DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP SLOVAKIA

Bratislava, June 2-5, 1998

MINISTRY OF ENVIRONMENT

in cooperation with the

Programme Coordination Unit
UNDP/GEF Assistance

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Preface

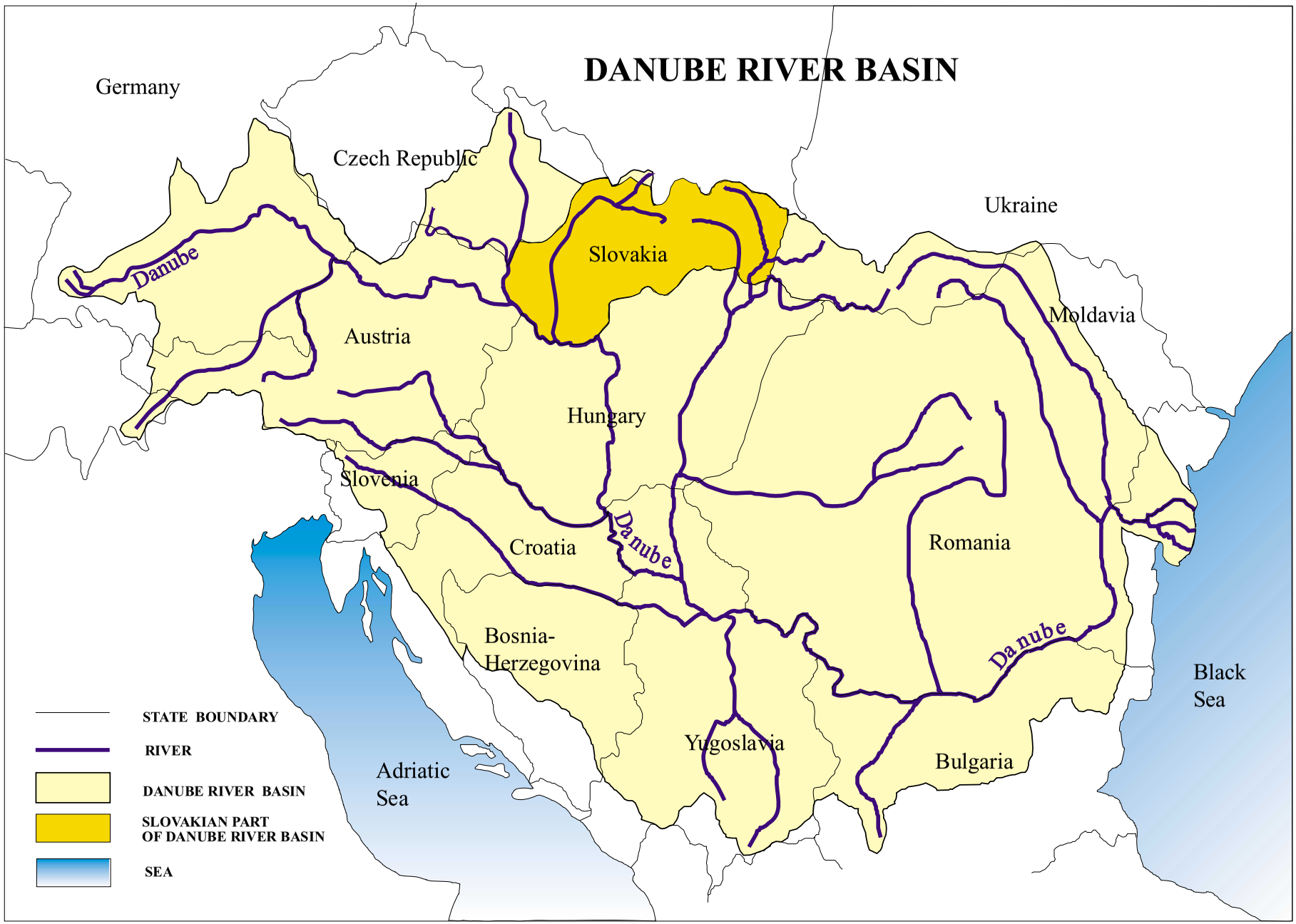
The present report is based on the results of the National Planning Workshop, held in Bratislava, Slovakia from 2 to 5 June 1998. The main goal of the workshop and its report is to provide a comprehensive presentation of analysis concerning problems and solutions for reduction, as well as control of 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 was prepared by the Slovak National Focal Point for the Danube Programme Mr. Boris Minarik with help of facilitators –Mrs. Renata Masanova, Mrs. Jana Drapalova and Mr. Jan Hanusin. 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: Representatives of Ministries (Ministry of Environment, Ministry of Soil Management as well as the Ministry of Economy), Regional Office of Bratislava, River Basin Authorities, Water Research Institute and Soil Fertility Research Institute, Association of Industrial Ecology in Slovakia, Slovak Agency for Environment, Water Work and Sewage Works. Furthermore representatives of several NGOs were present at the Workshop (Regional Environmental Center, Bratislava Regional Protection Center, Daphne and Slovak River Network). A list of participants is attached to this report in Annex.

The present report was prepared by the national facilitators with the assistance of the national experts, Mrs. Dagmar Petrikova and Mr. Juraj Namer. 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, support and guidance in the methodological approach and report writing. Overall conceptual guidance and technical advice was given by Joachim Bendow, UNDP/GEF Project Manager, to reinforce national initiatives.


DANUBE RIVER BASIN
Germany
Czech Republic
Ukraine
Slovakia
Danube
Austria
Moldavia
Hungary
Slovenia
Croatia
Danube
Romania
Bosnia-
Herzegovina
Danube
Black
Sea
Yugoslavia
Bulgaria
Adriatic
Sea
STATE BOUNDARY
RIVER
DANUBE RIVER BASIN
SLOVAKIAN 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 Slovak experts has elaborated National Reviews, providing information on water quality, analyzing financing mechanisms, describing social and economic framework conditions and developing projects and programs for pollution reduction, improvement of water quality, sustainable management of aquatic ecosystems and protection of resources. These elements, as well as the results of the National Planning Workshop shall constitute a national contribution to the development of the Danube Pollution Reduction Programme and shall provide elements for the revision of the Strategic Action Plan (SAP) of the ICPDR.

This present report shows the results of the National Planning Workshop, which took place in Bratislava, Slovakia, from 2 to 5 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.

Slovakia belongs to the European countries, which have considerably overloaded environment. Deteriorated water quality is one of the most serious problems of the present and for the future. In many cases, the recent water quality does not satisfy all requirements of users and the environment. The elimination of water pollution in Slovakia will result in the preventing the deterioration of biodiversity, especially in wetlands and flood plain ecosystems. The protection of groundwater resources already becomes a priority and their effective exploitation will improve the availability of water. The improvement of surface water quality will enable to provide the water supply also from this sources which will eliminate the competition for water. The cooperation on the local, regional as well as on national level will help to improve the human and natural environment.

The territory of Slovakia is drained by eleven major rivers, out of which nine belong to the Danube River Basin. The Danube River basin represents 96% from the total area of the Slovak Republic, which comprises 49 014 km^2.. There can be identified nine main basins of the tributaries in the Danube River basin on the territory of the Slovak Republic.

With respect to administration of river basins in Slovakia by River Basin Authorities, four river basin areas have been identified for this planning exercise. These are: the Danube River Basin area, which includes the Morava River, Danube River and Small Danube; the Vah River Basin Area - the Vah and Nitra; the Hron River Basin Area – Hron, Ipel and Slana; and the Bodrog and Hornad River Basin Area – Bodrog, Hornad and Bodva. The report describes the physical aspects, demography and human activities for each of these areas.

Particular causes and effects of pollution from point and diffuse sources, as well as transboundary water pollution have been analyzed in a sector approach, considering agricultural activities, industrial activities and the municipal sector. Based on the sector analysis, it has been identified as core problem that ***"Negative human intervention on water quality in aquatic ecosystems in Slovak part of the Danube River Basin".*** Direct causes of the core problem were described as "improper exploitation of forest and farmlands", from the agricultural sector, " high production of industrial waste" from the industrial sector and "significant pollution originated from urban areas" from the municipal sector. A number of effects of activities leading to negative human intervention on water quality in aquatic ecosystem in Slovak part of the Danube River Basin were identified, among them increased microbiological and toxic pollution, as well as increased phosphorus and nitrate concentration in the water.

Joint consequence of these effects is that water cycle in landscape is negatively affected. Effect of this is that water is unsuitable for agricultural purposes, for industrial processes and for drinking and recreation. The terminal effect is deterioration of the quality of human life.

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

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

In the sector **Soil Management (agriculture)** as the main causes of improper exploitation of forest and farmlands the inappropriate storage of wastes from livestock farming, improper agricultural and foresttechnical practices and elimination of buffer and selfpurificative elements from the landscape have been identified. In order to achieve protection and sustainable use of forest and farmlands, it is required to:

- ***introduce appropriate storage of wastes from livestock farming*** through reconstruction of old uncontrolled waste dumps from livestock farming; establishment of new landfills complying with applicable legislation; and minimization of quantities of disposed waste.
- ***apply proper agricultural and foresttechnical practices*** through supporting small and other alternative ecological methods of agriculture; assistance to the forest owners in restoration of biodiversity of forest ecosystems; and enhancing technical competence proven by certificates.
- ***protect and rehabilitate buffering zones and natural ecosystems*** through undertaking measures for financing of project for Sustainable River Basin Management and particularly to Wetlands; rehabilitation of floodplain and river bank ecosystems; minimization hydrotechnical impacts on natural parts of water courses; and improvement of the identification of land owners.
- ***implement appropriate legislative framework and high awareness*** through adoption of acts in area of sustainable forestry and agriculture management; supporting of institutional and personnel strengthening of organizations protecting nature and Slovak Environmental Inspectorate; raising of public awareness on protection and sustainable use of forests and farmlands.

In the sector **Industry** as the main causes of high production of industrial wastes the obsolete technologies, discharge of insufficiently treated industrial wastewaters, and insufficient legislative and financial mechanisms have been identified. In order to achieve sustainable industrial production, the following expected results were defined:

- ***apply appropriate technologies*** through undertaking measures for modernization of industrial processes; promotion of Environmental Management System (EMS) ISO 14000; and establishing of an information center for new environmental technologies.
- ***treat properly Industrial wastewater*** through introducing chemical and biological treatment technologies and technologies for nutrients removal; increasing the capacity and efficiency of WWTP; and establishing of monitoring and warning system systems in frame of water management of enterprises.
- ***implement adequate legislation and financial mechanisms*** through improvement of legislation; improvement of financial mechanisms; and making available funds (loans).

In the sector **Municipality** as the main causes of significant pollution from urban is insufficient treatment of discharged water, improper handling with solid communal waste and insufficient institutional frame. In order to decrease significantly pollution from urban areas, the following expected results were defined:

- ***implement sufficient treatment of municipal waste waters*** through performing of treatment of all discharged waste waters to a required degree according to legal standards; achieving a balance between a number of inhabitants connected to public waterworks and sewer systems; undertaking measures for reconstruction and finalizing of insufficient sewer system; providing funds for WWTP construction and reconstruction; increase utilization of sludge; and reduction of quantity of waste waters and mixing other waste water with sewage.
- ***achieve optimal handling with solid communal waste*** through creating conditions for separated waste collection; making available financial support for investments in recycling technologies; and application of appropriate methods for solving old environmental loads (old dumpsites).
- ***implement optimal institutional and legislative framework*** through undertaking measures for efficient state control and improving cooperation between executive and control authorities and bodies; improvement of professional skills of WWTPs operators; and implementation of system of eco-education and eco-labeling (household chemicals and detergents).

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 **soil management sector**:

- Floodplain Meadow Restoration in the Lower Morava River – by NGO Daphne;
- Analysis of Sediment Quality and Disposal of Extracted Sediments within the Slovak Part of the Danube – by Water Research Institute.

In the **industry sector**:

- Chemické závody Nováky – chemical plant;
- Bukocel Hencovce – wood processing; Považské chemické závody Žilina – chemical plant;
- Istrochem Bratislava – chemical plant.

In the **municipal sector:**

- WWTP Košice;
- WWTP Nitra,
- WWTP Banská Bystrica.

1. Introduction

1.1. Background

The first discussion about the proposal of the Water Pollution Reduction Program in the frame of the Environmental Program in the Danube River Basin has been started at the beginning of the year 1997. Slovakia, together with other Danube countries critically studied that proposal and in principle has shown its interest to participate in the activities of the project as much as possible. Broader discussion has been provided at the Country Program Coordinators meeting of the countries in the transition held in Vienna 17 March 1997. After a long exchange of views among countries including Germany and Austria, a common agreement about promotion of the Program has been taken.

Representatives of Slovakia, including NGO's attended a very carefully prepared workshop held in Krems 27-29 November 1997 where the whole structure of the project has been introduced comprising role of CPC's, international and national experts and also procedure at national levels aiming at involvement of all the stakeholders. A comprehensive assembly of participants was recognizing actively what would be necessary to be done, for example revision of the Strategic Action Plan, National Action Plans and, preparation new issues related to the transboundary impact measured by Danube Water Quality Model.

At the beginning of 1998 Slovakia started the work with choice and proposal of the national experts needed for the success of the project. Finally, in cooperation with CPC's the Project Manager nominated national experts according to the topics defined generally in Krems and later more precisely in Budapest where a specific training workshop has been held to ensure the same approach of the experts in revision of the National Review consisting of the description of the actual status of water quality, following it „hot spots", socio-economic aspects and financial questions, all of them associated with the aim of the program - water pollution reduction in the Danube River Basin.

Very important event in preparation of the revised National Review, so called the National Report, is the National Planning Workshop when national experts together with extra trained national facilitators created good conditions for identification of the problems, their causes and projects for improvement the existing situation in Slovakia. During workshop held 2-5 June in Bratislava by utilization of the visualization, all of the aspects later were introduced in the National Report and in the report from National Planning Workshop. Both documents are comprehensive basis for compilation of the intentions how to apply the idea of the Water Pollution Reduction in the Danube River Basin and for further positive discussion with any partner which is interested in to find solution in implementation of the remedial investment projects in the region. It is hope that the Danube countries will finally be in position to solve concrete and serious problems significant from national and from international view as well.

1.2. Planning approach

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

The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects for pollution reduction. For this purpose, a team of national experts for water quality data, water engineering, socio-economic analysis and financing mechanisms has been established within the Ministry of Environment, and under the guidance of the Country Programme Coordinator. The results of these studies represent

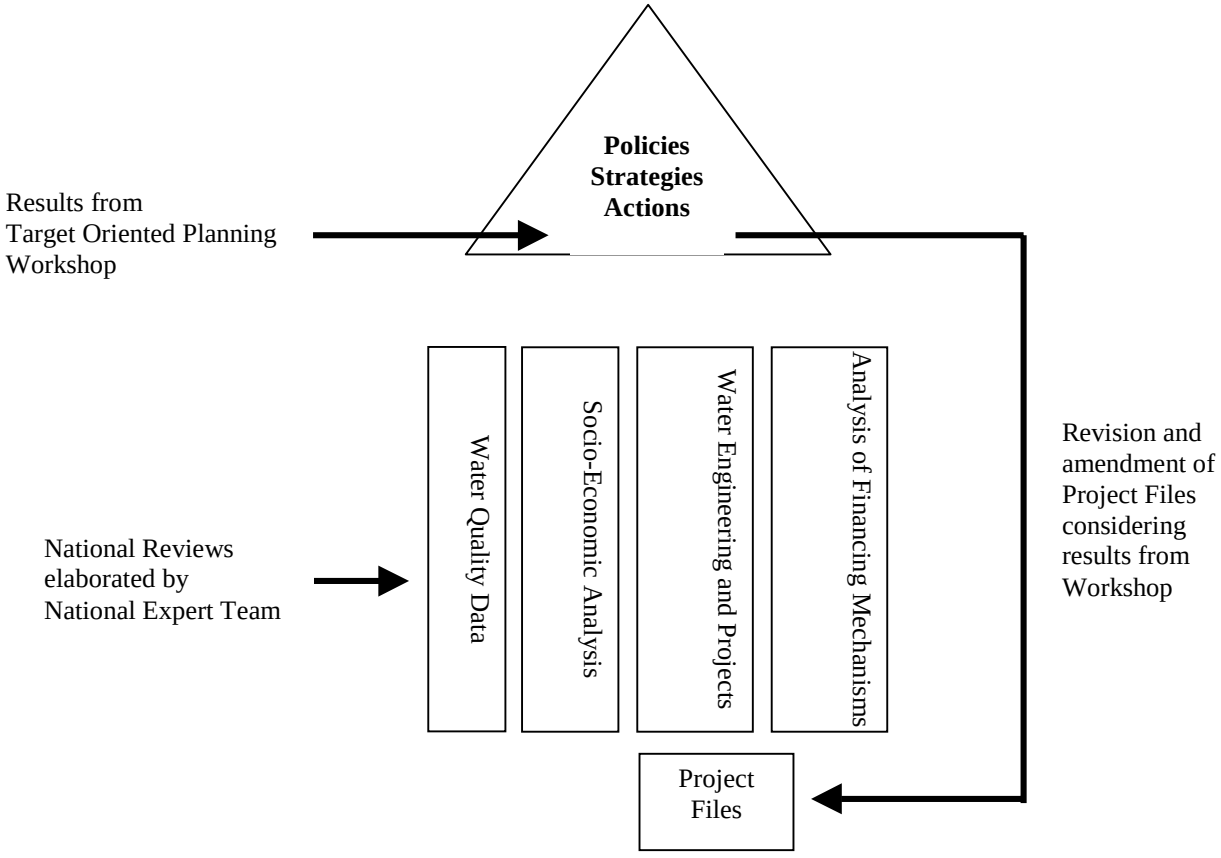
the baseline information for participants of the National Planning Workshop. Moreover, they constitute the national contribution, in technical, economic and financial terms, for the elaboration of the Danube Pollution Reduction Programme with particular attention to transboundary issues and the development of an investment portfolio.

To assure wider participation in the planning process, prior initiatives have been taken to organize an NGO-Consultation Meeting, which took place in Košická Belá from 14 to 15 May 1998. At this occasion, the Non-Governmental Organizations have discussed common strategies and priority measures for pollution reduction and designated their participants for the National Planning Workshop, as well as for the forthcoming regional meeting of the Danube Environmental Forum (regional NGO with the participation of all Danube countries).

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

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

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



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

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

The territory of Slovakia is drained by eleven major rivers, out of which nine belong to the Danube River Basin. It represents 96% from the total area of the Slovak Republic, which comprises 49 014 km^2.. There can be identified nine main basins of the tributaries in the Danube River basin on the territory of the Slovak Republic.

With respect to administration of river basins in Slovakia by River Basin Authorities, four river basin areas have been identified. These are:

- The Danube River Basin area - the Morava River, Danube River and Small Danube
- The Vah River Basin Area - the Vah and Nitra
- The Hron River Basin Area - the Hron, Ipel and Slana
- The Bodrog and Hornad River Basin Area – the Bodrog, Hornad, Bodva and Tisa

(i) The Danube River Basin area

Physical-Geographical Characteristics

The Danube River Basin area consists of the Morava, Danube and Small Danube subbasins.

The **Morava** River springs in the Czech republic under Kralický Snežník (1 275 m above see level.) and the area of the whole basin is 26 658 km^2, the Slovak part of the basin being 2 283 km^2. The relief consists mostly of lowlands and valleys. In the western part of the basin the mountain ridge of Malé Karpaty is situated with the highest peak of 870 m a.s.l.

The lowest discharges occur in summer in June and at the beginning of the autumn. The floods occur mostly in March. In the Lower Morava Basin the erosion processes take place in the lowlands of Záhorská nížina, where wind erosion occurs on arable lands.

The Lower Morava basin is in shortage of natural drinking water resources. There are a lot of small springs in the hydrogeological regions, but their yield very seldom exceeds 0.5 ls^{-1}.

The **Danube** River flows through the territory of Slovakia from the 1 880.2 km (mouth of the Morava river) to the 1 708.2 km (mouth of the Ipeľ river). The length of this reach is 172 km. The subbasins of Danube and **Small Danube** are situated in Podunajská nížina and on southeast slopes of Malé Karpaty. The erosion takes place in the deforested part of the mountains. Windy erosion occurs almost on the whole territory of the lowlands. Downstream Palkovičovo the bed slope decreases to one third of the above lying reach. It results in intensive sedimentation of the bed load. The typical feature of our Danube reach is the dense network of effluents on both sides of the main stream.

Danube together with Small Danube constitutes very fertile region of Žitný ostrov (Rye Island). The mean annual runoff volume through Bratislava is 65 milliards m^3 what corresponds to the mean annual discharge of 2 062 m^3s^{-1} and specific yield 15.7 $ls^{-1}km^{-2}$. It represents much higher runoff than from all other Slovak tributaries of Danube. The Danube subbasin is very rich in ground waters in its alluvial sediments. The dynamic resources of groundwater in Žitný ostrov are evaluated on 15 - 18 m^3s^{-1}. Afforestation of the Lower Morava basin is 36.3 % and of the Danube subbasin 12.2 %.

Socio-Demographic Characteristics

There are 872 865 inhabitants living in the Danube River Basin Area. Out of them 514990 inhabitants live in towns over 10 000 inhabitants. That means that 59% of the whole Danube River Basin Area are urban population. Also the capital of Slovakia Bratislava lies in this area. There is the higher rate of employment in the secondary and tertiary sector in the whole Slovakia

Transboundary Effects as Perceived

Transboundary effects are perceived from waters flowing into Slovakia due to Sugary in Austrian Hohenau, Wolfsthal and Kittsee agglomeration. From Slovak side the enterprise of Slovhodváb Senica – fibre production and ASSI DOMAN are expected. Floods can have also significant transboundary effects.

Human/Economic Activities

Overall environmental quality in this river basin area is influenced with agricultural activities, which have been identified as improper agrotechnical methods, inappropriate handling with wastes from livestock, point pollution sources from storage of organic fertilizers. Industrial activities contribute to pollution through discharges of insufficiently treated industrial waters. Within communal sphere the insufficient treatment of municipal waste waters, bypassing of rain and waste water, existence of uncontrolled waste dumps and leakage of nutrients from septic in Žitný Ostrov have significant negative effect on environment.

Quality of the Morava River is influenced with effluent of waste water from cities Senica, Myjava and upstream part of Morava River Basin. Significant municipal pollution sources represent WWTP Malacky and WWTP Devínska Nová Ves. Intensive agriculture also contributes to water pollution together with industrial activities – Hirocem Cement works in Rohožník, Slovhodváb Senica –fibre production, food production -Cannery Stupava, Záhorská Ves and Moravský Ján, heavy industry – ZVL Skalica, oil extraction, building of new oil pipelines – Ropovod Družba and extraction of gravel and sand.

The Danube River is affected with municipal waste water discharges from agglomeration of Bratislava, Petržalka, Hamuliakovo sewerage, Šamorín etc. Concentration of industry is very high in this area – Slovnaft (oil refinery), Istrochem (chemistry), BAZ, Technical Glass, Matador, Kablo, Gumon, Benzina, ASSI DOMAN Štúrovo-pulp/paper production, glass industry Bratislava, food processing, airport Bratislava etc. Agriculture represents also significant diffuse pollution source

(ii) The Vah River Basin Area

Physical-Geographical Characteristics

The Váh River Basin area is created from two subbasins of Váh and Nitra.

The Váh River originates from the confluence of Biely and Čierny Váh upstream of Kráľová Lehota. The total length of the Váh from the source of Čierny Váh to Komárno is 403 km and to the confluence with Malý Dunaj at Kolárovo 378 km. The Váh Basin is very diverse with a considerable altitude difference. The highest point in the basin measures 2 494 m a.s.l. in Vysoké Tatry and the lowest is on the confluence with the Danube River in Komárno at 107 m above see level.

Precipitation varies from 540 mm in flatlands up to 2200 mm in high altitudes. With its catchment area 11 625 km^2 and long-term mean annual discharge 152 m3/s Váh is the biggest river in Slovakia. Váh basin represents 23.7 % of the total territory of Slovakia. 15 809 kilometers of water courses are in the basin with a river network density of 2 km/km^2. In the lowlands the river network

density varies between 0 - 3, in higher flatlands 0.5 - 2.0 and on mountain slopes 0 - 3 km/km^2. Forested area covers in average 43 % of the basin. In 1970 the inundation area was 16 500 ha, of which 11 300 ha were in the inter-dike region and 5 200 ha in untreated river sections.

The Nitra River springs on the southern slopes of Malá Fatra Mountains in 1 205 m elevation and flows in the southern direction. The original confluence of the Nitra with Váh River was near Hurbanovo below Landor in 108.5 m a.s.l. In 1971 the relaying of Nitra channel was finished and below Nové Zámky near Komoča the larger part of the runoff is drained into Váh now.

The length of the Nitra River is 196.7 km or 242.8 km without relaying. The elevation range of the basin is 690 m and the mean slope is 0.283 %. The highest slope over 1.1 % is in the upper reach of Žitava, Handlovka and Bebrava. The total length of the streams in the basin is 7 300 km what represents the mean density of the river drainage 1,42 km per km^2.

According to mean annual course of run-off, the highest discharges are observed during snowmelt in March and the lowest in September. During the snow cover accumulation period in winter the runoff is lower though the snow cover duration in last 15 years becomes shorter due to some macro influences (climate change?).

The natural runoff in the outlet seems to be insufficient during summer season when with respect to water quality the critical concentrations of pollutants occur. The question of raising the discharges during summer season becomes more important though no reservoir construction in the basin is foreseen.

Socio-Demographic Characteristics

There are 2 182 249 people living in the Váh River Basin Area. Out of them 886 659 inhabitants live in towns with population over 10 000. It means that 52% is urban population. In the Váh River Basin Area there is a highest rate of employment in the secondary sector (industry) in the main towns of Žilina, Martin, Dubnica, Ružomberok, Považská Bystrica, Púchov, Dubnica n/Váhom.

Transboundary Effects as Perceived

Transboundary effects are perceived only from the effluent of waste water treatment plant in Komárno, which lies close to border with Hungary.

Human/Economic Activities

Several activities leading to water pollution have been determined. In field of agriculture, it is mainly improper storage of organic fertilizers and their use, together with improper land use. Industrial activities are represented with chemical, heavy and food processing industries. Natural Conditions allowed building of a cascade of water reservoirs, which are used also, for electricity production. In these reservoirs, the sedimentation occurs due to changed sediment regime. Navigation in the Váh River can be source of pollution by oil spills.

In the Váh River the industrial pollution originates from chemical industry – SCP Ružomberok (pulp/paper production), Považské chemické závody Žilina, Rubbery Púchov, Duslo Šaľa, Chemolak Smolenice; from food industry - Starch factory, Sugary Sládkovičovo, BIOPO Leopoldov. Heavy industry significantly contributes to environmental pollution through Oravské ferozliatinové závody široká-Istebné (metalurgy), ZŤS Martin, Dubnica n/Váhom (heavy machinery), dump site of metallurgy plant Sereď.

Agricultural pollution occurs is mainly due to livestock farming, liquid manure and fertilizers use. This influences mainly the Váh River alluvia. Municipal pollution is represented by discharges of insufficiently treated municipal waste waters – Trenčín, Hlohovec, Sereď.

The Nitra River is at the first place among the rivers with very much polluted water. Main source of pollution is industry -outflow of the Handlovka (waste water from industrial mine complex Handlová - Prievidza), NCHZ Nováky (chemistry), ENO Zemianske Kostoľany (powerplant), Tannery Bošany, Sugary Šurany, TATRA Bánovce nad Bebravou, Tatra Nábytok Pravenec (furniture production), Rubbery Dolné Vestenice.

Another source of pollution is agriculture and municipalities – public sewerage of cities Topoľčany, Partizánske, Nové Zámky. WWTP of Nitra is still under construction due to lack of finances. Agricultural an industrial pollution can affect ground waters in alluvial areas.

(iii) The Hron River Basin Area

Physical-Geographical Characteristics

The Hron River Basin Area contains of the Hron, Ipeľ and Slaná subbasins.

The Hron River springs in the Slovenské Rudohorie Mountains in the elevation of 934 m and flows in Danube River in 102.9 m. The length of the river is 284 km. The river basin of Hron is of prolonged and not well developed shape covering the area of 5 464 km^2. Its upper and middle parts are situated in the area of Inner Carpathians, while the lower part of the basin belongs to the lowlands. The river Hron bed has a slope of 7.6 % in the Upper Hron Valley and 1.6 % in Zvolen and Žiar Valleys, respectively. The lowest slope of about 0.9 % is in the Danube lowland.

