activities will be necessary in the following fields:

- industrial and combined WWTP's
- legislation
- monitoring of emissions and ambient water quality
- education and awareness

It is foreseen to:

- **undertake measures for the construction and maintenance of adequate industrial and combined WWTP's.** Industrial and combined WWTP's are needed for wastewater treatment and subsequent reduced load to environment. If the industrial wastewater does not meet the standards for municipal wastewater, it must be pretreated (at the industrial site, preferably) before let into the sewerage.

  It will be necessary to enforce National Environmental Action Plan and existing environmental protection law, in particular water law, standards and PPP.

  WWTP's should be adequately planned with involvement of national and international experts (selection through international tendering). Adequate operation and maintenance of WWTP's should be ensured through training of the operators and supervision of the experts, as well as carrying out training courses for managers and maintenance staff of WWTP's.

  For this activity the following projects have been identified:

  Planned Project(s)

  There are already some projects for industrial WWTP's in preparation, i.e. ICEC Videm Krško, leather industry Vrhnika, paper industry Paloma at Sladki vrh, paper industry Radeče, Laško Brewery, slaughter house Murska Sobota, etc.

Proposed Project(s)

Proposed projects comprise industrial WWTP's: Brewery Union in Ljubljana, dairy industry in Ljubljana, establishment of a training school for municipal managers and operators of WWTP's, etc.

- **implement the existing legislation, draft missing legislation.** Legislation shall be improved by harmonizing with the EU, in provisions according to the economical possibilities and by introducing proper conditions for more environmentally sound behavior of the industries, tourists, and transporters. Punitive part shall also be elaborated and strictly executed.

  Enforcement of law and regulation through inspection control, penal policy, incentives, taxation are important. Unannounced inspections including experts, NGO's and the public have to be performed.

  Efficient control by inspectors and civil society has to be introduced. It can be obtained with inspectors, random checks by accredited monitoring laboratories, NGO's, reports of citizens, etc. Without control, there is no means to guaranty the discipline.

  In order to introduce adequate inspection, it is necessary to improve professional skills and general knowledge and furthermore to assure authorization and sanctions.

  Improvement and maintaining of registers of polluters and WWTPs, condition of environment and technological processes is closely related with training inspectors to be able to use the relevant information technology. In addition, public should have access to relevant data as well.

  For this activity the following projects have been identified:

  Existing Project(s)

  Existing project are Water Law (in phase of final draft); running process of harmonization with the EU legislation

  Proposed Project(s)

  Proposed project is the establishment of an independent lab that could act as a service for unannounced inspections, public checking the official data, etc.

  Another proposed project is establishment of school for performing programs for professionals and public at large.

  Furthermore, establishment of an information center for collecting and distributing data has been proposed as well.

- **ensure the monitoring of emissions and ambient water quality.** Ambient water quality is measured in Slovenian part of the DRB on more than 50 locations, but still too seldom (2-4 times per year). At least at some crucial locations automatic and permanent water quality monitoring stations shall be installed to enable proper pollution control and management. Big industrial and municipal polluters are monitored on a regular basis. Frequency of sampling of these polluters is dependent on the yearly discharge into environment.

  Emissions have to be monitored before discharge into sewage system or the environment and at WWTPs. Ambient water quality monitoring of big polluters upstream and downstream have to be performed as well. With respect to these elements, the legislation for emissions and ambient quality monitoring in the entire DRB region should be harmonized. In addition, improvement of national network of monitoring, databases, data accessibility are expected, together with establishing TNMN (transnational monitoring network) and ensuring its operation and functioning.

Within this activity, several projects have been identified:

Existing/On-going Projects

The existing project is the programme of monitoring of all bigger polluters. Another project is establishment of TNMN within the Danube Programme.

Proposed Project(s)

The proposed projects are: - organize public hearing of projects; - establish an information collection center for collecting and distributing environmental data (bulletin, WWW, media, ...).

- **reinforce education and raise the awareness of experts and common people.** Better to prevent than to cure – in this spirit it is needed to educate and rise the environmental awareness of all people, especially of those which deal with waste, waste water, or in intervention groups, technologists, decision makers, designers, etc.

  Environmental education has to take place in elementary schools, secondary schools, and environmental courses at universities. Informal education should be carried out after school activities, in associations, NGOs and through media. Further education is necessary for people holding key positions and at all levels (managerial and employees).

  It is required to ensure quality control in order to maintain licenses and introduce ISO 9000, DIN 14000. In addition, public should have an access to relevant data.

  The following project(s) have been identified for this activity:

  Existing/On-going Project(s)

  Recently, there are research programs for elementary schools: ECO school, water detective.

  Proposed Project(s)

  Elaboration of curriculum for environmental tutorials for primary and secondary schools and Establishment of an information center for collecting and distributing data are the projects, which have been proposed.

(ii) Achievement of proper management of industrial and hazardous waste

To achieve proper management of industrial and hazardous waste, it is needed to develop activities in the following areas

- legislation and international agreements and conventions
- technologies
- dumpsites

It is necessary to:

- **undertake measures for implementing existing legislation and drafting new legislation**. Legislation is needed to define the frame and constraints for waste production, storage, processing, reuse, and/or final storage. Technologies that produce banned waste shall be replaced or abandoned.

  For this activity, it is important to follow EU legislation (in spirit, the actual provisions, according to economical possibilities). In this respect, it is essential to adopt legislation (general, secondary, standards), enforce legislation (penal policy, incentives, taxation) and inform the public on Slovenia-EU approximation (in general, on specific examples).

There were no existing, or in preparation, or proposed projects identified besides the permanently ongoing harmonization with EU legislation.

Efficient control through inspectors and civil society has to be enforced. Mostly the same as for the waste water – if there is lack of control, lack of discipline will develop. At present state it is needed to control also old landfills, industrial sites, etc. which have not been built and operated according to the EU legislation.

Introduction of adequate inspection (professional skills, general knowledge, authorization, sanctions..) is one of the important elements, crucial for this activity. Improvement and maintaining of register (of polluters and WWTPs, condition of environment, technological processes) is important mainly from the point of view of necessary training of inspectors to be able to use the relevant information technologies. With respect to possibility of control through civil society, it is essential to perform unannounced inspections including experts, NGOs and the public.

International agreements and conventions have to be implemented. International agreements and conventions, especially those that Slovenia has signed or ratified, shall be respected. This will immediately lead to improvement of the environment.

With respect to this activity, it is important timely ratify adopted conventions and international agreements. Consequently it is required to inform target groups and the public on international agreements and conventions. At the same time implementation of international agreements and draw up implementation programs are needed, together with consistent application of sanctions for those who violate international agreements and conventions.

For this activity one **existing project** have been identified: -IKROS

- **introduce technologies producing min. amounts of final waste.** Various technologies for waste (re)processing and use as a secondary raw matter can be applied. At the other site, new production technologies can be introduced which produce less waste.

  In order to fulfill this activity, it is important to educate people on key positions and at all levels (managerial, employee). Access to information libraries on “green” technologies and exchange of environmental know-how play essential role in for introduction of new technologies. In addition, promotion and providing incentives for these environmentally friendly technologies are necessary.

  For this activity the following projects have been considered:

  Existing/On-going Project(s)

  - Eco-fund amelioration of SME heating system has been identified.

- **construct appropriate dumpsites (industry, hazardous wastes).** Dumpsites are perhaps the weakest point. Right now, Slovenia has only one dumpsite (landfill) for special waste, and also this can not accept every kind of hazardous waste. Few more industrial dumpsites are needed, perhaps also incineration units. Old and existing dumpsites need to be sanitized and permanently monitored. Leachate ought to be suitably treated.

  One of the most important elements necessary for this activity is the elaboration of guidelines for selection of locations and management of industrial landfills. Public awareness about consequences of (in)adequate disposal of waste has to be raised. Furthermore, ecological compensation for people near not appropriately constructed landfills should be introduced.

For this activity the following projects have been considered:

Proposed Project(s)

- Introduction of ecological compensation.

(iii) Adoption of appropriate production technologies

To facilitate the adoption of appropriate production technologies, it is foreseen to undertake activities in the following fields:

- introduction of less polluting industries and technologies (BAT, BATNEEC)
- HEPP, TEPP and NEPP
- financial instruments
- water management

It is necessary to:

- **introduce industries according to the level of technology - international conventions, PPP.** As already said by waste (re)processing, change of production technology should lead to less waste production, less treatment costs, and finally to less pollution. The BATNEEC (Best Available Technology Not Entailing Excessive Costs) shall be preferred to BAT (Best Available Technology) – it means we shall take into account economic conditions.

  For these changes in industry, it is important to introduce closed technological processes for water and waste and encourage the use of materials that generate less waste, or less dangerous waste for the environment. Exchange and possible use of information on suitable technologies should be facilitated. Public should be informed about status and needs in industry.

  For this activity the following projects have been considered:

  Existing/On-going Project(s)

  -burning coal of better quality TETO-Ljubljana;

  -change of technology in numerous industrial facilities.

- **provide adequate planning, operation and maintenance of HEPP, TEPP and NEPP.** Energy production shall be improved in order to reduce pollution or degradation of the environment. Problems are heat release, exhaust gasses and fly ash, possible radiation, etc.

  Encouraging of efficient use of energy is supported on one side by educating, informing experts and common people and on the other side, waste heat could be used for municipal heating. Construction of TEPP along bigger rivers will decrease the influence of heat load Furthermore, compatible tourist activities on impoundment have to be encouraged.

  For this activity the following project(s) have been identified:

  Existing Project(s):

  -Moste reservoir restoration project (PHARE S6)

  Planned Project(s):

  -desulphurization of exhaust gases TEPP Šoštanj

- **apply relevant financial instruments (national/foreign sources and fines/incentives).** Proper financing institutions should be developed in addition to the ones already existing to enable competition and easier availability of funds. Subventions and incentives are also valuable mechanisms for restoration investments.

  It will be necessary to introduce also environmental taxation and punishments for pollution together with strict use of collected taxes in the water sector.

  The application of all above mentioned measures means, that greater part of GNP should be dedicated for the environment.

  For this activity the following project(s) have been identified:

  Existing Project(s):

  -taxes for water pollution;
  -Slovenian ECO-fund

  Planned Project(s):

  -assurance of bigger part of GNP for environmental protection

  Proposed Project(s):

  -taxes shall not drain into the budget

- **implement appropriate measures for water management.** In past times river training works were conducted too much in an environmentally unfriendly way – now is time to correct the past errors and construct environmental friendly works.

  Co-natural training of water courses and riparian land is one of the important elements for this activity. It is expected that these of badly trained areas will be sanitized. Furthermore, the construction and proper management of water impoundment is required.

  For this activity the following project(s) have been considered:

  Existing Project(s):

  -improvement of biodiversity in a regulated river (PHARE D6);
  -wetlands on the Mura river (PHARE D8)

(iv) Establishment of adequate tourism and transport

In order to establish adequate tourism and transport, it is needed to develop activities in the following areas:

- environmentally suitable transport and tourism forms
- collection, discharge and WWTP facilities
- tourism and traffic in vulnerable areas

It is foreseen to:

- **introduce tourism and transport forms, which are more suitable for the environment.** For this activity, it is important to define possibilities of tourism and traffic development in an environment-friendly manner.

  It is necessary to implement legislation, providing of international contracts and conventions by following the EU and the domestic standards. This stems from environmental reasons and also from the fact to be competitive on the market.

On the one hand, besides the implementation of incentives (parallel/substitute activities), it is necessary to support this sector through inspection and laic supervision.

On the other hand, to encourage the responsible behavior, it is required to promote the education and information of tourist and transporters in particular through media.

For this activity the following projects have been considered:

Existing/On-going Project(s)

- harmonization to EU legislation.

Proposed Project(s)

- advising tourists and transporters on less loaded areas/roads.

- **construct, operate and maintain collection, discharge and WWT facilities.** A lot of roads do not have adequately equipped resting lots (toilets!). Rainwater from streets is polluted and shall be treated before let into the environment –at least part of rainwater shall go to some treatment plant.

  It is important to decrease environmental pollution by adequate construction of traffic system. Therefore, the conditions for construction and operation of traffic system and tourist roads have to be defined. Consequently it is needed to build structures for collection, discharge and removal of water as well discharge and retention of hazardous substances from roads. It is required to operate and maintain all facilities for protection of water and environment.

  For this activity the following project(s) have been identified:

  Existing Project(s):

  -guidelines for highway runoff collection and treatment.

  Proposed Project(s):

  -monitoring and revision of performance of highway runoff structures;

  -implement adequate runoff treatment also for less important roads.

- **limit tourism and traffic in overloaded or vulnerable areas.** Massive tourism and transport in vulnerable areas shall be avoided, to enable sustainable development.

  With respect to tourism, traffic and natural environment, the criteria for evaluation of pollution and vulnerability have to be defined. Furthermore, it is necessary to identify overpolluted and vulnerable areas. Consequently, measures for limiting traffic and tourism have to be implemented. In parallel other activities to redirect transport and tourism to less loaded zones have to be encouraged and promoted.

  For this activity the following projects have been identified:

  Existing Project(s):

  -Eco-fund amelioration of SME heating system

  Proposed Project(s):

  -definition of vulnerability due to tourism and transport

3.2.4. Important Assumptions for the Sector

Important assumptions are external factors which are important for the success of the program but lie outside its scope and not under the direct control of the program. These external factors may affect the implementation and long-term sustainability of the program.

The important assumptions or external factors must be taken into consideration if the objectives defined at (the next) higher levels are to be achieved.

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

- **Co-operation among government, industry and public**
  This cooperation is needed to optimize planning, use of natural resources or production, and to reduce the consequence on the environment. Public has to have its voice in all stages, maybe also through the NGO's.
- **Development of CMP (Catchment Management Planning)**
  CMP is crucial for optimization of allocation of natural resources (quality, quantity, location, etc. of water, wastewater, waste, etc.). In other EU states the regional level of government is assured by legislation. In Slovenia we have only State's and local levels. The regional level is left for self organization on an interest basis for local communities.
- **Assurance of adequate and sufficient financial instrument**
  Although industry is distinct from municipalities in the fact that private capital is invested, a restructuring of so many industries in a very short time is money consumptive. Financial sources and various incentives are needed.
- **Availability of the environmental data to the public**
  The data on the status of the environment are partly accessible to the public in forms of annual reports. But the data on polluters are confidential and can be disclosed only for special purposes. In this way we pledge for more open information interchange.
- **Enforcement of the legislation**
  Proper monitoring of the complying with legislation is needed along with proper prosecution. Inspectors are the most responsible for this. If the punitive measures are too loose, there can not be achieved the needed discipline.

The following assumptions at the **results/outputs** level have been identified:

- **Water charges and taxation is effectively implemented.**
  Water charges and taxation are a precious source of money needed to undertake mitigation measures for the environment. On the other side, this money has a strong psychological component, as it directly reflects the (irrational) use of water and the (excessive) pollution generated.
- **PPP principal and corresponding regulations are implemented and respected.**
  Similar to above, the PPP (Polluter Pays Principle) is the only measure that releases the society from socializing the costs of pollution of identifiable polluters and thus charges the polluters for all direct and indirect costs for pollution, lost opportunities, remediation, etc.
- **International free market competition is introduced while respecting environmental regulations (of EU, and national).**
  The international, i.e. free market competition is a prerequisite for cheaper production and at the same time better environmental protection (due to respect of international legislation). Thus, ecological dumping will be phased out.

- **Environmental principles and regulations in tourism and transport are respected.**
  Due to relatively weekly regulated tourism and transportation in present moment, and due to lack of national plans in these sectors, at least environmental issues and principles shall be taken into account and subsequently respected. This will in turn enable sustainable (long term) development of tourism and transport.

3.2.5. Impact Indicators for Sector Results

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

The following objectively verifiable indicators were identified for **results**:

- **50 % of the industry in the Danube Basin in Slovenia meets EU and national emission standards (for waste water) by 2010, resulting in improved water quality and availability for recreation, fisheries and other uses.**
  To achieve this result combined municipal and industrial, or only industrial wastewater treatment plants must be build in settlements with more than 2000 inhabitants. The measuring of the result can be achieved by comparing the emission values and total loads, which are obtained through monitoring. This is a good indicator as it will comprise all big polluters, which are already today monitored and have to comply with emission standards.

- **80 % of industrial and hazardous wastes generated in Slovenian part of Danube river basin is adequately treated (EU & national legislation) by 2010, resulting in improvement of water quality and rehabilitation of environment.**
  This indicator can be measured through monitoring of production of waste at one hand and (industrial and hazardous) waste treatment and disposal at the other hand. This monitoring is already running, as each industrial plant is obliged to keep material booking (material balance sheets). This is a good indicator as it will measure the fate of the waste, which shall be properly stored and controlled on special landfills.

- **In Slovenian part of DRB the generation of waste in industry is reduced by 20 % regarding year 1998 by 2010, Eco-fund supports with ≥ 5% cheaper loans than others do, resulting in improved water quality and improvement of the environment.**
  Similar to the above indicator, this indicator can be effectively measured through comparing material balance for the industrial plants from year to year. Implementation of BAT is one possible way how to reduce waste generation. Eco-fund does not offer at present more benefits than commercial banks. This shall change in the future to enable more investments in ecology. This is a good indicator, as it will measure restructuring of the industry (implementation of the BAT).

- **The road transport is decreased ≥ 20% in favor of railway transport by 2010, density of tourists in dead seasons increases, while in peak seasons does not increase more than 2% per annum in Slovenian part of DRB, resulting in amelioration of environment and water quality.**
  To measure this indicator the measurements of road and railway traffic density and cumulative tons/year transported shall be made. A lot of these data can be already obtained through annual reports of the Statistical Agency of Slovenia, but maybe some

special arrangements will have to be made to properly measure and assess this indicator. This is a good indicator, as it will check (1) whether road transport is decreasing in favor to railway, and (2) whether tourists' pressure is more evenly spread throughout the year.

3.3. Municipality

3.3.1. Situation/Stakeholders Analysis

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

The sources of water pollution are urbanization, industry and agriculture. Measurements of the quantity of waste water generated by the different polluting sources and its material composition are not fully controlled by municipalities. Polluters do not generally monitor effluents. In regions without public supply, the problem is much more acute, as uncontrolled pollution is a potential threat to the water resources.

Pollution from urbanized areas along the rivers is especially severe, while pollution caused by industry has decreased over recent years partly as a result of reduced economic activity in certain key sectors (many of the polluting heavy metal industrial companies have disappeared since 1990).

The overall treatment performance is rather low, as secondary (biological) and tertiary treatments are not extensively developed. There are no data available on the pollution load generated, nor on the pollution eliminated in the waste water treatment facilities[1].

The Environmental Protection Act (EPA) of 1993 and the national water resources strategy are the two fundamental statements of objectives for water policy and management. The EPA - including its implementing regulations - concentrates on the control of water pollution from point sources. It sets out the principles of control by State organs, local authorities and polluters, of liabilities for pollution and damage, and of public access to relevant information.

The national water resources strategy is to be prepared by the MoEPP and will be part of the national water programme. It will aim at ensuring sufficient water supply for all users. Drinking-water supply is a priority.

Regulations required by the EPA focus on emission limits for waste-water discharges and all aspects of monitoring. They were adopted in 1996. The intention is to regulate discharges along rivers in agreement with the EC water quality directive. Regulations on the amounts and calculations of charges and fees and on EIA are also required. So far, there is no master plan for sewage and wastewater treatment.

3.3.1.2. Stakeholders Involved

The stakeholders involved in water pollution problems in the sector can be divided into three main groups of organizations, polluters and stakeholders affected by pollution.

Organizations

Ministry of Environment and Physical Planning (MoEPP) is one of the key stakeholders involved, for it is competent to prepare environmental legislation and standards. The initiation of the enforcement of environmental standards is the responsibility of the Environmental Inspectorate, which is one of the agencies of the MoEPP.

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[1] Source: Environmental Performance Reviews, Slovenia (published by United Nations: New York and Geneva, 1997)

Ministry for Health plays important role to test the impacts of better water quality on human health. The Institute of Public Health tests the quality of water in the supply system. The results of these tests are good indicators of the impact of water treatment projects.

Ministry of Education and Sport is responsible for the educational policy in Slovenia. So it has an important role in raising environmental awareness among young people.

Local authorities are in charge of local legislation and municipal budgets. The local authorities or municipalities are in most cases owners of public companies which distribute water and collect waste water.

Ecofund was established to finance environmental projects. In the past years some municipal water projects were partly financed by Ecofund. It is expected that Ecofund will also in the future finance water projects.

Public companies distribute water and collect waste water in majority of municipalities in Slovenia. Therefore they are important stakeholders in the municipality sector.

Non-governmental organizations (NGOs) are strongly involved in environmental issues. The NGOs are already very effective in raising of public environmental awareness.

Polluters

In the group of polluters the industry connected to public sewage system and 1 741 700 inhabitants have been considered.

Affected

Affected stakeholders include population living inside municipalities in Slovenian part of Danube river basin, especially ones living close to watercourses and lakes (natural and artificial).

Inhabitants are the most important stakeholders. They have a dual role. On the one hand they are the polluters and on the other hand they are stakeholders affected by pollution. So their task is to decrease the pollution of water, which can be achieved in different ways.

3.3.1.3. Current Strengths/Assets

Concerning the inadequate waste water treatment the following assets and achievements have been considered:

- existing legislation
- various technologies
- taxes
- existence of municipal funds
- concessions
- education and raising awareness
- spatial and land use planning
- solid waste sorting

These important assets are explained below in more details

- **Existing legislation**

  Ministry of Environment and Physical Planning (MoEPP) had developed new environmental legislation in the last past few years. MoEPP is paying special attention to harmonize new legislation with European Union legislation. The Environmental Protection Act (EPA) is the fundamental law for environmental policy. It is the basis for the preparation of other legal

instruments on the field environmental legislation. On the other hand the existing legislation, which is a positive condition, enable carrying out measures, which are leading to improve water quality.

- **Various technologies**

  To improve water quality, EU standard emission limit values and best available technology are the guiding principles for the MoEPP. Existence and knowledge of various technologies that are in accordance with specific conditions in Slovenia regarding financial capability and state of environment can contribute to quicker improvement of water quality. There are already institutions and individuals in Slovenia with the knowledge of various technologies for water treatment, which is an asset in solving waste water related problems.

- **Taxes**

  The ordinance on water pollution tax regulates that all polluters including the inhabitants should pay the tax proportional to the volume of pollution loads of the waste water discharged. The tax will be paid to the State budget. The present ordinance gives a possibility to all who are liable to taxation to be exempt from it if the revenues collected are used to fund the projects aimed at reducing water pollution (waste water treatment plants, sewerage systems,...). By implementing this ordinance the purpose of encouraging the polluters to reduce the pollution to permitted levels was achieved. Existence of this ordinance is a positive condition.

- **Existence of municipal funds**

  In some municipalities there are local funds which can contribute to financing water projects. So it is a potentiality to finance minor water projects, which will enable to solve some water problems locally.