The subbasin of the Ipeľ River is spreading out in the southern part of the Central Slovakia. Ipeľ River forms in great part of its length natural border with Hungarian Republic. The upper and middle part of the basin belong to the Inner Carpathians, while the lower part of the basin belongs to the system of Carpathian depressions.

The length of the main Ipeľ channel from its spring in Slovenské Rudohorie in 1047 m elevation to the mouth to Danube in 101 m elevation is 248.15 km, from which the borders with Hungary are 151.5 km. The area of the Ipeľ basin is 5151.06 km^2, from which 3648.6 km^2 belongs to Slovakia. The length of the water courses in Ipeľ basin is 2681 km what represents the mean density of 0.73 km per km^2. The Ipeľ River is after the Váh and Hron the third most important tributary of Danube in Slovakia. The slope varies for the Ipeľ River between 0.4 to 13.2 % and for its tributaries between 1 to 10 %. The density of river drainage varies between 0.5 to 3 km per km^2.

The minimum water stages are occurring in August and September, the maximums in March. In the first half of the year 75 % of the annual run-off volume enters Danube. For spring season, it is 50 %.

The River Slaná springs in Gemer region of Slovenské Rudohorie in Stolické vrchy. The total area of Slaná basin is 11 900 km^2 from which 3 198.52 km^2 are on territory of Slovak Republic. The length of the river is 92.5 km to the state border. The whole area of Slaná Basin belongs to one orographical system of the Inner Carpathians. River Slaná represents the second best developed river drainage system of Slovakia after Bodrog. The elevations vary between 195 - 1477 m a.s.l. The length of the Slaná River to the state border is 92.5 km. The longitudinal slope of the Slaná varies between 0.05 and 2 %, the density of the river drainage is between 0.5 and 3 km per km^2.

The maximal discharges occur in March, the minimal in September and October. The natural runoff regime of Slaná is influenced by water uptake from Hnilec for power plant.

Socio-Demographic Characteristics

There are 870 026 people living in the Hron River Basin Area. Out of them 347 821 people live in towns over 10 000 inhabitants. That means that 52% of inhabitants belong to urban population, but there are differences between the areas. The Hron River Basin is urbanized up to 47% and the Ipeľ and Slaná River Basins are much less urbanized, only up to 32%. It means that agricultural production prevails along the Ipeľ and Slaná Rivers, whereas the Hron River Basin is much more industrialized.

Transboundary Effects as Perceived

Transboundary effects are perceived only in the Ipeľ Basin from municipal discharges.

Human/Economic Activities

In the Hron River Basin area the environmental quality is influenced mainly by industrial activities, which are processing of aluminum, ore mines, food and chemical industry. Agriculture contributes to pollution through improper handling with organic fertilizers.

In the Hron River Basin the pollution by industrial activities comes from heavy industry – SNP Enterprise Žiar nad Hronom (alluminia factory), Železiarne Podbrezová (iron work); chemical industry – Petrochema Dubová. Furthermore, there are Paper Mill Harmanec, Sugary Pohronský Ruskov, Biotika Slovenská Ľupča (pharmacy), Bučina Zvolen (wood processing), SEP Zvolen (termo power plant), Spa Sliač and Kováčová and Ore mines Hodruša.

Municipal pollution comes from WWTP Banská Bystrica, which is still under construction due to lack of financial sources, WWTP Zvolen and others. Agricultural pollution is developed mainly in flat valley of the Hron River and alluvial areas.

Water quality in the Ipeľ River is influenced through food industry – small food enterprises, meat-processing factory (effluent to Krivánsky creek), milk processing Krupina and heavy industry – Kovosmalt Fiľakovo, Slovak Magnesite Enterprise Lovinobaňa, Podrečany.

Municipal sources of pollution represent WWTP of Fiľakovo and Lučenec, public sewerage of Krtíš and Lučenec.

In the Slaná River the impairment of water quality is caused by ore mining and processing – Iron ore mines Nižná Slaná and Rožňava, Slovak Magnesite Enterprise Jelšava Ľubeník. There is also Sugary Rimavská Sobota and Paper mill Slavošovce.

Ore mines together with agriculture can affect also quality of ground waters in alluvial areas. Municipal pollution is caused by municipal wastes disposal and waste water production.

(iv) The Bodrog and Hornad River Basin Area

Physical-Geographical Characteristics

The source of the Hornád River is on the eastern slopes of Nízke Tatry at 1 051 m a.s.l. and it departs Slovak territory on the state border at 160 m a.s.l. The length of the main river on Slovak territory is 193 km, of which 19 km create the state border with Hungary.

Hornád is the biggest tributary of the Slaná River and together they form the second largest river network system (after Bodrog) of eastern Slovakia with its center on Hungarian territory. The total area of the Hornád basin at its confluence with the Slaná River is 5436 km^2 and 4403 km^2 is on the territory of Slovakia. The total length of the water courses in the Hornád basin is 4 912.7 km. The river network density is 1.12 km/km^2. The inundation area was approximately 2 330 ha in 1970, from which 320 ha were in the inter-dike region and 2 010 ha in untreated river sections.

Precipitation on lowland regions of the basin in is 600 to 700 mm per year. The highest precipitation amount within the year falls in June and July. Precipitation is lowest in February.

The upper Hornád River has runoff maximum in the spring months from March to May. Mean monthly discharges reach highest values in April when they rise to approximately 170 % of the mean annual discharge. Monthly discharge values exceed the level of the average annual discharge also in May, June and July.

Minimal discharges occur especially in autumn. In September, the monthly discharge values drop to 55 - 60 % of the average annual discharge. On the upper reach of the Hornád River significant winter minimum occurring mostly in January have been measured, with discharges lower than 50 % of the annual average.

The Bodrog River Basin covers the most eastern part of Slovak territory with an area of 7 217 km^2. It is created by the confluence of Latorica and Ondava rivers above Zemplín. The length of the Bodrog River itself on Slovak territory is only 16 km. Approximately 40% of the catchment area is not on Slovak territory. From the total area 11 356 km^2 Slovakia has 7 217 km^2. In Hungary, the Bodrog flows into the Tisa River.

The river network density in the flood plain varies between 1 - 3 km/km^2, in the uplands 1 - 2 km/km^2, on flysh range slopes 1 - 3 km/km^2 and in volcanic ranges 0 - 3 km/km^2. The slope of the flows fluctuates between 10 - 7 %. in the highlands and drops to 1 - 0.7% and less in the lowlands.

The relief of the Bodrog basin may be divided from the orographical point of view into two parts: the highland part in the north and the lowland part in the south. The basin is not extremely diversified. Only 1% of the area of the basin is within the altitude zone 1000 - 1500 m a.s.l. The place on the state border where the Bodrog River enters Hungary is the lowest in the republic with 94 m a.s.l. The basin belongs to the Carpathian mountain range.

Lowest precipitation amounts are measured in the lowlands. 585 to 650 mm fall in the central part of the basin. The period of snow cover varies from 55 - 80 days in the lowlands up to 70 - 105 days in the hillslope regions.

Maximal discharge occurrence prevails in spring months. However, summer floods created by summer heavy rainfall are greatest. A different regime can be observed at the Uh River with flood occurrence highest in December and March.

The Bodva springs in the eastern slopes of the hill Osadník. The Bodva leaves the territory of the Slovak Republic at an altitude of 169 m a.s.l. The length of the main stream on Slovak territory is 48,4 km. The mean altitude of the basin is 425 m above see level and the highest point of the basin is at 1 264 m a.s.l. The Bodva flows in Hungary into the river Slaná. 48% of the basin's total area is on the territory of Hungary.

The area of this basin is on the territory of the Slovak Republic 900.61 km^2 - the remaining part of the total area of the Bodva basin (1.727 km^2) lies in Hungary. The Bodva's river-network isn't regular and tributaries from the left prevail. The total length of the streams is 698 km and the low density of the river-network is caused by the occurring of karst areas.

The mean precipitation per year is 693 mm in the Bodva Basin. Approximately 27% of the precipitation flows off - what makes in the end profile a drainage of 5.800 m3/s. The range of the annual discharge has it's minimum in September and in higher regions the minimum is in January. The highest discharge is in April. Due to natural and artificial factors, the Bodva uses to dry out for some days in the summer - in the middle section of the stream. This occurs in last few years. The forest in this area makes 46% (417 km^2), but in the different parts of the basin this figure varies considerably.

Socio-Demographic Characteristics

There are 1 241 038 people living in the Bodrog and Hornád River Basin Area. Out of them 572 621 people live in towns over 10 000 inhabitants – 31% of people belong to urban population. However, there are differences between basins. The Bodva River Basin is only rural area; the Bodrog and Tisa River Basins are urbanized up to 36% and the Horná River Basin up to 56%. There is the second largest city in Slovakia – Košice located.

Transboundary Effects as Perceived

Significant effects have oil accidents in the transboundary river Uh, which flows to Slovakia from Ukraine. There have been several accidents in past.

Transboundary effects are expected from VSŽ Košice – steel production, where the effluents flow into Sokoliansky potok.

Human/Economic Activities

Several activities have been identified, which influence overall environmental quality. Within soil management there are improper storage of fertilizes, land use and dewatering. Industrial activities are represented with extraction of raw materials and production of color metal. Production of municipal wastes and waste waters is also one of negative activities leading to water pollution

Surface water quality of the Hornád River is negatively affected mainly by municipal waste water discharges from big settlements WWTP Spišská Nová Ves, Košice, Prešov, etc and with tributaries which are also polluted. There are two WWTP in towns Krompachy and Košice, which are still under construction due to lack of finances.

Agriculture is one of important pollution sources, which influence ground water quality. In alluvial areas, polluted surface water of Hornád has also negative effect.

Industrial pollution comes mainly from mine activities and ore processing –Rudňany-Slovinky (mines), Kovohuty Krompachy, VSŽ Košice (steel processing) as well from cities Sabinov and Prešov (food processing)

The Bodrog River Basin as a confluence of the Latorica and Ondava, belongs to the most polluted rivers, resulting from discharges of municipal and industrial waste waters in basin. There are several municipal WWTP which are still under construction (Svidník, Bardejov, Michalovce and Humenné) Strážske, Michalovce, Vranov nad Topľou, Trebišov) due to lack of finance. There is also significant pollution from industrial sources (Bukocel Hencovce – woodprocessing, Chemko Strážske – chemistry), which may influence ground waters. Agriculture represents also one of important pollution sources with effect on ground water quality.

In the Bodva River Basin the impairment of surface water quality is caused mainly by municipal waste water discharges (WWTP Moldava n/Bodvou, Public sewage Šaca-Košice). Important pollution source is also agriculture and industry (Strojsmalt Medzev).

SLOVAKIA

IDENTIFICATION OF RIVER BASIN AREAS

2.2. Problem analysis

2.2.1. Core problem

The core problem for the program was identified:

"NEGATIVE HUMAN INTERVENTION ON WATER QUALITY IN AQUATIC ECOSYSTEMS IN SLOVAK PART OF THE DANUBE RIVER BASIN"

Water is important element of landscape structure. Through the hydrological cycle water penetrates all the elements (subsystems) of landscape system. It is one of the most dynamic element of landscape and therefore it can strikingly influence relations among the other landscape elements (subsystems).

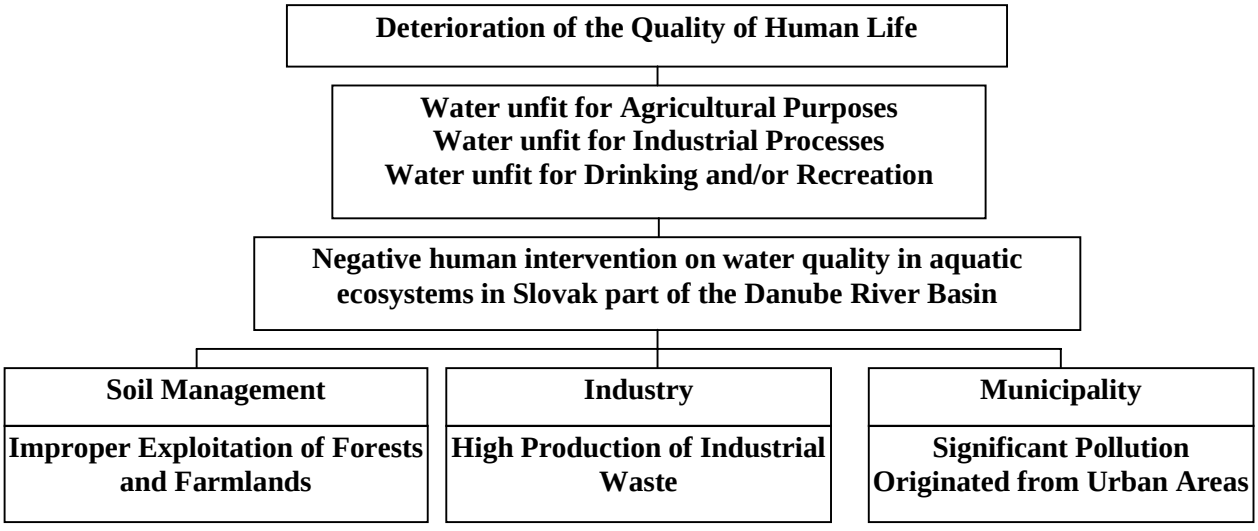
Improper, negative human intervention on water quality affects aquatic ecosystems causing thus deterioration of water quality. Through affecting of water quality also other landscape subsystems are negatively affected, mainly soil and biotic subsystems. On the other hand aquatic ecosystems are negatively affected also indirectly through negative human intervention to landscape subsystems: pollution of air, rock layers, soil, relief disturbances - all these impacts contribute to water pollution. It is clear, that the most distinct negative impact is done directly - by intervention to surface or ground waters.

2.2.2. Direct Causes of the Core Problem

Three direct causes leading to the core problem were identified:

- **improper exploitation of forest and farmlands** due to inappropriate storage of wastes from livestock farming, elimination of buffer and selfpurification elements and improper agricultural and foresttechnical practices;
- **high production of industrial waste** caused by use of obsolete technologies, discharge of insufficiently treated industrial waste waters and inadequate legislation and financing mechanisms;
- **significant pollution originated from urban areas** caused by insufficient treatment of municipal wastewaters, inappropriate disposal of municipal solid waste and inadequate institutional and legal frame.

Scheme of Problem



2.2.3. Effects of the Core Problem

Four direct effects of negative human intervention on water quality in aquatic ecosystems in Slovak part of DRB were identified:

- **Increased microbiological pollution**

  Microbiological pollution originates mainly from discharges of insufficiently treated municipal wastewaters. In agriculture, inappropriate management of wastes from livestock farming, as well as bad conditions of farms contributes to increasing of microbiological pollution in water streams and ground waters.

- **Increased toxic pollution**

  Heavy metals and specific organic substances show biologically toxic effects under certain conditions. The major part of toxic substance, present in water is sorbed into various parts of suspended solids, which may be found in flowing or stagnant waters and where they are gradually sedimented. Due to different solubility and of these substances and anaerobic conditions, there is a possibility of their reverse release into surface water from accumulated sediments, what negatively influences quality of surface and ground waters in concerned area.

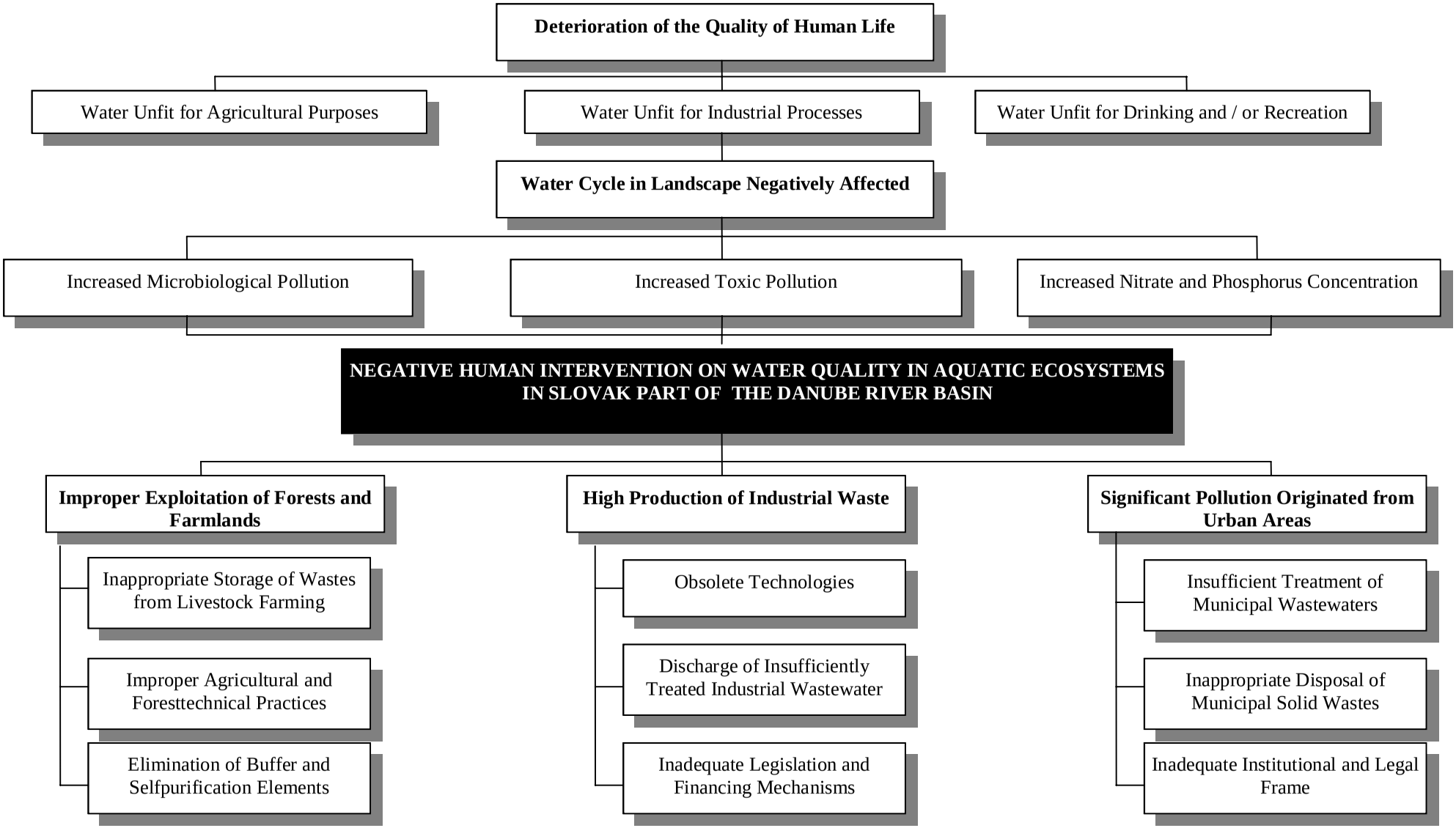
  The main sources of these harmful substances are chemical, metallurgy and machinery industries, food processing, pharmaceutical industry and agriculture.

- **Increased phosphorous and nitrate concentration**

  Excessive and unbalance use of nutrients (nitrogen and phosphorus) negatively affects water quality by increasing the concentration of nitrates in surface and ground waters with unfavorable influence on human health or indirectly by eutrophication of water. Loading of the rivers with the N and P compounds comes mainly from agricultural activities (inappropriate fertilizer use) and inhabitants (insufficiently treated wastewater and seepage from unsewered areas – phosphate detergents).

  Joint consequence of these effects is that water cycle in landscape is negatively affected. Effect of this is that water is unsuitable for agricultural purposes, for industrial processes and for drinking and recreation. The terminal effect is deterioration of the quality of human life.

GENERAL PROBLEM HIERARCHY



2.3. Analysis of Objective and Identification of Priority Sectors

2.3.1. Description of Objectives

The following program objective in Slovakia was defined:

"IMPROVEMENT OF WATER QUALITY IN THE SLOVAK PART OF THE DANUBE RIVER BASIN "

96% of the territory of the Slovak republic belongs to the Danube River Basin. The elimination of water pollution in Slovakia will result in the preventing the deterioration of biodiversity, especially in wetlands and flood plain ecosystems. The protection of groundwater resources already becomes a priority and their effective exploitation will improve the availability of water. The improvement of surface water quality will enable to provide the water supply also from these sources, which will eliminate the competition for water. All the mentioned factors will result in the decrease of the price of water. The cooperation on the local or regional level will help to improve the human and natural environment.

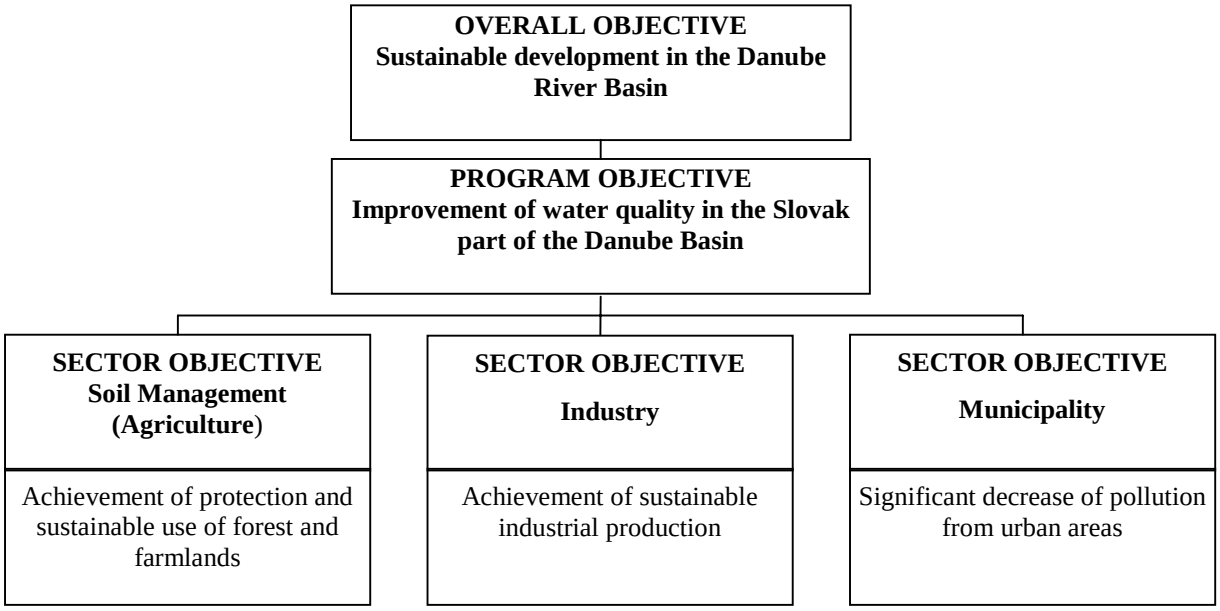
This program objective contributes to the overall objective of the UNDP/GEF Danube Pollution Reduction Program was defined as follows:

"ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN "

In order to assure the long-term improvement of water quality in the Slovak part of the DRB, specific objectives have been identified for the following sectors:

- **Soil Management:** Achievement of protection and sustainable use of forest and farmlands
- **Industry:** Achievement of sustainable industrial production
- **Municipality:** Significant decrease of pollution from urban areas

Scheme of Objectives



2.3.2. Identification of Priority Sectors

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

1. **Soil Management (Agriculture)**
   Concerning Soil Management (Agriculture), it is necessary to achieve protection and sustainable use of forest and farmlands. To obtain this objective it is required to:
   - introduce an appropriate storage of wastes from livestock farming;
   - apply proper agricultural and foresttechnical practices;
   - protect and rehabilitate the buffering zones and natural ecosystems;
   - implement an appropriate legislative framework and high awareness.
2. **Industry**
   In order to achieve sustainable industrial production. It is necessary to:
   - apply appropriate technologies;
   - treat properly industrial waste water;
   - implement adequate legislation and financial mechanisms.
3. **Municipality**
   Regarding the Municipal sector, the immediate objective is to decrease significantly pollution from urban areas. To obtain this objective, it is required to:
   - implement sufficient treatment of municipal waste;
   - achieve an optimal handling with solid communal;
   - implement an optimal institutional and legislative framework.

2.3.3. Important Assumptions for Program and Sector Objectives

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

The following assumption for **program objective** has been identified:

- **The willingness for long-term implementation of sustainability principles in governmental policy assured.**
  The governmental policy is the one who is fully responsible for the legislative tools, economic status of society and the implementation of environmental policy. So it is necessary that government support all the environmental aspects in the policies of different sectors.

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

- **General environmental awareness raised.**
  The nature protection and the proper land management, including the water management and sound agricultural practices are influenced by the public awareness in different parts of those activities. The positive approach towards environmentally friendly practices is necessary in implementing the sector policy.

- **Communication among resorts improved.**

  The communication among resorts, especially Ministry of Environment and the Ministry of Soil Management needs to be improved, because they both are responsible for different part of the water management issues within the basin area and land and forest management. The cooperation between other sectors needs to be improved as well.

- **Environmental protection as a priority for government fully accepted.**

  Concerning the industrial production itself is a pilot for the national economy. The environmental issues are at the second line of interest nowadays. The environmental protection should become a priority and introducing EU standards also for this economic sector will help to this.

  The environmental protection concerning the municipal waste production have to be fully accepted by government, which will result in the improvement of legislative and financial tools for the influencing the waste water treatment facilities, water distribution and collection systems, and solid waste storage.

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 assist the monitoring of activities leading to the accomplishment of objectives and sector results.

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

- **Water quality in watercourses is improved to class II according to the EU standards for surface waters by improving the availability and use of all water resources and environmental quality of ecosystems in Slovakia by 2010.**

  The program objective is focused on eliminating the bad state of water quality, which has undoubtedly the transboundary effects. Improvement of in-stream water quality is relatively easily measurable and would reflect a series of activities in all sectors of national economy, which will contribute in achieving the program objective.

The impact indicator for **sector - soil management** has been identified:

- **Compared to 1998 the area covered by forest and agricultural land on which environmental management is applied will increase by 40% in Slovakia by the year 2010.**

  Big portion of forest and agriculture land environmentally managed will be a good base for protection and sustainable use of forest and farmlands. Environmentally sound management is good framework for water pollution reduction, for introduction of buffering and selfpurificative elements to the landscape and for other activities done and elements introduced, which at last contribute to environmental friendly managed river basins.

The impact indicator for **sector – industry** has been determined:

- **The number of factories implementing EMS is increased to 50% compared to level of 1998 with the significant reducing the production of hazardous waste in Slovakia by the 2010.**

  The EMS is a series of standards, which are not easily accepted and implemented in the industrial enterprises because of high requirements on all aspects of production processes. However, the set of standards enables to measure the ecological behavior of industrial producers. Many industrial enterprises accept the EMS, more effectively and environmentally soundly production is introduced.

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

- **The quality in water courses improved from IV and V class to less then III class (oxygen regime) till 2010 in all (100%) monitored profiles compared to level of 1998 according to Water Quality Standard.**

  The municipal load on the surface water quality is very high. The improvement of in-stream water quality will be influenced by improving the waste water treatment, and by other measures taken in municipal sector as the handling with solid municipal wastes and controlling the dump sites and other measures.