- **Concessions**

  One of the main activities for improvement of water quality is construction of waste water treatment plants. This is directly linked with the financing problems. One of the means of financing construction of waste water treatment plants is by granting of concessions. Existing regulations enable to grant concessions for building WWTP. One of the first BOT projects in constructing WWTP is under way in Maribor. The experiences from these first BOT projects are an asset for other projects in Slovenia.

- **Education and raising awareness**

  Slovenia has relatively long tradition on the field of environmental education. NGO' s have very important role in education and raising of awareness by organizing educational and training programs, nature protection actions, ecological summer camps. Slovenia has joined the European program "Eco Schools". The program is supported by the Ministry of Education and Sport and it aims at involving pupils in elementary schools, their teachers and parents in a predetermined environmental activity every year. Environmental engineers are trained at Maribor University in Nova Gorica (Faculty of Environment) and at Ljubljana University.

- **Spatial and land use planing**

  Since the re-organization of the State administration in December 1994 the core responsibility for spatial planing has been with the MoEPP. The Environmental Protection Act defined three main environmental protection instruments to be used in spatial planning: environmental vulnerability studies, comprehensive assessments of environmental impact and assessment of environmental impact. According to the Act the vulnerability study at the national and municipal levels should be the basis for physical development.

- **Solid waste sorting**

  In 1996, the Government prepared and adopted the document on waste management strategy. The basis for its elaboration was an extensive study on the current state of waste production and management, which was carried out in 1995. One of the main characteristics of the strategy is that strategic principles of the European Union in the field of waste management are being transferred to Slovenia, which include also solid waste sorting. For instance in 1995, 850 000 tons of municipal waste were generated. About 750,000 tons of municipal wastes were not separately collected, while 100 000 tons were separately collected and reused. Therefore, solid waste sorting is an asset, which further implementation, by the help of local authorities and public companies dealing with wastes, can lead to water quality improvement.

3.3.1.4. Analysis of Transboundary Effects

Municipal activities leading to pollution have also undesirable transboundary effects. Namely pollution in Slovenia impact on environment in Croatia as well. Main expected effects are:

- **Deterioration of water quality**

  The problem is what we pollute here in Slovenia is somehow transported to Croatia if adequate treatment of waste water, ground water etc. is not achieved.

- **Deterioration of drinking water**

  The main source of water supply in Croatia is underground water, which is supplied by Drava and Sava River. As unpleasant consequence tension among countries due to unsolved environmental problems can occur.

- **Inflow and outflow of waste materials across borders**

  Outflows of untreated (polluted) water directly to the main watercourses in Slovenia (Sava, Drava, Mura River) causes problems in water supply in Croatia due to increased concentrations of nutrients.

  Increased concentrations of phosphorus and nitrogen result in latent eutrophication of the main watercourses (Sava, Drava, Mura River), boundary rivers (Mura, Ledava, Sotla and Kolpa River) and also consequently acute (critical) eutrophication is observed in the Black Sea. Therefore entire food web is affected in the Black Sea, problems to aquatic life caused by quantities of toxic materials (pesticides, etc.) occur and biological balance is ruined.

- **Concentration of pollutants in water and in sediments (heavy metals from Austria).**

  This effect is partly caused also by transport of pollution from Austria. Mainly heavy metals influence quality of sediments.

3.3.2. Sector Problem Analysis

3.3.2.1. Core Problem

The following core problem for the municipal sector has been identified:

“INADEQUATE WASTE WATER TREATMENT “

Inadequate waste water treatment outlines the situation of the environmental problems in Slovenia, especially in municipal waste water and solid waste management.

WWTP are inadequate, in landfills, if the inadequate location is not the problem by itself, leacheates are inadequately treated and sewage system with numerous inadequate cesstanks and manure deposits, all cause water pollution in Slovenian catchement area.

3.3.2.2. Causes Leading to Environmental Problems

Waste water treatment represents one of the most important problems in Slovenian part of Danube river basin. The three main causes of inadequate waste water treatment were identified as follows:

- insufficient treatment of waste water,
- inappropriate waste water treatment in landfills
- weaknesses of sewage system network

(i) Insufficient treatment of waste water

Insufficient treatment of waste water is due to inadequate waste water treatment plants, unfavorable framework conditions and untreated waste waters.

a. Inadequate waste water treatment plants

One of the important reasons of inadequate waste water treatment plants **is insufficient planning of waste water treatment plants**, because of:

- **discrepancy between settlement and sewage system network.**

  Old part of towns, surroundings do not have sewage system network. Majority of the sewage system network is not connected to waste water treatment plants, namely they discharge directly to watercourses. Towns increased without constructing sewage system network in the past.

- **mixing of municipal in industrial waters.**

  Industrial water should be treated separately(factories should have specific level of pre-treatment before discharging in sewage system network or in the watercourse, what is normally not the case in Slovenia), according to the field of industry, type of pollution and quality of receiving water or mixed with municipal water in an adequate ratio.

The **technical constraints** represent also weaknesses of waste water treatment plants, particularly because of improper design of waste water treatment plants in the past. Experts should have good knowledge to plan and design waste water treatment plants and on the other hand before planning and designing they should get enough information about waste water, discharging to waste water treatment plants. Further more, there were not enough waste water analysis (quantity and quality) in the past before planning and designing of waste water treatment plants.

Another important problem contributing to inadequate and insufficient waste water treatment in Slovenia in opinion of participants is the **lack of financial funds** in the past. Even if the planning, designing is adequate, technical constraints are solved, investments in adequate treatment of waste water can not be carried out without financial funds.

b. Unfavorable framework conditions

Unfavorable framework conditions are reflected in **lack of multidisciplinary co-operation** at designing of waste water treatment plants. There are many experts, which should give their contribution before designing of WWTP. Knowledge of biologists, chemists, hydrologists are not considered efficiently and especially there is no legal procedure established to connect different scientist. Responsibilities of designer of waste water treatment plants are still very low.

Politicians don't pay enough attention to environmental problems. They are not interested or do not have enough information about environmental problems. It results in the **lack of political will**, which also contributes to unfavorable framework conditions.

The unfavorable framework conditions are also due to **insufficient legislation**. Currently there is a general law on water under preparation. Some regulations required by the EPA (Environmental Protection Act) were adopted in 1996 and focus on emission limits for waste-water discharges and all aspects of monitoring. The intention is to regulate discharges along rivers in agreement with the EC water quality directive. Regulations on the amounts and calculations of charges and fees and on EIA are also required. But unfortunately, there is no master plan for sewage and waste-water treatment for now. Additional legislation from this filed is in the phase of adopting.

The insufficient legislation is particularly due to the **lack of inspection activities.** In fact, there are not enough capacities to cover this field.

c. Untreated waste water

One of the main causes of problem of untreated waste water is the **improper treatment of specific waste water.** Several reasons for this have been found; especially discharging waste water from hospitals and laboratories directly to watercourse or sewage system network, any or improper treatment of thermal and bathing water, what leads to harmful consequences in water environment. Bathing water is highly polluted with oil, grease, nutrients, chlorine (strong oxidizing agent, used for disinfecting purposes) and needs pre-treatment at the site of origin.

If enough dilution by the receiving water flow is not available the heat discharge may be deleterious to aquatic life (thermal tolerance of fish and other aquatic life depends on species, acclimation, period of exposure, presence of toxic materials, oxygen levels, etc.) This problem is emphasized at Krško nuclear power plant.

The reasons are mainly in insufficient data, accessed to public and therefore, neither awareness of the problems in that area, nor suitable respond or public pressure does not exist. On the other hand there is no convenient fund for problem solving available.

Another cause for untreated waste water in Slovenia **is inexistence of waste water treatment plants.** There are many big cities in Slovenia without suitable waste water treatment plants or any, like in: Sava River Basin (Celje - 75.000 PE , Domžale – Kamnik - 200.000 PE, Laško - 75.000 PE, Ljubljana - 300.000 PE, Novo Mesto -50.000 PE, Vrhnika -150.00 PE etc.); Drava River Basin (Maribor - 200.000 PE etc.); Mura River Basin (Murska Sobota - 42.000 PE etc.).

Many of WWTP's do not achieve expected effects of treatment and therefore **improper waste water treatment** contributes to the problem of untreated waste waters. The main causes are:

- **decreased capacity of decomposition of organic and other compounds in waste water treatment plant**

  It is due to inflow of unwanted – toxic substances. Toxic metals and other toxic substances damage treatment process or treatment facilities and must be therefore removed by pre-treatment at the site of origin.(Maximum concentration of toxic substances, if not known, should be determined by toxicity bioassays.

- **mixing of different waste water**

  The natural balance in waste water treatment plant is destroyed. Most industrial waste waters are amenable to treatment with domestic sewage, however, grease, oils hot liquids (> 40°C), gasoline, flammable solvents, etc. must be excluded in treatment processes and removed by pre-treatment at the site of origin. A large number of organic chemicals have been designated as toxic and harmful to treatment.

- **uncontrolled inflow rainfall runoff water in waste water treatment plant**

  The efficiency of waste water treatment plant is not adequate, if inflow of rainfall runoff water is not controlled. (not enough nutrients, separation of inflow of rainfall runoff water due to wrongly dimensioned capacities of sewer inflow storage basin etc.)

- **wrong and outdated technologies**

  Some technical solutions in the past for treatment of waste water are not economically acceptable.

One of the very important problems related to untreated waste water is the **absence or improper sewage system** due to inadequate septic tanks which highly pollute the environment (waste water and sludge goes directly into the soil).

(ii) Inappropriate waste water treatment in landfills

There are two main reasons for inappropriate waste water treatment in landfills, which are inadequate treatment of landfill leachate and improper location of dump-sites.

a. Inadequate treatment of landfill leachate.

One of the main problems in the field of treating landfill leachate is the **lack of waste water treatment plants in landfills**. Majority of landfills does not have waste water treatment plants for landfill leachate. The problems arise from the activities in the past. Before selection of proper treatment process for landfill leachate, data on the composition of the leachate in question must be available.

The lack of WWTP's is reflected in:

- **costly remediation of dump-sites**

  Remediation of dump-sites where the origin and toxicity of solid wastes is often not known is quite expensive. On the other hand priority to find new landfill location is given.

- **unprofessional approach to landfill construction in the past**

  In the past we did not pay enough attention to construction of landfills. Sometimes it was enough to find abandon gravel pit and put there solid waste without any protection measures from technical point of view. All we did was covering the daily input of wastes with excavation materials. Sanitary landfill should be arranged according to technical standards, what means collecting and treatment of the landfill leachate and landfill gas later and at the same time establishing the concept of waste management.

Leachate from landfills contains a vast number of specific compounds, in particular specific organic compounds in micro-amounts. The quality and quantity of leachate is varying with time in the same landfill. **Uncollected leachate from landfills** pollutes environment, in particular groundwater and surface water. The landfill leachate problems accompany landfill from its beginning to many decades after closure (long after the last amount of waste was disposed).

Next problem related with inadequate waste water treatment plants in dump sites is **improper and illegal landfills**. The problem in Slovenia is that landfills in Slovenia are less or not at all engineered and managed than the modern landfills should be. It is meant in terms of treatment of landfill leachate and landfill gases. Majority of our landfills is old-fashioned and dumps. The composition of waste received at a landfill is often governed by the disposal needs of the community. It serves, than of the needs of the landfill management (the composition of waste is taken for granted – was not considered that composition of landfills waste is an important factor to control the degradation processes).

Moreover, one of the main problems is **unawareness of public and administrative authorities** for problems in solid waste and waste water treatment management. If public isn't aware of harmful impacts of illegal disposal (pollution of groundwater, etc.) it won't react or behave in environmental sound manner.

b. Improper location of dump-sites

Improper location of dump-site (above aquifers) has several reasons. One of them is the **lack of users of secondary raw materials.** This is the problem in Slovenia, but it is not directly connected to location of dump-sites. There are not enough secondary raw materials users in Slovenia, there are no incentives for collecting and reuse of secondary raw materials.

Finally, the quantity of solid waste is decreased if solid wastes are collected separately at the source of their origin and the adequate surface for landfill location could be smaller consequentially. On the other hand if we build regional center for solid waste management, it would be nice to have users of secondary raw materials close to the location of regional center (economical benefits.)

Unplanned dump-site location contributes to their inadequate location. The landfill has to be located far from groundwater table and/or far from groundwater abstraction wells in low permeably soil (In the past it happened that site location was not a result of studying the hydro-geology of the area or considering important natural and artificial facts).

Inadequate location of dump sites is also due to **undefined criteria for planning and designing the dump site location**. These criteria were not adopted yet, actually the draft directive is in preparation these months.

Inhabitants of sprayed non-urban settlements used to dispose their wastes illegally in hillsides of forests, pits, etc. in the past. There are many illegal dump-sites in Slovenia.

(iii) Weaknesses of sewage system network

There are two main reasons for weaknesses in sewage system network, which are numerous inadequate septic tanks and manure deposits and leaking sewage system.

a. Numerous inadequate septic tanks and manure deposits

Problem of numerous inadequate septic tanks and manure deposits occurs due to **improper maintenance of septic tanks and operation,** because it is too costly and not enough education. Costs of pumping and transport of septic tank sludge are enormously higher comparing to sewage fees. Insufficient monitoring contributes to it as well. The state did not organize the supervision of maintenance and pumping from septic tanks.

Improper designing of septic tanks contributing to the problem is due to insufficient education of inspectors and designers, insufficient inspection during construction of septic tanks and not enough importance for designing septic tanks given by households.

b. Leaking sewage system

For leaking sewage system, the following reasons have been identified:

- **Households without proper sewage system**

  There were neither exposed demands for non-leaking sewage system in the past, nor the supervision at the building site was sufficient.

- **Old-fashioned sewage system**

  Explanation for leaking sewage system in the past has to consider different reasons. Inappropriate legislation adopted in the past, which didn't consider the criteria for infiltration or exfiltration of sewer materials. Special lining or coating wasn't applied to sewers to reduce the damage by corrosion, proper composition, good workmanship and quality control wasn't the practice in the past.

- **Unprofessional construction**

  The septic conditions of sewage that causes the formation of hydrogen sulfide was the result of unprofessional construction in the past, performed by unskilled enterprises, bad organization and unprofessional approach. (low velocities at insufficient slopes of the sewers, low flows or high temperatures, bad selection of material according to the environmental conditions.)

There was no suitable equipment in the past for inspection of sewers (TV camera, visual survey). The control system wasn't developed enough in sense of construction, operation and maintenance, penalties weren't incentive.

3.3.2.3. Environmental effects

Due to inadequate waste water treatment the following harmful environmental effects have been identified:

- **Eutrophication of water**

  Eutrophication lead to problems in water supply, technological water supply, recreation in and around water bodies, fishing, etc. Living conditions in waters are deteriorated. It leads to dying off some species of animal and vegetation. Receiving waters suffering from excessive algae and macrophyte (aquatic weeds) growths may require the removal of nitrogen and/or phosphorus from the effluent since these two components are nutrients that may promote their growth.

- **Pollution of ground soil**

  The pollution of soil with nutrients and pesticides is critical because they are rinsed through the soil into groundwater. There are problems with harmonization of Slovene and EU legislation, especially in term of performing and assuring the quality of groundwater. According to Slovene legislation, concentration of pesticides (atrazine) in drinking water can be higher than in EU Drinking Water Directive. There are no limit values for atrazine frequently present pesticide recently. The majority of groundwater, which is the main drinking water source, is exceeded with the concentration of nitrates.

- **Polluted water bodies**

  Some of the watercourse sections are still in 4^{th} quality class. The regulation classifies flowing waters regarding their potential utilization into the four quality classes. Flowing waters in 4^{th} quality class may be used for any purpose only following an adequate treatment and such water shows presence of chlorinated compounds which are typical man-caused pollutants, compounds which tend to accumulate in organisms and compounds with carcinogenic/mutagenic potential.

- **Occasional loses of water organisms**

  Due to uncontrolled discharge of municipal and industrial waste water, solid or liquid wastes to watercourses, surface waters, lakes etc. there are occasional loses of water organisms. Ecological accidents are due to release of dangerous and noxious substances to watercourse. There are registered many fish kills in Slovenia (49 in 1993); only some of them are investigated. The Fisheries Research Institute keeps the fisheries register and information of fish kills. It has no evidence of finding of perpetrators and their punishments. The causes for fish kills: outflows of chlorine, biocides, leachate from landfills, crude oil spill, hydrogen sulfide, ammonia, sulfates, the oscillation of the water stage due to breakdown of Hydro Power Plants.

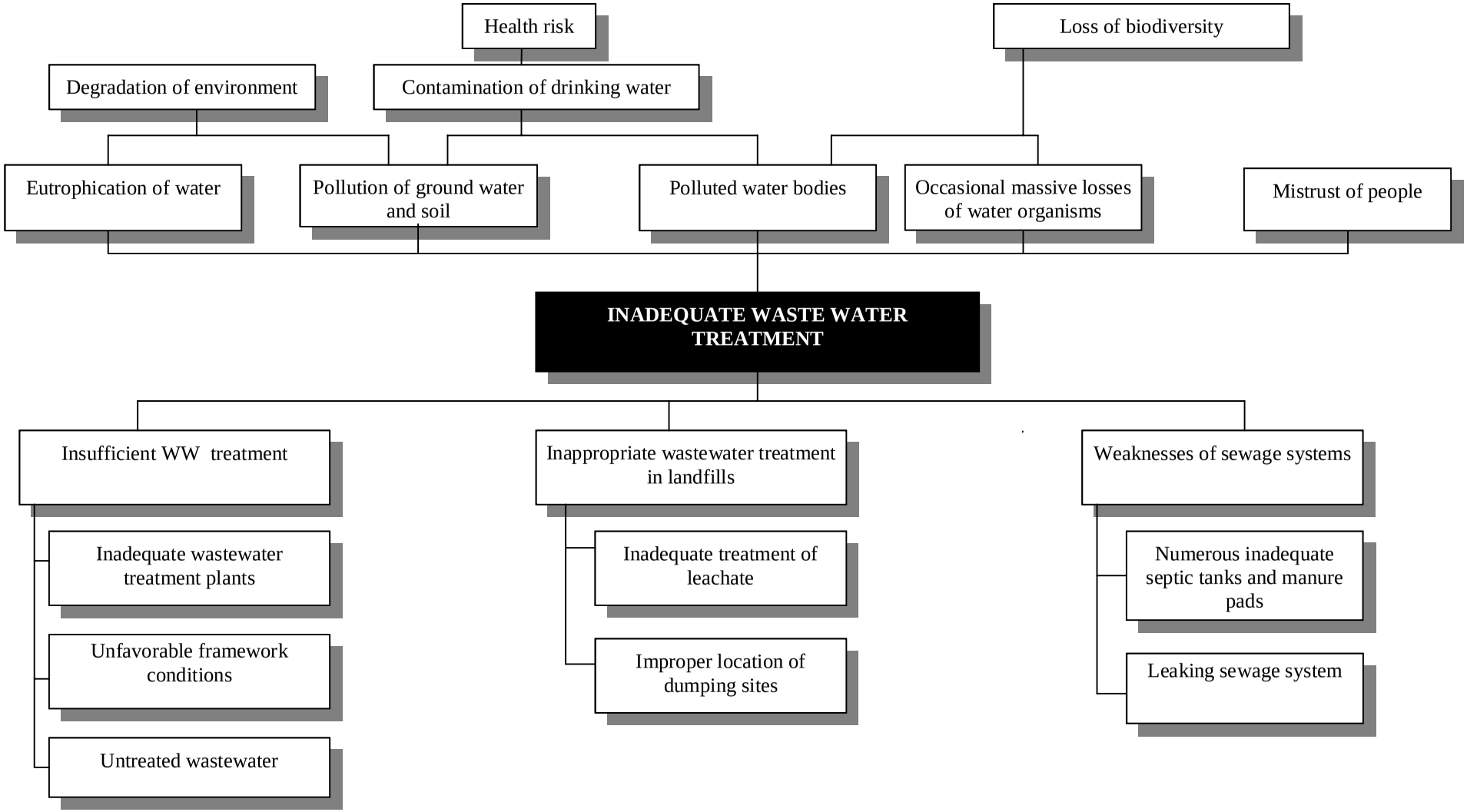
- **Mistrust of people**

  People has bad experience in not getting precise data about environmental situation in the past, therefore they still think actual data about environmental situation is concealed. Mistrust of people is quite severe consequence. To change peoples beliefs to act in environmental sound manner, to make them aware of environmental problems has to be a long-term strategy.

First three consequences lead to degradation of environment and contamination of drinking water resulting in health risk, on the other hand occasional loses of organisms and polluted water bodies leads to degeneration of bio-diversity. As the natural habitants of the various species are destroyed, the outcome is the continuous loss of bio-diversity as well as the tourist potentials.

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:

"HIGH REDUCTION OF NEGATIVE IMPAT OF MUNICIPAL WASTEWATER DISPOSAL"

The three results were identified to achieve this objective:

- Application of appropriate waste water treatment
- Optimization of municipal solid waste management
- Optimization of sewer system management

(i) Application of appropriate waste water treatment

Important assumption for applying appropriate wastewater cleaning is co-operation among all concerned sectors. The planning team shared the opinion that applying appropriate cleaning system involves many participants from various sectors. And at the present situation the lack or not sufficient of co-ordination among sectors causes problems in construction of adequate wastewater treatment plants.

In order to achieve application of appropriate wastewater treatment, several activities will have to be completed in the following fields:

- Financial resources
- new waste water treatment plant
- operation of existing waste water treatment plants

It is necessary to:

- **undertake measures for building national consensus for WWTPs and mobilization of financial resources.** It is required to build national consensus for wastewater treatment. Measures have to be undertaken to educate experts and the public via seminars, round tables, etc., enhance awareness of environmental problems in schools and enterprises, lobby municipal councilors, establish links between experts and parliament (e.g. technical committees).

  Appropriate tax policy should be introduced in order to use tax money for building of WWTPs as well funding from ecological development fund should be obtained. Liberalization of prices from municipal services should be introduced as well. Furthermore, if will be necessary to invite to tender for concessions/international tenders and obtain assistance by EC.

  The following project(s) have been considered for this activity:

  Existing/On-going Project(s)

  There are already some projects, taking place for that purposes, like: special planning workshops of ecological engineering, projects for constructed wetlands in three municipalities in alpine region and project in preparation: agenda 21 in municipalities.

  - collecting of funds for Ecofund

  Proposed Project(s)

  In the opinion of participants some new projects should start also, like: program of permanent education of environmental inspectors in Slovenia, program for co-operation between experts and politicians (in sense of workshops and good practice examples is

also desired), seminar for municipal employees in Slovenia, project for system solution for financing NGO participation at workshops, establishment of chamber for waste water treatment.

- development of education for international biding,

- reduction of taxes for all investments in environment.

- **assure building of new wastewater treatment plants using appropriate technology.** Wastewater should be analyzed prior to design the size of WWTP and adequate technology selected. It will be necessary to construct sewage system network before designing wastewater treatment plant as well.