Program Planning Matrix

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
Overall Objective: Sustainable development in the Danube River Basin achieved		
Program Objective: Water quality in the Slovak part of the Danube River Basin improved	➢ Water quality in water courses is improved to class II according to the EU standards for surface waters by improving the availability and use of all water resources and environmental quality of ecosystems in Slovakia by 2010 (PO)	➢ Willingness for long-term implementation of sustainability principles in governmental policy assured (PO)
➢ **Sector Objectives:** **1 Soil Management (Agriculture):** Protection and sustainable use of forest and farmlands achieved **2 Industry:** Sustainable industrial production achieved **3 Municipality:** Pollution from urban areas significantly decreased	➢ 1. Compared to1998 the area covered by forest and agricultural land on which environmental management is applied will increase by 40% in Slovakia by the year 2010 (SOSM)	➢ General environmental awareness raised (SOSM) ➢ Communication among resorts improved (SOSM) ➢ Environmental protection as a priority for government fully accepted (SOI) ➢ Environmental protection as a priority for government fully accepted (SOM)
➢ **Results / Outputs:** **1. Soil Management (Agriculture)** 1.1 Appropriate storage of agricultural waste introduced 1.2 Proper agricultural and foresttechnical practices applied 1.3 Buffering zones and natural ecosystems rehabilitated and protected 1.4 Appropriate legislative framework and high awareness implemented **2. Industry** 2.1 Appropriate technologies applied 2.2 Industrial waste water properly treated 2.3 Legislation and financial mechanisms adequately implemented **3. Municipality** 3.1 Sufficient treatment of municipal waste waters implemented 3.2 Optimal handling with solid communal waste achieved 3.3 Optimal institutional and legislative framework implemented	➢ 2. The number of factories implementing EMAS is increased to 50% towards the level of 1998 and by the same time we notice the significant reducing the production of hazardous waste in Slovakia by the2010 (SOI) ➢ 3. Quality in watercourses improved from IV and V. class to less III. class (oxygen regime). Till 2002 on all (100%) monitored profiles (SOM)	➢ Legislation in all environmental aspects approximated (1.4) ➢ Subsidies and funds to agriculture available (1.1 to 1.4) ➢ EMS effectively implemented (2.1) ➢ Developed free market economy favorable for environmental protection (2.2) ➢ Integrated approach to decision making process (3.2) ➢ Real strengthening of economical position of municipalities (3.1 and 3.2) (These assumptions will be described within the sector strategy)

PO - Program Objective SOSM - Sector Objective Soil Management SOI - Sector Objective Industry SOM - Sector Objective Municipality

3. Sector Strategies

3.1. Soil Management (Agriculture)

3.1.1. Situation/Stakeholders Analysis

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

Sector Land Management covers agriculture, forestry and management of the landscape. The total portion of sector agriculture on GNP (Gross national product) in 1996 was 5,2% (statistically sector includes agriculture, hunting, forestry and fishing). From this agriculture itself contributed 91%. Some 8,6% of employed in the economy were active in this sector in 1996. The number of employed in sector has a decreasing trend.

Agriculture includes all units, which are active in crop and livestock production in related service activities and fish-hatcheries. Forestry includes afforestration, regeneration, silviculture and conservation of forests, logging and timber deliveries.

Management of the landscape is understood as a set of activities of crossectorial nature, which ensures proper functioning of the landscape system as a whole. This contains agricultural, silvicultural and water management practices and nature protection as well. Due to methodological uncertainties, it is still hard to define exact economical benefit of the landscape management.

Three main ways leading to **direct or indirect water pollution** can be recognized within this sector:

- point sources (mainly from livestock farms);
- diffuse sources, which are the most important agent of water pollution coming from the sector;
- deterioration of particular landscape functions which can next indirectly lead to water pollution (e.g. removal of natural selfpurificative or protective elements from landscape).

There has been a general effort for minimizing point sources of water pollution, but less attention has devoted to diffuse sources, partly also due to methodological difficulties in gauging the amount of diffuse pollution.

The experience from developed countries shows that it is relatively easier to remove point sources of pollution than diffuse ones. In developed countries, the point sources are practically eliminated due to investments and technological development. On the other hand, reduction of diffuse sources needs not only financial investments, but also changes in legislation, cross-sectorial coordination and changes in development priorities on all levels, which is often much more difficult than direct investment in reduction of concrete point sources.

Three main activities contributing to water pollution in the sector were identified:

- inappropriate storage of wastes from livestock farming;
- improper agrotechnical and foresttechnical practices;
- elimination of buffering and selfpurificative elements from the landscape.

3.1.1.2. Stakeholders Involved

The stakeholders involved in water pollution problems in the sector can be divided into three groups of organizations, polluters and groups of individuals negatively affected by pollution or other negative actions.

Organizations

The following organizations are involved in the sector Soil Management (Agriculture) on organizational, decision-making and /or policy level:

- Ministry of Soil Management;
- Slovak Environmental Inspectorate and Environmental departments.
- River Basin Authorities
- Water and Sewerage Companies

Ministry of Soil Management is the central authority for agriculture soil protection, forest soil protection, forest protection and water management. It is also the central authority for organization and state enterprises in the branches of agriculture, food industry, forest and water management.

Slovak Inspectorate for Environment (SEI) is under the control of the Ministry of Environment. It performs the state supervision of environmental protection. It was established by the act no.595/1990 coll. it is divided on:

- section of water management inspection;
- section of air protection;
- section of waste management inspection.

Inspections of water and waste management are situated in Bratislava, Nitra, Žilina, Banská Bystrica a Košice. Inspectorates exert supervision in extent and under conditions given by autonomous regulations. The inspectorate imposes penalties for break down of juridical duties. The penalties present the income of the State Fund of Environment.

Responsibility for water quality bears Water Management Inspectorates. Environmental departments altogether with the Land, Agriculture and Forestry Department are the bodies responsible for implementation, decision making and control of environmental issues on regional and district level.

In addition to the above mentioned organizations, it is necessary to mention also the River Basin Authorities and Water and Sewerage Companies. They have very important role in the sector.

River Basin Authorities are responsible for river water quality control. The state authorities for administration of significant basin are the state enterprises established according to the Water Act no. 38/1973 Dig.. Four river basin authorities have been established:

- The Danube River Basin Authority;
- The Váh River Basin Authority;
- The Hron River Basin Authority;
- The Bodrog and Hornád River Basin Authority.

The duties of river basin authorities are to:

- administrate, operate and maintain watercourses, water engineering works and facilities constructed on them;
- supply of surface water to all sectors of management, including new water resources development;
- fulfill the duties given by the flood operational plan;
- maintain the water ways;
- monitoring surface and irrigation water quality and measures focused on water pollution control;
- create of conditions for utilization of the hydropower potential of water streams and conditions for navigation;
- administrate, operate, maintain, upgrade, modernize and construct new stated owned hydromelioration systems.

The river basin authorities are obliged pursuant § 33 of the Water Act No. 138/1973 Dig. in wording of later provisions to carry out following :

- monitoring and evaluation of water quality, as well as withdrawals, discharging of waste waters and other activities on water courses;
- cooperation in improving emergency surface water quality deterioration and elimination of its consequences;
- drawing up a plan of complex care concerning water quality, propose measures for water quality improvement in watercourses;
- carry out systematic control of water quality in specified cross-sections.

Water and Sewerage Companies are responsible for drinking water quality in groundwater sources, which may be negatively affected by some sector activities. Water and Sewerage Companies are owned by state and are responsible for the following:

- supply for drinking water to the population and other consumers;
- public sewerage and waste water treatment;
- providing development of water resources, technical and investment development in sanitary engineering;
- administration, operation and maintenance of waterworks, water supply networks, sewerage systems and waste water treatment plants;
- administration, operation, admittance, repair, upgrading, modernization of facilities.

In addition, Water and Sewerage Companies are engaged in a multitude of secondary and auxiliary activities, e.g. construction of infrastructures and installation services. Water and Sewerage companies posses their own laboratories serving for the analysis of supplied water quality and for the control of wastewater treatment plants.

Polluters

The most important polluters are:

- agricultural enterprises (private or cooperative farms);
- owners of forest land.

Responsibility for inappropriate land management or for inadequate melioration practices lies also upon River Basin Authorities, Forest Administration and on forest and farmland owners.

Affected

Negatively affected are:

- population (groups of population);
- river basin authorities;
- water and sewerage companies;
- forest and farmland owners.

Water polluted by the sector limits e.g. recreational use of the waters, is a threat for fish population and for fishery.

3.1.1.3. Current Strength/Assets

The following assets are available for agricultural sector:

- **Construction of suitable waste dumps**
  Construction of suitable waste dumps for appropriate storage of wastes from livestock production is necessary in order to eliminate possible leakage into environment. Proper operation and possibilities of further use of the waste should be also taken into account.
- **Implementation of proper agricultural and foresttechnical practice**
  Implementation of proper agricultural and forest technical practices will allow minimizing of chemical load in the landscape through ecological farming. It is foreseen to take into account also necessary financial and know-how support for farmers
- **Rehabilitation of natural retention ability of the landscape**
  Buffer and selfpurificative elements of landscape have to be rehabilitated and protected in order to increase retention ability of the landscape, which contribute to minimizing of hydrotechnical impacts on the streams. Experiences, financial support as well as system of criteria for financing are taken into account.
- **Rehabilitation of the streams and extension of inundated areas.**
  Rehabilitation of streams and extension of inundated areas is necessary for improvement of buffering elements in the landscape. Reintroduction of small greenery, scrubs, wetlands and other buffering elements is foreseen.
- **Keeping of protection zones for water streams**
  Protection zones for water streams mitigate of impact of buffering and selfpurificative elements elimination from the landscape. At the same time protection zones will preserve natural or reintroduced buffering elements.

3.1.1.4. Analysis of Transboundary Effects

Transboundary impacts can be a consequence of environmentally undesirable effects arising from sectorial activities. Three of them were identified:

- **Endangering of drinking water sources**
  From the transboundary point of view, drinking water sources can be endangered also due to excessive utilization of wells in alluvial parts, when infiltration from surface streams can occur. In case of Hungary, they extract drinking water from alluvial zones (neighborhood with Slovakia) and pollution from surface waters can reach the drinking water sources.

- **Acceleration of run-off, risk of floods**
  Inappropriate agricultural and forest technical activities (decreasing retention capacity of some areas), together with improper regulation of streams may lead to acceleration of run-off. During periods with high precipitation, the increased run-off can result in floods, which affects mainly downstream part of stream, very often belonging already to a neighboring country.
- **Wash-out of nutrients**
  Inappropriate application of nutrients in agriculture and soil erosion supported with improper agricultural and foresttechnical practices cause washout of nutrients from top layer of soil and their consequent wash-up into surface stream, which in many cases are transboundary ones.

3.1.2. Sector Problem Analysis

3.1.2.1. Core Problem

For the sector Soil Management the following core problem has been identified:

"IMPROPER EXPLOATATION OF FOREST AND FARMLANDS"

3.1.2.2. Causes Leading to Environmental Problems

The water quality in Slovak part of the DRB is negatively affected by the improper exploitation of forest and farmlands. This term includes framework of negative activities, elements and organizational issues causing direct or indirect threat for water quality.

Three main causes of improper exploitation of forest and farmlands were set up:

- inappropriate storage of wastes from livestock farming;
- improper agricultural and foresttechnical practices;
- elimination of buffer and selfpurificative elements from the landscape.

(i) Inappropriate storage of wastes from livestock farming

Inappropriate storage of wastes from livestock farming is typical point source of water pollution, which directly negatively affects water quality. **Not safely controlled waste dumps** are the main cause of this problem.

Big concentration of livestock on small area, which is typical for cooperative system of farming, is the main problem. Also private farmers who have smaller concentration of livestock can contribute to the problem by improper managing the wastes or by lack of responsibility .Inappropriate storage of livestock waste production can cause direct water pollution.

In the past this problem was more important due to **the existence of large livestock and pigs farms**. Fortunately, these problems have reduced because of collapse or significant decline of number livestock and/or pigs keeping in the particular farms or co-operatives.

(ii) Improper agricultural and foresttechnical practices

Improper agricultural and foresttechnical practices contribute to water pollution directly as diffuse sources. The significant impact on groundwater pollution also has uncontrolled percolation of sewage from holding or septic tanks. **Low level of personal qualification and competence** is one of the causes contributing to the improper practices in the agriculture and forestry. There is a lack of sharing competence in some strongly centralized bodies.

Besides the low level of qualification, there is also **low attractiveness of agricultural sector**. Financial inputs are relatively small comparing to the most developed EU countries that is one of the reasons of small wages for agriculture workers. Average monthly wage for sector Agriculture, hunting and forestry in 1996 was 6579 SK (Slovak crown) compared to 8154 SK which was national average.

Common causes contributing to this problem are **low level of environmental awareness**, **insufficient legislation** and **legal framework** and **insufficient control mechanism**.

(iii) Elimination of buffer and selfpurificative elements from the landscape

Elimination of buffer and selfpurificative elements from the landscape indirectly affects water quality. If these elements are lacking in the landscape there is small if any chance to protect river streams from wash out of pollutants from the basin area (e.g. agrochemicals). Though there are some new and progressive aspects in agricultural legislation, application of a new government policy in agricultural practice is slow.

Poor nature protection is not sufficient. It should be important tool for solving the problem.

Non fulfillment of property legal regulations makes an obstacle in effort for reintroduction of buffer and selfpurificative elements to the landscape. There are many uncertainties in rights and financial issues between the bodies responsible for reintroduction of such elements and landowners of the areas suitable for reintroduction.

Inappropriate government agricultural policy in the past was probably the main agent responsible for elimination of buffer and selfpurificative elements from the landscape. Enlargement of field size by connecting of small fields into big plots was one of the most distinct feature of the so called process of collectivization which run in Slovakia mainly in 50-ies. Private farmers were forced to give their farmland to cooperative farms. During and after this process the structure of the farming landscape has changed rapidly. Small greenery, scrubs, wetlands, and other buffering elements in the landscape disappeared.

3.1.2.3. Environmental Effects

Environmental consequences of sector activities impact the way of functioning of landscape systems and may also affect the health conditions of population. The most important consequences are:

- **Pollution of ground and surface waters**

  Inappropriate application of nutrients and other agrochemicals, their consequent wash-out, and leakage from storage of livestock wastes, significantly affects quality of ground and surface waters. In rivers and reservoirs, eutrophication occurs and therefore water become unsuitable for recreation purposes and other uses e.g. drinking water supply etc.

- **Accidental pollution**

  Accidental pollution may occur mainly due to improper handling and storage of fertilizers and wastes from livestock farming.

- **Human illness occurrence**

  Ground waters, which are used for public water supply, can be negatively affected through increased content of nitrates. It presents the risk for human health, mainly for bottle-feed babies. Increased content of nitrates is due to application of nitrogen fertilizers in agriculture and their consequent penetration into ground waters.

- **Impairment of water ecosystems and decrease of biodiversity**

  Unbalanced use of nutrients has negative impacts to water quality and therefore also to water ecosystems through process of eutrophication. It causes problems in river parts with slow waters, in reservoirs and banks ecosystems. It results in excessive development of algae and consequent oxygen deficit, decrease of production capacity of fish and change their species composition towards less valuable species. Elimination of buffer and selfpurification elements result in degradation of species and lowering their varieties living in a given area towards the species, not very sensitive to pollution.

- **Decrease of soil quality**

  Inappropriate agricultural practices, mainly improper crop shift and application of agrochemicals lead to degradation and decrease of soil quality.

- **Water and wind erosion**

  Territory of Slovakia has high potential for soil erosion. About 38% are potentially erodable arable soils. Improper agricultural methods, forest technical practices and land use accelerate erosion processes, mainly due to high level o cultivation in slope areas.

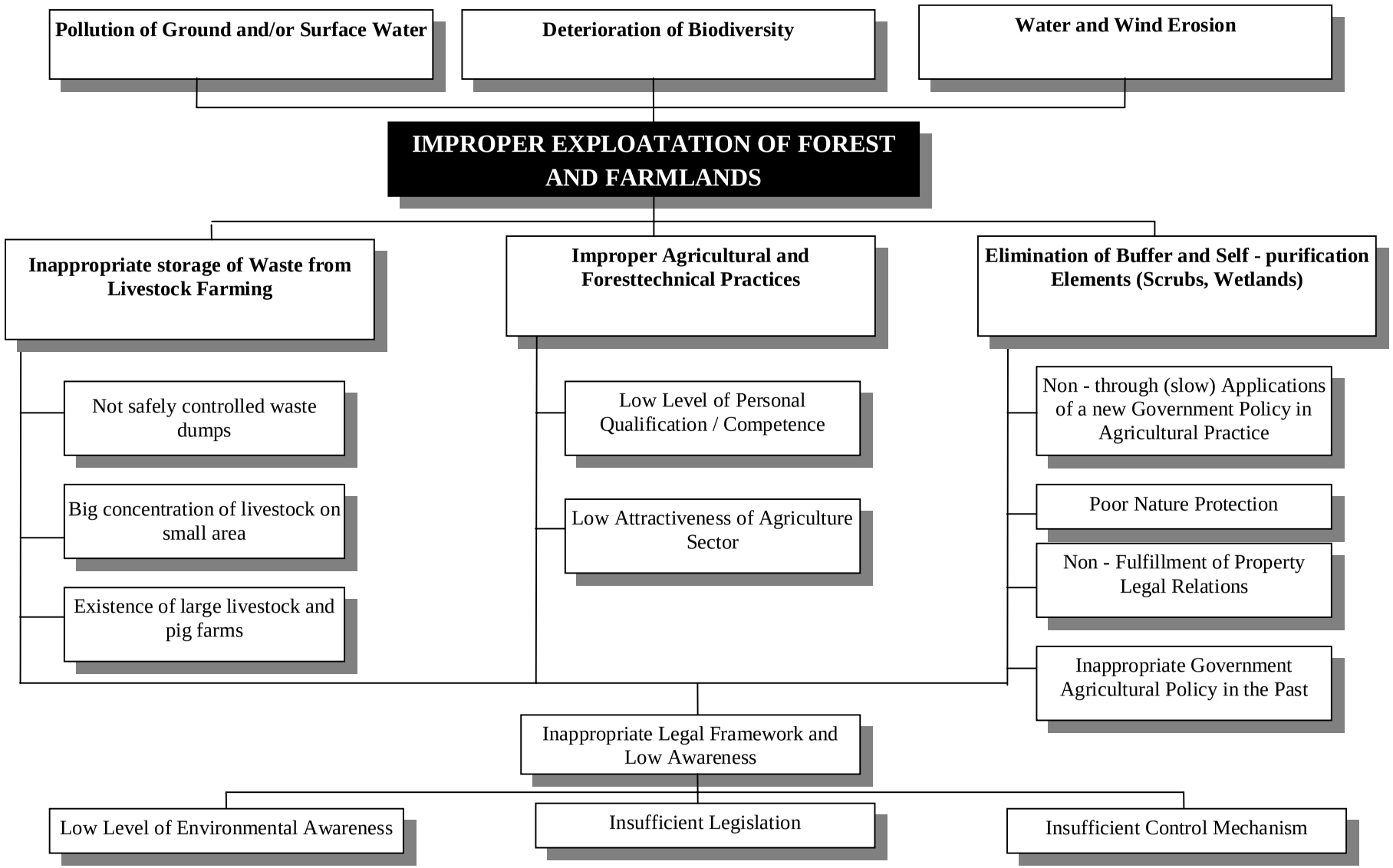
- **Negative change of water regime**

  Regulation of water streams, improper land use, agricultural and foresttechnical practices in past caused changes of retention ability of landscape, acceleration of run-off, erosion and general negative changes of water regime.

- **Decrease of selfpurification ability of the streams and landscape as a whole**

  Elimination of buffer and selfpurificative elements such as small greenery, scrubs and wetlands, affects water quality mainly through decreased selfpurification ability of landscape and streams to absorb pollutants from human activities e.g. nutrients or agrochemicals.

PROBLEM HIERARCHY
1. Soil Management



3.1.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective has been set for the sector Soil Management (Agriculture):

"PROTECTION AND SUSTAINABLE USE OF FOREST AND FARMLANDS "

Introduction of principles of sustainability to the use of forest and farmlands is the main sector task, which finally can help in achieving of program objective. Sustainable use of forest and farmlands eliminates improper human intervention and minimizes negative changes in qualitative and quantitative regime of water circulation in the landscape. This complex of activities contributes to direct and indirect improvement of water quality.

For achieving of the sector objective four results/outputs must be accomplished:

- Introduction of appropriate storage of livestock waste;
- Application of proper agricultural and foresttechnical practices;
- Rehabilitation and protection of buffering zones and natural ecosystems;
- Implementation of appropriate legislative framework and high awareness.

(i) Introduction of appropriate storage of wastes from livestock farming

In order to introduce an appropriate storage of wastes from livestock farming, several activities will be necessary in the following fields:

- old uncontrolled waste dumps from livestock farming;
- new landfills complying with applicable legislation;
- quantities of disposed waste.

It is foreseen to:

- **reconstruct old uncontrolled waste dumps from livestock farming**. To accomplish reconstruction of old uncontrolled waste dumps from livestock farming as a first important element a **pasportization of old (existing) waste dumps** was identified. All existing waste dumps from livestock farming must be seriously described as much in detail as possible. Special attention must be devoted to describing of their position with regard to water flows and/or groundwater deposits.

  Another important elements, which must be carefully assessed, are **infiltration properties** of the surrounding area as to estimate the process of pollution distribution**.**

  Selection of the **problems,** which have arisen from pasportization and finding out technical proposal for their **solution** would be the next important element. These problems must be divided according to their nature, then technical proposals for their solution can be more efficiently found.

  Up-to-date and effective tool for **monitoring of old environmental loads** from waste dumps is **GIS** implementation. This needs trained and educated personnel and proper hardware and software equipment as well.

  After the above mentioned important elements are accomplished**, rehabilitation of inappropriate waste dumps** in protected areas could be a logical result of the activity. To accelerate the feasible implementation of GIS, the program application able to cover the particular problems of waste dumps from livestock farming have to be developed.

- **establish new landfills complying with applicable legislation**. There is high level of exception that many of the existing landfills are not in compliance with applicable legislation. Working out type **proposal for waste dump building** is a necessary first step. Probably several types of waste dumps must be designed to tailor them for local natural and economical conditions.

  To examine the convenience of designed waste dumps types, building of a **network of pilot model waste dumps** is suggested as next important element.

  For continuous development of waste dumps construction it is necessary to work out the system of **financial support** for waste dumps constructing in compliance with valid legislation.

  To make the procedure more flexible and operative**, assistance to the farmers** in establishing new waste dumps is recommended. This would contain advisory in economical, technical, legislative and environmental issues.

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

  Proposed project(s)

  A proposed project for this activity should summarized the fundamental measures, practical experience and practices leading to the proper construction and operation of landfills. The description of the activities should be issued in the form of Manual of Practice and disseminate to farmers free of charge.

- **minimize quantities of disposed waste.** Each rationally oriented human society attempts to minimize the quantity of wastes. Similar activity was found to be important also in land management sector. First step in performing of this activity is preparing list of **possibilities for minimizing of disposed waste**. The list would include technical, economical and legislative tools for minimizing of disposed waste.

  To stimulate farmers for minimizing disposed waste working out of the system of **financial stimulation** for minimizing is necessary. Hand to hand with financial stimulation also **education of farmers** through environmental NGOs and media was found as an efficient important element.

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

  Existing/On-going project(s)

  There are several existing projects for processing and utilization of the biological waste for organic fertilizers. On five localities, composting plants for biological waste are designed under the responsibility of local communities and private enterprises.

  Proposed project(s)

  Proposed project is establishing of the network of composting plants on the national level.

(ii) Application of proper agricultural and foresttechnical practices

To apply proper agricultural and foresttechnical practices, it is needed to develop activities in the following areas:

- small and other alternative ecological methods of agriculture;
- assistance to the forest owners in restoration of biodiversity of forest ecosystems;
- technical competence proven by certificates.

It is necessary to:

- **support small and other alternative ecological methods of agriculture.** Ecological methods of agriculture can contribute to minimizing of chemical load in the landscape and contribute thus to water pollution reduction. **Educational activities** mainly towards private farmers must be developed to spread know-how about ecological farming.

  After the farmers are educated, a proposal for **funds for support of ecological farming** is necessary. To develop and support market with bio-products and make them profitable for production, creation of **stimulating prices and taxes system** is of big importance.

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

  Proposed project(s)

  These activities will support the official document of the Ministry of Soil Management *Concept for Organic Farming Development* approved in July, 1995 by the Slovak Government. There is a proposed project for creating of support fund for private and cooperative farmers for developing of alternative (ecological) farming. This fund should not replace the function of the existing support from the *State Fund for the Protection and Cultivation of Agriculture Land.*

- **assist the forest owners in restoration of biodiversity of forest ecosystems.** Diversified forest ecosystems have big ecological stability, high retention capacity and other favorable functions for the optimal and natural functioning of the river basin area. To keep or to improve biodiversity of forest ecosystems it is first necessary to **evaluate current status of forest biodiversity**.

  Biodiversity is changing under the pressure of human intervention that is why creating of **monitoring network** to observe changes in forest ecosystems **biodiversity** might be very useful. In some areas waterworks or water management structures can influence biodiversity of forest ecosystems. This **impact of water structures** must be evaluated to avoid improper decision making in future.

  Motivation program for implementing restoration of biodiversity would support restoration activities among forest owners. Restoration activities must be profitable for the society as a whole and this must be manifested in subsidies given to forest owners. Because to restore biodiversity in all forest ecosystems is unreasonable, **increase of biodiversity** in protected areas was given a priority.

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

  Proposed project(s)

  There is a prepared project for proposal of adaptation measures in forest ecosystems. Project for creation of network of forest reservations to protect original ecosystems with minimum total area 200 km2 was proposed.

- **enhance technical competence proven by certificates.** The main idea of this activity is to create a system of enhancing technical (environmental) competence of farmers and forest owners who adopted proper environmentally sound practices. This would be an analogy with industrial certificates ISO 9000 or ISO 14 000. Essential element is **regular training** of subjects in area of proper agrotechnical and foresttechnical practices.

  Furthermore, it is necessary to enhance the **technical competence** proven by certificates. For introducing and spreading the system of certificates among farm and forest owners, it is necessary to set **conditions for certificates** issuing to graduates of courses for implementing proper forest and agricultural practices.

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

Proposed project(s)

There is a proposed project for creation of training center for continuing education for proper agro- and foresttechnical practices.

(iii) Protection and rehabilitation of buffering zones and natural ecosystems

To facilitate the protection and rehabilitation of the buffering zones and natural ecosystems, it is foreseen to develop activities in the following fields:

- project for Sustainable River Basin Management and particularly for Wetlands;
- floodplain and river bank ecosystems;
- hydrotechnical impacts on natural part of water courses;
- identification of landowners.

It is necessary to:

- **undertake measures for financing of project for Sustainable River Basin Management and particularly to Wetlands**. This activity was found especially important because lack of experience from such activities has been used as a justification against these approaches. First, the identification of possible **financial sources** is important. Hence the financial sources are identified, working out of the system of **criteria for financing** of basin restorations and sustainable water management in basin can be performed.

  In next phase, it is crucial to determine the **pilot project basin** and **allocate funds** for pilot projects for sustainable water management of basins/wetlands.

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

  Proposed project(s)

  There is one proposed project for this activity: Proposal of financing system for basin restoration and sustainable water management.

- **rehabilitate floodplain and riverbank ecosystems.** Floodplain and bank ecosystems are heavily affected by improper hydrotechnical activities. River training, removal of riparian vegetation and other elements from floodplain ecosystem were measures undertaken due to speeding up the outflow of floodwaters from the area. Retention and selfpurificative function of river systems were deteriorated.

  The floodplains and bank ecosystems need to be rehabilitated to the most achievable and cost-effective degree. To rehabilitate floodplain and bank ecosystem it is necessary at first **map status of floodplain and bank ecosystems** and areas where the solution would require reasonable investments. From the analysis of the maps hardly affected water streams can be identified and evaluated.

  Rehabilitation of floodplain and bank ecosystems in affected areas is termination of the activity. To **keep hydroecological limits** for minimal discharges is a prerequisite for ecologically sound function of rehabilitated ecosystems.

  There are many **existing projects** and **projects in preparation** as well, which are fully or partly focused upon rehabilitation of floodplain and bank ecosystems. The survey of the projects can be found in the National environmental action program in sectors B (Protection and rational use of water) and E (Nature and landscape management and territorial development).

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

Existing project(s)

As worth to mention are existing projects for Rehabilitation of alluvial meadows in downstream Morava-phases 1 and 2, Proposal of basin revitalization in Slovak republic and Revitalization of Morava, Ipel, Danube and Small Danube were recognized.

Proposed project(s)

There is one proposed project for the future, which is Pilot project for the rehabilitation of the Hron River Basin and Bodrog River Basin.

- **minimize hydrotechnical impacts on natural parts of watercourses**. Big portion of watercourses in Slovakia is affected by hydrotechnical impacts. From about 50 000 km of rivers and streams in Slovakia some 10 900 km (22%) are influenced by hydrotechnical impacts (regulated, trained). First important element, relatively easy to achieve, is **adjusting operational schedule of waterworks** with respect to optimal function of ecosystems.

  Working out the system and methods for **increase of natural retention ability** in basins can contribute to minimizing of hydrotechnical impacts on the streams.

  Hydroecological discharge and its specification are another hot topic, which is still discussed without applicable result.

  For minimizing of hydrotechnical impacts, **implementation of EIA** act into new waterworks projects was found important. Recent EIA act is relevant only to some larger waterworks that is why demands for widening of its validity and strict keeping were introduced.

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

  Planned project(s)

  There is one prepared project for analysis of sediment quality and disposal of extracted sediments is prepared. Sedimentation in reservoirs, which are hydrotechnical impacts themselves, can influence the water quality too.

  Proposed project(s)

  Creation of integrated management models of basin was proposed project.

- **improve the identification of landowners.** The land owner identification is a process which needs an improvement in order to address the responsible subject for the rehabilitation and the protection of land. To progress in rehabilitation and protection projects effectively, identification of landowners is a prerequisite. Because land-register offices and other involved organization are overloaded, it is necessary to **strengthen capacity** of responsible institutions. This can be accomplished by using of modern software and computer techniques. **GIS** and its wide use is one of the efficient tool for improving existing and creating new **databases in land-register**.

  Another hot topic is unclear **ownership relation** of landowners. Hereditary acts were complicated in Slovakia before 1918 and next confusion was brought on he scene after 1948 during collectivization and nationalization of farmlands and forestland. Uncertainty among landowners, heirs and other stakeholders is ongoing problem in Slovakia.

(iv) Implementation of appropriate legislative framework and high awareness

In order to implement an appropriate legislative framework and high awareness, it is required to undertake actions in the following areas:

- sustainable forestry and agriculture management;
- institutional and personnel strengthening of organization protecting nature;
- public awareness on protection and sustainable use of forests and farmlands.

It is necessary to:

- **adopt acts in area of sustainable forestry and agriculture management.** It is necessary to adopt and implement acts in area of sustainable forestry and agriculture management. The **Act on Nature Protection** needs to be supported by the regulations and decrees. New **Water Act** contains many progressive tools for implementing and ensuring of sustainable forestry and agriculture. Its adoption in Parliament is of crucial importance. Nature protection act is another tool necessary for implementation of sustainable forestry and agriculture management.

  Furthermore, it is necessary to improve its efficiency by **preparation of missing executive regulations**. Too centralized decision-making and control disables sustainable forestry and agriculture management.

  Strengthening of competencies for local government in their territory can help in making decision making more flexible and operative. Competencies of local government in **sustainable forestry and agriculture** issues would have been compared with those in EU countries to approximate their legislative and decision making structure.

- **support institutional and personnel strengthening of organizations protecting nature and Slovak Environmental Inspectorate.** Nature protection as a whole is loosing its importance. On the top of the interests of the society are productive and direct profits making activities. To improve this, **analyses of current status** must be prepared to describe the background for the activity.

  As we are in process of approximation of law system to EU level, **comparison of enforcement of legislative regulations between EU countries and Slovakia** must be performed. Analysis of the comparison should lead to proposal for **adequate strengthening of particular state bodies**.

  Institutional and personnel strengthening can be performed by improving of efficiency of existing structures and by rising of funds necessary for functioning of new structures. For financial assistance to the activity, a **proposal for financial providing of organizations and bodies** strengthening must be accomplished.

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

  Proposed project(s)

  There are two proposed projects for this activity: Analysis of recent situation and proposal for strengthening the institutions in nature protection and Proposal for changes in competence of local governments.

- **raise public awareness on protection and sustainable use of forests and farmlands.** Poor public awareness to environmental issues is one of the weakest features in solving of environmental problems in Slovakia. Improving this it can significantly help in making public participation in and pressure on decision making process. This is very effective tool for implementation of environmentally sound decisions. The public awareness on protection and sustainable use of forests and farmlands need to be raised in order to solve the environmental problems also in future.

Media play important role in diffusion of information. Competition for an actual **broadcasting of educational programs about environment** can significantly help in spreading ideas of sustainability and importance of environment.

In public media, sufficient space has to be given for **educational programs** with special attention devoted to sustainable use of forest and agricultural land.

As the public media are supported by all taxpayers, they ought to be enforced **to regulate for broadcasting the environmental educational programs**.

Public awareness and appropriate legislative framework are inevitable conditions common for almost all activities performing within the sector.

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

Proposed project(s)

There is a proposed project for system of educational programs in public media.

3.1.4. Important Assumptions for the Sector

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

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

The following six assumptions at the **activity** level were identified and are important to achieve the sector results:

- **Availability of technical specification for landfills construction.**

  Properly constructed and maintained landfills guarantee protection of stream and ground waters from livestock wastes pollution.
- **Development of market with bio-products supported by government.**

  Governmental support of market with bio-products is assumption which has a stimulate effect for development of ecological agriculture and consequently on sustainable landscape (basin) management. One of the effects of this approach is reduction of water pollution in such areas.
- **Nonproductive values of forest are respected.**

  So called “nonproductive values” of forest include its retention function, buffering function, ecological stabilization and recreational function. Actually, all these values are producing profit, perhaps not so exactly measurable. Much bigger attention would be paid upon economical importance of “nonproductive values” of forest.
- **Introduction of financial evaluation of ecosystem functioning in EIA process.**

  This assumption is in close relationship with previous one. There is urgent general need for financial evaluation of particular ecosystems and implementation of the price to practical economy. Though to solve this problem will be rather complicated and difficult, it offers very powerful tool for implementation of principles of sustainability to economical calculations.
- **Discussion and adoption of new Water act in parliament.**

  To discuss and adopt new Water act can help in implementation of some more environmentally sound principles to water management practice.
- **Government accepts proposal for strengthening the environmental sector.**

  This is another important assumption for achieving of the sector objective. Unfortunately, environmental sector remains on the tail of national interests. Without its strengthening, progress in implementation of protection and sustainable use of forest and farmlands has only limited chance to succeed.

The two following assumptions at the **results/outputs** level are necessary to achieve the sector objective:

- **Legislation in all environmental aspects approximated.**
  Legislation approximated to EU legislation standard creates a framework for further development and implementation of sustainable use of forest and farmlands in accordance with the most advanced projects and efforts in some EU countries. It will enable legislative basis for further development of agriculture and integrated water management.
- **Subsidies and funds to agriculture available.**
  As the natural agroecological conditions in Slovakia are not extremely favorable for agricultural production, subsidies and funds must help to keep agriculture active.
  Moreover, subsidies and funds must be devoted for different programs oriented towards protection and sustainable use of forest and farmlands as general macroeconomic conditions are still not ready for acceptance of sustainable production from forest and farmlands. Subsidies and funds will help to improve wider implementation of organic farming and to harmonize requirements of agriculture and water management.

3.1.5. Impact Indicators for Sector Results

Objectively verifiable indicators were developed for the sector objectives and sector results. They define the contents of the objectives and result in operationally measurable terms (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:

- **Compared to 1998 number of landfills controlled in compliance with applicable regulations in SR increased by 60 % by the year 2010.**
  To get landfills under the control lowers risk of water pollution from point sources.
- **Compared to 1998 network of forest roads and chutes causing water erosion in forests decreased by 20% in protected areas by the year 2010.**
  Forest roads contribute to erosion processes in forested areas by 80-90%. The density of forest roads and frequency of their use is raising in the last period. Optimization and reconsidering of forest roads network will lead to lowering of material eroded which can positively contribute to proper foresttechnical practices.
- **Riparian vegetation in lowland and hilly-land parts of Slovak river basins restored and rehabilitated by 50% of water course length by the year 2010.**
  Lowlands and hilly-lands are the most productive regions of the country. At the same time they are most affected by intense agriculture activity. Waterworks influences local streams, reclamation measures are very common here. That is why river ecosystems on lowlands and hilly-lands urgently need restoration and rehabilitation
- **Compared to 1998 a number of “green” deputies in Slovak local government increased by 5% by the year 2002.**
  Number of “green” deputies reflects environmental public awareness. Currently the support for Green party in Slovakia fluctuated between 2-2,5%. In particular municipalities or regions, it can exceed 5-7%. Target year-2002 was chosen as the nearest regular election year.

3.2. Industry

3.2.1. Situation/Stakeholders Analysis

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

The economy of Slovakia changed significantly after the changes of political system in 1989 and after the Slovak Republic claimed the independence in 1993. During a very short period the central planned system of economy was changed to the market oriented economy. The state ownership of companies started to be changed into the private ownership during the process of privatization. The privatization is not yet successfully completed.

In 1996 the Gross National Product (GNP) in current prices was 3535 USD per capita. The industry produced 26.3% of the GNP, of which 21.3 % was produced by industrial manufacturing, 1.0 % by mining and 4.0 % comes from electricity, gas and water supply.

The industrial companies become the private subjects and mainly the legislative tools influence their actions. So, it is in case of discharging wastewaters, air pollution and soil contamination. The obsolete technologies with the high production of waste are still used and also the raw material for production has lower quality.

The **wastewater from industry** has very often specific composition which require applying special technologies for treatment facilities. The mechanical and several chemical treatment processes combined with legalization and/or equalization of wastewater produced is usually necessary considered. Biological treatment mostly represented by activated sludge process is used for advanced treatment and anaerobic treatment processes have already started implemented especially in case of food industry. Some local industries of a middle and small size are usually connected to the municipal sewer systems and produce a load on municipal WWTPs. The lack of pre-treatment efficiency of industrial wastewater discharged to public sewer system has often caused the operational problems not only in the sewer systems, but also mainly in the municipal wastewater treatment plant. In Slovakia the typical problem is that the industry very often does not reach the effluent quality set in consent contracts defined by District environmental authorities. This practice is very difficult to identify or approve because of the problem with direct field monitoring of discharged wastewater quality and flow-rate to the public sewer system in the particular time and site.

The industry is typical **point-source pollution,** therefore the portion to the nutrient balance in the Danube River Basin is not so significant. It is known that direct discharges from industry in terms of N is about 8 kt/year and P 1 kt/year in comparison to the total Slovak input 59 kt/year and 5.3 kt/year respectively. In addition, several upgrading of the existing treatment plant are ongoing or planned projects to reduce this impact on the surface waters. The main problem concerning with the industrial pollution of aquatic environment is the contamination of groundwater and particularly surface waters by hazardous substances represented by heavy metals, hydrocarbons, oil materials, and other micro-pollutants.

The pressure of the market is one of the issues, which influence the **production**. The raising interest of people for the environmental problems may change the priorities for the quality of production. In addition, the collapse of industry has helped to improve the situation in water **pollution control** in Slovakia and particularly in public sewer systems because of reducing the mass as well as hydraulic overloading of municipal wastewater treatment plants. However, this state is temporal and it is expected that after the completing the transient period of economy, the

industrial production will increase and thus the production of wastewater. In Slovakia the new environmental sound process technologies are preferred to reduce the consumption of process water and raw materials, production of waste waters and flux and predominantly the reduction hazardous substances, and finally increasing biodegradable compounds in waste water is favorable priority.

3.2.1.2. Stakeholders Involved

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

Organizations

Organizations involved on organizational, decision-making and/or policy level are

- top management of the particular industrial companies;
- state health institutes;
- Ministry of Environment;
- Slovak Environmental Inspectorate;
- Slovak Hydrometeorological Institute, etc.

Top management is responsible for the decision-making in every plant, either in private or state ownership. The top management prepares the strategy for the economic activities and is responsible for the operation and the compliance with the valid legal standards. It also decides on the investment activities and improvement of technological processes.

The State Health Institutes are responsible for the risk assessment concerning the specific pollutants and harmful substances. They influence the standards preparation. The technological safety of the processes and their influence on the human health are also part of their interest.

Ministry of the Environment is responsible for the enforcement of the valid standards, their preparation and updating, concerning the surface and ground water quality, the waste management and air pollution. The ministry is also responsible for supervising their organizations.

The Slovak Inspectorate for Environment performs the state supervision of environmental protection. It was established by the act No.595/1990 Dig. and it is supervised by the Ministry of Environment. It is divided on:

- section of water management inspection;
- section of air protection;
- section of waste management inspection.

Inspections of water and waste management are situated in Bratislava, Nitra, Žilina, Banská Bystrica a Košice. Inspectorates exert supervision in extent and under conditions given by autonomous regulations. The Inspectorate imposes penalties for break down of juridical duties, the penalties present the incomes of the state fund of environment.

Responsibility for water quality bears Water Management Inspectorates. Environmental departments altogether with the Land, Agriculture and Forestry Department are the bodies responsible for implementation, decision making and control of environmental issues on regional and district level.

The Slovak Inspection of Environment is responsible for executing the control of the permitted limits for wastewater discharges, air pollution and waste management. They have the authority to charge fines when the reality does not comply with the given permission.

The Slovak Hydrometeorological Institute is supervised by the Ministry of Environment.

The activity of Institute is mainly to obtain data about the state and regime of water and air, to process them, analyzed, to interpret and stored them. On this basis institute provides especially:

- regime and real-time information about surface and ground water, about their quantity and quality, provides information and forecasts of water levels and discharges;
- meteorological and climatological information, predictions;
- observes and evaluates the level of pollution and radiation of air, cooperates on the conception preparation and measures of air protection, provides professional activities and operational activities in hydrology, climatology, meteorology, water and air protection;
- systematically acquires, records and stores the documentation in the above mentioned fields.

District Environmental Authorities run the state administration in environmental protection the activity domain of the District Environmental Authorities is identical with the activity domain of the Ministry of Environment. The District Authorities for Environment are entrusted to issue statements according to the autonomous regulations, approvals and permissions and impose remedy measures and penalties found out on law duties in matters connected with environment protection.

In case of water management, they are also responsible for setting and permitting the effluent standards limits and amount of discharged wastewaters for different polluters. This permission set the basis for the calculation of penalties for different polluters who discharge the polluted water.

The Ministry of Soil Management is responsible for the waste water and sewerage companies, which operate the municipal WWTPs. The discharging the industrial wastewater into the municipal WWTPs brings the additional load to the municipal waste. The industrial WWTPs, which are incorporated to the industrial complex, are under the control of the top management of the relevant industrial plant.

The River Basin Authorities are supervised by the Ministry of Soil Management. River Basin Authorities are responsible for river water quality control. The state authorities for administration of significant basin are the state enterprises established according to the water act no. 38/1973 coll.

Four river basin authorities have been established:

- The Danube River Basin Authority;
- The Váh River Basin Authority;
- The Hron river Basin Authority;
- The Bodrog and Hornád River Basin Authority.

The duties of River Basin Authorities are:

- administration, operation and maintenance of watercourses, water engineering works and facilities constructed on them;
- supply of surface water to all sectors of management, including new water resources development;
- fulfill the duties given by the flood operational plan;
- maintain the water ways;
- monitoring surface and irrigation water quality and measures focused on water pollution control;
- creation of conditions for utilization of the hydropower potential of water streams and conditions for navigation;
- administration, operation, maintenance, upgrading, modernization and new construction of stated owned hydromelioration systems.

The River Basin Authorities are obliged pursuant § 33 of the Water Act No. 138/1973 Dig. In wording of later provisions to carry out following:

- monitoring and evaluation of water quality, as well as withdrawals, discharging of waste waters and other activities on water courses;
- cooperation in improving emergency surface water quality deterioration and elimination of its consequences;
- drawing up a plan of complex care concerning water quality, propose measures for water quality improvement in watercourses;
- carry out systematic control of water quality in specified cross-sections.

Polluters

Industrial enterprises have been identified as a representative of group of polluters. The production and manufacturing generate the production of waste. The water, soil and air pollution affects the all elements of the human and natural environment. The production of waste differs according to the type of production. The machinery, iron works are the most common types of enterprises in Slovakia. The minor types of industries are chemical industry, wood/paper processing and food industry.

Affected

The groups of individuals or institutions negatively affected by pollution or other negative action are population, civil associations and other more specific groups:

- farmers;
- downstream industrial enterprises;
- the river basin authorities;
- the water and sewerage companies.

Farmers: Population is the polluter and consumer of goods of industrial production and at the same time is the most affected by the adverse effects of their own activities. The main problem is the polluted water, which has to be purified prior to the distribution. The risks for endangering the health of population has to be eliminated or at least minimized. The specific pollutants are of the most importance because of the possibilities to enter the food chain, very often with the unknown long-term health influences. The polluted water influences the limited use of water for irrigation, fishery, recreation, etc.

Downstream industrial enterprises: The industry upstream has an advantage of using less polluted water. The downstream users have to use more polluted water which result in the higher operational cost.

Some kinds of industries, e.g. food and pharmaceutical industry require the clean water because of the character of their production. This brings high requirements on the water resources for water supply and purification of water.

The River Basin Authorities are supervised by the Ministry of Soil Management. They withdraw and sell the water from water sources for drinking, industry, irrigation and other uses. They maintain the water structure in the basin. They control the wastewater discharging and are responsible for taking measures and eliminating consequences in case any accidental pollution.

The Water and Sewerage Companies are supervised by the Ministry of Soil Management. They are responsible for water purification and distribution systems. They pay for water to the relevant river basin authority. They charge the individual and other users and the surplus is covering their operational costs and maintenance.

State enterprises Water and Sewerage Companies are responsible for the following:

- supply for drinking water to the population and other consumers;
- public sewerage and waste water treatment;
- providing development of water resources, technical and investment development in sanitary engineering;
- administration, operation and maintenance of waterworks, water supply networks, sewerage systems and waste water treatment plants;
- administration, operation, admittance, repair, upgrading and modernization of facilities.

In addition, Water and Sewerage Companies are engaged in a multitude of secondary and auxiliary activities, e.g. erection of structures and installation services. Water and Sewerage Companies posses their own laboratories serving for the analysis of supplied water quality and for the control of waste water treatment plants.

3.2.1.3. Current Strengths/Assets

The following assets and achievement have been identified for the industry sector:

- **Effective cash flow**

  Although the lack of financial means is general problem, some of the existing financial possibilities should be developed. The cooperation on a local level between municipalities and industries, which discharge into the municipal WWTP, is one existing possibility to improve the infrastructure or directly the WWTP. The models for the local cooperation exist and should be applied. The improvement of the cash flow of the industrial plant itself would mobilize the internal potential to gather means for investments.

- **Implementation of legislative measures**

  The effluent standard for discharging the wastewater should be fully enforced. The discharged pollution in many cases does not comply with the permitted amount and quality of wastewaters. If the regulations were broken, the system of fines should be applied without exceptions. The system of control should be optimized as well.

- **Increase of specialization of WWTP personnel and increase technological discipline**

  The personnel of the WWTP should be trained in order to improve the knowledge and technological discipline. This may increase significantly the efficiency of wastewater treatment. The training of management should be done regularly in order to update and increase the knowledge of managers.

- **Improvement of information availability concerning new technologies**

  The information on the new, best available or environmentally friendly technologies exist. The problem is that they are not easily accessible and it is time consuming to look for them. To increase the interest of managers to obtain the new information they should be easily readable and accessible. Easy access to Internet network should help in this matter.

- **Environmental management systems**

  The environmental management system is the existing system of standards which define the criteria for the environmentally soundly operation. It set the detailed information about all segments of production. It revises the system of work of every employee of the industrial plant. In some cases, the system gives ideas how to improve operation of plant toward the environmentally soundly procedures, even though it would be difficult to adopt it all.

- **Process of approximation of legislative with EU**

  The process of approximation the legislative with the directives of EU has already taken place and all the new prepared legal documents are in accordance with the standards of EU. The issue of their enforcement is the question of the next few years.

3.2.1.4. Analysis of Transboundary Effects

The following transboundary effects have been identified:

- **Deterioration of biodiversity**

  Transboundary effect concerning biodiversity is evident especially in downstream countries, which receives the water of bad quality. The deterioration of biodiversity is the result of worsening qualities of environment. The industrial hot spots are the producers of the highest part of pollution, which is the cause for endangering the environment. The produced pollution in the upper part of the overall basin is the cause for the worsening the biodiversity in countries, which lies downstream.

- **Deterioration of water quality in streams**

  Slovakia receives the polluted surface waters from the eastern part of the Bodrog River Basin, which lays in Ukraine. There happened some accidents with the consequences also in the Slovak territory. Most rivers of Slovakia enter Hungary. The water quality is deteriorated and induces the limited uses of water for industry, irrigation, recreation etc. The consequence of accidental pollution is also potential danger to the environment over the border.

- **Infiltration pollution into ground waters**

  In Hungary, they extract the drinking water also from wells in alluvial zones in the northern part of the country, so the risk of endangering the drinking water supplies by infiltrating the polluted water from streams exists.

- **Limited water use**

  The limited water use is a negative consequence, which is also transboundary issue. As it was described above the pollution is transferred by the river courses and infiltrates into alluvial zones. So, the surface and ground waters uses become limited because of the high content of pollution.

- **Health risk**

  The health risk exists also in the case of accidents. This issue has also transboundary effect, if the extent of pollution crosses the border.

3.2.2. Sector Problem Analysis

3.2.2.1. Core Problem

The core problem for industrial sector is identified as follow:

“HIGH PRODUCTION OF INDUSTRIAL WASTE”

3.2.2.2. Causes Leading to Environmental Problems

The economy in Slovakia is under the process of privatization nowadays. The new owners of industrial plants inherited either good or old-fashioned plants. They had to pay to the state for the plants, so the financial means for the investment into new technologies are very limited. There did not exist the strong need for environmental protection some years ago when the old fashioned technologies were installed.

The willingness to install environmentally sound or best available technologies exists, but it is limited by the financial constrains. The money for investments on the market is very expensive and every investment is a part of the overall decision making in the industrial plant. Moreover, the industrial plants pay considerable amount of money for discharging the wastewaters into watercourses.

The legislative tools either penalties or incentives do not support the motivation of the management to undertake the risk and manage some changes either in production or in packaging of goods. The penalties and fines seem to be low and the incentives are almost missing.

The insufficient treatment of industrial wastewaters is very important issue. The industrial wastewaters require applying special technologies for treatment. Some local industries are connected to the municipal sewer systems and produce a load on municipal WWTPs.

Industrial waste is typical point source of water pollution. Its removal compared to diffuse sources is relatively easy due to simple identification of hot-spots causing pollution.

Three main causes of the core problem were identified:

- obsolete technologies with high production of waste;
- discharge of insufficiently treated industrial waste waters;
- insufficient legislative and financial mechanisms.

(i) Obsolete technologies with high production of waste

Obsolete technologies are one of the most problematic environmental and economical heritage from communist period. Huge investments are necessary to replace obsolete **energy and raw material demanding technologies** by up-to-date ones, which are able to reach environmental sound features. High consumption of energy also has an effect on the worsening of environment. The raw material demanding technologies usually produce also high amount of wastes either solid or discharged into water or air and usually with high content of harmful substances.

The obsolete technologies or aged technologies have very often low safety and the probability of accidents and operational failures is higher. The low technological discipline has also impact on the waste production.

The technical conditions of internal sewer systems and technology lines cause the leakage from production processes into soil and ground waters and leads to its contamination. In many cases inappropriate **technologies** are used in specific natural condition.

(ii) Discharge of insufficiently treated industrial wastewaters

Discharge of insufficiently treated industrial wastewater is an effect of improper functioning of wastewaters treatment plants. Hydraulical and mass overloading of the existing WWTPs for treatment of industrial waste waters results in the low efficiency of treatment. Some of the WWTP needs reconstruction and enlargement.

In some cases the technology of production was changed so the composition of wastes has changed, but the treatment facilities remained the same. Also the quality of raw materials is low.

The technical conditions of internal sewer systems causes the seepage from sewerage collection systems. The obsolete technological equipment is considerably unsuitable and the motivation to change it is missing. It differs from case to case but the lack of financial means for investment is general problem.

Insufficient technological discipline of the personnel working at the WWTP is contributing to the low efficiency of treatment.

(iii) Insufficient legislative and financial mechanisms

Gaps in legislation are one of the most important constraints in this issue. Inadequate legislation and financing mechanisms are not able to secure proper legislative and financing framework. One of the reasons is low formal urgency of environmental problems in government and society as a whole as well.

The financial constrains and lack of financial resources are most common barriers against the investment for the new technologies. The industrial polluters pay penalties and fines to the State Fund of Environment. The specialized revolving fund for supporting new environmentally sound technologies is missing. The system of incentives is missing, too.

The information channels do not work efficiently and consequently lack of information do not help to improve the present state. The legal framework for applying either penalties or incentives is not optimal. Some standards and decrees were adopted some decades ago and do not comply with the present state of economical development.

3.2.2.3. Environmental Effects

The following environmental effects were distinguished:

- deterioration of biodiversity;
- deterioration of water quality in streams;
- deterioration of drinking water sources;
- infiltration pollution into ground waters;
- limited water uses;
- health risks;
- contamination of soil.

These environmental effects are explained below:

- **Deterioration of biodiversity**

  The discharging the wastewaters into the water streams result in the deterioration of the physical, chemical and biological qualities of water. The water from water streams enters into ground waters and brings all the pollution it received. The industry produce specific harmful substances and discharging the industrial waste water may result in the high biological oxygen demand, may cause the acute pollution of receiving water, etc.. The load by nutrients coming from industrial production is limited, however, some industries, e.g. producers of fertilizers, may load the water also by this type of pollution. This result in the degradation of species and lowering their varieties living in a given area towards the species which are not very sensitive to pollution. Specific pollutants are very dangerous when enter the food chain and their long-term consequences are not known.

- **Deterioration of water quality in streams**

  The amount and quality of discharged polluted water influence the state of art in-stream water quality. The situation is the worst in the parts downstream of the outlets from the large industrial plants. Non-soluble substances, chemical substances, specific organic pollutants and heavy metals pollute the water. The self-purifying capacity of water streams is limited and the amount of pollution is much higher then the natural environment is able to reduce by their own natural self-pitying mechanisms.

  The northern part of Slovakia has a mountainous character, where most rivers originate. So the upper parts of the rivers Vah, Hron, Ipel a Slana have the water of a good quality. The intensive industrial production results in the deterioration of in-stream waters especially in the Nitra basin, middle and downstream part of Vah and Bodrog basin. However, all the other river basins have also the water of worsened quality.

- **Deterioration of drinking water sources and Infiltration pollution into ground waters**

  The watercourses receive the polluted water which infiltrate the alluvial zone of a river. The selfpurification of the filtrating zones have a limited possibility to reduce the pollution regarding to its concentrations and types of pollutants. The accidental pollution e.g. from transporting chemicals and oils, may endanger directly the sources of drinking water (E.g. the route via Donovaly).

  Alluvial zones are the most important drinking water resources in Slovakia. There exist 26 ground water regions with the importance for water management, of which 10 regions are already protected.

- **Limited water use**

  The polluted water has limited use for industry, public water supply, irrigation, agriculture, fishery and other uses. The high content of pollution influences the high cost of treatment and purification and it result in the high cost of the water itself. Limited water use induces the competition for water.

- **Health risks**

  The specific organic pollutants, harmful substances, heavy metal, oil materials, radioactive pollutants have very negative influence on the human health and the assessment of risks is in some cases very difficult. The effects on health of population have a long-term character.