  Competition among designer companies (in terms of price and technology), as well as responsibility of designers for the performance of waste water treatment plants is demanded. Furthermore, drawing up and adoption of adequate physical planning acts, as well as consistent enforcement of legislation is necessary.

  The following project(s) have been identified for this activity:

  Proposed Project(s)

  - establishment of priority list for construction of new waste water treatment plants and assurance of finances

  - introduction of wastewater treatment for small settlements (alternative technologies).

- **assure appropriate** operation **of existing wastewater treatment plants (upgrading, remediation if necessary).** Wastewater treatment plants have to be upgraded and those, which do not operate properly, rehabilitated. It is necessary, to complete partially built wastewater treatment plants. Managers of wastewater treatment plants have to be continuously educated. Co-operation among inspection agencies should be fostered and regular monitoring of the operation and functioning of existing wastewater treatment plants is required.

  For this activity the following projects have been identified:

  Existing/On-going Project(s)

  - second and third grade of treatment of central waste water treatment plant of Saleška dolina

  - waste water treatment plant of Gornji grad, Mozirje (emphasized are the projects well known among participants)

(ii) Optimization municipal solid waste management

Inappropriate disposal of solid wastes results in pollution of water due to leachate from dumpsites. There is a large number of dumpsites of solid wastes in Slovenia without proper leachate control and treatment. All of them can not be remedied in a short time. Therefore a priority list must be made to ensure that resources employed will use most effectively.

To achieve optimal municipal solid waste management, several activities are required in the following fields:

- rehabilitation of old dump sites
- investments in waste management
- regional center
- awareness

It is foreseen to:

- **assure the rehabilitation of old dumpsites (legal, illegal).** To carry out this activity, several elements are important. There is a need to draw up the register, public municipal service, hot line, ensure financial funds, state subsidies, collect and treat leachate (construct waste water treatment plants) and volunteer working camps should be organized.

  In field of control, acquisition of permits, ensuring constant supervision of inspection are important. Taxes on use of non-recycled materials and introducing subsidies for use of recycled materials, grant concessions to companies collecting secondary raw materials (useful waste) and separating will significantly support this activity.

  The following project(s) have been identified for this activity:

  Planned Project(s)

  There is already one project in preparation known, i.e. agenda 21 in municipalities.

  Proposed Project(s)

  - introduction of program for permanent education of environmental inspectors in Slovenia,

  - arrangement of "hot-line" (080- to give people opportunity to inform about new, old illegal dump-sites or unusual illegal discharges to lakes, watercourses, etc.,)

  - establishment of register of landfills in all municipalities,

  - preparation of programs for connecting experts and politics (workshops, good practice examples..)

- **promote investments in waste management (separate waste collection, recycling).**

  Presenting foreign models (for separate collection, sorting at the source of origin, material recycling) is one of the important elements for this activity.

  Dumpsite locations should be chosen according to adequate criteria for CERO (Center for waste management – CWM). Within this respect, location selection control has to be introduced (by independent expert bodies to prove that technical, environmental socio-economic criteria were used properly). It will enable to use suitable land location for CERO (for example: land location purchased by the state – to surmount difficulties occurring even landfill location is selected according to all criteria).

  Municipalities should be motivated to co-operate and solve problems in the region.

  The following project(s) have been identified the following projects:

  Existing Project(s)

  There was already elaborated project; i.e. IKROS (integrated concept for solid waste management in Slovenia) in 1991.

  Proposed Project(s)

  - preparation of tax system (incentives - tax exempt) for environmentally friendly packaging (recycling of packaging material),

  - introduction of compulsory sale of suitable landfill location (national location), organizing seminars for municipals and employees, communities for all municipalities

- **construct new regional centers according to modern criteria (recycling..).** Several elements are essential for this activity. Reinforcement of adoption of legislation on construction of landfills, discharge water treatment and special waste management are needed.

Organization of mass cleaning actions (in dwelling environment, illegal dumpsites, river banks..), increasing awareness of population (through the media, information leaflets) and organizing regular actions to collect wastes (special, hazardous wastes from households) are important. Willingness to co-operate, the state of awareness about environmental problems, satisfaction, etc can be found out via questionnaire.

- **raise awareness with regard to waste disposal.** In this field it is foreseen to introduce more education in school system about the environment and environmental problems, to organize lectures by and for different environmental associations, NGO' s, local communities, companies. Public awareness of environmental problems is very important. Without public awareness of all negative impact of municipal wastewaters to ground and surface waters the attainability of the results will be hindered.

  For this activity the following project(s) have been identified for this activity:

  Planned Project(s)

  There are some projects in preparation for voluntary working camps. The main emphasize in the project planning in the future should be, according to the opinion of participants, stimulation of population towards cleaning actions, increase awareness-raising, projects for separate collection, sorting at the source of origin, material recycling, issuing local magazine (to present problems and solutions), via questionnaire get information and influence on people's behavior.

(iii) Optimization of sewer system management

Ground waters are also polluted by absence or leaking sewage systems. Slovenia has nearly 4 thousand kilometers of public sewage systems. The maintenance of sewage system is costly. So the available financial funds are important assumption to achieve good maintenance of new and existing sewage systems.

In order to facilitate the optimization of sewer system, it is necessary to develop activities in the following fields:

- local community involvement
- maintenance of sewage system network
- simultaneous construction of WWTP's and sewage network
- inspection control

It is required to:

- **undertake measures for increasing local community involvement.** This can be achieved by informing the public via lectures, workshops, tours, regular performing of education and appropriate good practices should be applied. Education can be formal, informal or through counseling. In opinion of the participants target groups should be involved: employees, local authorities and landowners.

  Furthermore, inspection control has to be improved. To assure reinforcement of inspection control, the public should exercise pressure on inspection agencies, data should be accessed to the public and the share of women in inspectorate agencies should increase. Salaries of inspectors should be performance related.

  The following project(s) have been considered for this activity:

  Existing/On-going Project(s)

  - voluntary working camps taking place

Planned Project(s)

Agenda 21 is planned to be applied for municipalities

Proposed Project(s)

There have been several project proposals related with these activities:

- programs for co-operation between experts and policy (workshop, good practice examples),
- program on education for municipal and local authorities in Slovenia,
- program on permanent education of environmental inspectors in Slovenia,
- system solution of financing NGO' s participation on workshops,
- improvement of co-operation of interest groups in the municipality,
- establishment of sewage system register and of priority measures list.

In particular, referring to the inspection control, more projects have been proposed, such as publication about work of inspection services and granting of concessions for independent services.

The strategy for waste river basin quality management should be adopted and become obligatory for all municipalities involved in river basin. System of financial incentives and appropriate organization should be developed to solve problems in river basins.

Projects for cheaper, more effective, safe wastewater treatment plants should be accomplished in terms of design and construction.

Maintenance of existing sewer systems should be performed regularly to prolong the life span of objects, assure safe work to employees, bigger efficiency in the wastewater treatment plants.

Present practice to construct sewage collectors without waste water treatment plant at the end of collector shouldn't take place, on the other hand waste water treatment plant without appurtenant sewage system network is the same expensive solution to treat waste water (it is not fully loaded and therefore has smaller efficiency of treatment process).

Inspection control has to be strengthened. Unprofessional performers will be replaced, factories with untreated waste water or outflows with exceeded limit values for certain substances will be closed, concessionaire-enterprises responsible for maintenance and operation not working properly will be free from concessionaire agreement.

- **assure maintenance of new and existing sewage system networks.** In this area, an inventory has to be done of the present situation with the help of all available data.

  Draw up a plan of sewage network for regular maintenance later and regular updating of sewage system networks are important elements for this activity.

  There were identified the following project(s)

  Proposed Project(s)

  There were some suggestions proposed for the future, like: setting the standards for maintenance of sewage system network, project on liberalization of sewage fee (costs of maintenance should be included in sewage fee)

- **construct WWTP simultaneously with sewage systems.** To ensure construction of waste water treatment plants simultaneously with sewage systems, some measures should be taken, like: harmonizing of planning sewage system network with waste water treatment plants, construction of waste water treatment plant before connecting to water supply network, regular supervision of the constructed sewage and treatment systems.

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.

At the **activities** level, the following assumptions have been considered:

- **Ensured purchase of selected land by the state**
  One of the problems of wastewater treatment projects is acquisition of land for the sites that are the most suitable for WWTP. Since the land is privately owned it can be bought only with the consent of the owner. If the owner is not willing to sell the land the construction of WWTP is hindered.
- **Adequate social circumstances**
  Adequate social circumstances include, public awareness of waste water problems, sound economic position of the state which is closely related with availability of the funds and commitment of the local and state authorities to handle waste water projects as a priority.
- **Financial resources available**
  Realization of wastewater treatment projects requires substantial financial funds. Without available financial resources activities of wastewater projects can not start.
- **Co-operation of informed public is efficient**
  One of the drawbacks at the present is mistrust of the public. There are doubts whether the technical solutions are correct, if public funds are efficiently spent. With the co-operation of the informed public the wastewater treatment projects will have a better chance to be completed.

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

- **Sector co-operation is effective**
  To achieve the results in municipal sector nearly 160 waste water treatment plant must be build, several kilometers of new sewage system must be constructed, several kilometers of old sewage systems must be reconstructed and many of old dump sites must be remedied. Realization of all this projects involves many parties from different sectors. Without proper co-operation among sectors results will be postponed and solutions could be less effective.
- **Priority list is taken into consideration**
  Realization of numerous wastewater treatment projects strongly depends on availability of funds. In order to carry out wastewater treatment projects effectively and to achieve best results on funds spent a priority list of projects would be helpful.
- **Public awareness is achieved**
  In order to solve a problem it must in the first place recognized as a problem. Therefore public awareness is essential to make treatment of wastewaters as a priority task in Slovenia.

3.3.5. Impact Indicators for Sector Results

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

The following objectively verifiable indicators were identified for **results**:

- **All discharges of a capacity > 2000 P.E. in the catchment area are treated in accordance with EU standards until the year 2010.**

  To achieve this result wastewater treatment plants must be build in settlements with more than 2000 inhabitants. Thus building of at least 160 WWTP can be expected. The measuring of the result can be achieved by checking the number of appropriate WWTP constructed each year.

- **Pollution of water due to leachate is reduced for 60% until 2010 in the catchment area.**

  To decrease the pollution of water due to leachate from dumpsites, can be achieved by remediation of old improper dumpsites. By remediation of most acute cases the reduction of pollution of water for 30% can be achieved by 2010. In order to monitor the progress the present situation must be assessed. Then the yearly progress in reducing water pollution from the dumpsites can be measured.

- **Water pollution due to sewage system is decreased for 30% until 2010 in the catchment area.**

  Ground waters are also polluted because of lack or leaking sewage system. With the construction of new sewage system and with reconstruction of existing ones the pollution of water will be decreased. Since the pollution of water through improper sewage system is not exactly measured, the measuring of decreased water pollution can be indirect by tracking how much new sewage systems has been built and how much of existing reconstructed.

Annexes

1. **Identification of River Basin Areas**
2. **Situation/Stakeholders Analysis of Activities Leading to Water Pollution in Specific Areas**
3. **Problem analysis**
4. **Sector Planning Matrix**
5. **Activities, Important Elements and Projects**
6. **Organization of the Workshop**

Annex 1. Identification of River Basin Areas

1.1. Sava River Basin

1.2. Mura River Basin

1.3. Drava River Basin

Physical-Geographical Characteristic	Socio-Demographic Characteristic	Transboundary Effects as Perceived	Human Activities in the Basin	Economic Activities in the Basin Leading to Water Pollution
General: ➢ River springs are in Slovenia **Relief:** ➢ Diversity in topography ➢ Narrow passages(Sava in the Zasavje region) ➢ Various types of geographical regions (Alps, Dinaric, Panonic.) **Numerical Parameters:** ➢ Catchment/ area:11,734 km^2 ➢ 58% of Slovenia's population ➢ spring at the altitude of 833 m ➢ altitude at the border with Croatia 132 m ➢ floodplains: 317 km^2 ➢ Q_{mean}: 290 m^3/s ➢ Runoff coefficient: 0.5 ➢ Three types of water regime: ➢ Torrential upper course of the river ➢ Balanced erosion and transport in mid parts ➢ Sedimentation in lowland stretches ➢ Large percentage of forests (59%) ➢ Karst (44%) ➢ Upper river reaches are in SLO ➢ Alpine landscapes ➢ Karst hydrology (partly) **Climate:** ➢ Various climatic and vegetation zones on average 1,600 mm of precipitation	**Population:** ➢ Population density 103 inhabitants/km^2 ➢ 717,000 urban population in towns ➢ 59.8% of Slovenia's population ➢ 84% of households connected to the water supply system ➢ 55% of households connected to sewerage system ➢ high % of active population ➢ environmental awareness is rising	**Contribution of Slovenia:** ➢ Ntot (inorg.) 15,740 t/a ➢ Ptot (inorg.) 2416 t/a ➢ pathogens 3.4E5 MPN/l ➢ BOD 49,348 t/a ➢ COD 187,109 t/a ➢ the Krško nuclear power plant: hot water discharges ➢ eutrophication will increase due to the construction of hydro power plants in the Sava river ➢ introduction of alien species of flora and fauna ➢ toxic organic compounds ➢ heavy metals in river sediments ➢ Sava river infiltrates in ground water providing supply for Zagreb in Croatia ➢ reduced input of suspended matter from mining activities ➢ improved situation of suspended matter in the river	**Agriculture:** ➢ fish farms ➢ introduction of alien fish species ➢ large animal farms ➢ crops production ➢ irrigation of fields and orchards, vineyards ➢ reparian vegetation and lowland forests ➢ arable land above aquifers	**Agriculture:** ➢ arable areas (manure application,) ➢ intensive plant production (hops) ➢ discharges from fish farms (eutrophication, inadequate waste water treatment) ➢ introduction and breeding of alien/exotic species ➢ convention of wetlands into fish farms ➢ uncontrolled use of slurry in protected water zones ➢ inadequate manure disposal ➢ inadequate use of pesticides and fertilizers ➢ water abstraction / use ➢ unplanned ➢ uncontrolled abstraction of water for irrigation purposes ➢ dispersed pollution, extensive use of fertilizers ➢ inadequate irrigation practices ➢ extensive water abstraction for irrigation purposes (insufficient water resources) ➢ damage of wetland areas **Examples:** ➢ hops production in Savinja valley ➢ extensive mais production in all valleys ➢ pig farm Ihan situated on small stream without enough arable land to dispose manure ➢ pig farms Stična, Kočevje on small karstic streams ➢ fish farm on inlet to eutrophic lake Bled

Physical-Geographical Characteristic	Socio-Demographic Characteristic	Transboundary Effects as Perceived	Human Activities in the Basin	Economic Activities in the Basin Leading to Water Pollution
Characteristic of the River Basin: ➢ diversity of pedology and geology ➢ biodiversity (especially diversity of ecosystems, species, endemites) ➢ corridors for migratory species - landscape diversity ➢ alluvial plains: different type of vegetation ➢ high self-purification capacity ➢ nival-pluval water regime	**Settlements:** ➢ low population density in mountainous and Karst areas (extensive agriculture, lack of water supply) ➢ concentration of people live in urban areas ➢ dispersed settlements ➢ high population density in lowland agricultural and urban areas ➢ population density: 307 inhabitants/km^2 ➢ large towns ➢ high population density along the main water courses		**Industry:** a. metal processing b. coal mines c. chemical industry d. paper manufacturing e. leather manufacturing f. food industry g. dairy processing h. breweries i. pig farms j. etc... ➢ industry in general, heavy industry in particular ➢ stream canalization ➢ mines ➢ outdated technologies ➢ water use for energy production: ➢ nuclear power plant ➢ hydro power plants ➢ small private companies (metal finishing plants, dry cleaning plants)	**Industry:** In general: ➢ inadequate, outdated technologies ➢ personnel not trained in environmental protection issues ➢ inadequate, industrial waste disposal ➢ inadequate, industrial waste water treatment ➢ discharge of chlorine containing organic compounds due to inappropriate process technologies (cellulose bleaching) ➢ insufficient consideration of elements and processes of the natural environment ➢ insufficient consideration of natural laws for river training (canalization) interventions ➢ slag disposal, filling in the hydro power Moste water power plant reservoir ➢ elsewhere (almost all of the industry processes are outdated) ➢ hot water discharge into the Sava river (NPP, thermoelectric PP) ➢ interrupted transport of suspended material and sediments ➢ accumulation of heavy metals and chemicals in the reservoir ➢ decrease in river biotops diversity

Physical-Geographical Characteristic	Socio-Demographic Characteristic	Transboundary Effects as Perceived	Human Activities in the Basin	Economic Activities in the Basin Leading to Water Pollution
River characteristics: ➢ torrents ➢ stagnate water, lakes ➢ underground waters ➢ aquifers in the: Ljubljana, Kranj and Sorško Polje Krško-Brežice basin Celje basin ➢ substantial fluctuation/ratio between the high and low discharges	**Settlements count'd:** ➢ settlements at the river ➢ settlements and human activities located in the areas of drinking groundwater sources ➢ tourism developed in the upper reaches of the river ➢ water use		**Industry cont'd:** ➢ traffic infrastructure ➢ road infrastructure ➢ gravel extraction ➢ ind. plant construction ➢ tourism ➢ bathing, recreation **Municipalities:** ➢ Municipal waste management: ➢ Sewage ➢ municipal waste ➢ industrial waste ➢ hazardous waste	**Industry cont'd:** ➢ inadequate road network construction ➢ inadequate consideration of natural laws and water regime in planning, construction and use (maintenance) of infrastructure facilities ➢ inadequate collection and treatment of rain fall runoff (water) from streets ➢ excessive gravel abstraction ➢ inappropriate sites of abstraction ➢ increase of paved impermeable areas ➢ massive mountaineering **Examples:** ➢ the municipality of Ljubljana ➢ enterprises: Jata (poultry processing), metal ind. Saturnus ➢ cement factory in Trbovlje ➢ the Savinja and the Sava rivers: companies Cinkarna, Zlatarna ➢ Krsko nuclear power plant ➢ Uranium mine in Zirovski vrh: radioactivity ➢ Crna: caoline ➢ Hotavlje: stone production ➢ company ICEC Videm Krsko **Municipalities:** ➢ discharge of waste water into the river without proper treatment ➢ WWTPs not in good working condition ➢ leakages from dump sites ➢ untreated rainfall runoff water ➢ inappropriate disposal of solid waste and discharge of waste water from hospitals ➢ inadequate sewage systems ➢ numerous permeable cesspits and manure pads

Identification of River Basin Areas — 2. Drava River Basin — Annex 1.2.

Physical-Geogaphical Characteristic	Socio-Demographic Characteristic	Transboundary Effects as Perceived	Human Activities in the Basin	Economic Activities in the Basin Leading to Water Pollution
Relief: ➢ diversity in topography ➢ extensive lowland areas **Characteristics of the River Basin:** ➢ variety of landscapes ➢ pedological, geologic and hydrological diversities ➢ corridors for migratory species ➢ Pohorje, Kozjak (specific geologic structure) ➢ Diverse biotopes ➢ Sedimentation ➢ Erosion ➢ the river sources in other countries ➢ less snow **Numerical Parameters:** ➢ surface area 3,253 km^2 ➢ precipitation 1,222 mm ➢ evaporation 650 mm ➢ outflow 571 mm ➢ the highest density of rivers in Slovenia (1,88 $km/km^{2)}$ ➢ $Q_{AUSTRIA}$ = 265m^3/s ➢ $Q_{CROATIA}$ = 325m^3/s **The river characteristics:** ➢ Modified hydrological regime due to water accumulation ➢ slow flow ➢ diminished areas near the river ➢ regulated river beds ➢ diminished flow in the former Drava bed **Groundwater:** ➢ high level of groundwater ➢ draining from the groundwater aquifers the Vrbanski Plato the Drava field the Ptuj field **Climate:** ➢ sub-Alpine, sub-Pannonic ➢ precipitation around 1200 mm	**Population:** ➢ 415,000 of inhabitants ➢ 121 per sq. km ➢ density near water streams 280 inhab./sq. km ➢ 46% of urban population ➢ connection to water supply system 73,3% ➢ connection to municipal waste water collection system 38 % **Settlements:** ➢ dispersed population in the highlands ➢ relatively high population density near water streams in the lowlands ➢ high concentration of population in the lowlands ➢ industrial development in decline ➢ various types of settlements ➢ poor highlands; rich lowlands ➢ 19% of jobs ➢ high unemployment rate ➢ birth rate in decline ➢ connection to municipal waste water collection system 30%	**Import from Austria:** ➢ Ntot (inorg.) 8,223 t/a ➢ Ptot (inorg.) 159 t/a ➢ pathogens 5.4E4 MPN/l ➢ BOD 14,207 t/a ➢ COD 63,514 t/a ➢ heavy metals in sediments **Export to Croatia:** ➢ Ntot (inorg.) 12,668 t/a ➢ Ptot (inorg.) 184 t/a ➢ pathogens 1.6E5 MPN/l ➢ BOD 25,623 t/a ➢ COD 71,744 t/a **Contribution of Slovenia:** ➢ Ntot (inorg.) 4,445 t/a ➢ Ptot (inorg.) 25 t/a ➢ pathogens 1.1E5 MPN/l ➢ BOD 11,416 t/a ➢ COD 8,230 t/a ➢ effects on the water ecosystems ➢ HEPP Golica in Austria ➢ atmospheric influences ➢ less extensive use of N, P and K in agriculture ➢ rapid river flow ➢ 4m/s-3,5 billion m^3/year ➢ between the 2nd and 3rd quality class	**Agriculture:** ➢ Specific activities: ➢ Intensive land use ➢ Extensive land use ➢ big animal (pig) farms ➢ bio agriculture foreseen to expand ➢ b)forestry **Industry:** ➢ Drava HEPP ➢ Closing down of the Mežica mine ➢ Modifications of economic activities (the decline of industry) ➢ Closing down of industrial plants ➢ Untreated hazardous wastes: a) textile b) metal c) wood processing ➢ dairy and food industry, pig farms ➢ training of the river bed ➢ steeply inclined concrete culverts dangerous to animals ➢ groundwater used for water supply ➢ gravel abstractions **Municipalities:** ➢ hospitals ➢ gravel abstractions ➢ traffic infrastructure ➢ army polygons ➢ environmental education and awareness-raising is not sufficient	**Agriculture:** ➢ excessive use of mineral fertilizers ➢ inappropriate use of plant protection substances ➢ waste water discharge from fish farms ➢ untreated waste water discharges from farms ➢ overburdening (no. of animals/ha) ➢ inappropriate irrigation ➢ inappropriate hydromeliorization solutions in terms of environment **Industry:** ➢ inappropriate storage of final products, or by-products, or waste (pesticides in Pinus) ➢ the Mežica mine, old car batteries dumps ➢ inappropriate garbage and industrial waste disposal (gravel-pits, Kidričevo) **Municipalities:** ➢ insufficient waste water treatment ➢ non-treated waste waters ➢ inadequate use of abandoned gravel-pits (illegal dump sites, eutrophication, toxic algae) ➢ army polygons: uncontrolled emissions: a) heavy metals: Pb, Cu b) oils (machinery) c) solvents and detergents d) fires

Identification of River Basin Areas — 3. MuraRiver Basin — Annex 1.3.