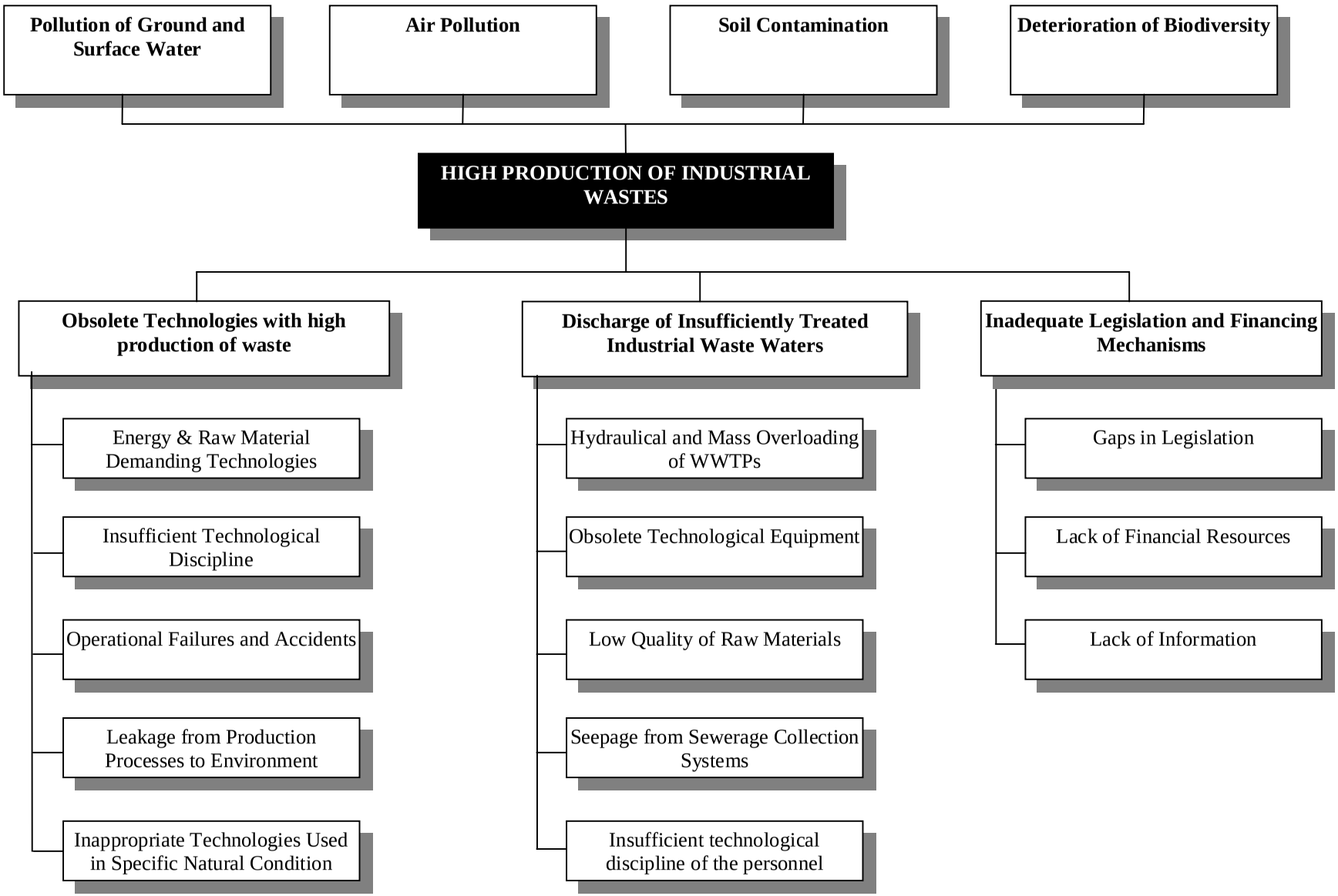
- **Contamination of soil**

  The soil contamination is an issue directly in the industrial complex. The leakages from the internal sewer systems of industrial plants are especially dangerous when collecting the polluted water of the specific character. This issue has no transboundary effects.

  The soil contamination caused by industrial production in general is mainly caused by the air pollution, which is transferred to the soils also by the rains.

  The special and typical environmental impact of chemical industry is the barreling of chemicals. This activity may cause the groundwater and soil contamination if protection of the site is not provided properly.

Problem Hierarchy
2. Industry



3.2.3. Objectives, Expected Results, Actions and Related Projects

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

"ACHIEVEMENT OF SUSTAINABLE INDUSTRIAL PRODUCTION "

The three following results were identified to achieve this objective:

- application of appropriate technologies;
- proper treatment of industrial waste water;
- adequate implementation of legislation and financial mechanisms.

(i) Application of appropriate technologies

In order to apply appropriate technologies, several activities will be necessary in the following fields:

- modernization of industrial processes;
- environmental Management System ISO 14000;
- information center for new technologies.

It is foreseen to:

- **undertake measures for modernization of industrial processes.** The technologies used presently are in most cases old-fashioned and do no fulfil the required parameters. The modernization of industrial processes may be influenced and supported by using the legislative and economic tools, both penalties and incentives systems. The **control of technological processes** will lead to the improvement of technological discipline and will result in eliminating the probability of failures and accidents.

  The **system quality ISO 9000** needs to be promoted and implemented as widely as possible in order to improve and optimize the operation. It is necessary to utilize and follow the activities of the **Center for clean production**.

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

  Planned project(s)

  There is on project in preparation. It is Project 2000 in Chemko Strázske. The aim of this project is the reduction of mass and energy consumption in the production process of cyclohexanon and the reduction of ecology loading. The replacement of oxidation process of cyclohexanon production will improve the safety factor of production and reduce the generation of wastes. (waste water 60 % less, emissions 80 % less, wastes 95 % less in compare to the present state).

  Proposed project(s)

  Proposed project for Disposal of wastes from PCB production is in Chemko Strázske as well. The system of waste disposal contaminated by PCB should be developed for the whole territory of Slovakia. It is supposed to establish the common approach of solving this problem, to define the processing and treatment of this type of waste prior to the disposal. The implementation of the project would have an effect for the whole territory of Slovakia. The results could be utilized also in other CEE countries.

- **promote Environmental Management System (EMS) ISO 14000.** The Environmental Management System ISO 14000 is a system of standards which application results in the high quality of the performance of the industrial plant. Nowadays it is only recommended

system with no obligation to implement it. It is needed to educate and provide sufficient number of **qualified trainers of EMS** in order to enable the large number of industries to get interested to adopt the system.

Furthermore, it is needed to implement extensively the **system of internal control** in industrial plant, the criteria for a successful system are also one part of the EMS.

Regular training of the management and personnel needs to be carried out with the aim to optimize the decision-making processes and to increase the technological discipline.

Within the EMS the **eco-labeling** needs to be promoted in order to educate the people about the real meaning of eco-labels, so the eco-labels will help to sell the product. Selling the products is a priority for producers and the public awareness concerning the environmentally friendly production and packaging will help to create the pressure for clean production.

Perform **environmental audit** is also needed as widely as possible in order to improve the decision making processes and prepare strategies for industrial plant.

- **establish an information center for new environmental technologies.** The information center for new environmental technologies needs to be established. Within its activities it is needed to identify the conditions for the **new technologies** use within different branches of industry.

  In addition, it is also needed to identify the new **suitable technologies for Slovakia** considering the existing sources of raw materials.

  One of the activities of the center will be focused on the preparation and creation of the **database of new technologies** and the **database of enterprises selling the new environmentally friendly technologies**. Informative databases need to be regularly updated. Information and other services of the center need to be at disposal for every subject **free of charge**.

(ii) Proper treatment of industrial waste water

To achieve proper treatment of industrial wastewater, it is needed to develop activities in the following areas

- treatment technologies;
- capacity and efficiency of WWTP;
- monitoring and warning systems in water management of enterprises.

It is necessary to:

- **introduce chemical and biological treatment technologies and technologies for nutrients removal.** The low energy demanding technologies, specialized systems for treatment of highly concentrated wastewater, methods of advanced treatment are only few aspects of this issue. It is necessary to **support the low energy demanding technologies**, which are already available.

  The efficiency of treatment will be improved by implementing **technologies specialized for campaign operation**, especially in cases of food processing industry.

  It is needed also to **support the anaerobic systems of treatment with the highly concentrated waste waters**, the separation of the waste waters from different technological stages or plants of production will help to produce highly concentrated waste waters with less variation in quality and flow rate.

Moreover, it is necessary to **apply and support alternative methods of advanced treatment**. The using of chemicals for the precipitation of pollutants should be more optimized to reduce the consumption of chemicals and generation of sludge. In case of food industry, the application of selector technique may help to reduce the problems with bulking sludge or with foaming.

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

Planned project(s)

There is one **project in preparation**: Removal of chlorinated hydrocarbons in the production of propylenoxid in NCHZ Nováky. The main goal of the project is to reduce the discharge of chlorinated hydrocarbons generated in the production of propylenoxid. The technology designed is based on solid/liquid separation of lime from the process water and stripping of chlorinated hydrocarbons by hot air. The extracted hydrocarbons will incinerate. The second source of hydrocarbons in the production line in plant will be closed. These measures will significantly improve situation in the Nitra River mainly from the point of view of reduction hazardous substances.

- **increase the capacity and efficiency of WWTP.** The capacity and efficiency of WWTPs is not sufficient in most cases. In order to increase the capacity and efficiency of WWTP several steps needs to be taken. It is foreseen to **review an existing state of the WWTPs** with the focus on their capacity and efficiency of treatment processes.

  In addition, it is necessary to revise the current state of treatment technologies in WWTPs and the changes of production technologies in the industrial plant.

  The treatment efficiency of WWTPs needs to be optimized. In order to clean effectively the highly concentrated wastewater it is necessary to introduce the separation of produced wastewater during the technological production processes.

  Some industrial processes produce wastewater of inappropriate quality suitable for treatment technologies. So it is necessary to find the supplementary available sources of nutrients for optimizing the biological stages of treatment rather then to add the necessary chemicals, e.g. to find the source of municipal waste water and carry it via sewer line into the industrial WWTP.

  It is recommended to reduce the smell and aerosols load in wastewater. The introducing of fine bubble aeration systems could help to minimize these problems.

  Moreover, it is needed to provide the accidental reservoirs protecting the biological part of WWTP in order to increase its safety operation. In general, the change of old aeration technologies to modern ones should be carried out. It means that the mechanical aerators would be replaced by pneumatic aeration systems with fine bubbles to reduce the power consumption, to improve the safety operation and finally to upgrade the efficiency of aeration process.

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

  Existing/On-going Project(s)

  There are several existing projects typical for this category of activities, as follows :

  a. Reconstruction of caprolactam holding tanks, barreling the chemicals for production in PCHZ Zilina: these projects are solving the problem of groundwater protection. The aim of the projects is to protect the manipulating sites with chemicals such as phenols, NaOH, caprolactam, etc., to reduce of the risk of their leakage to the groundwater and to improve the monitoring of ground water pollution on these sites. In Case Of PCHZ Zilina, these projects are very important due to the ongoing construction of new hydropower reservoir Zilina.

b. Reconstruction of sewer system in Chemko Strázske, Centralize collection and treatment of wastewater polluted by chrome in Tannery Bošany. Both of these projects are solved the widely spread problem in industrial plants. The operation of existing and often uncompleted industrial sewer system is not sufficient. In addition, the sewer systems are old and defective. Therefore, the exfiltration or infiltration to pipes is typical problem, which lead to the contamination of groundwater or hydraulic overloading of treatment process. Finally the problem of separation process wastewater, sewage and storm water is considered in the project of sewer reconstruction in Chemko Strázske.

Planned Project(s)

The similar problems have to carry out the projects in preparation such as: Reconstruction of WWTP in Bukocel, a.s., Reconstruction of WWTP in PCHZ Zilina, Reconstruction of ammonium storehouse in Varín and methylmethaclrylate holding tanks, reconstruction of activated sludge tanks of WWTP in Chemko Strázske and reduction of discharged waste water pollution to the Danube river in AssiDomän Štúrovo.

In general these projects solve the problems of upgrading of aeration systems at WWTPs by replacing the mechanical aerators to fine bubble aeration systems Again the implementation of measures to ensure the groundwater protection are the important goals for holding tank and/or storehouses in PCHZ Zilina.

The upgrading of AssiDomän Štúrovo wastewater treatment plant is important from the point of view of transboundary pollution. In this project the reduction of carbon as well as nutrient pollution have to be assumed, therefore the nitrification and denitrification will have to be applied.

The same situation is in WWTP PCHZ Zilina. The reduction of TN is necessary due to the significant dilution reduction of receiving water (the ongoing construction of Zilina reservoir will significantly reduce the flow rate in bio-corridor where the effluent of plant is discharged).

Proposed Project(s)

The proposed projects represent the similar activities as the former ones. Most of them plan to implement the reconstruction and/or upgrading the existing treatment plant such as: Construction of WWTP with reconstruction and expansion of sewer system in Bucina Zvolen, WWTP reconstruction in Biotika Slovenská Lupca, Biological treatment step in HP Harmanec.

We also could find the project solving the important problem typical for Slovakia - The sludge disposal upgrading in WWTP VSZ Ocel, a.s. Košice. The project will implement the latest technology of sealing the existing sludge lagoon to reduce its impact on groundwater quality near lagoon and it will improve the monitoring of this site.

- **establish monitoring and warning system systems in frame of water management of enterprises.** The monitoring and warning system systems in frame of water management of enterprises needs to be established in order to prevent the accidental leakage into soil and ground water. It is needed to perform the **monitoring of a current state of internal collection systems** in order to prevent the leakage into soil and ground water.

  The **warning system** connecting the production and collection system management is needed to build up to maximize the possibilities for pollution reduction in receiving waters.

  To help to achieve the reduction of pollution it is necessary to provide the **continual monitoring of discharges** in the chosen measuring profiles in order to control the amount and quality of discharged wastewater.

Furthermore, it is needed to **monitor the specified qualitative parameters of wastewater** with the stress on toxic substances. In case of significant source of pollution, a real time control of internal industrial sewer system as well as treatment plant should be applied.

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

Existing/On-going Project(s)

These above mentioned activities integrate the existing project on Management of waste water in NCHZ, a.s. Nováky. This pilot project could be utilized as a case-study for the other industrial plants in Slovakia how to improve the state of water management in its company. The aim of the project is to develop the water pollution control model and to make up the optimal warning system of uncontrolled flow of particular organic substances to internal industrial sewer system. This system will use the fluid chromatography operating in automation regime as a control sensor. The information from the installations is collected in the process computer installed in environmental department with non-stop operation. The alarm situation is alerted by light and sound warning system.

Planned Project(s)

The projects in preparation which intend to improve or establish the monitoring and/or warning systems are several in Slovakia. However it worth to mention the project Final landfill Chalmová - VI. construction because this project should reduce pollution of the highly polluted Nitra river by hazardous substance - As. The project will ensure the sufficient capacity of landfill site for residual ash produced by thermal power plant and to control the groundwater and soil contamination by leachate water. The monitoring of the landfill will play the important role in this case.

(iii) Adequate implementation of legislation and financial mechanisms

To facilitate the achievement of adequate implementation of legislation and financial mechanisms, it is foreseen to undertake activities in the following fields:

- legislation;
- financial mechanisms;
- availability of funds (loans).

It is necessary to:

- **improve legislation.** The legislative tools are nowadays the most important to influence the production of wastes by the private subjects. The **proposal for the change of tax system** with the aim of supporting the implementation of environmental technologies needs to be prepared and adopted. This needs to be incorporated within the system of incentives for industrial enterprises.

  Moreover, it is foreseen to prepare the proposal for **supporting the industrial environmental measures** also from the State Fund of Environment according to the set of priorities.

  In addition to above mentioned it is necessary to ensure the process of **approximation of legislative with the directives of EU.** Although it is still ongoing, it is needed also to ensure and speed up the whole process concerning the standards oriented on industrial production and environmental pollution control. It is also required to **amend the Effluent Standard No 242/93**.

- **improve financial mechanisms.** To improve the financial mechanisms it is necessary to look for existing possibilities of optimizing the cash flows, e.g. within the State Fund of Environment. The income of the State Fund of Environment comes mostly from penalties and fines paid by industrial enterprises. It was proposed to set a system of priorities and ensure to some extent that the money would come back to the subjects who contribute to the fund. However, it is generally known that the State Fund of Environment is not able to fulfill all the requests for support on investment activities. So, some new system of **revolving fund** for supporting the environmental activities needs to be prepared and adopted in order to provide the cheap money for investment in the environmentally sound technologies.

  Optimization of the **finance distribution** from the State fond of Environment back to the subjects who contribute to the income of the fond is one of the important elements within improvement of financial mechanisms.

  Change in the **system of paying the penalties and fines** should be carried out and it should reflect the present economical situation.
- **make available funds (loans).** The funds for investment need to become available. The **system of incentives** has to be prepared and adopted, in order to help the producers to start en ecological production, e.g. tax allowance for producing ecological products.

  Also the **system of paying the penalties and fines** needs to be changed not only in the sense of the increase of penalties and fines, but the system needs to incorporate also some incentives, e.g. **decrease the penalties** during the investment for a new environmental technologies.

  It will be very helpful to **lower the interest rate of loans** for environmentally sound technologies.

3.2.4. Important Assumptions for the Sector

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

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

- **Environmental Management System effectively implemented.**

  The EMS according to ISO 14000 is a set of standard used for environmentally sound operation of the whole enterprise. After the EMS is implemented as widely as possible the sustainable industrial production may be achieved.
- **Developed free market economy favorable for environmental protection.**

  The system of measures taken in the financial and legislative framework together with the free market economy development should be combined with the raised awareness of environmental issues not only among people, but also in the bank sector and big industrial enterprises, which could contribute to the environmental protection. Together with above mentioned the increasing level of local cooperation between municipalities and industries, create the conditions for the environmentally oriented free market economy favorable for environmental protection.

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.

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

- **Implementation of economic and legislative tools requiring application of modern technologies.**

  The legislative and economic tools are always prepared considerably long time. The proposal itself is only the first step. The new systems and legal framework start to result in improvement or the change of processes just after they are adopted, implemented and executed.

- **Legislation effectively implemented.**

  The legislation concerning the production of pollution has to be implemented effectively in order to assure that the regulations will not only be optimally prepared but also successfully enforced. This requires also the effective control mechanisms and systems.

- **Co-operation between bank sector and industry in implementation of environmental projects highly effective.**

  The financial constrains are the most common barrier to introduce the environmentally friendly technologies, goods packaging. The effective cooperation between bank sector and industry is an assumption for overall development of investment and implementing the environmental projects.

- **Co-operation between government and industry effective.**

  The financial constrains in the case of big investments may be solved by state guarantee for the loan. The state guarantee is always very difficult to obtain, but the highly effective cooperation between government and industry may to help to set the priorities oriented towards the environmental protection projects.

- **Emission limits enforced.**

  The emission limits needs to be not only adopted but also enforced in practice.

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

- **The process water consumption in industrial sector is decreased by 20% compared to the level of 1998 by increase of mass loading of discharged water in Slovakia by 2010.**

  Currently the consumption of process water is very high due to obsolete technologies. Therefore it is necessary to improve water management in industry to apply more frequently reuse and recycling of water in production process. On one side it decrease process water consumption, but at the other side the concentration of pollution will be higher in discharged waste water. It will decrease hydraulic loading of treatment plants, however it will be necessary to adjust their treatment lines.

- **The number of factories meeting EU effluent standards is increased by 50% compared to 1998 by reducing the load on aquatic ecosystems in Slovakia by 2010.**

  Application of modern treatment technologies should improve the efficiency of treatment plants to reduce discharged pollution, especially nutrients, toxic substances and other pollutants. This will require upgrading of WWTP and installation of new equipment and replacement of existing ones. In particular cases it will be necessary to expand the existing structures of plant.

- **The interest rate is decreased by 5% for the loans for clean technologies by decreasing the production of hazardous substances in Slovakia by 2010 compared to the level of 1998.**

  The reduction of interest rate will accelerate implementation of new clean technologies, which will bring less pollution mainly resistant pollutants, non-biodegradable substances or even toxic pollutants. This measure will preventively decrease the acute pollution of rivers.

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

Since 1990, political, economic and social **changes in Slovakia** have influenced almost every element of socio-economic life, including water management. The ongoing economic transition has also affected the generation and quality of waste waters. Increasing water prices have reduced and may continue to influence the decline of production of waste water. Auspicious, these changes have positively improved the quality of particular parts of heavily polluted rivers in Slovakia by one or two water quality classes. However, it is expected that municipal waste water discharges will not change significantly in spite of the liberalization of water price. Presently, state ownership is dominant in all sectors of water management; both the river basin authorities and the water supply and sewage works are state owned enterprises. It is planned, however, that in the future only the strategically most important fields will remain in the hands of the state (e.g. most functions of the river basin authorities), utilities of both Water and Sewerage Companies and river basin authorities will be privatized.

The high concentration of population in urban areas brings the threat for the environmental qualities of life. The population living in cities with more than 10 000 inhabitants exceeds 69 % in the Morava and Danube River Basin, 55 % in the Vah and Nitra River Basins, 39 % in the Hron, Slana and Ipel River Basins and 46 % in Bodrog and Hornád river basins. The high requirements for drinking water supply, excessive water use and high production of municipal waste waters induce the necessity of effective operation and maintenance of **drinking water supply** systems and **sewerage system** operation. The state of old water distribution systems and sewerage is in many cases very poor and necessarily requires huge investments in order to reduce the losses of drinking water in distribution systems and minimize the leakage from the sewer systems or infiltration into them. The steadily increasing number of inhabitants influences the increase of produced municipal waste waters which flow into waste water treatment plants which were designed many years ago and their capacity for current waste water inflow is not sufficient. Moreover, the newly built or reconstructed waste water treatment plants stay in the building process several years because of the lack of financial means for their construction or reconstruction.

From the 2,871 settlements in Slovakia, 1,820 have public water supply systems; expressed in percentage it is about 79,84% of the population. Comparison with Western European values shows a significant lack in public water supply. Per capita **water consumption** have decreased during the past six years from 433 l/cap.d (1990) including industry, to 301,5 l/cap.d (1996) in average. Water consumption in households decreased from 195,5 l/cap/day to the value of 134,6 l/cap/day. However in municipalities the specific household consumption was 83,3 l/cap/day in 1996, compared with the level of specific consumption in EU this value is seriously below the average

and is close to the hygienic minimum (80 l/cap/day). The long term trend of decreasing of drinking water was influenced also by price regulation for households (August, 8 , 1996 - 5.- Sk/m3). The major problem in water supply is losses from water mains, which could reach even 25% (22,2 % in 1996).

The situation is even worse in sewerage. It is constantly behind the development of water supply systems which is typical for the most of CEE countries. Only 12,96 % of settlements have complete **sewer systems** which is about 53,03 % or 2 850 000 inhabitants of the total Slovak population. The lowest level of waste water collection is in some northern and south-eastern regions with less then 30% of population served by sewerage.

Since the majority of settlements in Slovakia are smaller towns or villages (there are only 27 towns with a population equal to or higher than 25 000) the typical sewer system is the separate, sanitary sewer system, only larger towns are served by combined sewer systems. In general, urban drainage systems are defective, infiltration of groundwater causes problems in almost every settlement. Infiltration discharges are estimated about 10 to 30% of dry weather flow on average, but higher values are reported as well.

The majority of local **industrial waste water** is collected together with municipal waste water and consequently they are treated at municipal treatment plants. Recently the ratio industrial waste water/sewage has been dramatically changed due to the decline of the production of industrial waste water (shut-down of many plants). The level of **waste water treatment** also lags behind western standards. Only about 90% of all collected waste water is treated in 204 municipal waste water treatment plants (WWTPs) running by waterworks and 77 by municipalities, however, only less than 50 % of all WWTPs meet recent environmental standards. The number of treatment plants with mechanical-biological treatment line is 89,22 %, with mechanical treatment 10,78 %. The total capacity of waste water treatment plants was 1917,6 103 m3/day in 1996 (only mechanical treatment 17 049 m3/day, mechanical-biological treatment 1 900 547 m3/day).

The main reason of **insufficient treatment** is hydraulic and mass overloading, the next problem being the quality of waste water (impact of industry connected to public sewer systems). High portion of groundwater infiltration causes dilution of waste water and decrease of its temperature, which causes problems at the treatment plants. The age of the most of larger existing waste water treatment plants varies from 15 to 20 years. Since now the quality of influent and flow rate has significantly been changed, however the treatment line and capacity of majority plants have not been adjusted. In Slovakia most WWTPs consist of mechanical and biological treatment (only about 90 % of collected waste water is treated biologically) though it is known that an amount of conveyed waste water to WWTPs is bypassed to reduce their overloading especially during wet period.

In Slovakia, the **smaller waste water treatment plants** prevail. Due to the demographic situation of Slovak population and due to the more realistic local investment possibilities it is expected, that the small plants will be those most frequently designed and constructed also in the near future. Upgrading and extension of existing WWTPs is typical for towns and cities beyond 20 000 inhabitants. **Sludge treatment and disposal** is tremendous problem in Slovakia, as well. In 1997 municipal waste water treatment plants produced 89,8.103 tons of dry solids (DS) of sewage sludge for disposal per year (in 1996 92 090 t DS/year). The current complex situation and the future production of sludge are affected by two dominant factors: the changes in effluent standards and newer tighter sludge disposal regulations. The reduction of organic pollution and nutrients discharged to receivers requires upgrading the existing treatment plants and building new ones for both phosphorus and nitrogen removal. This assumes a gradual increase of sewage sludge production. Sludge disposal is the main contemporary problem of sludge management. The actual quality of the sludge as well as sewage sludge disposal regulations have resulted in a significant reduction of its agricultural utilization.. In 1997 20 % of total sludge production did not meet the

requirements of Slovak Technical Standard (STN 46 5735 Industrial composts) for composting and according to the Guideline for agricultural use of sewage sludge and sediments. all tested sludge did not fulfill its requirements in particular analyzed parameters. The main problem is contamination of sludge by heavy metals diffidence and unwillingness, which prevents sludge disposal to agricultural land, therefore landfilling has become the most frequent method of sludge disposal in Slovakia.

From the past until recently, comprehensive and sufficiently accurate data have frequently not been available on the **design of sewerage and waste water treatment plants**. Thus, a number of treatment plants have been under or over designed. Specific problems are involved with the construction of treatment plants. They can be summarized as follows: a high level of groundwater, very flat (in southern Slovakia) or very sharp ground slopes (in northern of Slovakia) and complicated geology and hydrogeology conditions (mainly in southern and western Slovakia). To reduce operational difficulties in treatment plants, several urgent problems need to be solved, but many of them are closely related to **upgrading plants**. However, since the total overloading of plants will be partially reduced due to the recent collapse of industry and the increase in the prices of public water and sewerage services, the pretentious investment costs will probably inhibit the reduction of infiltration or rehabilitation of sewer systems. Most of the upgrading concerns the **modification of existing treatment processes**. These main approaches should be considered: upgrading solid/liquid separation processes, modifying the activated sludge process with the aim of reducing the washout of sludge flocs from tanks to effluent (bulking sludge) and removing nutrients, and finally, upgrading sludge treatment with respect to anaerobic stabilization (digestion) and mechanical dewatering process. Treatment processes, or modifications, with reasonable efficiency and low construction and operation costs are preferred. Upgrading existing primary treatment plants to chemically or precipitation plants seems to be one of the possible alternatives, serving as temporally enhanced step allowing for the later implementation of biological treatment methods for the removal of organic and nitrogen or phosphorus however in Slovakia this alternative is not preferred due to the higher production of sludge as well as the difficulties with sludge dewatering.

Uniform **effluent standards** generally lead to uniform technologies. However, this is not the case in Slovakia because the upgrading of existing facilities, often overloaded and performed with historically different developed treatment lines, requires viable alternative strategies resulting in technologies which may vary from plant to plant. The priority of present goals is to reduce municipal emission, which often contributes of about two-third of the total BOD_5 load in the catchment, e.g. in the most polluted parts of river basins. Control and treatment of urban storm water, upgrading the existing combined systems in this sense and consideration of the impact of combined sewer overflows on the water body in the context of catchment-wide integrated pollution control are on the edge of present focus in Slovakia from the point of view affordability.

Because of the lack of investments, probably future **upgrading of existing treatment plants** will be oriented on modification of treatment processes (upgrading of biofilters and activated sludge reactors, application of new aeration systems, combination of fixed-film and suspended biomass processes, improvement of final clarifiers etc.). In any case, according to the effluent standards introduced by Decree No.242/1993 in many cases "hi-tech" nutrient removal systems will have to become a standard technology in Slovakia (in contrary to "low-tech and low-cost" systems very often recommended for Central and Eastern European countries).

The **transformation processes** of Water and Sewerage Companies should be completed during the next few years, considering the responsibilities of municipalities for the drinking water distribution and waste water collection and maintenance of systems. It requires undertaking few legislative steps. However, the real improvement of situation demand the introduction of effective financial mechanisms, introduction of some revolving funds and mobilization of other sources for financing the investment in municipal sector. The commitment of financial support should be set to the

industries, which discharge their waste waters into the municipal sewer systems. The optimization of cash flow in the state economy is also one of the very important issue which requires the legislative framework.

The municipalities have also to deal with the high load of the **solid communal waste** production. This invokes the problems with the collection, dumping and liquidation of waste. During the last few years, the separation of solid waste started to be introduced in Slovakia. It was successfully introduced only in a few cities, so it brings up many problems to be solved in the future. One important issue is the support of the companies for separate waste collection and processing but it has to be combined with the activating of public awareness programs in a given area. The role of local governments in this issue is of very high importance.

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 affected.