Physical-Geogaphical Characteristic	Socio-Demographic Characteristic	Transboundary Effects as Perceived	Human Activities in the Basin	Economic Activities in the Basin Leading to Water Pollution
Relief: ➢ river springs in another country ➢ lowlands (Panonian plain) **Climate:** ➢ precipitation 903 mm ➢ evaporation 675 mm ➢ characteristic draught periods **Numerical Parameters:** ➢ surface area 1,376 km^2 ➢ runoff 228 mm = 10 m^3/s ➢ Q max = 1,800 m^3/s ➢ Q av = 179 m^3/s ➢ Q min = 34 m^3/s ➢ flood areas F_{100} = 1,708 ha **Fast flowing river:** ➢ 4 m/s **River bed:** ➢ gravel and mud **Characteristic of the river Basin:** ➢ plant and animal community ➢ secondary biotopes ➢ gravel pits ➢ ecosystem typical of lowlands ➢ flood meadows and other wetlands ➢ self-purification capacity, relatively high in main stream Mura and low in tributaries ➢ although the river is regulated, there is a diversity of water wildlife and landscape ➢ diverse types of water streams ➢ erosion of water bed is stressed **Other Characteristic:** ➢ inundation areas ➢ groundwater, sensitive aquifers ➢ corridors for migratory species ➢ originally slow river flow, numerous dead river arms, after training fast flow ➢ thin protection layer over the groundwater ➢ thermal springs ➢ geological composition	**Population:** ➢ 118,000 (i.e. 6% of total population in Slovenia) ➢ cca 6% of workplaces of Slovenia ➢ high share of rural population ➢ population density 97 inh./km^2 ➢ high population density near water streams ➢ share of urban population: 28% ➢ types of settlements: urban, rural ➢ connection to drinking water supply system 67 % ➢ connection to municipal waste water collection system: 23% ➢ artificially changed landscape	**Import from Austria:** ➢ Ntot (inorg.) 9,657 t/a ➢ Ptot (inorg.) 254 t/a ➢ pathogens ? MPN/l ➢ BOD 17,771 t/a ➢ COD 80,729 t/a ➢ heavy metals in sediments **Export to Croatia:** ➢ Ntot (inorg.) 10,932 t/a ➢ Ptot (inorg.) 267 t/a ➢ Pathogens 2.2E5 MPN/l ➢ BOD 18,018 t/a ➢ COD 108,174 t/a **Contribution of Slovenia:** ➢ Ntot (inorg.) 1,275 t/a ➢ Ptot (inorg.) 13 t/a ➢ pathogens ? MPN/l ➢ BOD 247 t/a ➢ COD 27,445 t/a ➢ bad smell from the pig farm Podgrad spreading to the health resort in Radkesbourg-Austria ➢ accumulation of gravel in Austria -trend: the Mura river bed is deepening ➢ Croatia: water quality degradation	**Agriculture:** ➢ some fish farms use drinking water ➢ pig farms ➢ milk processing industry.. ➢ intensive agriculture ➢ large irrigation schemes ➢ large melioration plots **Industry:** ➢ food processing industry ➢ dikes to prevent floods ➢ disposal of various substances ➢ exploitation of minerals from water ➢ gravel abstraction ➢ tourism and recreation ➢ traffic infrastructure ➢ energy infrastructure ➢ burdens on water and river banks from (agriculture, fisheries, tourism and recreation) **Municipalities:** ➢ illegal dump sites ➢ groundwater used for water supply ➢ rapid development of health resorts without considering environmental capacities ➢ highly loaded environment: low buffer capacity ➢ protection of natural and cultural heritage	**Agriculture:** ➢ inappropriate slurry disposal and application ➢ waste waters from pig farms are discharged without proper treatment ➢ excessive use of pesticides and slurry in agriculture (Mursko polje, Apaško polje) **Industry:** ➢ inappropriate storage and use of hazardous substances ➢ inappropriate operation of slaughter houses ➢ waste water treatment insufficient or non-existent **Municipalities:** ➢ inappropriate location of landfills (situated above acquifers) ➢ inappropriate handling (treatment, disposal) of leakage waters ➢ discharge of thermal water into the Lipnica creek ➢ insufficient water treatment because capacities of WWTP are too small

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

2.1. Agriculture

2.2. Industry, Tourism & Transport

2.3. Municipalities

Activities leading to water pollution	Assets/achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **1.1. Insufficient land and water resources management**					
➢ Inappropriate land–use	➢ Implementation of international conventions and treaties ➢ training of farmers (specialized schools) ➢ intersectoral co-operation (Ministry of the Environment and Physical Planning-Ministry of Agriculture, Forestry and Food) ➢ convenient distribution of agricultural land ➢ Agriculture Advisory Service ➢ land ownership ➢ introduction of rotation of crops ➢ introduction of organic farming ➢ Irrigation Forecasting Service ➢ legal provision	➢ loss of fertile soil ➢ decline in crop production ➢ loss of biological diversity ➢ degradation of wetlands ➢ loss of wetland-dependant species ➢ yield is at risk ➢ fluctuation of groundwater level (especially during summer season) ➢ fluctuation of water level in the surface reservoirs (reduction of the ecological functions) ➢ leaching of fertilizers and pesticides ➢ impact on hydrological properties and biocenoses	➢ changed water quality and quantity ➢ increase in content of toxic substances ➢ downstream pollution and overloading of water and wetland ecosystems	➢ inappropriate distribution of land ➢ fragmentation of agricultural land	➢ integrate land and water use planning in the catchment area ➢ take into account landscape diversity ➢ organize land use also including nature conservation measures ➢ implement international conventions through national laws ➢ maintain traditional agricultural land use ➢ improve co-ordination between sectors ➢ consider the natural hydrological regime
➢ Neglection of landscape diversity:				➢ canalization of water streams and clearance of riparian vegetation ➢ non-systematic approach in preparation of regional plans ➢ insufficient co-ordination between sectors ➢ lack of knowledge and environmental education ➢ insufficient background studies ➢ inadequate irrigation management practices	➢ maintain riverbank (using woody vegetation) ➢ conserve wetland ecosystems (natural stream wetlands) ➢ improve professional knowledge ➢ improve background studies ➢ provide subventions for conservation of floodplain forests ➢ provide subventions for maintenance of riparian vegetation
➢ Inappropriate irrigation				➢ basic information not available on time ➢ sectoral approach in planning and implementation ➢ high water consumption technologies ➢ out-of-date technology ➢ overuse of water for irrigation and uncontrolled irrigation	➢ co-ordinate work between HMZ and Stations for irrigation ➢ apply work of Stations for irrigation on pilot farms ➢ establish co-operation between sectors ➢ introduce appropriate technologies ➢ establish the monitoring system (quality and level of groundwater, etc.) ➢ up-dating technology, education system ➢ information system (WWW)

Activities leading to water pollution	Assets/achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **1.2. Inadequate use of pesticides and fertilizers in agriculture**					
➢ Inadequate application of pesticides and fertilizers ➢ Intensive crop production ➢ No respect of legislation	➢ Enforcement of Regulation (68/96 ➢ Introduction of sustainable technologies in agriculture	➢ increase in pesticides and nitrates content in surface waters and groundwater ➢ accumulation of toxic substances in food chains ➢ negative impact on human health	➢ accumulation of harmful substances in food chains / negative impact on human health and water and wetland ecosystems ➢ increase in pesticides and nitrate content in surface and groundwater	➢ over-use of fertilizers and pesticides ➢ ignorance of natural laws ➢ lack of knowledge and education ➢ lack of environmental awareness ➢ sanctions are not applied ➢ insufficient control	➢ amendment of Regulation of 68/96 (shorten the moratorium) ➢ consistent implementation of PPP (polluters pay principle) ➢ introduction of IPM (integrated pest management
➢ **1.3. Inappropriate fish farm management**					
➢ Inadequate waste water treatment from fish farms: ➢ Construction of fish farms at inappropriate locations ➢ Inappropriate selection of species	➢ Provide standards for planning, construction and management of fish farms ➢ Implementation of EIA (environmental impact assessment)	➢ release of nutrients into the stream water, eutrophication ➢ occurrence of alien species and competition with local species, biocenoses decline ➢ considerable impact in the source area of water streams	➢ introduction of alien species ➢ competition with local species ➢ deterioration of biocenoses	➢ over-sized fish farms ➢ uncontrolled discharge of waste water ➢ lack of control (ineffective inspectors) ➢ conversion of wetlands into fish farms ➢ lack of awareness and concern ➢ introduction and breeding of exotic species ➢ inappropriate feeding practices	➢ construction of complex water treatment systems, constructed wetlands for waste water treatment ➢ compliance to standards and legislation ➢ control of dosage and feeding practices ➢ monitoring of water quality at discharge ➢ reconstruction of existing fish farms (remedy measures) ➢ education and awareness raising

Activities leading to water pollution	Assets/achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **1.4. Inappropriate treatment of animal waste farms**					
➢ Inappropriate waste water disposal from animal (pig) farms: ➢ Insufficient management and size of animal farms ➢ Inappropriate location and size of animal farms ➢ Inadequate manure disposal	➢ standards for farm construction ➢ Regulation on the input of toxic substances and nutrients (Uredba o vnosu nevarnih snovi in rastlinskih hranil v tla)	➢ leakage of substances from inadequately managed manure pads (from animal farms) into soil, groundwater, flowing and stagnant water ➢ bad smell, especially during specific weather conditions		➢ lack of information about animal farms and their technologies ➢ lack of waste water treatment facilities ➢ ineffective control and punitive action ➢ ineffective control and inspection ➢ inappropriate size of the animal farms ➢ financial benefits ➢ inappropriate analysis of the environment ➢ neglect of environmental characteristics ➢ lack of sectoral co-ordination in land use ➢ lack of knowledge about manure management ➢ lack of information on the state of environment ➢ lack of waste water treatment facilities ➢ inadequate manure pads	➢ control (inspection service), ➢ monitoring ➢ legal punishment for those who cause pollution ➢ introduction of WWTPs on livestock farms ➢ implementation of EIA ➢ improvement of economic policy (purchase prices, subventions...) ➢ education and raising of public awareness ➢ creation of maps of endangered surface waters and groundwater (studies of ecological vulnerability) ➢ co-operation between sectors (improvement) ➢ establishment of information system (inventory) ➢ rehabilitation of manure pads and pits ➢ introduction of adequate manure management (new technologies

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **2.1. Insufficient waste water treatment**					
➢ Non-existent treatment of waste waters	➢ NEAP (National Environmental Action Plan) ➢ Legislation (regulations, incentives) ➢ Standards ➢ Cadaster/maps ➢ Control: a) inspection b) public ➢ Raising public awareness: - country level - local level ➢ numerous experts and institutions which plan and construct WWTPs	➢ Lack of good quality water for: ➢ drinking water ➢ technology ➢ irrigation ➢ cooling ➢ accumulation of heavy metals and other pollutants in sediments (the long term effect of pollution) ➢ eutrophication ➢ water pollution in general	➢ Pollution and overloading of water and the environment ➢ changed appearance = aesthetic value impaired ➢ international conflicts	➢ inefficient inspection control ➢ disregard of legislation and international treaties ➢ due to lack of knowledge of: ➢ experts ➢ administration ➢ public ➢ taking advantage of cheaper production (ecological dumping)	➢ efficient inspection control ➢ complying to existing legislation , elaborating the missing legislation ➢ education and raising awareness at all levels: ➢ of experts ➢ of administration ➢ of public ➢ complying international treaties, e.g. PPP
➢ Inadequately operating WWTPs				➢ bad maintenance of existing WWTPs, outdated technology -20 years and more	➢ combined (industry and municipalities) ➢ monitoring the effect of waste water treatment, toxicological tests ➢ monitoring ambient water quality (chemical, physical, microbiological and biological) ➢ also NGO's, civil society, non-expert monitoring
				➢ inadequate planning at all levels ➢ construction of adequate WWTPs: ➢ industrial	➢ obligatory planning and construction of WWTPs in every urban and industrial center ➢ Improvement of industrial and technological procedures, processes and technologies ➢ recycling of technological water
➢ Unfavorable framework conditions	➢ NGOs, civil societies, institutions in the field of water protection ➢ problem solving among various departments ➢ joint rehabilitation of the industrial and municipal sectors ➢ alternative (simpler) technologies, BAT ➢ ecological fund ➢ privatization process ➢ problems of companies that are bankrupt	➢ environment degradation: ➢ inappropriate appearance ➢ extinction or decline of animal species, flora and fauna near streams, rivers ➢ bad smell, possible occurrence of infectious diseases of people and animals ➢ protests: ➢ demands of inhabitants and NGO ➢ disputes among various water and land users		➢ political causes; lack of consensus among political parties	➢ inclusion of NGO and of the public in decision-making procedures (multi-stage public hearing) ➢ concessions for foreign companies in the construction of modern WWTPs, end of monopoly of Slovenian firms
				➢ ack of co-operation among sectors	➢ improvement of communication between: ➢ administrative departments, ➢ local communities, ➢ industry and inhabitants
				➢ price for water and waste-water is not adequate	➢ implement market price of potable and waste water ➢ founding of financial resources for the carrying out of the regulations ➢ construction of water accumulations
				➢ incomplete privatization process	➢ completion of the privatization process

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **2.2. Inadequate use, transport and disposal of industrial and hazardous waste**					
➢ Insufficient consideration of elements and processes in the natural environment	➢ NEAP ➢ legislation: ➢ enforcement ➢ incentives ➢ ADR compliance to and implementation of the Convention on transport of hazardous substances and fossil fuel ➢ supervision: -by inspectors -by civil society ➢ geological conditions ➢ abandoned mines and industrial plants ➢ information technology & data available to inspectors ➢ informing of the public ➢ education ➢ public opinion (NIMBY) ➢ progressive taxes ➢ credits, ecological fund, banks ➢ studied landfill sites ➢ recycling	➢ uncontrolled leakage of waste water ➢ overloading of environment ➢ contamination of potable water and groundwater ➢ change of appearance of tourist sites due to pollution ➢ epidemics, diseases, ecological disasters ➢ concealment of data by the polluters ➢ NGO threats of suing due to people's right to public data ➢ possible pollution with radionuclides	➢ pollution and depreciation of aesthetical values of: ➢ water ➢ environment ➢ import and export of waste, the Basel Convention ➢ decreased water quality ➢ long-term pollution loads in sediments	➢ lack of knowledge of experts and professionals, administration, and common people	➢ education and raising awareness at all levels (of experts and public)
				➢ neglection of environmental conditions at preparations of production plans	➢ complying to local agendas ➢ complying to EMS standards at preparations of production ➢ implementation of acts and regulations
				➢ not complying to legislation and international treaties	➢ complying to international treaties and regulations ➢ ambient water quality and emission monitoring
				➢ insufficient and ineffective inspection control	➢ increase in inspection control
				➢ insufficient control of dump sites	➢ efficient monitoring
				➢ the contents of waste not known	➢ a record of all illegal dump sites, analysis of substances and rehabilitation
				➢ lack of market approach, i.e. waste = useful matter	➢ credits for procedures for the secondary use of non-hazardous wastes ➢ introduction of controlled technological processes ➢ waste recycling
➢ Inadequate industrial waste disposal regarding - technology -site	➢ commission for nuclear safety by MoEPP and international experts	➢ accumulation of unsolved problems ➢ NIMBY effect ➢ spills of toxic and dangerous substances, especially on karst (accidents during transport) ➢ mixing of various industrial wastes in municipal dump sites		technology: ➢ no incentives	➢ the Trbovlje power plant ➢ h. Petrol (gas) ➢ situation analysis and restoration ➢ obligatory preparation of rehabilitation plans, rehabilitation of dump sites and gravel-pits ➢ collection, transport and recycling of waste materials ➢ taxes without exceptions ➢ ecological compensations (rent) ➢ introduction of economic instruments
				site: ➢ adequate industrial or hazardous waste disposal site not available ➢ NIMBY syndrome **Examples:** ➢ inappropriate use and storage of hazardous wastes: ➢ the Zirovski vrh uranium mine(radioactivity) ➢ Crna (kaolin) ➢ Hotavlje (quarry) ➢ the Mezica mine, deposit of old accumulators ➢ the Gudronja Cave, Pesnica ➢ the Sostanj power plant	➢ inform people ➢ construction of dump sites ➢ inform people ➢ construction of dump sites

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **2.3. Inadequate production technologies**					
➢ Inadequate (outdated technology):	➢ NEAP ➢ legislation ➢ incentives ➢ regulations ➢ standards ➢ legislation already in force ➢ complying to international standards ISO 9000, DIN 14000 ➢ control (inspection, public) ➢ ecological fund ➢ international competition	➢ over-production of waste waters and wastes	➢ pollution load and change of aesthetic qualities of: ➢ water ➢ environment ➢ transport of hazardous substances	➢ lack of financial resources and will to rehabilitate the situation	➢ stricter taxation, implementation of the PPP ➢ acceptance of international competition
				➢ use of inadequate process materials	➢ acceptance of international competition ➢ use of adequate technical procedures ➢ incentives for the introduction of ISO, EMS, EMAS standards
				➢ concentration of massive animal production Examples: ➢ discharge of chlorinated organic substances due to inadequate production technologies (cellulose bleaching) ➢ inappropriate procedures of slaughterhouses (Murska Sobota)	➢ consider the EU and domestic legislation ➢ change of technology to less waste-water production
➢ Unfavorable cooling systems	➢ concessions, legislation ➢ EIA (Environmental Impact Assessment) ➢ informing and raising awareness	➢ degradation of the environment and its aesthetic appearance ➢ overheating of water, water streams and stagnant water ➢ inappropriate waste disposal ➢ air, soil and groundwater pollution ➢ diseases	➢ pollution loads and change of aesthetic qualities of: ➢ water ➢ environment ➢ problems of radioactive waste disposal ➢ thermal pollution	➢ incomplete cooling system ➢ possible radiation, ionization (lack of data)	➢ constructing the cooling system ➢ elaboration and complying of/to EIA ➢ possible closure of the Krsko nuclear power station
➢ Unsustainable construction and operation of dams	➢ control (inspection, public) ➢ -the Sava, Drava and Mura rivers fall into II. quality class ➢ a chain of water power stations ➢ connections to gas supply network in Slovenia ➢ storage of natural gasses ➢ ecological fund ➢ used thermal waters shall be returned to undergr.			➢ reduced transport: alluvial material (gravel) organisms (fish)	➢ rehabilitation and renewal of the existing hydro power plants, regular removal of sediments from accumulations ➢ construction of fish ladders
				➢ Hydro power stations: accumulation of heavy metals and chemicals behind the dams settling of chemicals	➢ regular removal of (toxic) sediments from accumulations
				➢ Degradation of ecosystems due to damming: -short-term planning	➢ long-term planning with the help of EIA
				➢ Construction of dams:-problems and impact on the environment during construction	➢ construction with consideration of EIA
➢ Insufficient consideration of environment in regulatory interventions				➢ lack of knowledge of professionals, public and administration	➢ a more efficient inspection control ➢ introduction of alternative sources of energy (solar, water etc.)

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **2.4. Inadequate tourism & transport**					
➢ Inadequate behavior of tourists & transporters	➢ Ministry of the Environment and Physical Planning ➢ Ministry of Traffic and Transportation ➢ Ministry of Agriculture, Forestry and Food ➢ Ministry of Tourism ➢ Ministry of Economic Affairs	➢ environmental pollution in view of: water pollution soil pollution air pollution noise degradation of the environment ➢ water shortages in peak season ➢ eutrophication of Alpine lakes	➢ pollution and overloading of water and environment ➢ changed appearance = aesthetical values impaired ➢ international conflicts ➢ endangered migratory species and their habitats due to pollution and overcrowding	➢ lack of basic culture or behavior principles ➢ lack of environmental consideration ➢ lack of suitable infrastructure (dust-bins, toilettes, open fire-places, …)	➢ rising awareness of people ➢ proper taxation ➢ elaboration of a national and local plans for tourism development
➢ Road infrastructure not adequate				➢ high concentration of tourists in short time ➢ some less vulnerable sites are not known to tourists ➢ tourist activities incompatible with environmental capacities ➢ lack of suitable infrastructure (dust-bins, toilettes, open fire-places, …) ➢ poor programmes and management in tourism	➢ improvement of the quality of roads (reconstruction) ➢ improvement of existing guidelines for environmental protection for highways and implementation on also other roads, parking lots, etc. ➢ rising awareness of people ➢ efficient legislation, monitoring and prosecution
➢ Transportation policy inadequate	➢ legislation (regulations, incentives) ➢ standards ➢ control: - inspection - public ➢ raising public awareness: - country level - local level	➢ overcrowded areas by people ➢ too dense traffic ➢ endangered species due to pollution and loss or reduction of habitat areas		➢ too much road traffic ➢ low railway traffic ➢ supporting international road transport by lorries ➢ use of salt for defrosting street	➢ higher taxation (fuel price) for long distance transport (international) of goods via roads ➢ incentives or compensations for using railway to transport goods long distance ➢ introduction of cargo wagons that can carry lorries ➢ elaboration of a national plan for the development of railway transport ➢ rising awareness of people ➢ introduction of less destructive defrosting techniques

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ **3.1. Inadequate and insufficient wastewater treatment**					
➢ 3.1.1. Lack of WWTPs or undersized WWTPs:	➢ existing legislation ➢ various technologies ➢ taxes ➢ existence of municipal funds ➢ concessions ➢ adequate political will ➢ education and raising awareness ➢ ecological funds ➢ public at large ➢ spatial planning ➢ co-operation between sectors ➢ data base on water quantity and quality	➢ overloaded waste water ➢ polluted water bodies ➢ contaminated water sources and drinking water soil-pollution ➢ eutrophication ➢ degradation of natural environment	➢ deterioration of drinking water in Croatia ➢ deterioration of water quality ➢ growing tension among countries ➢ inflow and outflow of waste material across borders ➢ concentration of pollutants in water and in sediments	➢ mixing of industrial and municipal waste waters ➢ discrepancy between settlements and sewage system ➢ lack of financial funds ➢ lack of expertise planning in the past ➢ few analyses of water to be treated before project designing ➢ technical obstacles ➢ lack of control (ineffective inspectors)	➢ 3.1.1 (Re)Construction of WWTP's ➢ appropriate procedures for constructing waste water treatment facilities and monitoring the improvements ➢ constructing a separate system for municipal waste waters and rainfall runoff waters ➢ drafting and passing of appropriate environmental legislation ➢ provide budget funds ➢ expert education and training ➢ chemical and biological water analyses at the inflow and outflow of the WWPT ➢ improvement of control (inspection service) ➢ free market economy of municipal services
➢ 3.1.2. Untreated waste water				➢ absence of or improper sewage system ➢ improper waste water treatment technologies ➢ no WWTP ➢ improper mixing of various waste waters ➢ uncontrolled inflow of rainfall runoff water in WWTP ➢ reducing decomposition capacity in WWTP due to inflow of toxic substances ➢ untreated discharges from hospitals and laboratories ➢ improper disposal of thermal and bathing waters ➢ lack of expert knowledge ➢ insufficient public pressure ➢ partial data and no access to information ➢ lack of financial resources for problem solving	➢ 3.1.2. Planning waste water treatment (at the national and local levels) ➢ construction and maintenance of the sewage system ➢ encouraging the introduction of various suitable technologies (BAT) ➢ effective modernization and construction of WWTPs where necessary ➢ strict control of water users (manufacture, industrial and chemical waters) ➢ construction of a support system ➢ effective elimination of toxic wastes ➢ treatment of waste waters from laboratories and hospitals ➢ continuos education of municipal workers and raising public awareness ➢ public co-operation and informing the public ➢ improvement and access to various data on water quantity and quality ➢ the introduction of "polluters pay principle"

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ 3.1.3. Inappropriate conditions				➢ lack of co-operation between sectors in the planning and construction of the WWTPs ➢ lack of environmental awareness and lack of understanding the problem ➢ lack of political will ➢ lack of control ➢ insufficient legislation	➢ 3.1.3. Improve conditions: ➢ Independent monitoring, NGO's, civil societies, purchase of a mobile chemical laboratory for comparison of data ➢ to require interdisciplinary co-operation (chemistry, biology, construction, mechanics) ➢ simultaneous informing of the public about the municipal activities ➢ public and expert pressure on the political parties ➢ enforcement of water legislation with efficient punitive system
➢ **3.2. Inadequate waste disposal**					
➢ 3.2.1. Inadequate leachate management:	➢ existing legislation ➢ various technologies ➢ political will ➢ solid waste sorting ➢ education and information ➢ land-use planning ➢ inventory on dumping sites	➢ pollution of groundwater and surface water with leachate waters ➢ purchase of bottled water ➢ illegal dumping sites ➢ deterioration of environment's biological equilibrium (locally) ➢ occasional loses of water organisms ➢ contamination of drinking water sources ➢ soil pollution ➢ landscape deterioration ➢ deterioration of ecosystems ➢ alternation of bio-diversity ➢ mistrust of people	➢ decline of water quality ➢ raising conflict situations between countries	➢ lack of WWTPs at the dump sites ➢ inadequate and illegal dump sites ➢ unaware public and administrative authorities ➢ costly remediation of dump sites ➢ random location of dump sites ➢ use of disused gravel-pits ➢ "aesthetic deterioration" of river banks	➢ 3.2.1. Accumulation and treatment of leachate water: ➢ construction of WWTPs at dump sites ➢ remediation of the existing dump sites that need location permits ➢ awareness-raising of the population ➢ provide financial resources

Activities leading to water pollution	Assets/Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
➢ 3.2.2. Inadequate location of dump sites:				➢ landfills without working permits ➢ illegal dump sites ➢ lack of users of secondary resource ➢ undefined criteria for designing a landfill	3.2.2. New dump sites have to be planned according to the environmental standards: ➢ remediation of gravel-pits ➢ dump sites located according to properly defined criteria ➢ permit acquisition ➢ organized cleaning events of illegal dumping sites ➢ provide incentives for material collection ➢ define criteria for landfill locations (technical, social, environmental...)
➢ **3.3. Inadequate sewage systems**					
➢ 3.3.1. Numerous permeable cesspools and manure pads	➢ adequate financing ➢ taxes ➢ Ecological Fund ➢ public	➢ loading of WWTPs ➢ wastewater partially exfiltrate into the soil ➢ polluted groundwater ➢ disperse environment pollution ➢ uncontrolled emissions into environment (damaged sewage system) ➢ infiltration of surrounding waters ➢ direct discharge of waste water into water supply system	➢ decline of groundwater quality	➢ improper maintenance of cesspools ➢ dispersed sewage system ➢ insufficient capacities of cesspools	3.3.1. Proper maintenance of cesspools: ➢ legislation implementation ➢ stricter punitive legislation ➢ WWTPs for septic tanks (dispersed settlements) ➢ -constructed wetlands for cesspool effluent
➢ 3.3.2. Sewage system				➢ outdated sewage system ➢ households without sewage system ➢ unprofessional construction	3.3.2. Making sure if channel systems need to be remedied: ➢ expert capacity building ➢ completed sewage system (condition for water supply system completion)

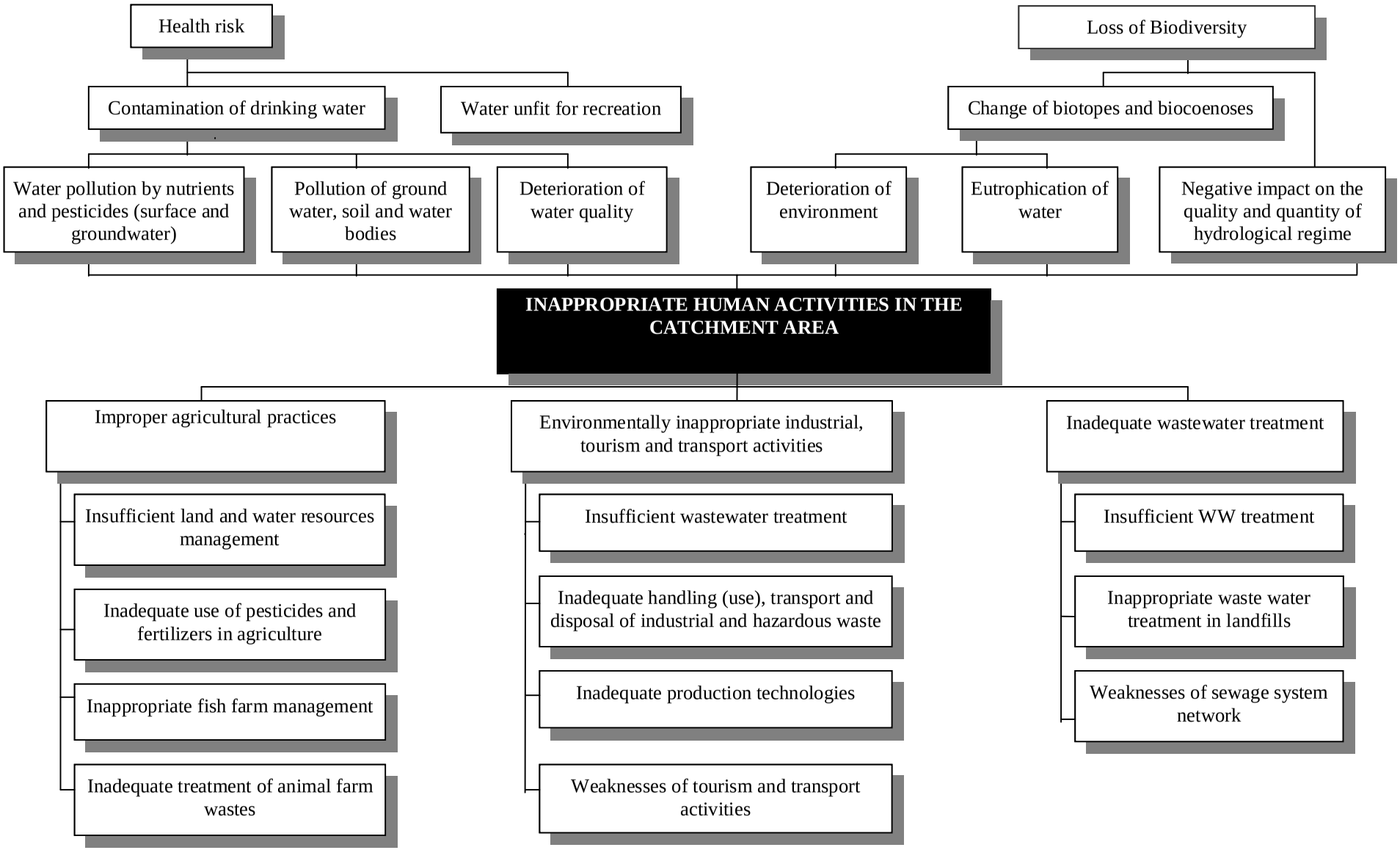
Annex 3. Problem analysis

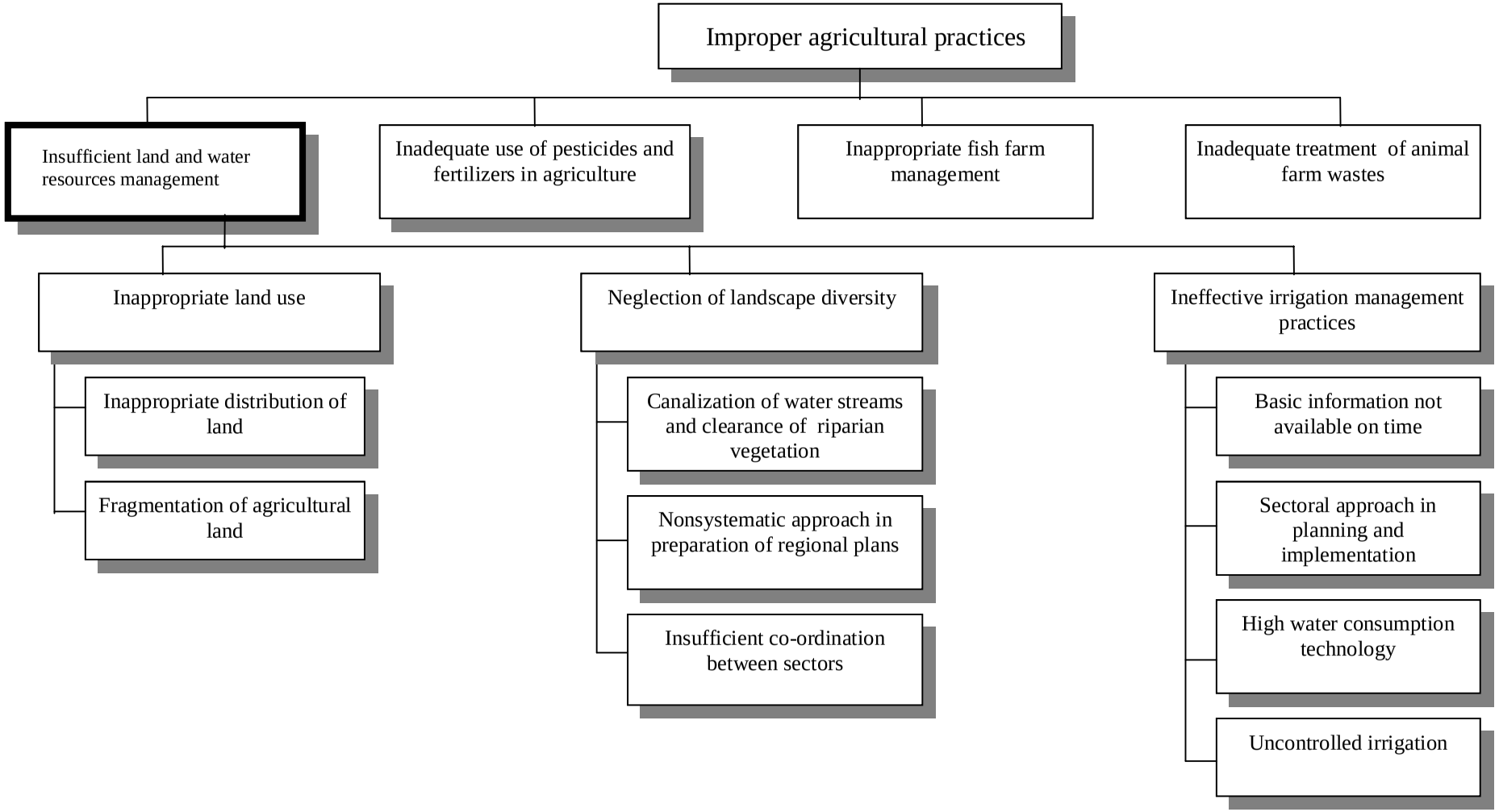
3.1. Agriculture

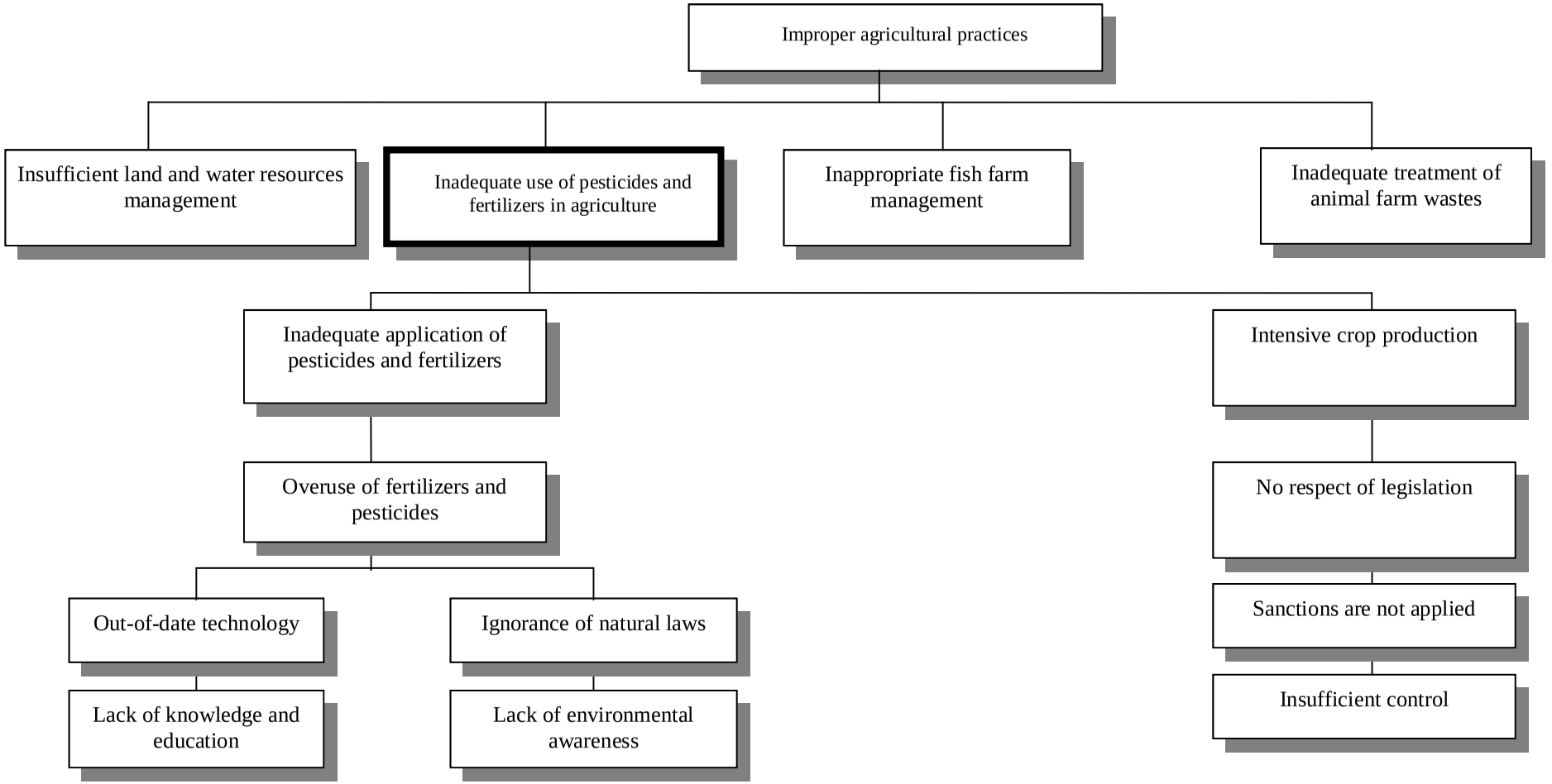
3.2. Industry, Tourism & Transport

3.3. Municipalities

GLOBAL HIERARCHY OF PROBLEMS **Annex 3.0**




Improper agricultural practices
Insufficient land and water resources management
Inadequate use of pesticides and fertilizers in agriculture
Inappropriate fish farm management
Inadequate treatment of animal farm wastes
Inappropriate land use
Neglection of landscape diversity
Ineffective irrigation management practices
Inappropriate distribution of land
Fragmentation of agricultural land
Canalization of water streams and clearance of riparian vegetation
Nonsystematic approach in preparation of regional plans
Insufficient co-ordination between sectors
Basic information not available on time
Sectoral approach in planning and implementation
High water consumption technology
Uncontrolled irrigation