Organizations

The following organizations involved on organizational, decision-making and/or policy level in the Municipal Sector have been identified:

- municipal governments;
- ZMOS - Association of town and villages and UMO – Union of towns and villages;
- Ministry of Environment;
- Slovak Environmental Inspectorate;
- Slovak Hydrometeorological Institute;
- district environmental authorities;
- Water Research Institute;
- Ministry of Soil Management;
- river basin authorities;
- waste collecting enterprises and waste dumps managing enterprises;
- the water and sewerage companies;
- Ministry of Health;
- Slovak Agency for Environment.

Municipal governments: The process of straightening the role of municipal governments has been advanced during the last few years of building the democracy in Slovakia. The municipal governments will play the decisive role in the process of privatization of Water and Sewerage Companies. It is also their competence to decide how to deal with the communal solid waste. However, the competencies of municipal governments will have to be defined and enforced by the appropriate legislative frame, considering the financial mechanisms for the distribution of sources from the state budget.

ZMOS - Association of town and villages and UMO - Union of towns and villages: Both organization play important role in the process of preparing and adopting the relevant legislation, concerning the municipal and local governments. They also provide a basis for regional and local cooperation. These organizations may play important role to accelerate the process of approval of particular environmental legislation norms

Ministry of the Environment is the central state administration authority for environment in the Slovak Republic. The domain of its competencies was adapted as follows :

- nature conservation;
- conservation of water quality and quantity and its rationale exploitation;
- air protection;
- territorial planning and building order;
- waste management;
- arrangement of the uniform environmental information system, including of aerial monitoring;
- geological research and survey.

The Ministry of Environment is also responsible for the preparation of regulation proposals in the field of environment. The Ministry is also responsible for supervising their organizations.

The Slovak Inspectorate for Environment performs the state supervision of environmental protection. It was established by the act no.595/1990 Dig. It is divided on:

- section of water management inspection;
- section of air protection;
- section of waste management inspection.

Inspections of water and waste management are situated in Bratislava, Nitra, Žilina, Banská Bystrica a Košice. Inspectorates exert supervision in extent and under conditions given by autonomous regulations. The inspectorate imposes penalties for break down of juridical duties. the penalties present the incomes of the state fund of environment. Responsibility for water quality bears Water Management Inspectorates.

The Slovak Inspectorate of Environment is supervised by the Ministry of Environment and is responsible for executing the control of the permitted limits for waste water discharges, air pollution and waste management. They have the authority to charge fines when the reality does not comply with the given permission.

The Slovak Hydrometeorological Institute is supervised by the Ministry of Environment. The activity of Institute is mainly to obtain data about the state and regime of water and air, to process them, analyzed, to interpret and stored them. On this basis Institute provides especially:

- provides regime and real-time information about surface and ground water, about their quantity and quality, provides information and forecasts of water levels and discharges;
- provides meteorological and climatological information, predictions;
- observes and evaluates the level of pollution and radiation of air, cooperates on the conception preparation and measures of air protection, provides professional activities and operational activities in hydrology, climatology, meteorology, water and air protection;
- systematically acquires, records and stores the documentation in the above fields.

District Environmental Authorities run the state administration in environmental protection. The activity domain of the District Environmental Authorities is identical with the activity domain of the Ministry of Environment. The District Authorities for Environment are entrusted to issue statements according to the autonomous regulations, approvals and permissions and impose remedy measures and penalties found out on law duties in matters connected with environment protection. In case of water management, they are also responsible for setting and permitting the effluent standards limits and amount of discharged waste waters for different polluters. This permission set

the basis for the calculation of penalties for different polluters who discharge the polluted water. Environmental Authorities is the body responsible for implementation, decision making and control of environmental issues on regional and district level.

Water Research Institute in Bratislava is directed by the Slovak Ministry of Soil Management. The Institute deals with the problems related to water quality monitoring and waste water treatment. It also provides hydrological characteristics for water management planning and hydraulic parameters of different water structures. It is also responsible for the preparation of the technical standards, legislative norms in the field of water pollution control and exploitation. The Institute solves the research tasks dealing with the surface and ground water assessment and control, their exploitation for the drinking purposes, navigation and hydropower production.

Ministry of Soil Management is the central authority for agriculture soil protection, forest soil protection, forest protection and water management. It is also the central authority for organization and state enterprises in the branches of agriculture, food industry, forest and water management.

The River Basin Authorities are supervised by the Ministry of Soil Management. River Basin Authorities are responsible for river water quality control. The state authorities for administration of significant basin are the state enterprises established according to the Water Act No. 38/1973 Coll. Four river basin authorities have been established:

- The Danube River Basin Authority;
- The Váh River Basin Authority;
- The Hron River Basin Authority;
- The Bodrog and Hornád River Basin Authority.

The duties of River Basin Authorities are to:

- perform administration, operation and maintenance of watercourses, water engineering works and facilities constructed on them;
- supply of surface water to all sectors of management, including new water resources development;
- fulfill the duties given by the flood operational plan;
- maintain the water ways;
- monitor surface and irrigation water quality and measures for water pollution control;
- create conditions for utilization of the hydropower potential of water streams and conditions for navigation;
- perform administration, operation, maintenance, upgrading, modernization and new construction of stated owned hydromelioration systems.

The River Basin Authorities are obliged pursuant § 33 of the Water Act No. 138/1973 Dig. in wording of later provisions to carry out following:

- monitoring and evaluation of water quality, as well as withdrawals, discharging of waste waters and other activities on water courses;
- co-operation in improving emergency surface water quality deterioration and elimination of its consequences;
- drawing up a plan of complex care concerning water quality, propose measures for water quality improvement in watercourses;
- carry out systematic control of water quality in specified cross-sections.

Waste collecting enterprises and waste dumps managing enterprises. The private companies which are hired by municipal governments to collect the municipal waste and for the managing of dumpsites should be willing to introduce the new technologies for the waste separation and the secondary use and processing of waste. The legislative and financial incentives should help to develop the competitive atmosphere to succeed in the profit oriented activity with the high importance for the environmental protection.

The Water and Sewerage Companies are supervised by the Ministry of Soil Management. These state enterprises Water and Sewerage Companies are responsible for the following :

- supply for drinking water to the population and other consumers;
- public sewerage and waste water treatment;
- providing development of water resources, technical and investment development in sanitary engineering;
- administration, operation and maintenance of waterworks, water supply networks, sewerage systems and waste water treatment plants;
- administration, operation, admittance, repair, upgrading and modernization of facilities.

In addition, Water and Sewerage Companies are engaged in a multitude of secondary and auxiliary activities, e.g. erection of structures and installation services. Water and Sewerage Companies posses their own laboratories serving for the analysis of supplied water quality and for the control of waste water treatment plants.

Polluters

The following polluters have been identified:

- local industry and public service and system maintenance;
- hospitals and health facilities;
- population.

Local industry and public service and system maintenance. Local industrial companies, especially of the middle and small size, very often discharge their industrial wastes into municipal sewer systems. In view of toxic effects often caused by the presence of these wastes, even at very low concentrations, the general practice of combining pretreated or partially pretreated industrial and domestic waste would be reevaluated by a number of municipalities. In the future many municipalities may either provide separate treatment facilities or require that they be treated to a higher degree at the point of origin to render them harmless before allowing their discharge to public sewers. Public service and system maintenance represents the smallest component of municipal water use. Public service water uses include water used for buildings, fire fighting, irrigation public parks and greenbelts, and system maintenance. The waste water produced by commercial and institutional facilities based on size and number of these facilities and type of the housing function or activity provided. The commercial water-using facilities such as laundries or car washes can influence the daily variation of waste water flow-rates in small communities as well as may introduce special wastes such as oil material, detergents, etc.

Hospitals and health facilities. The production of specially polluted waters is one of the characteristics of such polluters. Disinfecting is one necessary step, which has to be taken prior the discharge to public sewer system.

Population will always be also polluter. The problem is low awareness toward the environmental issues. Low interest in the communal waste separation, which very often fails because of ignorance of inhabitants and high water consumption are the two main important problems, which may be solved by the raising the interest of population and their education. The waste water generated by

population can be classified to water used by residential households, commercial districts, institutional and recreational facilities. (see the paragraph of this chapter about local industry and public service and system maintenance.)

The Water and Sewerage Companies (VAK) ensures that the waste water from population is collected and flows into the WWTP or is directly discharged into the water course. It is responsible for public sewerage and waste water treatment, for the providing development of water resources, technical and investment development in sanitary engineering, for the administration, operation and maintenance of waterworks, water supply networks, sewerage systems and waste water treatment plants as well as administration, operation, admittance, repair, upgrading and modernization of facilities.

Affected

The group of individuals or institutions negatively affected by pollution or other negative action has been distinguished as follows:

- individual users;
- NGOs;
- river basin authorities (RBA), water and sewerage companies (VAK);
- users of technological waters;
- food and pharmaceutical industry.

Individual users - population, civil associations (fishermen, farmers, etc.), owners of land in the vicinity of water streams, recreation facilities and tourism.

Population is the polluter and consumer of goods of industrial production and at the same time is the most affected by the adverse effects of their own activities. The main problem is the polluted water, which has to be purified prior to the distribution. The risks for endangering the health of population has to be eliminated or at least minimized. The specific/ micro pollutants and/or hazardous ones are of the most importance because of the possibilities to enter the food chain, very often with the unknown long-term health influences. The polluted water influence the limited use of water for drinking, irrigation, fishery, recreation, food industry, etc.

NGOs oriented toward the nature protection and sustainability of life are groups, which have the specific sensitivity to the environmental issues and usually feel more affected then other groups of population. This should positively influence the public awareness.

River basin authorities (RBA), Water and Sewerage Companies (VAK). The VAK and RBA companies are supervised by the Ministry of Soil Management. They withdraw the water from water sources for drinking, industry, irrigation and other uses. More polluted water requires more facilities and financial sources for water treatment, which means less money for investments and higher costs per m^3 of produced water.

Users of technological water. In some cases the water use as technological water is limited because of its poor quality. This requires additional financial sources for water treatment to improve the quality of water and the maintenance of production systems.

Food and pharmaceutical industry require the clean water because of the character of their production. This brings high requirements on the water resources for water supply.

3.3.1.3. Current Strengths/Assets

Concerning the insufficient treatment of discharged water the following assets were considered:

- **Economical and legislative tools**

  The penalties and fines are the economical tools, which are applied to polluters for discharging the polluted water. This generates a pressure on polluters to eliminate their amount of discharged pollution, because the penalties are paid from the profit. The system of incentives is not widely applied and it would help the polluters to increase their concern to deal with pollution. Especially when the incentives help them to solve their situation not only in present time but also in future.

- **Existence of new treatment technologies**

  The obsolete treatment technologies in the WWTPs influence the low efficiency of treatment. The enlargement and reconstruction of the whole WWTP is costly and the lack of finance is one of constrains. The step by step approach would advance the process of improvement of waste water treatment.

- **Management and operators**

  The management systems concerning the discharges of polluted water should be mobilized and optimized their capability to improve the decision making processes. The successfully introduced system for training the management and operators of WWTPs would result in eliminating the operational failures, improving the technological discipline and optimizing the operation.

- **Monitoring**

  Monitoring of water quality is performed and provides the data for the water quality assessment. The data on the discharged amounts of polluted water and their quality are also available. Nowadays, the monitoring includes also the biological methods.

- **Research academic and scientific potential**

  The water quality assessment requires the researcher and specialists who know the situation in details and their ability to propose the adequate and not very costly measures for different tasks is very valuable. This group could present the progressive and new or alternative solution of particular problems in this field. The existence of such specialists is an asset, which is not yet appropriately used.

- **Financial sources**

  The main sources of financial means are either state budget or the budget of municipalities. The gathering of financial sources should also be considered as a common effort of members of society or municipality who join their potential in order to improve the living conditions in the city or village. As an example: the industrial plants discharging waste water into the communal WWTP may join their effort to built new WWTP together with the municipal government.

- **Grants for environmental NGOs for environmental education**

  The environmentally oriented NGOs are willing to promote the systems for the raising the public awareness concerning the environmental issues. Donors and foundations provide financial support for different project. There exist NGOs, which perform the educational programs for children and schools.

Concerning insufficient institutional and legal frame the following asset was taken into account:

- **Process of approximation the legislative with EU**
  The process of approximation the legislative with the directives of EU has already taken place and all the new prepared legal documents are in accordance with the standards of EU. The issue of their enforcement is the question of the next few years.

Regarding inappropriate disposal of municipal solid waste the following assets and achievements are considered:

- **Methods for the separated waste collection**
  The separated waste collection is not sufficiently applied in Slovakia in spite of facts that this is one of the ways to reduce and recycling the amount of waste. The possibility still exists and the interest to apply the methods for separated waste collection should be increased and induced by the high cost of incineration and dumping of wastes.
- **Application of sludge in agriculture**
  The application of sludge in agriculture is very often limited because of the inappropriate quality of sludge predominantly contaminated by heavy metals. There exist a necessity to assess the situation and look for solution from case to case. In some cases, it is needed just to eliminate one source of pollution and the sludge would have the quality appropriate for applying on agricultural land.
- **Economical and legislative tools**
  The economical and legislative tools may help to stop the wild dumping and enforce the proper handling with solid communal wastes.

3.3.1.4. Analysis of Transboundary Effects

The following transboundary effects have been identified:

- **Potential threat to biodiversity**
  The boundary for river does not exist, the polluted water flows downstream and brings all the negative effects on the environment. Therefore, it means that the biodiversity degradation, which is caused by the polluted waters, is also transboundary issue. Moreover, the downstream parts of basin are affected to higher degree than the upstream part.
- **Endangering of water uses and ground waters**
  The transboundary issue has the very similar character. Slovakia receives the polluted waters from the eastern part of the Bodrog river basin, which lays in Ukraine. Occasionally some accidental pollution occurs (oil spills). Most rivers of Slovakia originate here and from the source to the border section receives the waste waters from many industrial and municipal sources of pollution. The receiving country is Hungary, which lays on the south of Slovakia. Hungary has the similar character of alluvial zones used for drinking water supply in the northern part of the country, so the risk of endangering the drinking water supplies exists.
- **Influence on alluvial waters**
  The special importance with limited transboundary effects, mainly along the narrow area along the border, is given to the leakage from wild dumps, especially in cases when no data exists about the composition of waste deposited.
- **Health risks**
  The water-born decease and epidemics do not occur often but the steps eliminating the potential risks have to be taken. It may become a transboundary issue just locally in the very narrow area along the border.

3.3.2. Sector Problem Analysis

3.3.2.1. Core Problem

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

"SIGNIFICANT POLLUTION ORIGINATED FROM URBAN AREAS "

3.3.2.2. Causes Leading to Environmental Problems

The high concentration of population and industry on the small area brings the necessity to deal with the municipalities as the hot spots concerning the water pollution and the communal waste production. In case of developed sewer system which terminates into WWTP, urban area can be more-less considered as point source of water pollution. Small villages and settlements without any sewerage cause more diffuse pollution. Urban areas are the places of concentration of another activities, which can contribute to water pollution. Let us mention traffic, industry, health care, municipal solid waste production and others, sometimes hard to identify and control activities.

Three main causes leading to significant pollution originated from urban areas were identified.

Considering the reasons mentioned above the three main causes were identified as follows:

- insufficient treatment of discharged water;
- inappropriate disposal of municipal solid waste;
- insufficient institutional frame.

(i) Insufficient treatment of discharged water

Only 53% of Slovak households are connected to public sewerage. Even some big cities or their parts still have no or insufficient WWTP. The discharges from municipal WWTP are often by-passed and treated with low efficiency. The load is higher when **insufficiently treated industrial waters** from local industries are **discharged directly to the public sewer systems**.

The technical state of the sewer systems is often very poor because of the lack of finance for repairs of old systems. In rural or unsewered areas is limited options of waste water management systems application because in Slovakia on-site systems for individual residences and other community facilities are practically not allowed to operate There exist many small towns and villages with the low percentage of people connected to the sewer systems. They use the septage holding tanks or discharge sewage directly into the streams without any treatment. The role of municipalities in building the new systems is very important. The State Fund of Environment is one of the financial sources for building the new systems, however, the finances of fund are limited.

The obsolete collection and treatment facilities represent the problem, which also needs finance to be solved. The old system needs repairs and investments in order to eliminate the leakage from sewer into ground water and/or reduce the infiltration into pipes. The using the old technologies in WWTP causes the low efficiency of water treatment.

The designed inflows usually exceed the optimal operational capacity and hydraulic overloading of WWTP is very common issue within existing plants. The bypass of waste waters is discharged without treatment into the streams.

The **absence of advanced treatment** in the WWTPs in Slovakia is a common issue. It is caused mainly by the lack of finance. This issue influences also the **long-term construction of new WWTP**. It happens very often that the building of a new WWTP have to be temporarily stopped because of the lack of financial sources. In some cases, the building of WWTP exceeds 10 years. The common issue for all mentioned partial problems is the lack of finances in budget of towns and villages.

(ii) Inappropriate disposal of municipal solid waste

Inappropriate handling with solid municipal waste is problem typical for settlements. Municipal solid wastes are often stored on spots close to water streams or groundwater sources, there is often poor if any technical design of deposits. Typical phenomenon in Slovakia is to dispose the solid wastes to depressions or to abandon river streams, which are often in connection with ground waters. The solid waste management is directed in the framework of the Waste Act No.238/1991. After the law was adopted, the systematic approach was applied to assess and control the dumpsites. There exist 8300 dumpsites in Slovakia. More then 530 are approved and 71 have regional character. Solid communal waste production brings about several issues. The first is the **high production of waste**. There is low knowledge about **possibilities to decrease waste production** on the side of producers.

The separation and secondary processing of communal wastes is not sufficiently introduced. There do not exist sufficient knowledge about the technologies for the waste separation and it is not considered to be the profit making activity and thus **separation of wastes is insufficient**. It induces the low interest of businessmen to start with it. The low interest of public is one critical point of such activity because the concern of people is the starting point for the communal waste separation.

There is a **lack of controlled waste dumps** or the waste dumps are controlled only to limited degree. The **monitoring of waste dumps is not sufficient** and does not provide representative information about the dumped waste.

(iii) Inadequate institutional and legal frame

Inadequate institutional and legal frame is also a direct cause of significant pollution originated from urban areas. Low level of staff education, **insufficient legislation** and soft standards do not force for implementation of significant improvement measures.

Water quality management in Slovakia is based on the Water Act and government directives, further supported by technical standards. The present Water Act is based on the former Czechoslovak Water Act No.138 from 1973 and is currently being revised. The Act is still being considered to be progressive, since it satisfies even the existing needs of water pollution control in the country, except the articles concerning the state ownership in water management.

Regarding waste water treatment, the most important requirement is that all subjects discharging waste water or special water into surface or ground water must ensure treatment in a manner corresponding with the contemporary state of technical development to ensure the quality of receiver (Article 23, par. 1.) The Water Act (same article, par. 2) also authorized the Government to specify the present level of the technical development as well as effluent standards according to the level of knowledge and technical possibilities by means of Government Decrees.

However, the present problems of water related issue are connected to the Water Act No.138/73 and relevant regulations and decrees. Some of the regulations and decrees were prepared some decades ago and do not reflect the nowadays economical changes and high importance of environmental issues. The fines and penalties do not comply with the inflation and seems to be low. The breaking of the permitted limits for the discharging the waste waters is a common state and the enforcement of emission limits is missing. The **illegal discharges of waste water** into sewerage are not appropriately punished. And the peak **irregular discharges of waste waters** from industry breaking the sewerage regulations still remains an issue.

Although the WWTPs are not sufficiently constructed or furnished by new technologies, **the insufficient specialization of the WWTPs operators** and management worsen the situation and lower the efficiency of WWTP.

The low and **insufficient environmental awareness** helps to ignore the problems with the municipal waste waters. The pressure of the public opinion is missing and does not help the process.

The latest Slovak legislative norm for effluent standards was issued in November 1993. The Government Decree No.242/1993 was prepared with the aim to correspond with European legislation, especially with Directive 91/271/EEC. It represents a fusion of ambient water quality standards and (end-of-pipe) effluent standards common in European countries and it contains two kinds of standards:

- end-of-pipe limits (maximum acceptable level of pollution in the discharged effluent), which are defined both for municipal and selected industrial waste water;
- ambient (environmental) water quality standards.

The local Environmental Authorities, are authorized to issue stringent (but not weaker!) consent contracts for individual effluent limits (e.g. if it is necessary to improve the present quality of water body). An important feature of this Decree is the step-wise approach of setting effluent standards: till December 31, 2004 and more stringent after January 1, 2005. This realistic way has left necessary time to polluters to get prepared to fulfill the more stringent effluent requirements without exceptions.

In Slovakia the majority of water courses are very sensitive (according to the classification of sensitive areas in the sense of ANNEX II of Directive 91/271/EEC) due to their low dilution rate. Therefore, the Gov. Decree No.242/93 also set up new ambient water quality standards to give the water authorities a tool for protection of these sensitive receiving bodies.

It is known that the finances accumulated from the fines create a basic income of the State Fund of Environment. In addition, the polluter must pay for the discharged effluent pollution to the river basin authorities. The payment is based on article 8 of Government Decree No.2/1989, which is a practical expression of the Polluter Pays Principle within the Slovak Water Act. At present, the polluters are penalized in case of exceedance of the following effluent quality standards: BOD_5, suspended solids, acidity/alkalinity, salinity and non-polar extractable substances.

The last two legislative norms are old fashioned and they do not reflect the new economic situation such as inflation, changes from planned to market economy, etc. Especially the Slovak Government Decree No. 31/1975 does not fulfill the expected effect and is together with Government Decree No.2/1989 in the process of amendment. The system of estimation of fines as well as the Polluter Pays Principle would be included directly in the newly prepared Water Act.

Nowadays the Gov. Decree No.242/1993 seems to be the most important legislative norm and it will hopefully influence the perspectives of waste water treatment in the Slovak Republic for a long time. However, it contains many problematic parts and therefore at present is under preparation the amendment of this Decree. The new Decree has evaluated the experience of water authorities with this legislative norm, the comments of plant owners and operators as well as design engineers, the changes in water management (privatization of water industry) and water pollution control in Slovakia and to approach as closely as possible the requirements of Directive 91/217/EEC. (e.g. missing the effluent standard for the form of nitrite nitrogen; system of sampling, etc.).

3.3.2.3. Environmental effects

The following environmental effects were identified:

- **Deterioration of biodiversity**

  Low oxygen demand, high load of specific harmful substances and high load of nutrients are the main consequences of discharging waste waters into water courses. The result is the degradation of environment and development of the species, which are not so sensitive to the pollution and survive also in polluted water to some degree. The specific pollutants may cause the degradation of species and may enter the food chain without knowing their further long-term consequences. The particular impact of non-controlled discharge of nutrients is the eutrophication of watercourses.

- **Limited water use due to pollution of surface and ground waters**

  Discharging the waste waters into water courses causes the high content of pollutants, the lowering of selfpurification capacity of rivers and the threatening of the drinking water resources in flood plains. Alluvial zones are the most important drinking water resources in Slovakia. The polluted water has limited use either for industry, public water supply, irrigation and other uses. The usage of polluted water induce the high cost of water treatment, lowering the quantity of usable waters and at the end influences the high cost of water.

- **Influence on alluvial waters**

  Alluvial zones are the most important drinking water resources in Slovakia, so the regions with the high importance for drinking water supply are protected and controlled. They are endangered by the pollution from surface water as it was mentioned above. The special importance with limited transboundary effects, mainly along the narrow area along the border, is given to the leakage from wild dumps, especially in cases when no data exists about the composition of waste deposited. This so called time bomb may be activated by changing the stream lines of groundwater after some hydrotechnical structures or wells started new operation.

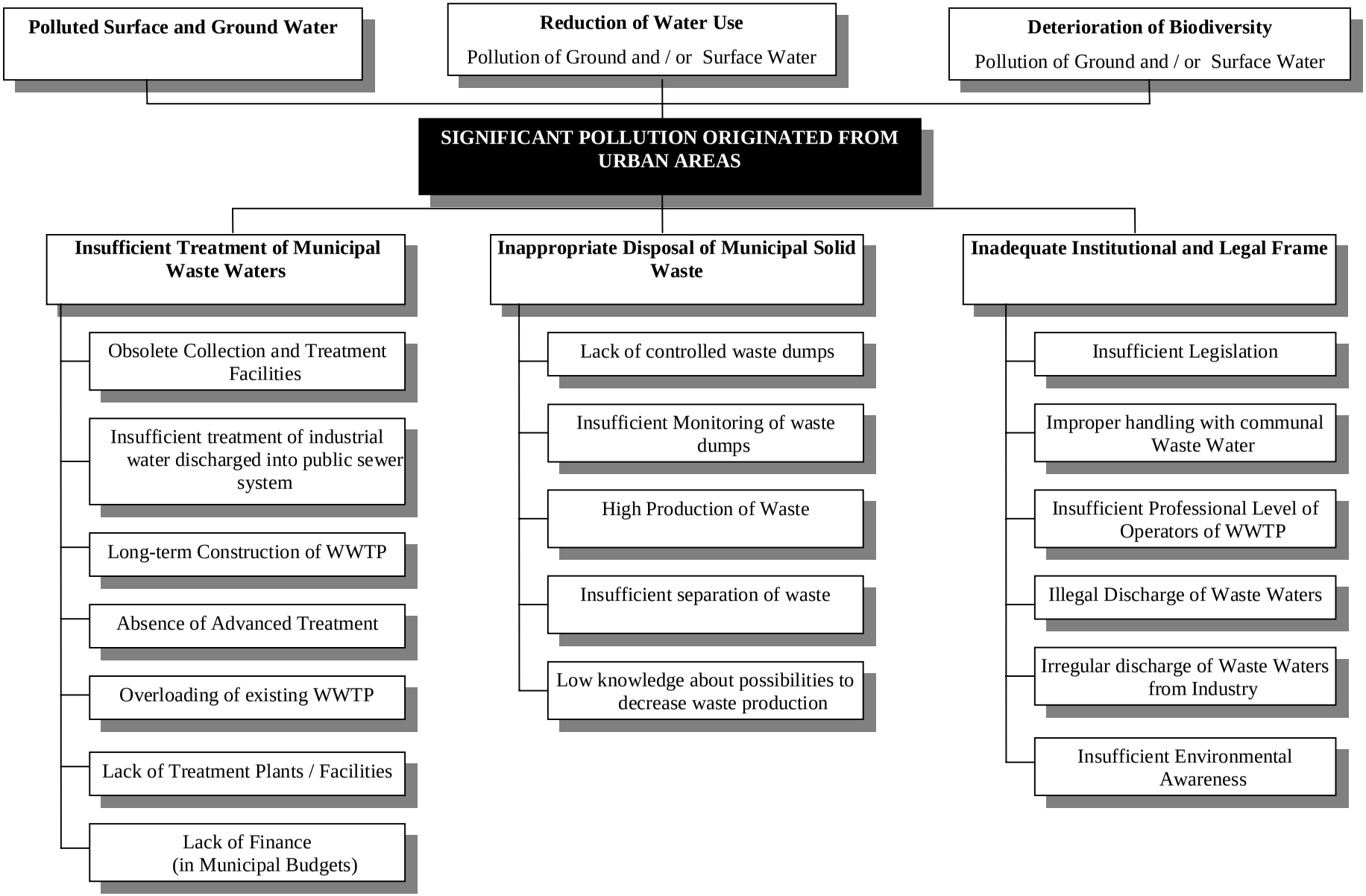
- **Health risks and intoxication of environment**

  The water-born decease and epidemics do not occur often but the steps eliminating the potential risks have to be taken. Uncontrolled municipal waste dumps can lead to intoxication of environment due to possible leakage into ground waters.

- **Degradation of landscape**

  The degradation of landscape has negative effects. River pollution in many cases causes the visible effects especially directly downstream of the outlets. The number of sites with the bad smell still exists. The wild dumpsites or the dumpsites not well situated represent also one important issue.

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:

"ACHIEVEMENT OF SIGNIFICANT DECREASE OF POLLUTION FROM URBAN AREAS"

The three results were identified to achieve this objective:

- implementation of sufficient treatment of municipal wastewater;
- achievement of optimal handling with solid communal waste;
- implementation of optimal institutional and legislative framework.

(i) Implementation of sufficient treatment of municipal wastewater

In order to achieve implementation of sufficient treatment of municipal wastewaters, several activities will have to be completed in the following fields

- treatment of all discharged wastewaters;
- balance between number of connected inhabitants to public waterworks and sewer systems;
- insufficient sewer system;
- funds for WWTP construction and reconstruction;
- utilization of sludge;
- quantity of wastewaters and mixing other wastewater with sewage.

It is necessary to:

- perform treatment of all discharged wastewaters to a required degree according to legal standards. The role of municipalities in this process is essential. The municipalities need support in the process of transformation of the ownership of the water and sewerage companies to become fully aware of their responsibilities for the distribution and collection systems operation and maintenance. The ownership of the WWTP also needs to be clarified, what will enable the new owner to prepare the long-term planning for investments.

  It is necessary to perform treatment of all discharged wastewaters to a required degree according to legal standards. Municipal **WWTPs need reconstruction, intensification and extension**. Their operation requires significant improvement, especially by improving their technological processes.

  The application of **new wastewater treatment (alternative) technologies** in appropriate conditions is very important. The advanced step of treatment for biological **nitrogen and phosphorus removal** needs to be introduced as widely as possible.

  The financial means are very often the limiting factor for the postponing the construction of the WWTP. It is necessary to ensure sufficient sources for operation and maintenance of sewerage system and WWTP. Further more, when the project comes to the realization, it may be already out of date. The **re-evaluation and assessment of the designed technical parameters** of the newly constructed or the reconstructed WWTP need to be verified before the real construction takes place.

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

Existing/On-going Projects

There is number of **existing projects** such as to complete the upgrading and expansion of treatment plants (WWTP Košice, WWTP Nitra, WWTP Banská Bystrica, WWTP Humenné, WWTP Michalovce, WWTP Liptovský Mikuláš, WWTP Roznava). Most of these treatment plants have changed also their treatment line to remove nutrients (especially TN) using nitrification and denitrification.

The typical activity to ensure the sufficient amount of oxygen in activated sludge tanks, necessary mixing with required possibility of building rigid activated sludge flocs have been replacement of mechanical aerators to fine bubble aeration systems.

The significant role plays also the upgrading the final clarifier to improve the removal of suspended solids in effluent. The biological removal of phosphorus is also applied and in particular cases is combined with simultaneous precipitation. In addition, the upgrading of sludge treatment has been applied at these treatment plants (thickening, digestion and dewatering of sludge).

The most serious situation is in Nitra because the old treatment plant is not able to cover by its capacity the collected wastewater and the significant part of them are regularly bypassed even during dry period without treatment to the Nitra River. The similar situation is in Svidnik (a new WWTP is not completing yet) and in Trencín right side where since this time the plant has not existed at all.

Planned Project(s)

At present, there is a prepared project for upgrading of WWTP Topolcany.

- **achieve a balance between a number of inhabitants connected to public waterworks and sewer systems.** The problem of low percentage of people connected to public water distribution and collection systems is remaining mainly in small towns and villages. The measures for reconstruction and finalizing of insufficient sewer systems needs to be taken in order to improve their technical conditions.

  Re-evaluation of waste categorization is needed in relation to septics. It means that the category of waste in relation to septage needs re-consider in order to allow to classify the septage as wastewater and withdraw from the category of dangerous waste. This change would help to treat septage in the special treatment plants have already constructed in Slovakia without sewer systems.

  To overcome financial constrains the rational **phasing of the building of sewer systems** needs to be introduced and accepted. Where no other possibilities exists the building of **small WWTP** may be a solution for treatment of wastewaters with alternative sewer systems (vacuum or pressure sewer systems).

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

  Existing/On-going Project(s)

  The **project of pilot study** with the selection of feasible regions in Slovakia and possible implementation on-site treatment systems for individual residences and other community facilities in unsewered areas should be considered. It is assumed that the distribution of Manual of Practice on design, construction and operation of small WWTPs or on-site treatment systems combined with alternative systems of treatment (e.g. reed beds) could improve situation in this field.

- **undertake measures for reconstruction and finalizing of insufficient sewer system.** The state of sewer systems in cities is generally very poor because of its age and because of the lack of finance for maintenance and investments for reconstruction.

  The situation requires clarifying the ownership of the collection systems by creating **overview of sewerage system** (municipality, water work enterprises). Moreover, there is also need to prepare the detailed **database of sewer system** which will provide the information on the technical parameters of the systems and technical objects built within the system. The reconstruction of the systems needs to be carried out.

  Further more **rain water infiltration areas** approach in urban units should be used **prior to discharging** into sewer systems.

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

  Existing/On-going Project(s)

  The existing project of Nitra assumes also expansion of sewer system in this area.

  The typical problem of some municipalities in districts of Banská Bystrica is that there are several outlets on sewer systems without any regular control discharging wastewater directly to the Hron River. The problem of combine sewer overflows is also importance in this case. Comprehensive solving this problem requires applying the integrated management of urbane drainage system.

  The ongoing pilot project implementing this design strategy represents the study for improvement drainage system in Lucenec. The utilizing the digital maps, hydraulic model of sewer system MOUSETM and field measurements for verification of modeling, several scenarios can be solved to predict the behavior of sewer system, its impact on WWTP and receiving water during wet period.

  The present ongoing project of upgrading and enlargement of Malacky WWTP would help to reduce the pollution discharge to Morava River. This point-source pollution will further reduce if the reconstruction of defective sewer system will be implemented.

  Proposed Project(s)

  Due to the fact that in Slovakia consulting activities in this field are more less old fashioned based mostly on rational method, the proposed pilot project intends to improve the knowledge in simulation, modeling and verification of existing urban drainage system with usage of the existing model such as SWMM, MOUSE, combined with WWTP modeling (GPS-X, STOAT) with impact on river quality (MIKE 11). The implementation of sewerage database e.g. VaKBASE could help to improve its operation to Water and Sewerage Companies.

- **provide funds for WWTP construction and reconstruction.** The main constrains for the WWTP construction and **reconstruction** is a lack of finance. The need to establish the **revolving fund** was expressed in order to provide cheap money for investments. Nevertheless, the **criteria for state subsidizing** policy need to be clarified and applied as well as possibilities for **joining of finance in local level** should be created. The penalties and fines paid by polluters are coming into the State Fund of Environment which provide money for investments, but obviously the demand is much higher then the possibilities of the fund. If the penalties and fines were higher the State Fund of Environment would increase its income and consequently would provide more money for investment activities. More **realistic water fees and discharge fees** should express their real costs and expenses.

- **increase utilization of sludge.** In order to increase the sludge use there exists the need to solve the **sludge hygienisation**. The re-evaluation of **hygienic regulation for sludge** which define is further usage is needed in order to enable and define the future possibilities for sludge application. From case to case there is a need to assess and propose the system for lowering the contamination of sludge by harmful substances or very often by heavy metals and ensure decrease of sludge contamination in order to extend the possibilities of their usage, e.g. for agricultural purposes.

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

  Existing Project(s)

  The existing project monitoring the quality of sludge generating at municipal treatment plants has revealed the decreasing the contamination of sludge by heavy metals due to the collapse industry previously sewered to public sewer system. However, the quality of sludge is not sufficient, therefore the new alternative methods are looking for reduction the harmful substances in sludge. The promising and novel technology e.g. bioleaching of sewage sludge could improve this situation by its biological decontamination.

  Proposed Project(s)

  In Slovakia there is the trend to introduce the hygienisation of stabilized sludge if they utilize in agriculture. The lack data and experience with the hygienisation of sludge could fill the proposed pilot project.

- **reduce quantity of wastewaters and mixing other wastewater with sewage.** The usage of **existing models** for sewerage systems needs to be enlarged and applied in practice. The **overview of water collection systems** including all the technical details need to be prepared in each municipality as well.

  In addition, the **retention on sewerage** needs to be effectively used. The real **operation of sewerage** needs to be in accordance with **sewerage regulation**.

  Reduction of the amount of **rain waters discharged into public sewerage system** and their pollution is needed. The technical solution for catching the rain water in tanks have to be promoted in order not to mix the rain water with sewage because this result in the hydraulic overload of WWTP and bypass of excessive amount of wastewaters.

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

  Proposed Project(s)

  At present, Water Research Institute and Slovak Technical University Bratislava conduct the field measurement and monitoring of sewer systems and impact of combine sewer overflows during wet periods. The obtained data would help to start the proposed pilot project on implementation of vortex separators instead of classical CSOs and thus may also reduce the transported pollution into the receiving water bodies.

  The significant contribution to implementation of storm water source control facilities in Slovakia conditions could be assumed in the case of the second proposed project. Infiltration systems provide detention storage following by infiltration of storm runoff to the natural soils. This source control practice has a number of advantages in comparison with conventional drainage systems. These conventional system are for example decreasing of hydraulic loads to WWTPs, reducing the number and duration of CSOs by decreasing peak flow in the sewer systems and increasing groundwater recharge and pollution prevention by passing the water through an unsaturated layer of soil.

(ii) Achievement of optimal handling with solid communal waste

To achieve optimal handling with solid communal waste, several activities are required in the following fields:

- separated waste collection;
- investments in recycling technologies;
- solving old environmental loads.

It is foreseen to:

- **create conditions for separated waste collection.** To introduce successfully the separated waste collection the two conditions needs to be necessarily fulfilled. First is to attract profit oriented companies to start this activities and from that point of view the **financial benefit** of secondary raw material use in production is important issue which would attract their interest. In addition, also the **different VAT** for separated and non-separated waste **collection** will help to improve the economical condition of this issue.

  The second very important condition is the concern of people. To improve this situation the **separation of waste** need to be introduced at schools as a part of **environmental education** and establish separate waste collection in schools in practice.

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

  Proposed Project(s)

  Two proposed projects should help in this situation: project of separation and processing of plastic package and the second one - pilot projects in villages for the separation, supported by NGO and municipalities.

- **make available financial support for investments in recycling technologies.** The financial benefit and propagation of products produced from secondary raw materials would help to introduce such products in appropriate price levels. The subsidies for recycling technologies, e.g. subventions of interest during the investments need to be introduced.

  The new act on packing needs to be prepared, adopted and enforced. Furthermore, the **lobbing for adopting of law about packaging** is very important. The fund for packages processing will help to deal with packages. The hard recyclable packages need to be burden with taxation.

- **apply appropriate methods for solving old environmental loads** (old dumpsites).The updating of database of originators and owners of old environmental loads is necessary to appoint the appropriate subjects for remediation of dumpsites. It is foreseen also to prepare legislative solution for problem of liquidation of old waste dumps by originator of environmental load.

  There is a need to legally clarify the responsibility for this remediation in special cases, e.g. the **owner** was not an originator of pollution or the originator is unknown. The old **uncontrolled waste dumps** need to be **decontaminated and recultivated.**

(iii) Implementation of optimal institutional and legislative framework

In order to facilitate the implementation of optimal institutional and legislative framework, it is necessary to develop activities in the following fields:

- state control and cooperation between executive and control authorities and bodies;
- professional skills of WWTP operators;
- system of eco-education and eco-labeling.

It is required to:

- **undertake measures for efficient state control and improving cooperation between executive and control authorities and bodies.** The efficient state control of polluters and good cooperation between executive and control authorities and bodies needs to be supported in order to enforce the legislative measures in practice. The overall system of **monitoring, collecting and data processing** needs to be optimized and improve in order to provide the sufficient information for decision making processes and for the water quality assessment. The integrated **environmental information system** is missing and plays a special role in providing the overall information for state administration.

  The staff of the state administration and municipalities working with environmental issues requires continuous **training and certificates** to ensure and straighten their capabilities.

  The **position and competencies of the Slovak Inspection for Environment,** department of wastes and water protection, needs to be straighten**.** The **legislative barriers** during environmental controls need to be removed.

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

  Proposed Project(s)

  The proposed projects reflect the present state in this filed. There is an absence of continuing education in the water and wastewater treatment and water pollution control in spite of the boom of new technologies, processes, products, etc. in this field. Therefore it is assumed to establish the regular training courses for District Environmental Authorities staff to improve their knowledge not only in legislative framework but also in water and wastewater and water pollution control. The courses should provide the invited professionals from Universities, state central bodies, consulting firms, research institutes or private firms.

  The second proposed project should solved the problems and harmonized them the differences between the monitoring in the sector of Ministry of Environment and Ministry of Soil Management and to include a new parameters such as TN.

- **improve professional skills of WWTPs operators.** The training center for operation and maintenance of sewer systems needs to be established in order to improve professional skills of operators of WWTPs and sewer systems.

  The introducing the new technologies requires experienced personnel and practical experiences. It will be required to **gain practical experiences with WWTP operation abroad**. The **control system for specialized operation of WWTP** needs to be established as well.

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

Planned Project(s)

The **project in preparation** should establish the training center for the operators. This training center should serve not only for Slovakia but it should be a model training center for other CEE countries. The Ministry of Environment guaranteed this project.

- **implement system of eco-education and eco-labeling** (household chemicals and detergents). The implementation of environmental education in schools in all levels is very important issue for future behavior of people.

  The **educational programs** on environmental load by wastes need to address. The **pilot projects of waste separation** in schools need to be introduced to achieve the positive result in future. There exist a need to support the non-profit oriented educational activities of NGOs.

  The public awareness needs to be addressed also trough the systems of eco-labeling. **Increase/improve ecolabeling** (including its promotion and sufficiently provided information) will be necessary.

  The price of ecological products such as phosphate free detergents is still high, so some economical tools need to be introduced, e.g. to **subsidize the price of ecological products**.

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

  Proposed Project(s)

  The proposed project of campaign to promote and support use of phosphate free detergents should accelerate the process of the implementation of these measures in our society.

3.3.4. Important Assumptions for the Sector

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

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

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

- ownership of water and sewerage companies clarified;
- cheap financial resources available;
- cros-subsidation for price of water eliminated;
- tax benefits for treatment in rural and environmentally sensitive areas;
- best available techniques introduced;
- the regulation and decrees of the Water Act adopted;
- responsibilities between local and regional governments and municipalities clarified;
- social and political support for enforcing of ecological standards widely accepted;
- new Act on municipalities adopted;
- environmental awareness raised;
- tax benefit from collection and processing of separated waste, decrease of transport costs;
- package law, responsibility of producer for liquidation of waste, prepared and adopted.

These assumptions are in details explained below:

- **Ownership of water and sewerage companies clarified.**
  The transition period of the national economy induced the process of privatization. The change of ownership of the water and sewerage companies has already stared and it is still not finished. To introduce new investment programs and ensure the rightful operation and maintenance of systems the ownership of systems should be undoubtedly legally clarified.
- **Cheap financial resources available.**
  The financial constrains are the most important for finalizing the construction of WWTPs which are under construction or their construction stopped because of the lack of finance. The availability of financial resources would help to advance the process of improvement of treatment of wastewaters.
- **Cros-subsidation for price of water eliminated.**
  The subsidizing the price of water has negative consequences. The industrial consumers have to pay the high price because the price for individual users is regulated by state. The industrial companies have to pay more and so lower their investment capacities. The regulated price in households induces the higher water consumption. The system of regulated price should be changed into the system of regulated profit of water and sewerage companies
- **Tax benefits for treatment in rural and environmentally sensitive areas.**
  The small villages usually want to find as cheap solution of their problems as possible. Each motivation towards the building the water distribution and collection systems and water treatment facilities is very important. The environmentally sensitive areas should have privilege to apply for reduce taxes or other system tax benefits.
- **Best available techniques introduced.**
  Best available techniques for wastewater treatment should be introduced in order to improve the efficiency of existing WWTPs and to ensure the effective and long-term optimal operation of newly built WWTPs.
- **The regulation and decrees of the Water Act adopted.**
  The regulation of the Water Act should clarify the responsibilities and competencies of authorities by improving the efficient state control of pollution production and dumping or discharging into water in order to minimize the environmental consequences of pollution.
- **Responsibilities between local and regional governments and municipalities clarified.**
  The responsibilities and competencies between local and regional governments and municipalities have to be clarified in order to eliminate the situations when no one is responsible and no one is supervising.
- **Social and political support for enforcing of ecological standards widely accepted.**
  The ecological standard are usually very demanding and put the load on the producers who have to take measures to achieve the compliance with the new standards. This is very often costly and their lobbing is usually against such standards so the widely accepted social and political support is necessary to enforce ecological standards.
- **New Act on municipalities adopted.**
  The role of municipalities during the transition period is being changed. Their new responsibilities need to be legally clarified in order to ensure the optimal legal framework.

- **Environmental awareness raised.**

  The environmental awareness is very important for introducing new ecological standards, for using and buying the ecological products, for willingness to participate on the separation of wastes, for inducing the public pressure on solving some environmental issues which has also political accent, for successful introduction of ecological education in schools.

- **Tax benefit from collection and processing of separated waste and decrease of transport costs.**

  The profit oriented character of the separation of wastes is not assured because of some uncertainty which can not be influenced purely by a good management of companies but depends also on the participation of people. The companies should be motivated to take the risk.

- **The package law, responsibility of producer for liquidation of waste, prepared and adopted.**

  The packing the goods has not been an issue before. High production of waste influenced also this problem and the new law for package and the responsibility of producer for liquidation of waste should be clearly stated.

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

- **Integrated approach to decision making processes.**

  The integrated approach to decision-making processes is important because it directly influences the production of wastes. When introducing the new production the whole cycle of using the product should be considered into details, including the packing of the product and its recycling. The environmental issue of production and selling the product should become an important part of the policy of producers.

- **Real strengthening of economical position of municipalities.**

  The role of municipalities during the transition period is being changed. The municipalities have already taken many responsibilities without having strengthening their economical position. Strengthening of economical position of municipalities will help to have more significant influence on decision-making in water management.

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**:

- **The emissions in wastewaters represented by BOD_5 decrease by 30% till 2010 in all outlets in Slovakia compared to level of 1998.**

  It will be necessary widely apply biological nutrient removal, to construct new small WWTP in rural areas, to upgrade existing WWTPs and finally to improve the level of operation of treatment plants.

- **100 % of made consent contracts will be in accordance with Governmental Decree No. 242/93 or the respective valid regulation until 2010 in Slovakia.**

  Validity of recent exceptions from above mentioned decree has to end by 2010. This will require the improvement of treatment plant efficiency. This measure will need partial changes in treatment lines or introduction of pre-treatment or advanced treatment.

- **The existing methods of separation of municipal waste by 5 components (glass, metal, paper, plastics and hazardous waste) will be introduced in 90 % of town with more then 5000 inhabitants in Slovakia until 2010.**

  Introduction of separation of municipal wastes will decrease the amount of waste for disposal and enable reuse of separated waste (glass, metal, paper). It will allow the reduction of necessary area for landfills, increase level of waste site monitoring, decrease of pollution caused by leakage from waste dumps and finally reduce operational and transport costs.

Annexes

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

Annex 1. Identification of River Basin Areas

1.1. Danube River Basin Area

1.2. Váh River Basin Area

1.3. Hron River Basin Area

1.4. Bodrog and Hornád River Basin Area

Identification of River Basin Areas — 1. Danube River Basin Area — Annex 1.1.

Basin	Physical-Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the Basin		
➢ **MORAVA**	➢ Catchment area 2 282 km^2 ➢ Qa =118,7 l/s ➢ Length of stream ➢ 870 m above see level	➢ Population 196 800 / 39 % of urban ➢ Diffused settlement at upstream part of the Myjava river	➢ Flood ➢ Quality of water flowing into our territory ➢ Austrian Agglomeration WOLFSTHAL Kittsee ➢ Sugary Hohenau	➢ Ropovod DRUŽBA – construction of new oil pipe lines ➢ Cannery Stupava, Záhorská Ves, Moravský Ján ➢ ZVL Skalica ➢ Slovhodváb Senica - fibre production ➢ Food industry ➢ WWTP Malacky, WWTP Devínska Nová Ves ➢ Extraction of sand and gravel ➢ HIROCEM Rohožník- cement factory ➢ Oil extraction ➢ Fertilising- % - areas afforestration water areas agriculture ➢ Military space	➢ Improper agrotechnical methods ➢ Wind erosion Sedimentation in streams ➢ Inappropriate handling with wastes from livestock ➢ Point pollution sources from storage of organic fertilizers ➢ Discharging of untreated or insufficiently treated waters from industry	➢ Soil management ➢ Industry
➢ **DANUBE+ SMALL DANUBE**	➢ Catchment area 1 138 km^2 ➢ Length of Danube reach 172 km ➢ Q_a = 2 271,0 m3/s Komárno ➢ Dunaj – atypical development of max. discharges, culmination – summer	➢ Population 676 065 / 79 % of urban ➢ High concentration of inhabitants at small area (Bratislava) ➢ Low unemployment	➢ SH Senica -fibre production ➢ ASSI DOMAN	➢ Slovnaft – refinery ➢ Istrochem Bratislava chemical plant ➢ ASSI DOMAN Štúrovo - paper / pulp production ➢ Letisko Bratislava - airport ➢ VD Gabčíkovo ➢ Glass industry – Bratislava-Dúbravka ➢ Ground water withdrawals CHUHO ➢ Recreation ➢ Leakage of nutrients from septic Žitný Ostrov (Rye island)	➢ Insufficient treatment of communal waste waters ➢ Bypassed rain and waste waters ➢ Existence of uncontrolled waste dumps	➢ Communal sphere

Identification of River Basin Areas — 2. Váh River Basin Area — Annex 1.2.

Basin	Physical -Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the Basin		
➢ **VÁH**	➢ Catchment area a 14 268 km2 ➢ Length of main stream 403 km (from Čierny Váh to confluence with Small Danube in Kolárovo ➢ Qa=141,7 m3/s Šaľa ➢ Discharge regime - influenced by reservoirs ➢ Precipitation 540 – 2200 mm ➢ Altitudes: 2494 –107 m above see level	➢ Population 1 528 723 / 58 % of urban ➢ Unemployment ➢ Restructuralization of industry (conversion) ➢ Migration to the Czech Republic	➢ WWTP Komárno	➢ Sugary Sládkovicovo ➢ Starch factory Boleráz ➢ Chemolak Smolenice / chemical plant ➢ BIOPO Leopoldov / ➢ Duslo Šala -chemical plant ➢ ZŤS Martin, Dubnica - heavy machinery industry ➢ making navigable of the Váh ➢ Nuclear power plant Jaslovské Bohunice ➢ Povazské-chemické závody Žilina - chemical plant ➢ SEZ Martin ➢ Rubbery Púchov ➢ Váh cascade ➢ Oravské ferozliatinové závody Široká-Istebné/ metallurgy ➢ Agriculture in down stream part of the basin ➢ NH Sered, skládka Luženca / dumpsite ➢ WWTP Trenčín – preparation phase ➢ Utilisation of geothermal waters ➢ SCP Ruzomberok / paper-pulp production	➢ Improper storage of organic fertilizers ➢ Improper land use, fertilizers ➢ Chemical and food industry ➢ Navigation/ spill of pollution ➢ Electricity production ➢ Sedimentation of accumulation space of reservoirs	➢ Soil management ➢ Industry
➢ **NITRA**	➢ Catchment area 4 501 km2 ➢ QR = 18,2 Bánov ➢ Length of main stream 242,8 km without relying ➢ Altitudes: 1205 – 108,5 m above see level	➢ Population 653 526 / 48 - % of urban		➢ WWTP Nitra – under construction, lack of finances ➢ SEP Zemianske Kostolany / powerplant ➢ TATRA Bánovce nad Bebravou ➢ Sugary Šurany ➢ Tannery Bošany ➢ NCHZ Nováky /chemical plant ➢ Tatra Nábytok Pravenec / furniture production ➢ Rubbery Dolné Vestenice ➢ Mines Handlová		

Identification of River Basin Areas — 3. Hron River Basin Area — Annex 1.3.

Basin	Physical -Geographical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human /Economic Activities in the Basin		
➢ **HRON**	➢ Catchment area 5465 km^2 ➢ Q_R = 47,4 Brehy ➢ Length of main stream 284 km	➢ Population 476 809 / 47 % of urban		➢ WWTP Banská Bystrica – under construction, lack of finances ➢ Sugary Pohronský Ruskov ➢ Ore Mines Hodruša ➢ Petrochema Dubová / chemical plant ➢ Spa Sliač, Kováčová ➢ Enterprise of SNP Žiar nad Hronom - alluminia factory ➢ Paper mill Harmanec ➢ Biotika Slovenská Ľupča ➢ Zeleziarne Podbrezová /ironwork ➢ Bučina Zvolen - wood processing ➢ SEP Termo power plant Zvolen ➢ WWTP Zvolen ➢ Levitex Levice ➢ Agriculture	➢ Improper storage of organic fertilizers	➢ Soil management
➢ **SLANÁ**	➢ Catchment area 3217 km^2 ➢ Q_R = 21,6 Hranica ➢ Length 92,5 km ➢ Elevation 195 –1477 m above see level	➢ Population 182 485 / 32 % of urban	➢	➢ SLZ Hnúšťa ➢ Iron-ore mines Nižná Slaná, Rožňava ➢ Slovak magnesite enterprise Jelšava, Lubeník ➢ Sugary Rimavská Sobota ➢ Paper mill Slavošovce ➢ Agriculture	➢ Processing of alluminia	➢ Industry
➢ **IPEĽ**	➢ Catchment area 3649 km^2 ➢ Length 248,2 km ➢ Q_R = 19,3 Ipeľský Sokolec ➢ Fluctuation of flow rates	➢ Population 210 732 /31 % of urban ➢ Highest unemployment in Slovakia ➢ Problem with gypsies	➢ Municipal pollution	➢ Slatina Santovka Žriedla ➢ Kovosmalt Fiľakovo ➢ Glass industry ➢ Milk processing Krupiná ➢ Slovak magnesite enterprise Lovinobaňa, Podrečany ➢ Small food processing enterprises ➢ MWWTP Fiľakovo ➢ Agriculture ➢ MWWTP Lučenec ➢ Regulation of the Ipeľ stream - disturbance of ecosystem	➢ Production of communal waste waters	➢ Communal sphere

Identification of River Basin Areas **4. Bodrog and Hornád River Basin Area** **Annex 1.4.**

Basin	Physical-geographical characteristics	Socio-Demographic characteristics	Transboundary Effects as Perceived	Human/Economic Activities in the basin		
➢ **BODROG**	➢ Catchment area 7272 km^2 ➢ Qr=109,3 m^3/s Streda nad Bodrogom ➢ Areas without runoff – need of pumping ➢ Discharges influenced by regulation in reservoirs	➢ Average density of population person / km^2 ➢ Population 535338 / 36 -% of urban	➢ Oil accidents in the Uh river from Ukraine	➢ WWTP Svidník under construction, lack of finances ➢ WWTP Bardejov under construction, lack of finances ➢ Chemko Strážske ➢ WWTP Michalovce under construction, lack of finances ➢ Bukocel Hencovce (Vranov) wood processing ➢ Agriculture ➢ WWTP Humenné under construction, lack of finances ➢ EVO Vojany - power plant	➢ Improper storage of organic fertilizers ➢ Improper land use, fertilizers use ➢ Dewatering (melioration)	➢ Soil management
➢ **HORNÁD**	➢ Catchment area 4414 km^2 ➢ Length 193 km ➢ Q_R = 31,2 Ždaňa ➢ Discharges influenced by reservoir	➢ Population 655000 / 58 % of urban ➢ Gipsy settlements	➢ Steel (VSŽ) Košice Sokoliansky potok ➢ Occurrence of heavy metals in border profile	➢ WWTP Krompachy under construction, lack of finances ➢ SIEZ Krompachy ➢ Ore mines Rudňany Slovinky ➢ WWTP Košice under construction, lack of finances ➢ VSŽ Košice ➢ Industrial and municipal waste dumps ➢ Solivar Prešov ➢ Agriculture ➢ Kovohuty Krompachy	➢ Extraction of raw materials with out of date technologies ➢ Production of color metals	➢ Industry
➢ **BODVA**	➢ Catchment area 858 km^2 ➢ Qr= 5.8 m3/s border ➢ Occurrence of zero discharges	➢ Population 50700/0 - % of urban		➢ VK Šaca – sewage ➢ WWTP Moldava ➢ Agriculture ➢ Strojsmalt Medzev	➢ Production of communal waste waters	➢ Communal sphere

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

2.1. Soil Management (Agriculture)

2.2. Industry

2.3. Municipality

Situation/Stakeholder Analysis Leading to Water Pollution in Specific areas 1. Soil Management (Agriculture) Annex 2.1.