Improper agricultural practices
Insufficient land and water resources management
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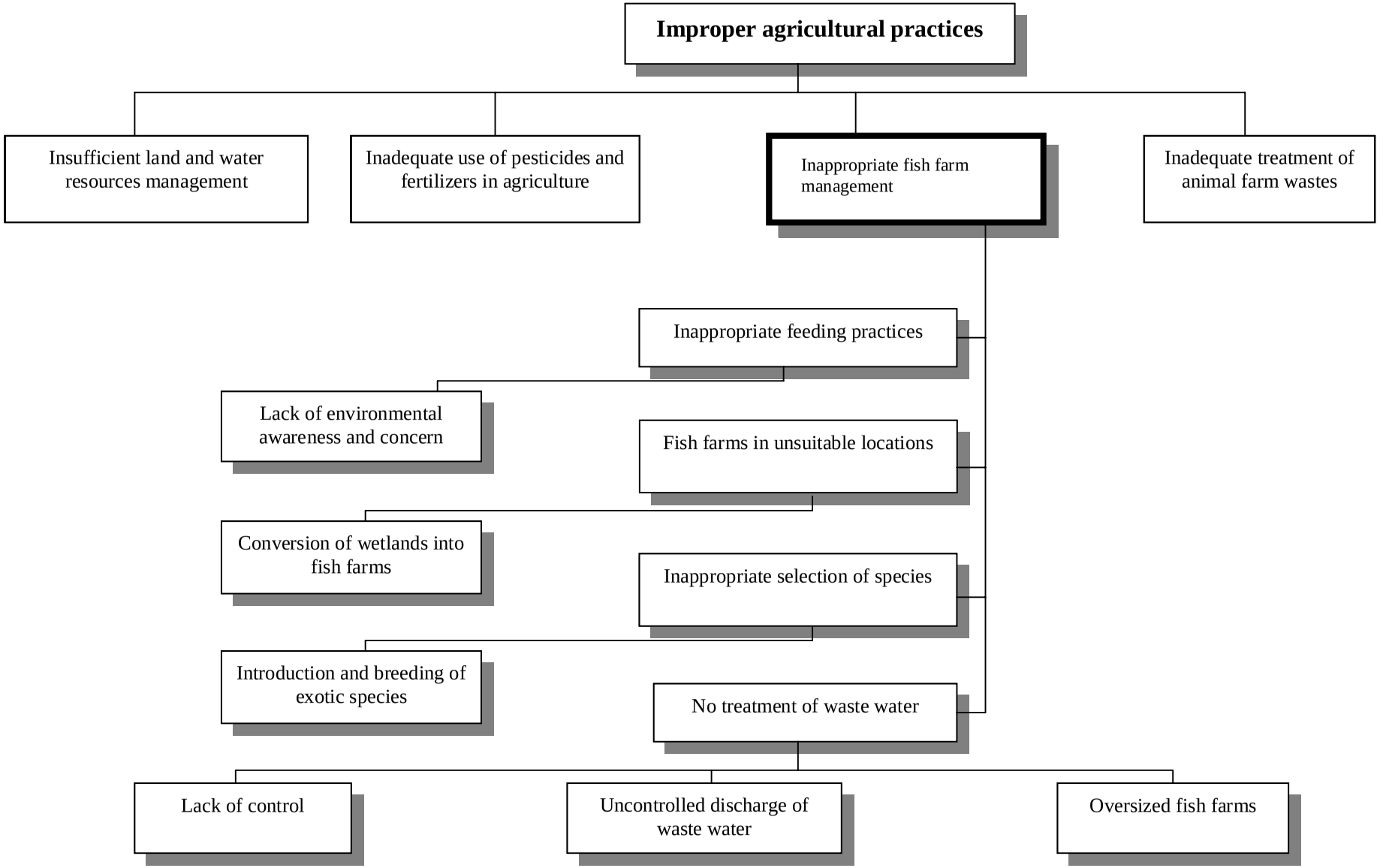
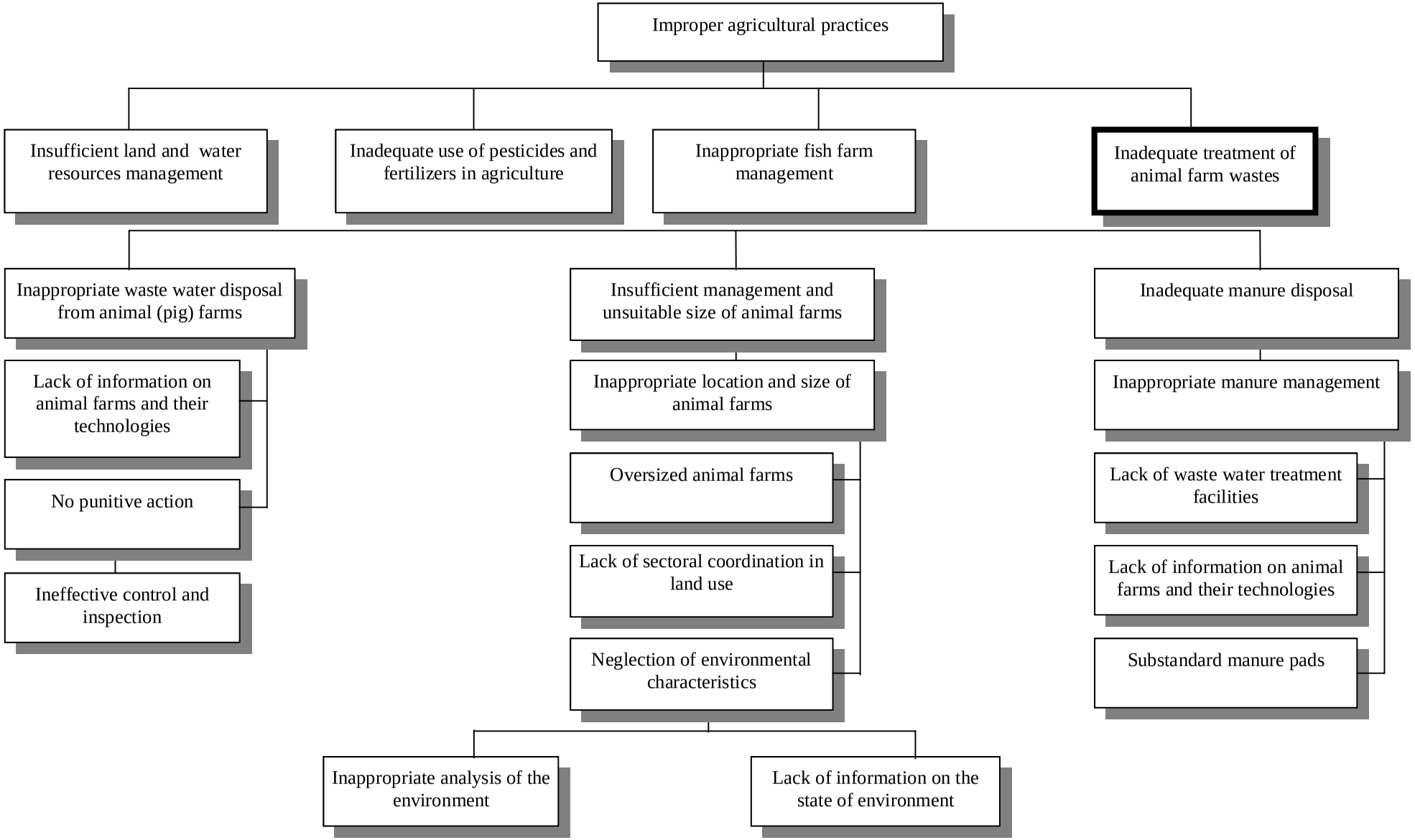
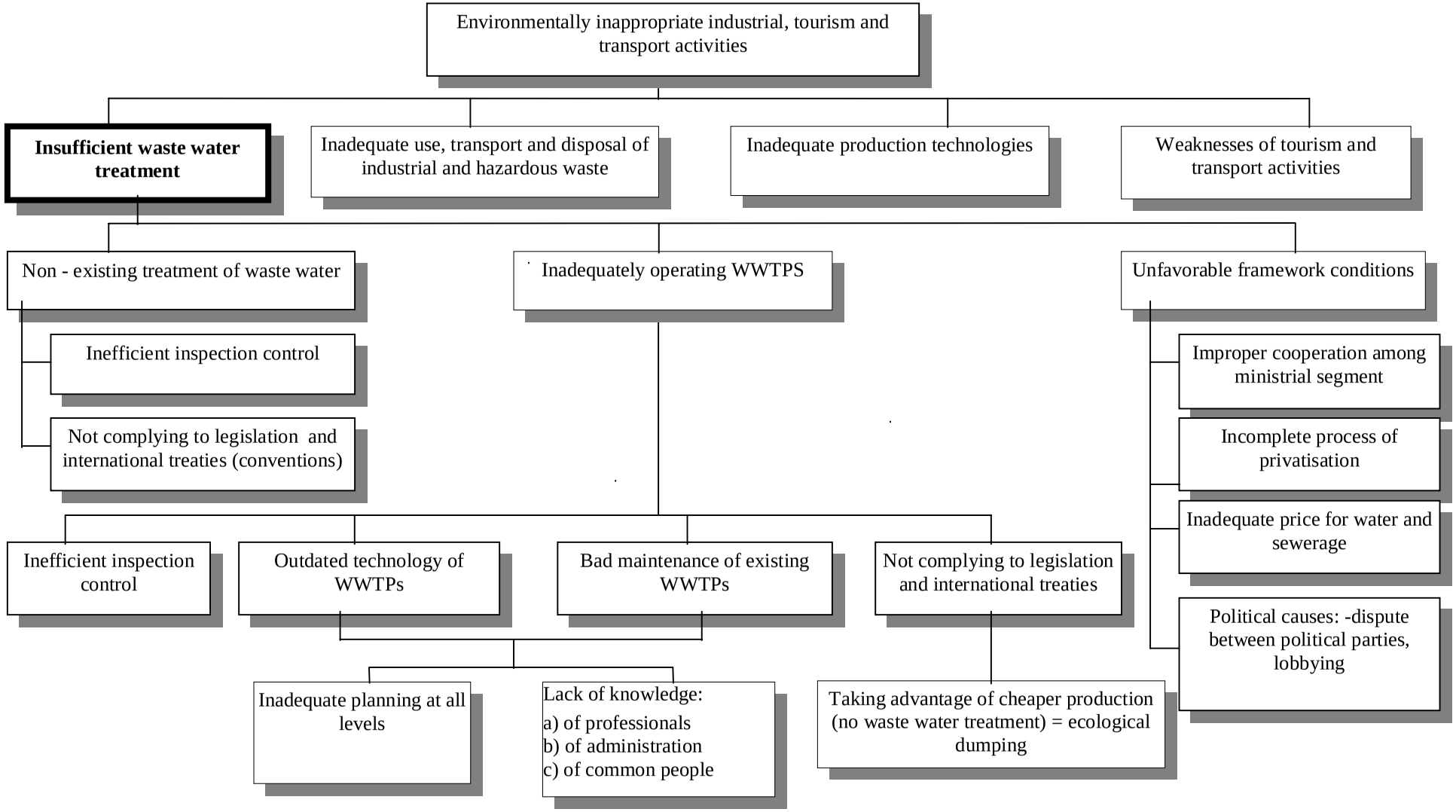
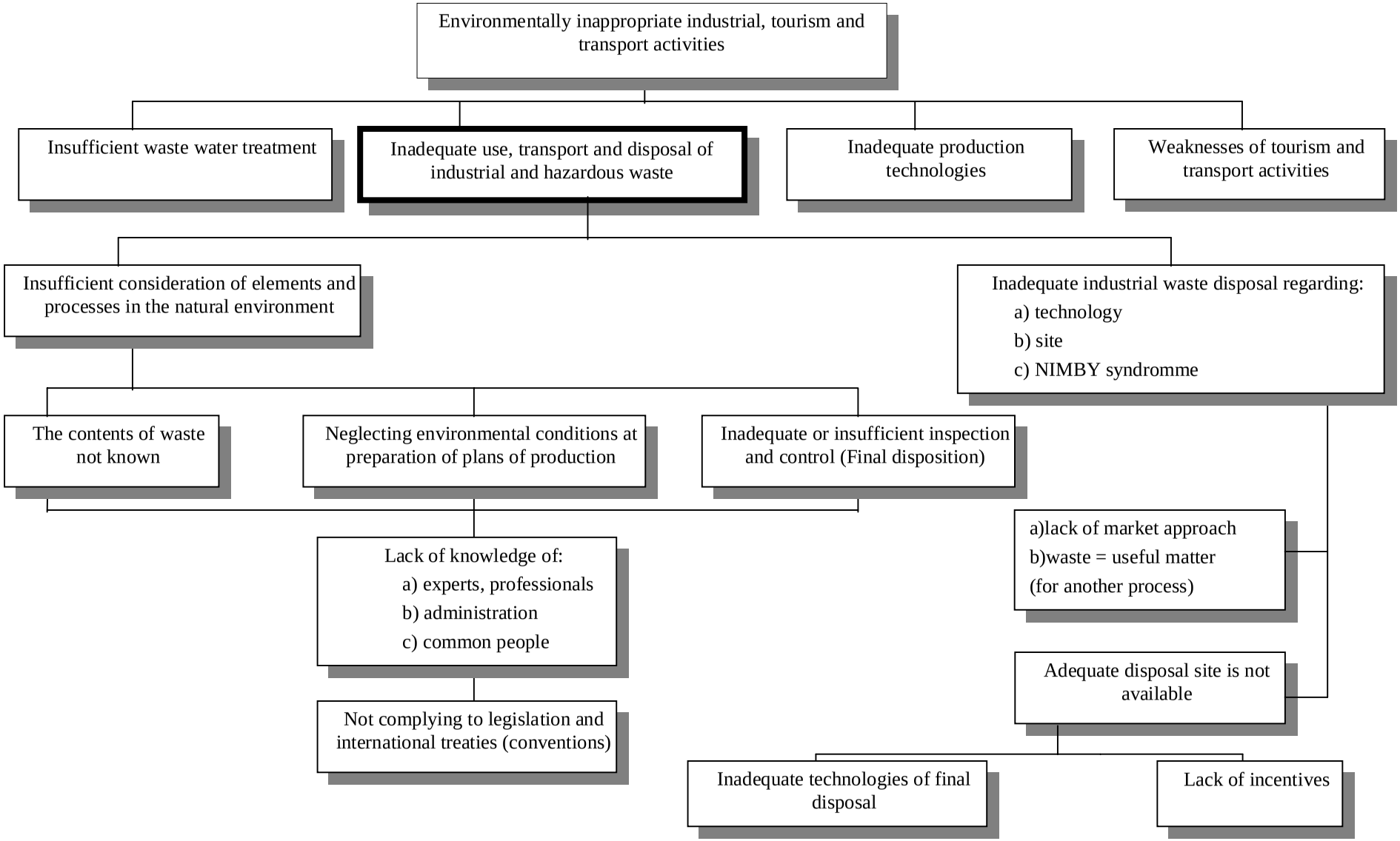
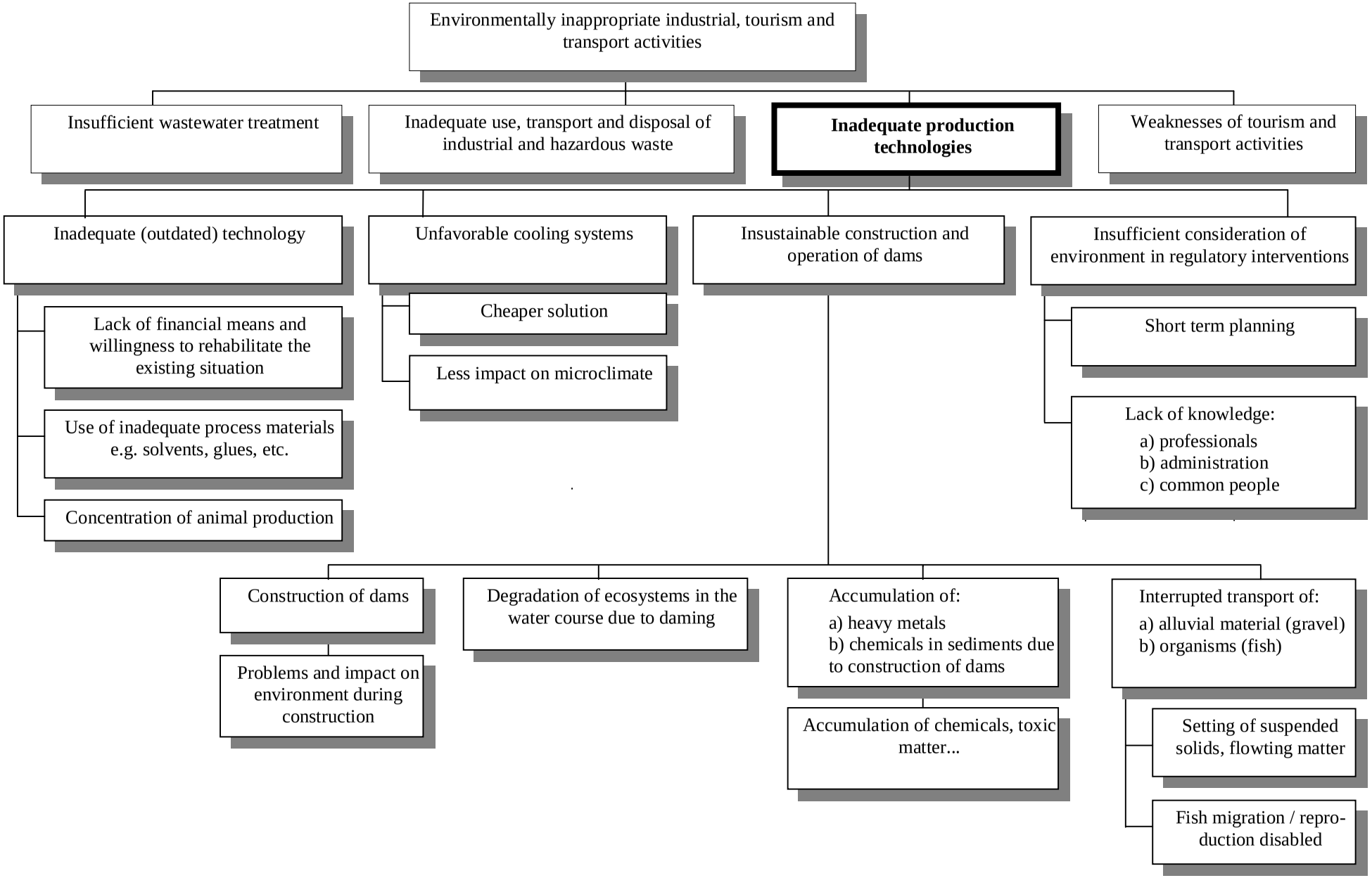
Inappropriate fish farm management
Inadequate treatment of animal farm wastes
Inadequate application of pesticides and fertilizers
Intensive crop production
Overuse of fertilizers and pesticides
No respect of legislation
Out-of-date technology
Ignorance of natural laws
Sanctions are not applied
Lack of knowledge and education
Lack of environmental awareness
Insufficient control

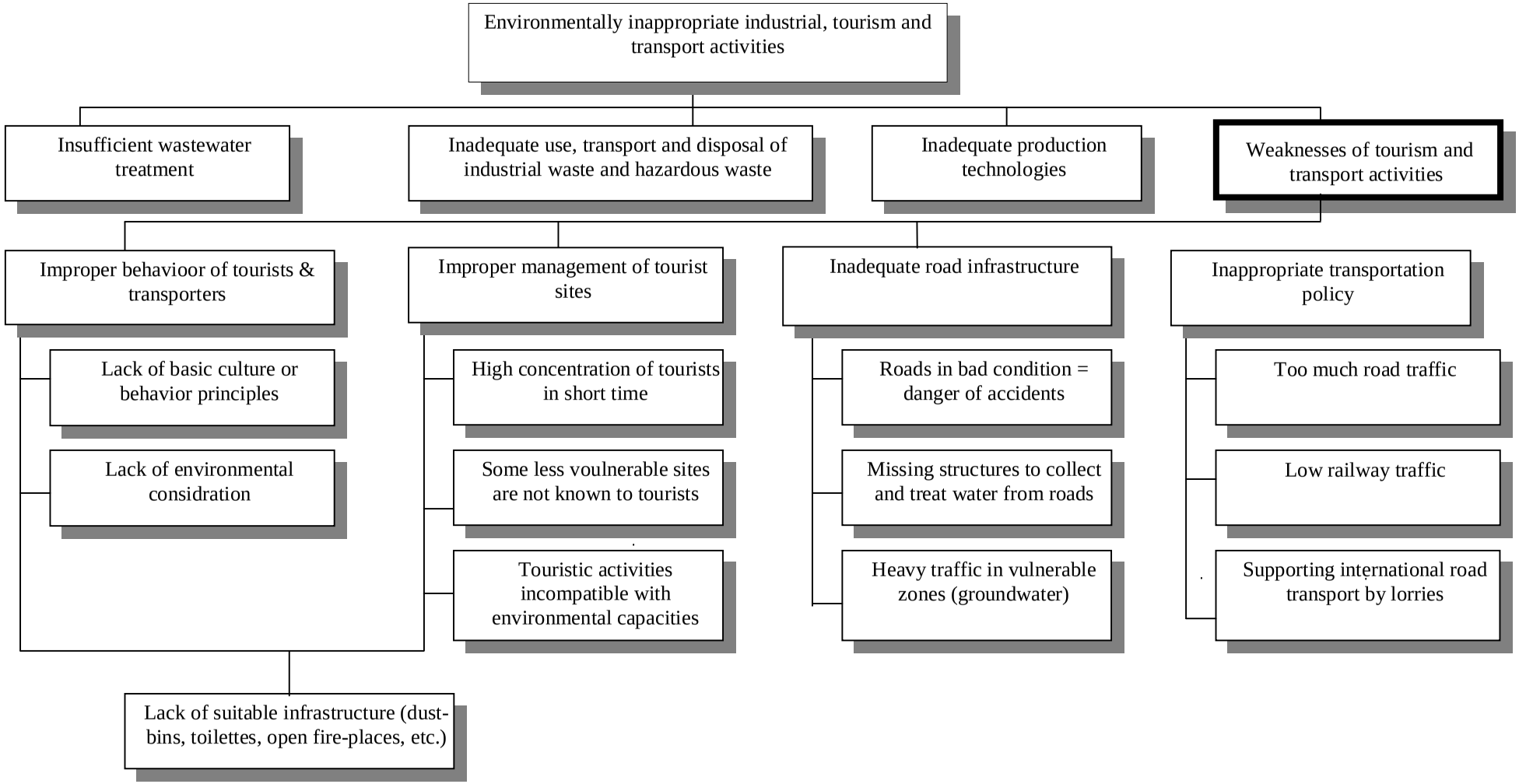

Improper agricultural practices
Insufficient land and water resources management
Inadequate use of pesticides and fertilizers in agriculture
Inappropriate fish farm management
Inadequate treatment of animal farm wastes
Inappropriate feeding practices
Lack of environmental awareness and concern
Fish farms in unsuitable locations
Conversion of wetlands into fish farms
Inappropriate selection of species
Introduction and breeding of exotic species
No treatment of waste water
Lack of control
Uncontrolled discharge of waste water
Oversized fish farms

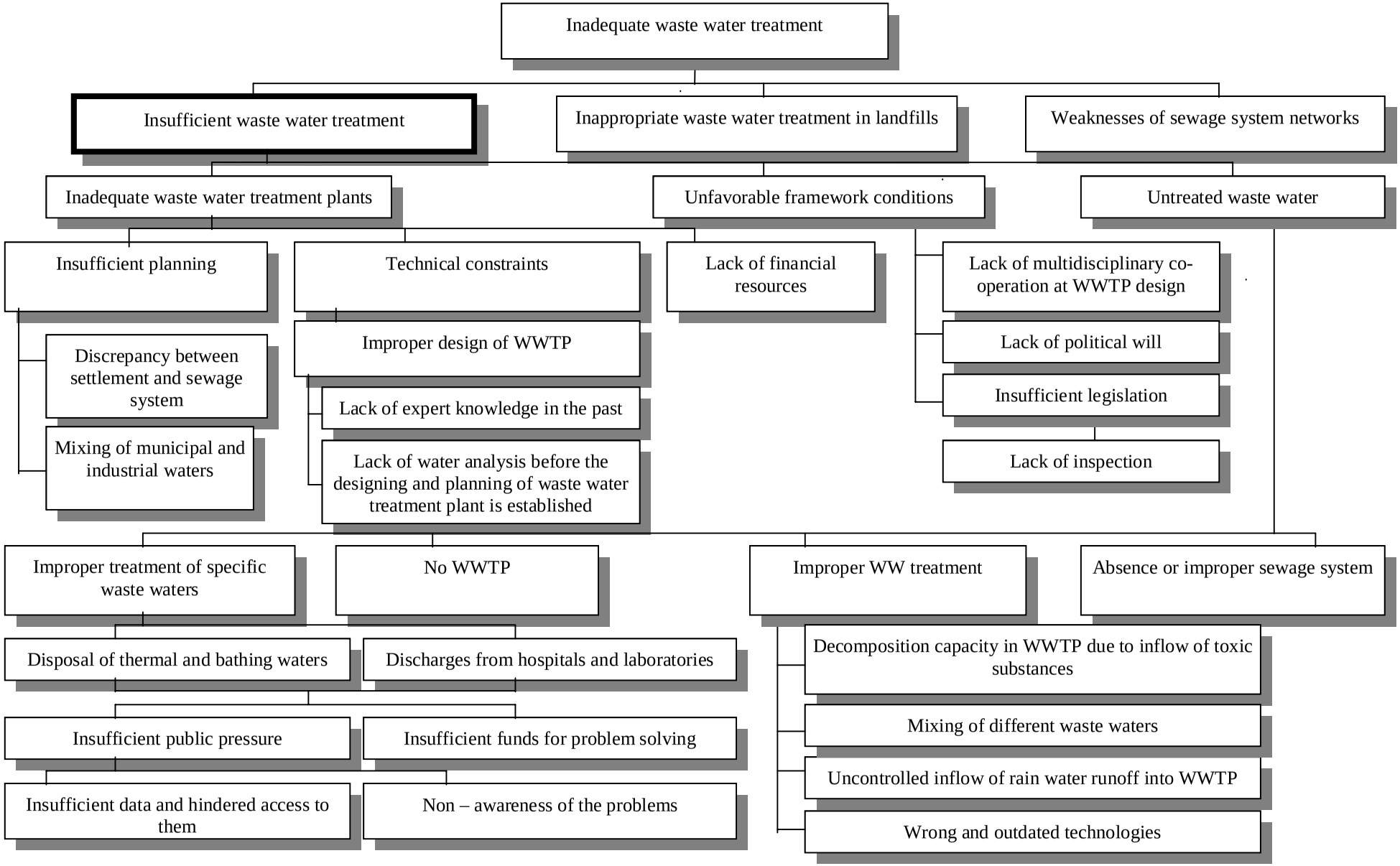

Improper agricultural practices
Insufficient land and water resources management
Inadequate use of pesticides and fertilizers in agriculture
Inappropriate fish farm management
Inadequate treatment of animal farm wastes
Inappropriate waste water disposal from animal (pig) farms
Lack of information on animal farms and their technologies
No punitive action
Ineffective control and inspection
Insufficient management and unsuitable size of animal farms
Inappropriate location and size of animal farms
Oversized animal farms
Lack of sectoral coordination in land use
Neglection of environmental characteristics
Inappropriate analysis of the environment
Lack of information on the state of environment
Inadequate manure disposal
Inappropriate manure management
Lack of waste water treatment facilities
Lack of information on animal farms and their technologies
Substandard manure pads

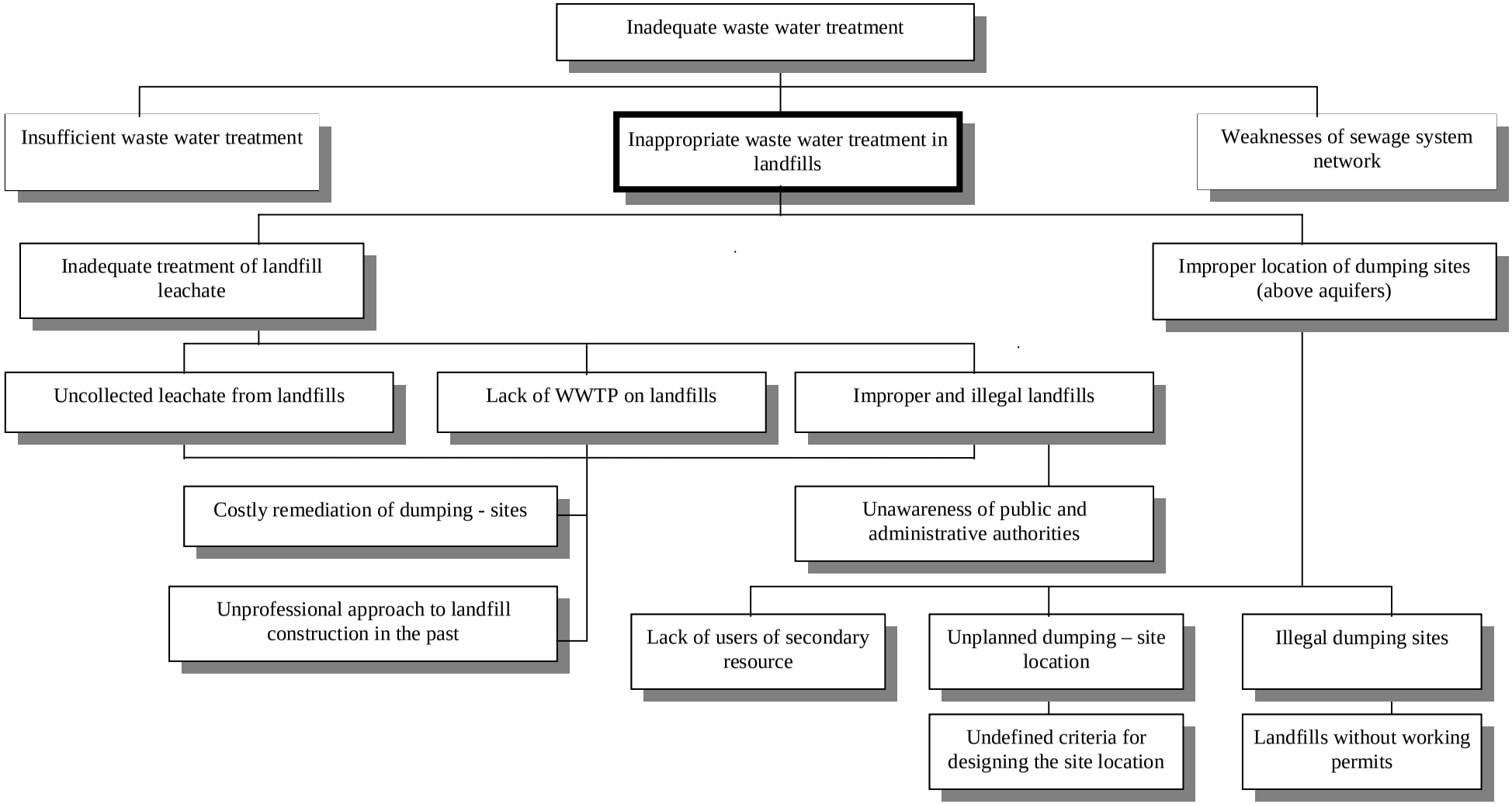

Environmentally inappropriate industrial, tourism and transport activities
Insufficient waste water treatment
Inadequate use, transport and disposal of industrial and hazardous waste
Inadequate production technologies
Weaknesses of tourism and transport activities
Non - existing treatment of waste water
Inadequately operating WWTPS
Unfavorable framework conditions
Inefficient inspection control
Not complying to legislation and international treaties (conventions)
Improper cooperation among ministrial segment
Incomplete process of privatisation
Inadequate price for water and sewerage
Political causes: -dispute between political parties, lobbying
Inefficient inspection control
Outdated technology of WWTPs
Bad maintenance of existing WWTPs
Not complying to legislation and international treaties
Inadequate planning at all levels
Lack of knowledge:
a) of professionals
b) of administration
c) of common people
Taking advantage of cheaper production (no waste water treatment) = ecological dumping

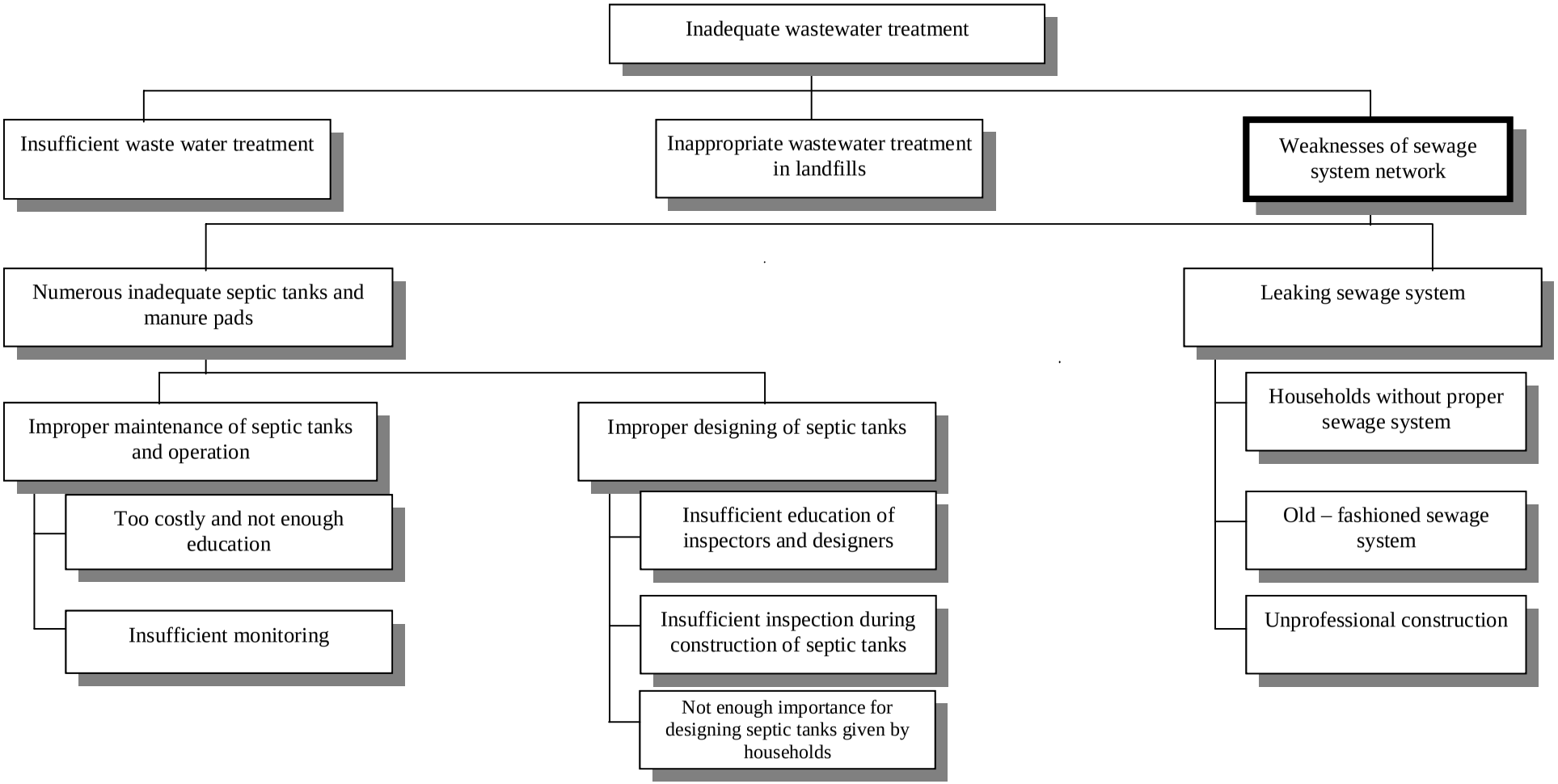

Environmentally inappropriate industrial, tourism and transport activities
Insufficient waste water treatment
Inadequate use, transport and disposal of industrial and hazardous waste
Inadequate production technologies
Weaknesses of tourism and transport activities
Insufficient consideration of elements and processes in the natural environment
Inadequate industrial waste disposal regarding:
a) technology
b) site
c) NIMBY syndromme
The contents of waste not known
Neglecting environmental conditions at preparation of plans of production
Inadequate or insufficient inspection and control (Final disposition)
Lack of knowledge of:
a) experts, professionals
b) administration
c) common people
Not complying to legislation and international treaties (conventions)
a)lack of market approach
b)waste = useful matter
(for another process)
Adequate disposal site is not available
Inadequate technologies of final disposal
Lack of incentives


Environmentally inappropriate industrial, tourism and transport activities
Insufficient wastewater treatment
Inadequate use, transport and disposal of industrial and hazardous waste
Inadequate production technologies
Weaknesses of tourism and transport activities
Inadequate (outdated) technology
Unfavorable cooling systems
Insustainable construction and operation of dams
Insufficient consideration of environment in regulatory interventions
Lack of financial means and willingness to rehabilitate the existing situation
Use of inadequate process materials e.g. solvents, glues, etc.
Concentration of animal production
Cheaper solution
Less impact on microclimate
Short term planning
Lack of knowledge:
a) professionals
b) administration
c) common people
Construction of dams
Problems and impact on environment during construction
Degradation of ecosystems in the water course due to daming
Accumulation of:
a) heavy metals
b) chemicals in sediments due to construction of dams
Accumulation of chemicals, toxic matter...
Interrupted transport of:
a) alluvial material (gravel)
b) organisms (fish)
Setting of suspended solids, flowting matter
Fish migration / repro-duction disabled


Environmentally inappropriate industrial, tourism and transport activities
Insufficient wastewater treatment
Inadequate use, transport and disposal of industrial waste and hazardous waste
Inadequate production technologies
Weaknesses of tourism and transport activities
Improper behavioor of tourists & transporters
Improper management of tourist sites
Inadequate road infrastructure
Inappropriate transportation policy
Lack of basic culture or behavior principles
Lack of environmental considration
High concentration of tourists in short time
Some less voulnerable sites are not known to tourists
Touristic activities incompatible with environmental capacities
Roads in bad condition = danger of accidents
Missing structures to collect and treat water from roads
Heavy traffic in vulnerable zones (groundwater)
Too much road traffic
Low railway traffic
Supporting international road transport by lorries
Lack of suitable infrastructure (dust-bins, toilettes, open fire-places, etc.)


Inadequate waste water treatment
Insufficient waste water treatment
Inappropriate waste water treatment in landfills
Weaknesses of sewage system networks
Inadequate waste water treatment plants
Unfavorable framework conditions
Untreated waste water
Insufficient planning
Technical constraints
Lack of financial resources
Lack of multidisciplinary co-operation at WWTP design
Lack of political will
Insufficient legislation
Lack of inspection
Discrepancy between settlement and sewage system
Mixing of municipal and industrial waters
Improper design of WWTP
Lack of expert knowledge in the past
Lack of water analysis before the designing and planning of waste water treatment plant is established
Improper treatment of specific waste waters
No WWTP
Improper WW treatment
Absence or improper sewage system
Disposal of thermal and bathing waters
Discharges from hospitals and laboratories
Insufficient public pressure
Insufficient funds for problem solving
Insufficient data and hindered access to them
Non – awareness of the problems
Decomposition capacity in WWTP due to inflow of toxic substances
Mixing of different waste waters
Uncontrolled inflow of rain water runoff into WWTP
Wrong and outdated technologies


Inadequate waste water treatment
Insufficient waste water treatment
Inappropriate waste water treatment in landfills
Weaknesses of sewage system network
Inadequate treatment of landfill leachate
Improper location of dumping sites (above aquifers)
Uncollected leachate from landfills
Lack of WWTP on landfills
Improper and illegal landfills
Costly remediation of dumping - sites
Unawareness of public and administrative authorities
Unprofessional approach to landfill construction in the past
Lack of users of secondary resource
Unplanned dumping – site location
Illegal dumping sites
Undefined criteria for designing the site location
Landfills without working permits


Inadequate wastewater treatment
Insufficient waste water treatment
Inappropriate wastewater treatment in landfills
Weaknesses of sewage system network
Numerous inadequate septic tanks and manure pads
Leaking sewage system
Improper maintenance of septic tanks and operation
Improper designing of septic tanks
Households without proper sewage system
Too costly and not enough education
Insufficient education of inspectors and designers
Old – fashioned sewage system
Insufficient monitoring
Insufficient inspection during construction of septic tanks
Unprofessional construction
Not enough importance for designing septic tanks given by households

Annex 4. Sector Planning Matrix

4.1. Agriculture

4.2. Industry, Tourism & Transport

4.3. Municipalities

Sector Planning Matrix — 1. Agriculture — Annex 4.1.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Water quality in the Slovenian part of the Danube River Basin improved	➢ By the year 2010, the water quality has improved for one quality class in the 80% of the Sava river basin while the water quality of the Drava and the Mura river basins in Slovenia is the same as it has at the border with Austria. (PO)	
➢ **Sector Objective:** Sustainable agricultural development and conservation of natural resources	➢ Introduction of sustainable farming in compliance with the standards and regulations of the EU on the 50% of farms by 2010 and at the same time water pollution from agriculture is reduced and maintained within the "MAC" (maximum allowed concentration). (SOA)	➢ Funds in the national budget ensured in long-term (SOA) ➢ Common understanding between sectors achieved (SOA)
➢ **Results/Outputs:** 1.1 Integrated land use and water resources management applied 1.2 Appropriate use of pesticides and fertilizers achieved 1.3 Appropriate fish farm management adopted 1.4 Appropriate animal waste management implemented	➢ 1.1 By the year 2010, integrated management of the Sava, Drava and Mura river basins achieved by the inter-sector co-operation and implementation of the environmental legislation providing the EU directives have been fully incorporated into implemented legislation. ➢ 1.2 By the year 2002, the use of fertilizers and protective substances (pesticides) has decreased by 10% on 50% of arable land in the Pomurje and Podravje region and in the Savinja valley decreasing contamination of ground water by nitrogen and pesticides residues. ➢ 1.3 By the year 2005, all fish farms in the Slovene part of the Danube river basin have introduced management in compliance with the criteria for construction, operation and maintenance of fish farms and at the same time decreasing pollution of the surface water by nitrogen. ➢ 1.4. By the year 2005, in the Slovene part of the Danube river basin, pollution of waters with animal waste has decreased at least to the "MAC" levels of allowed concentration and in compliance with the "GAP.	➢ Sustainable agriculture considered the priority issue for inter sector co-operation
➢ **Activities:** 1.1.1 Introduce sustainable agriculture (management, planning, implementation, etc.) 1.1.2 Improve co-operation between various sectors 1.1.3 Rehabilitate the "hot spots" 1.2.1 Implement the legal provisions for use of pesticide and fertilizers 1.2.2 Introduce sustainable agriculture practices 1.2.3 Train farmers and agriculture advisers to improve farming practices 1.2.4 Raise public awareness about sustainable agriculture 1.3.1 Undertake measures for construction and maintenance of fish farms 1.3.2 Define species to be bred in fish farms 1.3.3 Train fish farm managers 1.4.1 Introduce sustainable livestock breeding 1.4.2 Improve control and planing of waste water discharge from animal farms 1.4.3 Reinforce control of the implementation of regulations in manure management		➢ Agro-environmental legislation together with sufficient inspection services is efficiently implemented. ➢ Incentives for sustainable animal husbandry are provided on time ➢ Effective co–operation between ministries and common agreement between sectors is obtained in the long-term. ➢ Reconstruction of the "hot spots" is ensured or provided

PO - Program Objective SOA - Sector Objective of Agriculture

Sector Planning Matrix — 2. Industry, Tourism &Transport — Annex 4.2.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program objective:** Water quality in the Slovenian part of the Danube River Basin improved	➢ By the year 2010, the water quality has improved for one quality class in the 80% of the Sava river basin while the water quality of the Drava and the Mura river basins in Slovenia is the same as it has at the border with Austria. (PO)	
➢ **Sector Objective:** Sustainable industrial practices, tourism and transport developed and implemented	➢ The pollution of groundwater and surface water due to industry is reduced ≥ 80 % regarding year 1998 by 2010, or to meet II. quality class of surface water, or to meet MAC (EU, national) in groundwater (whichever option applies) (SOI)	➢ Environmental protection has high priority for Slovenian government (SOI)
➢ **Results/Outputs:** 2.1 Adequate waste water treatment applied 2.2 Proper management of industrial and hazardous wastes achieved 2.3 Appropriate production technologies adopted 2.4 Adequate tourism and transport established	➢ 2.1 50 % of the industry in Danube basin in Slovenia meets EU and national emission standards (for waste water) by 2010, resulting in improved water quality and availability for recreation, fisheries and other uses ➢ 2.2 80 % of industrial and hazardous wastes generated in Slovenian part of Danube river basin is adequately treated (EU & national legislation) by 2010, resulting in improvement of water quality and rehabilitation of environment ➢ 2.3 By 2010, in the Slovenian part of DRB the generation of waste in industry is reduced by 20 % regarding year 1998, Ecofund supports with ≥ 5% cheaper loans than others, resulting in improved water quality and improvement of the environment ➢ 2.4 The road transport is decreased ≥ 20% in favor of railway transport by 2010, density of tourists in dead seasons increases, while in peak seasons does not increase more than 2% per year in Slovenian part of DRB, resulting in amelioration of environment and water quality	➢ 2.1 Water charges and taxation effectively implemented ➢ 2.2 PPP and corresponding regulations are implemented or respected ➢ 2.3 International free market economy is introduced while respecting environmental regulations (EU) ➢ 2 4 Environmental principles and regulations in tourism and transport are respected
➢ **Activities:** 2.1.1 Undertake measures for the construction and maintenance of adequate industrial and combined WWTP 2.1.2 Implement the existing legislation, draft missing legislation 2.1.3 Ensure the monitoring of emissions and ambient water quality 2.1.4 Reinforce education and raise the awareness of experts and common people 2.2.1 Undertake measures for enforcement of legislation and implementation of international agreements and conventions 2.2.2 Introduce technologies producing min. amounts of final waste 2.2.3 Construct appropriate dump sites (industry, hazardous waste) 2.3.1 Introduce industries according to the level of technology -international conventions, PPP 2.3.2 Provide adequate planning, operation and maintenance of HEPP, TEPP and NPP 2.3.3 Apply relevant financial instruments (national/foreign sources and fines/incentives) 2.3.4 Implement appropriate measures for water management 2.4.1 Introduce tourism and transport forms which are more suitable for the environment 2.4.2 Construct, operate and maintain collection, discharge and WWT facilities 2.4.3 Limit tourism and traffic in overloaded or vulnerable areas		➢ Co-operation among government, industry and public is obtained 2.1.4, 2.2.1, 2.2.3, 2.3.4, 2.4.4 ➢ CMP (catchment management planning) is developed 2.3.4 ➢ Adequate & sufficient financial instruments are assured 2.3.3 ➢ Data on the status of the environment are available to public 2.1.2, 2.1.3, 2.2.1 ➢ Legislation is enforced 2.1.2 - 2.1.3, 2.2.1, 2.4.1

PO - Program Objective SOI - Sector Objective for Industry, Tourism & Transport

Sector Planning Matrix **3. Municipalities** **Annex 4.3.**

Summary of Objectives and Activities	Indicators	Important Assumptions
➢ **Program Objective:** Water quality in Slovenian part of the Danube River Basin improved	➢ By the year 2010, the water quality has improved for one quality class in the 80% of the Sava river basin while the water quality of the Drava and the Mura river basins in Slovenia is the same as it has at the border with Austria. (PO)	
➢ **Sector Objective:** Negative impact of municipal WW disposal highly reduced	➢ In the catchment area costs for treatment of ground and surface water decreased and at the same time improvement of water quality duo to 2. class is noticed by the 2010 (SOM)	➢ Politicians co–operate (SOM) ➢ Successful lobbying (SOM) ➢ Ensured budgetary financing (SOM)
➢ **Results/Outputs:** 3.1 Appropriate waste water treatment applied 3.2 Municipal waste management optimized 3.3 Management of sewer systems optimized	➢ 3.1. All discharges of a capacity > 2000 P.U. in the catchment area are treated in accordance with the EU standards by the year 2010 ➢ 3.2. Pollution of water due to leacheates is reduced for 30% by 2010 in the catchment area ➢ Water pollution due to sewage system is decreased for 30% by 2010 in the catchment area	➢ 3.1. Sector cooperation is effective ➢ 3.2. Priority list is taken into consideration ➢ 3.1. – 3.3. Public awareness is achieved ➢
➢ **Activities:** 3.1.1. Undertake measures for building national consensus for WWTPs and mobilization of financial resources 3.1.2. Assure building of new WWTP using appropriate technology 3.1.3. Assure appropriate operation of existing WWTP (rehabilitation, expansion completion) 3.2.1. Assure the rehabilitation of old dumping sides (legal, and illegal) 3.2.2. Support investments in waste management (separate waste collection, recycling.) 3.2.3. Construct new regional centers according to to-date standards (recycling.) 3.2.4. Raise awareness with regard to waste disposal 3.3.1. Undertake measures for increasing local communities involvement 3.3.2. Assure maintenance of new and existing sewage system networks 3.3.3. Construct WWTPs together with sewage systems		➢ 3.2.3. Ensured purchase of selected land by the State ➢ 3.3.1. Adequate Social circumstances ➢ 3.3.1. Co-operation of informed public is efficient ➢ 3.3.2. Financial resources are available ➢ ➢

PO - Program Objective SOM - Sector Objective Municipalities

Annex 5. Activities, Important Elements and Projects

5.1. Agriculture

5.2. Industry, Tourism & Transport

5.3. Municipalities

RESULT 1.1.: INTEGRATED LAND USE AND WATER RESOURCES MANAGEMENT APPLIED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.1.1 Introduce sustainable agriculture	➢ identify key ecological, landscape and human introduced processes (erosion, flooding) ➢ introduce appropriate regional planning ➢ integrate land and water regime management ➢ elaborate maps ➢ include sustainable agriculture into development priorities of agriculture sector ➢ stress the importance of breeding and use of autochthonous breeds ➢ support those traditional sustainable farming practices that are sustainable ➢ conserve or establish ecological corridors ➢ introduce relevant technologies	➢ Preparation of regulations: a) water law b) regional planning law c) nature conservation law ➢ National environmental programme ➢ wetland inventory ➢ preparation of new Ramsar sites ➢ groundwater protection model for the arable areas ➢ programme of protected areas (nature parks)	➢ integrated management of catchment areas ➢ National biodiversity strategy and action plans (NBS&AP) ➢ programme of protected areas ➢ integrated evaluation of running waters	➢ training for CMP (catchment management planning) ➢ establishment of a system of irrigation stations
➢ 1.1.2 Improve co-operation between various sectors	➢ define conditions of intersectoral co-operation ➢ consider the principles of sustainable development and natural characteristic ➢ elaborate national and local environmental plans (Agenda 21) ➢ implement international conventions through national legislation			
➢ 1.1.3 Rehabilitate the "hot spots"	➢ elaborate and implement rehabilitation programmes ➢ introduce buffer zones to prevent pollution due to fertilizer and pesticide use ➢ control the use of chemical fertilizers and pesticides ➢ introduce IPM (Integrated Pest Management) ➢ conserve riparian vegetation and wetlands ➢ conserve the original river beds and river dynamics	➢ ecologically sustainable manure disposal and smell abatement for pig farm Podgrad (Phare D7)		➢ defining buffer zones (area size) ➢ application of the functional analysis of floodplain wetlands in the Danube basin in the Slovenian catchment area

RESULT 1.2.: APPROPRIATE USE OF PESTICIDES AND FERTILIZERS ACHIEVED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.2.1 Implement the legal provisions for pesticide and fertilizers use	➢ supervise the distribution of mineral fertilizers and protective substances (on prescription) ➢ consider ecological conditions regarding dosage and application ➢ establish monitoring of implementation of standards ➢ harmonize legislation with the EU standards ➢ amend regulation No 68/96 ➢ (shorter moratorium period) ➢ introduce sale and use control through price policy ➢ raise awareness and education of farmers on irrigation	➢ preparation of a programme on regulations N^{o} 68/96	➢ preparation of local Agenda 21	➢ introduction of “catch crops” ➢ monitoring the impact of fertilizers and pesticides in irrigation areas
➢ 1.2.2 Introduce sustainable agriculture practices	➢ provide subsidized investments (fin. means) for sustainable agricultural production ➢ provide support for sustainable farms ➢ introduce trade marks for products of integrate agricultural production ➢ implement various pilot projects for sustainable farms ➢ evaluate and apply research results			➢ introduction of sustainable agricultural production on pilot farms
➢ 1.2.3 Educate farmers and consultation services to improve farming practices	➢ organize awareness courses for potential users of government subsidies ➢ organize capacity building (NGOs) schemes ➢ introduce environmental consideration into all services and activities (not only economical) ➢ introduce IPM practices and sufficient education of farmers		➢ defining criteria for subventions and subsidies for sustainable farming	➢ educating local agriculture consultation services
➢ 1.2.4 Raise public awareness on sustainable agriculture	➢ raise public awareness through: a) media: TV, radio, etc. b) publications, leaflets c) meetings, workshops ➢ organize a campaign on application of organic fertilizers ➢ educate farmers on the application of “green fertilizing” practices			➢ introduction of sustainable agricultural production on pilot farms

RESULT 1.3.: APPROPRIATE FISH FARM MANAGEMENT ADOPTED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.3.1 Undertake measures for construction and maintenance of fish farms	➢ improve expertise (suitable location and appropriate stock capacity, technology and maintenance) ➢ rehabilitate inappropriate fish farms ➢ provide compliance with standards and legislation ➢ introduce compulsory monitoring of fish farm functioning ➢ control inspection service			
➢ 1.3.2 Define species to be bred in fish farms	➢ raise awareness of fish farmers about the importance to breed native species ➢ comply to standards and regulations (punitive measures, incentives) ➢ promote tourism ➢ supply the locally bred fish for local tourist consumption	➢ introduction of local species		
➢ 1.3.3 Train fish farm managers	➢ determine minimal technical skills ➢ provide continuous education and ➢ training: a) agriculture advisers b)training courses ➢ provide state subventions for education and training ➢ establish monitoring of effluent	➢ management of waste from fish farms in Slovenia		

RESULT 1.4.: APPROPRIATE ANIMAL WASTE MANAGEMENT IMPLEMENTED

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 1.4.1 Introduce sustainable livestock breeding	➢ determine incentives for sustainable animal farming ➢ include research institutes (research possibilities, technologies) ➢ train farmers and consultation services ➢ assist small farms to introduce sustainable livestock breeding ➢ define and upgrade standards for environmentally sound farm production ➢ prepare maps of the areas where surface and underground waters are endangered ➢ start research and consultation on optimal size of animal farms ➢ determine standards for different farm-size		➢ defining eligibility criteria for subventions and subsides for sustainable breeding of livestock	➢ programme for raising awareness and education of farmers ➢ introduction of good agriculture practices on pilot farms
➢ 1.4.2 Improve control and planing of waste water discharge from farms	➢ make inventory of "hot spots" ➢ provide inspection, monitoring, punitive measures (fines) for polluters ➢ establish information system ➢ rehabilitate inappropriate manure pads ➢ install WWTP on animal farms		➢ preparation of an inventory (register) of polluters ➢ manure and WWTP of KG “Rakican” ➢ pig farm “Ihan”	➢ rehabilitation of inappropriate manure pads
➢ 1.4.3 Reinforce control of the implementation of regulations in manure management	➢ plan application of manure, criteria: plant demand for nitrates ➢ provide education of all levels of society and general public ➢ provide effective inspection service ➢ train livestock managers (farmers) on manure management possibilities ➢ introduce new technologies for manure handling	➢ management of animal waste produced on pig farms in Slovenia		

RESULT 2.1.: ADEQUATE WASTEWATER TREATMENT APPLIED

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.1.1. Undertake measures for the construction and maintenance of adequate industrial and combined WWTP	➢ enforce: NEPP, environmental protection law, water law, legislation, standards, PPP ➢ adequately plan WWTPs (national/foreign experts,. international public tenders) ➢ ensure adequate operation and maintenance of WWTPs (train employees, supervise (by experts)) ➢ carry out training courses for managers and maintenance staff of WWTP		➢ ICEC Videm Krsko ➢ leather industry Vrhnika ➢ paper industry Paloma, Sladki vrh ➢ paper industry Radece ➢ Lasko brewery ➢ slaughter house Murska Sobota	
➢ 2.1.2. Implement the existing legislation, draft missing legislation	➢ enforce laws (inspection control, penal policy, incentives, taxation) ➢ comply with EU legislation (in spirit, in provisions, according to economical possibilities) ➢ adopt legislation (general (water law), secondary legislation, standards) ➢ perform unannounced inspections including experts, NGOs and the public ➢ introduce efficient control by inspectors and civil society - introduce adequate inspection: improve professional skill, general knowledge, authorizations, sanctions - improve and maintain registers of polluters and WWTPs, condition of environment, technological processes - train inspectors to be able to use the relevant information technology - assure public access to relevant data	➢ Water Law ➢ harmonization with the EU legislation		➢ establishment of an independent lab that could act as a service for unannounced inspections, public checking the official data, etc. ➢ establish school for performing programs for: professionals public at large ➢ -establish an information center for collecting and disseminating data

RESULT 2.1.: ADEQUATE WASTEWATER TREATMENT ACHIEVED

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.1.3. Ensure the monitoring of emissions and ambient water quality	➢ monitor emissions: - before discharge into sewage system or the environment - at WWTPs ➢ harmonize legislation for emissions and ambient quality monitoring in the entire DRB region ➢ ambient quality monitoring of big polluters: - upstream - downstream ➢ improve national network of: - monitoring - databases - data accessibility ➢ establish TNMN (transboundary monitoring network) and ensure its functioning	➢ monitoring of polluters	➢ establish TNMN according to DRB requirements	
➢ 2.1.4. Reinforce education and raise the awareness of experts and common people	➢ environmental education in: - elementary schools - secondary schools - environmental courses at universities ➢ informal education: - after school activities - associations, NGOs - media ➢ further education of people: - holding key positions - at all levels - managers - employees ➢ quality control: - maintain licenses - introduce ISO 9000, DIN 14000 ➢ assure public access to relevant data	➢ research programmes for elementary schools: ECO school ➢ Water Detective		➢ elaborate curriculum for environmental tutorials for: - primary schools - secondary schools ➢ establish an information center for collecting and disseminating data

RESULT 2.2.: PROPER MANAGEMENT OF INDUSTRIAL AND HAZARDOUS WASTES ACHIEVED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 2.2.1. Undertake measures for enforcement of legislation and implementation of international agreements and conventions	➢ follow the EU legislation (in spirit, the actual provisions, according to economic possibilities) ➢ adopt legislation (general, secondary, standards) ➢ enforce legislation (penal policy, incentives, taxation) ➢ inform the public on Slovenia-EU approximation (in general, on specific examples) Enforce efficient control through inspectors and civil society ➢ introduce adequate inspection (professional skills, general knowledge, authorization, sanctions..) ➢ improve and maintain register (of polluters and WWTPs, condition of environment, technological processes) ➢ train inspectors to be able to use the relevant information technologies ➢ perform unannounced inspections including experts, NGOs and the public Implement international agreements and conventions ➢ inform target groups and the public on international agreements and conventions ➢ timely ratify adopted conventions and international agreements ➢ establish present situation/implement international agreements and draw up implementation programmes ➢ consistent application of sanctions for those who violate international agreements and conventions			
		➢ IKROS		
➢ 2.2.2. Introduce technologies producing min. Amounts of final waste	➢ educate people on key positions, at all levels (managerial, employee) ➢ promote and provide incentives for environmentally friendly technologies ➢ access to information libraries on “green” technologies ➢ exchange environmental know-how	➢ Ecofund improvement of SME heating system		
➢ 2.2.3. Construct appropriate dump sites (industry, hazardous waste)	➢ elaboration of guidelines for selection of location and management of ind. Landfills ➢ rising public awareness about consequences of (in)adequate disposal of waste ➢ introduce compensation for people near appropriately constructed landfills			➢ introduction of ecological compensation

RESULT 2.3.: APPROPRIATE PRODUCTION TECHNOLOGIES INTRODUCED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 2.3.1 Introduce industries according to the level of technology – international conventions, PPP	➢ inform public about status and needs in industry ➢ introduce closed technological processes for water and waste ➢ encourage use of materials that generate less waste, or less dangerous waste for the environment ➢ exchange and possible use of information on suitable technologies	➢ burning coal of better quality TETO-Ljubljana ➢ change of technology in numerous industrial facilities		
➢ 2.3.2. Provide adequate planning, operation and maintenance of HEPP, TEPP and NPP	➢ construction of TEPP along bigger rivers to decrease the influence of heat load ➢ encouraging efficient use of energy: - educating and informing experts and common people - use of waste heat for municipal heating ➢ encourage compatible tourist activities on impoundments	➢ Moste reservoir restoration project (PHARE S6)	➢ desulphurization of exhaust gases TEPP Šoštanj	
➢ 2.3.3. Apply relevant financial instruments (national/foreign sources and fines/incentives)	➢ provide incentives and subventions for environmental restoration investments ➢ introduce environmental taxation and punishments for pollution ➢ strict use of collected taxes in the water sector ➢ give greater part of GNP for the environment	➢ taxes for water pollution ➢ Slovenian ECO-fund	➢ assurance of bigger part of GNP for environmental protection	➢ taxes shall not drain into the budget
➢ 2.3.4. Implement appropriate measures for water management	➢ restoration of badly trained river courses and riparian land ➢ co-natural training of water courses and riparian land ➢ constructing and properly managing water impoundments	➢ improvement of biodiversity in a regulated river (PHARE D6) ➢ wetlands on the Mura river (PHARE D8)		

RESULT 2.4.: ADEQUATE TOURISM AND TRANSPORT ESTABLISHED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 2.4.1 Support tourism and transport forms which are more suitable for the environment	➢ define possibilities of tourism and traffic development in an environment-friendly manner ➢ implement legislation, providing of international contracts and conventions by following the EU and the domestic legislation ➢ to implement inspection and laic supervision ➢ encourage responsible behavior by informing and educating tourists and transporters ➢ implementation of (incentives, parallel/substitute activities)	➢ harmonization to EU legislation		➢ advising tourists and transporters on less loaded areas/roads
➢ 2.4.1. Construct, operate and maintain collection, discharge and WWT facilities	➢ define the conditions for construction and operation of traffic system and tourist roads ➢ decrease environmental pollution by adequate construction of traffic system ➢ construct structures for collection, discharge and removal of water from roads ➢ construct structures for collection, discharge and retention of hazardous substances ➢ operate and maintain facilities for protection of water and environment	➢ guidelines for highway runoff collection & treatment		➢ monitoring and revision of performance of highway runoff structures ➢ implement adequate runoff treatment also for less important roads
➢ 2.4.3. Limit tourism and traffic in overloaded or vulnerable areas	➢ define criteria for determining pollution and vulnerability, due to tourism and traffic ➢ define overpolluted, vulnerable areas, regarding tourism and traffic ➢ define and implement measures for limiting tourism and traffic ➢ redirecting transport and tourism to less loaded zones	➢ Ecofund amelioration of SME heating system		➢ definition of vulnerability due to increasing tourism and transport pressures

RESULT 3.1.: APPROPRIATE WASTEWATER TREATMENT APPLIED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.1.1 Undertake measures for building national consensus for WWYP and mobilization of financial resources	➢ Build national consensus for wastewater treatment: - educate experts and the public (seminars, roundtables) - enhance the awareness in school - lobby municipal councilors on the part of experts - establish a link between experts and parliament (technical committees, globe parliament) ➢ Finance and support WWTPs through: - tax money - Ecological Development Fund ("Ecofund") - introduce appropriate tax policy (incentives and disincentives) tax relieves - liberalization of prices for municipal services ➢ obtain assistance from EU and invite to tender for concessions-international tenders	➢ special workshop on planning for ecological engineering ➢ constructed wetlands in three ➢ municipalities in the Alpine region ➢ system of fund raising for "Ecofund"	➢ Agenda 21 for municipalities	➢ programme for the permanent education of environmental inspectors in Slovenia ➢ program for co-operation between experts and politicians at workshops (examples of good practices,..) ➢ seminar for municipal employees in Slovenia ➢ project on system solution for financing NGO participation at the workshop ➢ establishment of "Chamber of waste water treatment" ➢ training for international bidding ➢ reduction of taxes for all investments in environment

RESULT 3.1.: APPROPRIATE WASTEWATER TREATMENT APPLIED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.1.2. Assure building of new WWTP using appropriate technology	➢ construct sewage system before designing N.W. treatment plant ➢ analyze waste water prior to designing the size of the plant and select adequate technology ➢ introduce competition among designing companies (in terms of price and technology) ➢ demand responsibility of designers for the functioning of WWTPs ➢ preparation and adoption of adequate planning legislation ➢ consistent enforcement of legislation			➢ establishment of priority list for the construction of new WWTPs and provision of financial resources ➢ introduction of WW treatment in small settlements (alternative technologies)
➢ 3.1.3. Assure appropriate operation of existing WWTP (rehabilitation, expansion completion)	➢ complete unfinished WWTPs and put them to use ➢ upgrade WWTP, where necessary ➢ reconstruction of WWTP that do not operate properly ➢ foster co-operation among inspection agencies ➢ continuously educate managers of WWTPs ➢ establish regular monitoring on plant operation ➢ regular monitoring of the operation and functioning of existing WWTPs	➢ second and third stage of treatment of the main WWTP in Saleska dolina and WWTP in Gornji grad, Mozirje		

RESULT 3.2.: MUNICIPAL WASTE MANAGEMENT OPTIMIZED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.2.1. Assure the rehabilitation of old dumping sites (legal, illegal)	➢ draw up the register of public municipal service ➢ establish "hot line" ➢ ensure financial resources ➢ state subsidies ➢ collect and treat leaching waste waters (WWTP) ➢ organize volunteer working camps ➢ acquisition of permits ➢ ensure constant supervision of inspection ➢ introduce disincentives (taxes) on use of non-recycled materials ➢ introduce incentives (subsidies) for use of recycled materials ➢ grant concessions for companies applying selective collection of useful waste ➢ separate waste due to their risk impact		➢ Agenda 21 in municipalities	➢ prepare a programme for permanent education of environmental inspectors in Slovenia ➢ project on “hot-line” (080) ➢ establishment of register of landfills in all municipalities ➢ preparation of programmes for connecting experts and politicians (workshops, good practice examples..)
➢ 3.2.2 Support investments in waste management (separate waste collection, recycling, etc.)	➢ present foreign models ➢ choose dumpsite locations according to adequate criteria for CERO (Regional Center for waste management) ➢ introduce location selection control (by independent expert bodies) ➢ enable use of suitable land location for CERO), for example: land purchased by the state ➢ motivate municipalities to co-operate in problems solving at the regional level	➢ IKROS (Integrated Concept of Waste Management in Slovenia)		➢ preparation of tax system for packaging ➢ introduction of compulsory sale of suitable landfill (national location) ➢ seminars for municipalities and employees,

RESULT 3.2.: MUNICIPAL WASTE MANAGEMENT OPTIMIZED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.2.3 Construct new regional centers according to to-date standards (recycling..)	➢ urge adoption of legislation on construction of landfills, waste water treatment and special water management ➢ organize public cleaning activities (residential areas, illegal dumping sites, riverbanks, etc.) ➢ raise public awareness (through media, information leaflets) ➢ organize collection activities (collect special waste) ➢ use pools to collect data on the state of public awareness, satisfaction (increase about actual conditions)			
➢ 3.2.4. Raise awareness with regard to waste disposal	➢ formal education (school system) ➢ lectures organized by: - associations, NGOs - local communities - companies		➢ voluntary working camps	➢ surveying the stimulation of population for organized public cleaning actions (questionnaire) ➢ issue a local magazine

RESULT 3.3.: MANAGEMENT OF SEWER SYSTEM OPTIMIZED

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.3.1 Undertake measures for increasing local communities involvement	➢ inform the public by organizing: a) lectures b) workshops c) tours ➢ educate through: a) formal education system b) informal education c) counseling d) apply examples of good practice ➢ involve target groups: a) employees b) local authorities c) land owners ➢ improve inspection control a) exercise pressure on the part of the public on inspection agencies b) provide public access to the data c) increase the number of women in inspection agencies d) performance-related inspector salaries	➢ voluntary working camps	➢ Agenda 21 for municipalities	➢ Programs for co-operation between experts and politicians (workshops, examples of good practices) ➢ education for municipal and local authorities in Slovenia ➢ programme of permanent education of environmental inspectors in Slovenia ➢ system solution of financing NGOs participation on workshops ➢ improvement of co-operation between interest groups in a municipality ➢ establishment of a sewage system register and of a list of priority measures ➢ annual publication about work of inspection services ➢ granted concessions for independent services ➢
➢ 3.3.2 Assure maintenance of new and existing sewage system networks	➢ make an inventory of the present situation ➢ provide help of all available actors ➢ draw up a plan of sewage network ➢ ensure regular updating of sewage system networks			
➢ 3.3.3. Construct WWTPs together with sewage systems	➢ harmonize planning of sewage system network and WWTPs ➢ ensure waste water treatment before connecting to water supply network ➢ construct sewage network and WWTP ➢ regular supervision of the constructed sewage network and treatment systems			

Annex 6. Workshop Organization

6.1. Agenda of the Workshop

6.2. List of Participants

6.3. Evaluation of the Workshop

Annex 6.1.

National Planning Workshop

SLOVENIA, 17 – 20 JUNE 1998

Day 1:

09:30 - 10:00	Opening and Introduction of work programme, workshop objectives and methodological approach
10:00 – 12:30	Description and discussion of river basin areas and ecological zones
12:30 – 14:00	*Lunch*
14:00 – 18:00	Situation Analysis

Day 2:

09:00 – 12:00	Situation Analysis
12:00 – 13:30	*Lunch*
13:30 – 18:00	Elaboration of Programme Planning Matrix (analysis of objectives and identification of actions)

Day 3:

09:00 – 12:00	Identification of impact indicators and important assumptions in line with National and International (EU) water quality targets
12:30 – 13:30	*Lunch*
13:30 – 18:00	Definition of important elements for strategies and actions with particular attention to development of new projects for pollution reduction and improvement of water quality

Day 4:

09:00 – 12:00	Review of projects in relation to identified objectives (targets)
12:00 – 13:30	*Lunch*
13:30 - 17:00	Presentation of Programme Planning Matrix
	Discussion of results

Closure

Annex 6.2.

LIST OF PARTICIPANTS

Representatives of state administration - national level

1. Beltram Gordana, MOP - URSVN, Ljubljana (A)
2. Dimnik Joze, Ministrstvo za gospodarske dejavnosti (I)
3. Jug Metka, MOP - Urad RS za prostorsko planiranje (A)
4. Kresnik Ivo, MOP - URSVN, Ljubljana (I)
5. Novak Joze, UVN Izpostava Murska Sobota (samo prvi dan) (RB)
6. Zupan Martina, HMZ (RB)
7. Mikulic Zlatko, HMZ (RB)
8. Marincek Matija, MOP, URSVN, Izpostava Celje (A)
9. Grbovic Jasna, HMZ RS (I)
10. Mitja Bricelj, MOP (A)

Representatives of state administration - local level

11. Kriznar Tadeja, Obcina Domzale (RB)
12. Lozak Erik, Partizanska 39 Trbovlje (W)
13. Dolar Mojca, Komunala Radovljica (W)
14. Ramšak Rudi, ERICO Velenje (RB)
15. Šterbenk Emil, ERICO Velenje (RB)
16. Rošer Drev Alenka, ERICO Velenje (W)
17. Anzicek Darko, Obcina Krško (RB)
18. Ošlaj Feri, ISKRAEMECO, Kranj (I)

Representatives of academic institutions

19. Gaberščik Alenka, Nacionalni inštitut za biologijo, Ljubljana (A)
20. Kimovec Janez, IBE d.d., Ljubljana (W)
21. Kompare Boris, FGG, Ljubljana (I)
22. Podgornik Samo, Biotehniška fakulteta, Ljubljana (od 18.6.) (A)
23. Ravbar Marjan, Inštitut za geografijo, Ljubljana (A)
24. Zaja Sabina, Inštitut za ekološki inzeniring, Maribor (W)
25. Globevnik Lidija, Vodnogospodarski inštitut (RB)

Representatives of Non Governmental Organization

26. Maticic Brane, Slovensko društvo za namakanje in odvodnjo, Ljubljana (A)
27. Urbanc Bercic Olga, Društvo ekologov Slovenije (W)
28. Zagmajster Maja, Društvo študentov bilologije (W)
29. Znidaršic Bojan, VITRA, Cerknica (W)
30. Vogrin Nuša, Društvo za preucevanje ptic in varstvo narave, Rače (A)
31. Lipic Karel, Slovensko ekološko gibanje, Ljubljana (I)
32. Zejn Aleksander, Društvo študentov biologije (W)
33. Cervek Urban, SOD (W)
34. Barbic Gorazd, LABECO (I)

Annex 6.3

Evaluation of the Workshop

Within the scope of the information gathering and awareness creation on environmental issues, the Ministry of the Environment and physical planning (MoEPP) in collaboration with the United Nations Development Programme (UNDP) and the Zavod za tehnicno izobrazevanje organized a National workshop for elaboration of an environmental management plan for the Slovenian part of the Danube river basin between June 17th and 20th, 1998.

The Planning Workshop, which brought together thirty four technicians and specialists to elaborate specific strategies and priority actions for the pollution reduction programme in Slovenia.

In order to ensure a broad-base and multi-disciplinary input in the entire process, the Target Oriented Programme Planning (TOPP) approach was utilized. This approach not only ensured a wide participation of relevant institutions in the Process, but also constituted a logical approach to the identification of environmental problems, objective specification and the determination of strategies and priority actions.

The successful use of this approach, the general awareness created, results of the planning workshop and participants' evaluation of the entire process indicate that the objectives of the workshop were mostly attained.

This report contains details of each phase of the planning workshop. The first part is devoted to a brief summary and explanation of the methodology; while the second part contains a detailed analysis of the environmental problems in the Slovenian part of DRB, the third part is devoted to an exhaustive specification of the strategies (results), priority actions, important assumptions and impact indicators.

The planning team consisted of 34 participants:

8 from state administration - local level

10 from state administration - national level

7 from research organizations and institutions

9 from Non-Governmental Organizations

Three moderators, Mr. Maxime Belot, Mag. Irena Rejec Brancelj and Mrs. Natalija Vrhunc helped to facilitate discussions in plenary sessions and group work.

There were 34 participants in four days workshop divided into three groups: for agriculture (A), industry (I) and waste water management (W). Some people participate only in groups for identification of river basins (RB) (see list of participants).