Activities leading to water pollution	Stakeholders			Assets / achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organization	Polluters	Affected					
➢ **Improper exploitation of forests and farmlands**								
➢ Inappropriate storage of wastes from livestock farming	➢ Ministry of Soil Management ➢ Environmental Inspection	➢ Agricultural enterprises ➢ Private farmers	➢ Inhabitants ➢ River basin authorities ➢ Water and sewerage work enterprises	➢ Construction of suitable waste dumps	➢ Pollution of ground and surface waters ➢ Accidental pollution ➢ Illnesses occurrence	➢ Endangering of drinking water sources	➢ Low environmental awareness ➢ Not safely controlled waste dump ➢ Insufficient control mechanisms	➢ Increase environmental awareness ➢ Improvement of technical parameters of waste dumps ➢ Improvement of control and legislation
➢ Improper agrotechnical and foresttechnical practices	➢ Ministry of Soil Management	➢ Owners of forest land	➢ Population ➢ River basin authorities ➢ Land owners ➢ Administrators of forest	➢ Implementation of proper agricultural and forest-technical practice	➢ Decrease of soil quality ➢ Decrease of biodiversity ➢ Water and wind erosion	➢ Acceleration of run-off - risk of floods	➢ Inadequate agricultural and forest-technical methods ➢ Low level of personal qualification / competence ➢ Low attractiveness of agricultural sector ➢ Low specialization of staff (agriculture / not attractive sector) ➢ Insufficient legislation and state policy	➢ Implementation of proper agricultural and forest-technical practice ➢ Economical stimulation of organic farming ➢ Increase specialization of staff ➢ Improvement of state economical policy and legislation in comparison with EU
➢ Elimination of buffering and selfpurificating elements (scrubbery, wetlands)	➢ Slovak Inspectorate of nature and landscape protection ➢ Environmental Departments ➢ Ministry of Soil Management	➢ Owners of land ➢ River basin authorities ➢ Forest administrations	➢ Population ➢ River basin authorities ➢ Owners of land	➢ Rehabilitation of natural retention ability of landscape ➢ Rehabilitation of streams ➢ Extension of inundation area ➢ Keeping of protection zones for water streams	➢ Impairment of water ecosystem status ➢ Negative change of water regimes ➢ Decrease of selfpurification ability of stream ➢ Decrease of biodiversity	➢ Wash-out of nutrients	➢ Improper agricultural policy of state (in the past) ➢ Breaking of property – juridical relations ➢ Inconsistent (slow) implementation of new state policy in agricultural practice ➢ Lack of water stream protection zones in legislation	➢ Removal of consequences from the past ➢ Strong implementation of property-juridical relations ➢ Effective implementation of new state policy in agricultural practice ➢ Strengthening of nature protection ➢ Inclusion of protection zones into legislation

Activities leading to water pollution	Involved subjects			Assets / Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	Polluters	Affected					
➢ **High production of industrial waste**								
➢ Obsolete technologies (with high waste production)	➢ State health institutes ➢ Ministry of Environment ➢ Slovak Inspection of Environment ➢ Top management	➢ Industrial enterprises	➢ Population ➢ Civil associations ➢ Farmers ➢ River basin authorities ➢ Downstream industrial enterprises ➢ Water and sewerage works	➢ More effective cash flow ➢ Thorough implementation of legislative measures ➢ Increase of specialization of WWTP personnel ➢ Improvement of information availability concerning new technologies ➢ Environmental management systems	➢ Deterioration of water quality in streams ➢ Deterioration of biodiversity ➢ Increased health risks ➢ Epidemics ➢ Contamination of soil, surface and ground waters ➢ Deterioration of drinking water sources ➢ Limited water uses - restraining of water use possibilities	➢ Deterioration of biodiversity ➢ Deterioration of water quality in streams ➢ Specific pollution of downstream part of the Danube ➢ Infiltration of pollution into ground water ➢ Limited water use ➢ Health risk	➢ Lack of finances ➢ Inappropriate technologies used for specific natural conditions ➢ Energy and raw material demanding technologies ➢ Operational failures and accidents ➢ Leakage from production processes	➢ Assessment of environmental risk for loans ➢ Replacement of out-of-date technologies with new ones ➢ System measures for elimination of human factor failure ➢ Trained personnel ➢ Environmental audits ➢ Warning system + monitoring ➢ To be ready for accident elimination ➢ Improvement of legislation ➢ Economical instruments in legislation ➢ Regular revisions and repairmen of sewerage

Activities leading to water pollution	Involved subjects			Assets / Achievements	Environmental Consequences of Economic activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	Polluters	Affected					
➢ **High production of industrial waste**								
➢ Discharge of insufficiently treated wastewaters from industry	➢ State health institutes ➢ Ministry of Environment ➢ Slovak Inspection of Environment ➢ Relevant water management body of state administration t ➢ Ministry of Soil Management ➢ Slovak Hydrometeorologica l Institute		➢ Population ➢ Civil associations ➢ Farmers ➢ River basin organizations ➢ Downstream industrial enterprises ➢ Water and sewerage companies	➢ Increase of technological discipline	➢ Infiltration of pollution into ground waters ➢ Specific pollution ➢ Restraining of water use possibilities	➢ Specific pollution of downstream part of the Danube ➢ Limited water use	➢ Hydraulic and mass overloading of WWTP ➢ Obsolete technological equipment ➢ Use of raw materials with low quality ➢ Lack of technological discipline ➢ Leakage from sewage collection system	➢ Measures in production technology ➢ Extension and modernization of WWTP ➢ Modernization of WWTP ➢ Allocation of funds from state environmental fund to finance measures in industry
➢ Insufficient legislative and financial mechanisms	➢ Ministry of Economy ➢ Ministry of Environment ➢ Local authorities		➢ Population ➢ Civil associations ➢ Farmers ➢ River basin organizations ➢ Downstream industrial enterprises ➢ Water and sewerage companies	➢ Process of approximation of legislative with EU	➢ Deterioration of environment – water soil air		➢ Gaps in legislation ➢ Lack of finances ➢ Lack of information	➢ Economical motivation of pollutes ➢ Technology modernization ➢ Overall implementation of efficient internal control in enterprises

Activities leading to water pollution	Stakeholders			Assets / Achievements	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	**Polluters**	**Affected**					
➢ **Significant Pollution Originated from Urban Areas**								
➢ Insufficient treatment discharged water	➢ Municipalities ➢ Ministry of Environment, ➢ Slovak Inspection for Environment ➢ Ministry of Health, ➢ Ministry of Internal Affairs ➢ ZMOS - Association of towns and villages ➢ ÚMO - Union of towns and villages ➢ Water and sewerage companies	➢ Local industry ➢ Communal sphere ➢ Health facilities ➢ Population ➢ Water and sewerage companies	➢ Users of technological water (cooling) ➢ SRZ (Fisherman) ➢ Farmers (irrigation) ➢ Water and Sewerage companies ➢ Recreation facilities and tourism ➢ Food and pharmaceutical industry ➢ Owners of land in the vicinity of water courses ➢ NGOs	➢ Economical and legislative tools ➢ New treatment technologies ➢ Management and operators ➢ Proposal of system for training center for WWTP operators ➢ Monitoring ➢ Research academic and scientific potential ➢ Financial sources (investments) ➢ Grants for environmental NGOs for environmental education	➢ Deterioration of biodiversity ➢ Limited water use ➢ Health risks (epidemics) ➢ Influence on alluvial waters	➢ Potential threat to biodiversity ➢ Endangering of water uses ➢ Health risks and water-borne infections ➢ Endangering of ground waters ➢ Influence on alluvial waters	➢ Out of date treatment facilities ➢ Insufficient treatment of industrial wastewaters discharged to public sewer system ➢ Long-term building of WWTP ➢ Lack of advanced treatment ➢ Overloading of existing WWTP ➢ Insufficient amount of treatment facilities (number of inhabitants connected to sewerage) ➢ Lack of finances in budget of towns and villages ➢ Defective sewer system	➢ Modernization of sewerage and treatment facilities ➢ Improvement of technical and financial planning ➢ Identification and implementation of advanced treatment ➢ Increasing of treatment plant capacities ➢ Improvement of sewerage system functioning ➢ Building of sewerage system and WWTP to decrease difference between population connected to sewerage system and to public water supply ➢ Ensuring bank loans at local and regional level ➢ Revolving fund (establishment) (GREEN BANKS) ➢ Cooperation in regional level to solve transboundary effects

Activities leading to water pollution	Stakeholders			Assets / Achievements	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	Polluters	Affected					
➢ **Significant Pollution Originated from Urban Areas**								
➢ Inadequate institutional and legislative frame	➢ Water and sewerage companies ➢ Ministry of Environment ➢ Municipal government ➢ Ministry of Internal Affairs ➢ Ministry of Soil ➢ Ministry of Health ➢ Management ➢ Relevant water management body of state administration, MZ SR ➢ SAV –Slovak Academy of science ➢ VUVH Water research institute ➢ SHMU –Hydromet. institute	➢ Population citizens facilities ➢ Municipality ➢ Industry connected to municipal sewerage systems	➢ Schools, scientific institutions ➢ NGOs ➢ Water and sewerage companies ➢ Individual users	➢ Research academic and scientific potential ➢ Process of legislative approximation with EU ➢ Professional knowledge and expertise ➢ Existence of funds and financial sources	➢ Limited water use ➢ Deterioration of biodiversity	➢ Negative influence on water quality (Ground and surface water) ➢ Potential threat to biodiversity	➢ Insufficient legislation ➢ Improper handling with communal wastewaters ➢ Insufficient specialization of WWTP operators and management ➢ Illegal discharges, breaking of sewerage regulations ➢ Peak discharges of wastewaters by connected industry ➢ Insufficient environmental awareness	➢ Amendment of water law and related regulations ➢ Thorough control of keeping of Water Law ➢ Cooperation in planning, implementation for all involved subjects ➢ Improvement of monitoring system for wastewaters ➢ Training of WWTP operators ➢ Economical tools (increase of penalties and fees) ➢ Education for inhabitants, educational system at schools
➢ Inappropriate disposal of municipal solid waste	➢ Water management body Ministry of health SR ➢ Municipality government ➢ Ministry of Environment ➢ Ministry of Internal Affairs ➢ Ministry of Soil Management ➢ Slovak Agency for Environment ➢ Waste collecting enterprises and waste dumps managing enterprises	➢ Population ➢ Citizens facilities ➢ Municipalities ➢ Local (small) enterprises	➢ Water and sewerage companies ➢ Water Users ➢ NGOs ➢ agricultural subjects ➢ River basin authorities	➢ Separated waste collection, recycling of waste ➢ Incineration ➢ Application in agriculture ➢ Legislation	➢ Pollution of surface and ground waters ➢ Intoxication of environment - health consequences ➢ Degradation of landscape	➢ Import / Export of waste ➢ Endangering of water uses	➢ Lack of controlled waste dumps ➢ Insufficient monitoring of waste dumps ➢ high waste production ➢ Insufficient separation of waste ➢ Low knowledge about possibilities to decrease waste production	➢ Decrease of produced amount of produced waste ➢ Improvement of recycling technologies ➢ Ensuring of waste dumps monitoring ➢ Motivation and propagation of separated waste ➢ Increase /adjustment of prices for secondary raw material ➢ Separation of toxic waste

Annex 3. Sector Planning Matrix

3.1. Soil Management (Agriculture)

3.2. Industry

3.3. Municipality

Sector Planning Matrix — 1. Soil Management (Agriculture) — Annex 3.1.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Water quality in the Slovak part of the Danube River Basin improved	➢ Water quality in water courses is improved to class II according to the EU standards for surface waters by improving the availability and use of all water resources and environmental quality of ecosystems in Slovakia by 2010 (PO)	➢ Willingness for long-term implementation of sustainability principles in governmental policy assured (PO)
➢ **Sector Objective:** Protection and sustainable use of forest and farmlands achieved	➢ Compared to1998 the area covered by forest and agricultural land on which environmental management is applied will increase by 15% in Slovakia by the year 2010 (SOSM)	➢ General environmental awareness raised (SOSM) ➢ Communication among resorts improved (SOSM)
➢ **Results/Outputs:** 1.1 Appropriate storage of wastes from livestock farming introduced 1.2 Proper agricultural and foresttechnical practices applied 1.3 Buffering zones and natural ecosystems rehabilitated and protected 1.4 Appropriate legislative framework and high awareness implemented	➢ 1.1 Compared to 1998 number of landfills controlled in compliance with applicable regulations in SR increased by 60% by the year 2010	➢ Legislation in all environmental aspects approximated (1.1-1.4) ➢ Subsidies and funds to agriculture available (1.1 to 1.3)
➢ **Activities:** 1.1.1 Reconstruct old uncontrolled waste dumps from livestock farming 1.1.2 Establish new landfills complying with applicable legislation 1.1.3 Minimize quantities of disposed waste 1.2.1 Support small area and other alternative ecological methods of agriculture 1.2.2 Assist the forest owners in restoration of biodiversity of forest ecosystems 1.2.3 Enhance technical competence proven by certificates 1.3.1 Undertake measure for financing projects for sustainable River Basin management and particularly Wetlands 1.3.2 Rehabilitate floodplain and river bank ecosystems 1.3.3 Minimize hydrotechnical impacts on natural parts of water courses 1.3.4 Improve the identification of land owners 1.4.1 Adopt and implement the new acts in area of sustainable forestry and agriculture management 1.4.2 Support institutional and personnel strengthening of organization protecting nature and Slovak inspection for environment 1.4.3 Raise public awareness on protection and sustainable use of forests and farmlands	➢ 1.2 Compared to 1998 network of forest roads and chutes causing water erosion in forests decreased by 20% in protected areas by the year 2010 ➢ 1.3 Riparian vegetation in lowland and hilly-land parts of SR river basin restored and rehabilitated by 50% of water course length by the year 2010 ➢ 1.4 Compared to 1998 a number of „green“ deputies in Slovak local government increased by 5% by the year 2002	➢ Technical specification for landfills construction available (1.1.1) ➢ Government supports development of market with bio products (1.2.1) ➢ Non-productive values of forest respected (1.2.2) ➢ Financial evaluation of ecosystem functioning in EIA process introduced (1.2.2) ➢ New water act in parliament discussed and adopted (1.4.1) ➢ Government accepts proposal for strengthening of the environmental sector (1.4.1 to 1.4.3)

PO - Program Objective SOSM - Sector Objective of Soil Management

Sector Planning Matrix 2. Industry Annex 3.2.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program objective:** Water quality in the Slovak part of the Danube River Basin improved	➢ Water quality in water courses is improved to class II according to the EU standards for surface waters by improving the availability and use of all water resources and environmental quality of ecosystems in Slovakia by 2010 (PO)	➢ Willingness for long-term implementation of sustainability principles in governmental policy assured (PO)
➢ **Sector Objective:** Sustainable industrial production achieved	➢ The number of factories implementing EMS is increased to 50% compared to 1998 with the significant reducing the production of hazardous waste in Slovakia by the 2010 (SOI)	➢ Environmental protection as a priority for government fully accepted(SOI)
➢ **Results/Outputs:** 2.1 Appropriate technologies applied 2.2 Industrial wastewater properly treated 2.3 Legislation and financial mechanisms adequately implemented	➢ 2.1 The process water consumption in industrial sector is decreased by 20% compared to 1998 by increase of mass loading of discharged water in Slovakia by 2010 ➢ 2.2 The interest rate is decreased by 5% for the loans for clean technologies by decreasing the production of hazardous substances in Slovakia by 2010 compared to 1998	➢ EMS effectively implemented 2.1 ➢ Developed free market economy favorable for environmental protection 2.2
➢ **Activities:** 2.1.1 Undertake measures for modernization of industrial process 2.1.2 Promote environmental management system ISO 14000 2.1.3 Establish an information center for new environmental technologies 2.2.1 Introduce chemical and biological treatment technologies for nutrients removal 2.2.2 Increase capacity and efficiency of WWTP 2.2.3 Establish monitoring and warning systems in frame of water management of enterprises 2.3.1 Improve legislation 2.3.2 Improve financial mechanisms 2.3.3 Make available funds (loans)	➢ 2.3 Number of factories meeting EU effluent standards is increased by 50% compared to 1998 by reducing the load on aquatic ecosystems in Slovakia by 2010	➢ Economic and legislative tools requiring application of modern technologies implemented 2.2.1 ➢ Legislation effectively implemented 2.2.1 ➢ Co-operation between bank sector and industry in implementation of environmental projects highly effective 2.3.3 ➢ Co-operation between government and industry effective 2.3.3 ➢ Emission limits enforced 2.3.1 to 2.2.3

PO - Program Objective SOI - Sector Objective for Industry

Sector Planning Matrix — 3. Municipality — Annex 3.3.

Summary of Objectives and Activities	Indicators	Important Assumptions
➢ **Program Objective:** Water quality in Slovak part of the Danube River Basin improved	➢ Water quality in water courses is improved to class II according to the EU standards for surface waters by improving the availability and use of all water resources and environmental quality of ecosystems in Slovakia by 2010 (PO)	➢ Willingness for long-term implementation of sustainability principles in governmental policy assured(PO)
➢ **Sector Objective:** Pollution from urban area is significantly decreased	➢ Quality in watercourses improved from IV and V. class to less III. class (oxygen regime) till 2010 on all (100%) monitored profiles compared to level of 1998 according to valid Water Quality Standard (SOM)	➢ Environmental protection as a priority for government fully accepted (SOM)
➢ **Results/Outputs:** 3.1 Sufficient treatment of municipal wastewaters implemented 3.2 Optimal handling with solid communal waste achieved 3.3 Optimal institutional and legislative framework implemented	➢ 3.1 The emissions of wastewaters measured by BOD5 decrease by 30% till 2010 in all outlets in SR compared to level of 1989	➢ Integrated approach to decision making process 3.2 ➢ Real strengthening of economical position of municipalities 3.1; 3.2
➢ **Activities:** 3.1.1 Perform the treatment of all discharged wastewaters in required level according to legal standards 3.1.2 Achieve a balance between a number of inhabitants connected to public waterworks and sewerage works and sewer system 3.1.3 Undertake measures for reconstruction and finalizing of insufficient sewerage system 3.1.4 Provide funds to WWTP construction and reconstruction 3.1.5 Increase utilization of sludge 3.1.6 Reduce quantity of wastewaters and mixing other wastewater with sewage 3.2.1 Create conditions for separated waste collection 3.2.2 Make available financial support for investments in recycling technologies 3.2.3 Apply appropriate methods for solving old environmental loads(old dumpsites) 3.3.1 Undertake measures for efficient state control and improving co-operation between executive and control authorities and bodies 3.3.2 Improve professional skills of WWTP and sewerage operators 3.3.3 Implement system of eco-education and eco-labeling (household chemicals and detergents)	➢ 3.2 The existing methods of separation of municipal waste by 5 components (glass, metal, paper, plastic, hazardous waste) will be introduced in 90% towns with more then 5000 inhabitants in SR till 2010 ➢ 3.3 100% of made consent contracts will be in accordance with government decree No. 242/93 or the respective valid regulations till 2010 in Slovakia	➢ Ownership of water and sewerage companies clarified (3.1.1, 3.1.4) ➢ Cheap financial resources available (3.1.4) ➢ cros-subsidation of price of water eliminated(3.1.4) ➢ Tax benefits for treatment in rural and environmentally sensitive areas (3.1.1; 3.1.2) ➢ Responsibilities between local and regional governments and municipalities clarified (3.1.2) ➢ Best available techniques introduced (3.1.3) ➢ Environmental awareness raised (3.2.1) ➢ Tax benefit from collection and processing of separated waste and decrease of transport costs introduced (3.2.1) ➢ The regulations and decrees of the Water Act adopted (3.3.1) ➢ Social and political support for enforcing of ecological standards (3.3.1) ➢ New act on municipalities adopted (3.3.1) ➢ The package law - responsibility of producer for liquidation of wastes prepared and adopted (3.3.1)

PO - Program Objective SOM - Sector Objective Municipally

Annex 4. Activities, Important Elements and Projects

4.1. Soil Management (Agriculture)

4.2. Industry

4.3. Municipality

RESULT 1.1.: Appropriate storage of agricultural waste introduced

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.1.1 Reconstruct old uncontrolled waste dumps form livestock farming	➢ Pasportization of old (existing)waste dumps ➢ selection of problems and technical proposal for their solution ➢ assessment of infiltration properties of surrounding areas ➢ implementation of GIS on monitoring of old environmental loads ➢ rehabilitation of inappropriate waste dumps in protected areas			➢ Adjust GIS software for particular problems of waste dumps from livestock farming
➢ 1.1.2 Establish new landfills complying with applicable legislation	➢ Work out type proposal for waste dump building ➢ Build a network of pilot model waste dumps ➢ Work out system of financial support for waste dumps constructing in compliance with valid legislation ➢ Assist to farmers in establishing new waste dumps			➢ Develop the manual of practice for construction and operation of waste dumps for agricultural wastes
➢ 1.1.3 Minimize quantities of disposed waste	➢ Prepare list of possibilities for minimization of disposed waste ➢ Work out system of financial stimulation to minimize amount of disposed waste ➢ Make pressure to minimize waste production through education (NGOs, media)			➢ Establish network of facilities for composting

RESULT 1.2.: Proper agricultural and foresttechnical practices applied

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.2.1 Support small area and other alternative ecological methods of agriculture	➢ Educational activities mainly towards private farmers ➢ Support fund for private farmers and cooperative farmers – proposal ➢ Create stimulating prices and taxes system to support market with bio-products			➢ Create support fund for private farmers and cooperative farmers (alternative agriculture)
➢ 1.2.2 Assist the forest owners in restoration of biodiversity of forest ecosystems	➢ Evaluation of current status of forest biodiversity ➢ Create monitoring network to observe changes in forest ecosystems biodiversity ➢ Impact Evaluation of water management structures on forest ecosystems biodiversity ➢ Create and implement motivation programme ➢ Increase biodiversity in protected area		➢ Proposal of adaptation measures in forest ecosystems	➢ Create network of forest reservations to protect original ecosystems with minimum total area of 200 km2
➢ 1.2.3 Enhance technical competence proven by certificates	➢ Regularly train subject in area of proper agrotechnical and forest technical practices ➢ Establishment of certificates for participants of training (certificates on organic agriculture of sustainable forest management) ➢ Set conditions for certificates issuing to graduates of training for ability to implement proper forest and agricultural practices			➢ Creation of training center for regular education for proper agro/forest technical practices

RESULT 1.3.: Buffering zones and natural ecosystems rehabilitated and protected

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.3.1 Undertake measures for financing of project for sustainable River Basin management and particularly Wetlands	➢ Identification of possible financial sources ➢ Work out system of criteria for financing of basin restorations and sustainable water management in basin ➢ Determine the pilot project basins and allocate funds for pilot projects for sustainable water management of basins/ wetlands			➢ Proposal of financing system for basins restoration and sustainable water management
➢ 1.3.2 Rehabilitate floodplain and bank ecosystems	➢ Map status of floodplain and bank ecosystem ➢ Evaluation of hardly affected water streams ➢ Rehabilitation of floodplain and bank ecosystems in affected areas ➢ Keep hydro-eco-limits for minimum discharges	➢ Rehabilitation of alluvial meadows in Downstream Morava - Phase 1 ➢ Proposals of basins revitalization in SR	➢ Rehabilitation of alluvial meadows in Downstream Morava - Phase 2 ➢ Revitalization of Morava, Ipeľ, Danube and Small Danube	➢ Pilot project for the Hron River Basin ➢ Revitalization of the Bodrog River Basin

RESULT 1.3.: Buffering zones and natural ecosystems rehabilitated and protected

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 1.3.3 Minimize hydrotechnical impacts on natural parts of water courses	➢ Adjust operational schedule of waterworks with respect to optimal function of ecosystems ➢ Work out system for increase of natural retention ability in basins ➢ Specify definition of hydroecological discharge ➢ Thorough implementation of EIA when designing new waterworks		➢ Analysis of sediment quality and disposal of extracted sediments	➢ Creation of integrated management models of basin
➢ 1.3.4 Improve the identification of land owners	➢ Strengthen capacities of responsible institutions (land register offices) ➢ Use modern application software in computer technics ➢ Thorough application of GIS when creating new databases ➢ Solve ownership relations during identification of land owners			

RESULT 1.4.: Appropriate legislative framework and high awareness implemented

Activities	Important Elements	Projects		
		Existing	In preparation	Proposed
➢ 1.4.1 Adopt and implement acts in area of sustainable forestry and agriculture management	➢ Adopt and apply new water law ➢ Accelerate preparation of missing executive regulations to act on nature protection ➢ Strengthen competencies of local government in area of protection and sustainable use of forest and agricultural land in their territory ➢ Compare .the competence of local governments in Slovakia with the same. in EU			
➢ 1.4.2 Support institutional and personnel strengthening of organization protecting nature and Slovak Environmental Inspectorate	➢ Analysis o current status ➢ Compare system of enforcement of legislative regulations in EU countries and in Slovakia ➢ propose adequate strengthening of state bodies ➢ Propose way of financial providing of organizations and bodies strengthening			➢ Analysis of recent situation and proposal for strengthening the institutions in nature protection ➢ Proposal for changes in competence of local governments
➢ 1.4.3 Raise public awareness on protection and sustainable use of forests and farmlands	➢ Competition for educational programs in environment ➢ Enforcement of regulation for broadcasting the environmental educational programs ➢ Create the space in public media for educational programs concerning sustainable use of forest and agricultural land			➢ Proposal for systems of educational programmes in public media

RESULT 2.1.: Appropriate technology applied

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 2.1.1. Undertake measures for modernization of industrial processes	➢ Promote and implement system quality ISO 9000 ➢ Perform the control of technological processes ➢ Utilize and follow the activities of the Center for clean production		➢ Chemko Strážske Project 2000	➢ Disposal of wastes from PCB production (Chemko Strážske)
➢ 2.1.2. Promote Environmental Management System ISO 14000	➢ Educate and provide sufficient number of qualified trainers of EMS ➢ Promote eco-labeling ➢ Implement extensively the internal control in industrial plants ➢ Perform the environmental audit ➢ Train regularly management and personnel			
➢ 2.1.3. Establish an information center for new environmental technologies	➢ Identify the conditions for the new technologies use within different branches of industry ➢ Identify the new suitable technologies for Slovakia considering the existing sources of raw materials ➢ Create the database of new technologies and make use of it free of charge ➢ Create the database of enterprises selling the new environmentally friendly technologies			

RESULT 2.2.: Industrial wastewater properly treated

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.2.1. Introduce chemical and biological treatment technologies and technologies for nutrients removal	➢ Support the low energy demanding technologies ➢ Implement technologies specialized for campaign operation ➢ Support the anaerobic systems of treatment with the highly concentrated wastewaters ➢ Apply and support alternative methods of advanced treatment		➢ Removal of chlorinated hydrocarbons in the production of propylenoxid	
➢ 2.2.2. Increase the capacity and efficiency of WWTP	➢ Review an existing state of the WWTPs with the focus on their capacity and efficiency ➢ Revise the current state of treatment technologies in WWTPs and the changes of production technologies in the industrial plants ➢ Introduce the separation of produced wastewaters during the technological production processes ➢ Find the supplementary available sources of nutrients for optimizing the biological stages of treatment ➢ Reduce the smell and aerosols load in wastewaters ➢ Provide the accidental reservoirs protecting the biological part of WWTP ➢ Change old aeration technologies for modern ones	➢ Reconstruction of caprolactam holding tanks ➢ Barreling the chemical for production ➢ Reconstruction of sewer system in Chemko Strážske ➢ centralize collection and treatment of waters polluted by chrome in tannery Bošany	➢ Reconstruction of WWTP in Bukocel, a.s. ➢ Reconstruction of WWTP in PCHZ Žilina ➢ Reconstruction of ammonium storehouse Varín and methylmethaclylete holding tanks ➢ Reconstruction of AS tanks of WWTP Chemko Strážske ➢ Reduction of discharged wastewaters pollution to the Danube River (AssiDomen)	➢ Construction of WWTP with reconstruction and expansion of sewer system (Bučina Zvolen ➢ WWTP reconstruction in Biotika ➢ Biological WWTP in Harmenec ➢ The sludge disposal upgrading in WWTP VSŽ steel Košice
➢ 2.2.3. Establish monitoring and warning system systems in frame of water management of enterprises	➢ Perform the monitoring of a current state of internal collection systems ➢ Provide the continual monitoring of discharges in chosen measuring profiles in order to control the amount and quality of discharged wastewater ➢ Monitor the specified quantitative parameters of wastewater pollution with the stress on toxic substances ➢ Built up the warning system connecting the production and collection system management to maximize the possibilities for pollution reduction in receiving waters	➢ Management of wastewater in NCHZ Nováky	➢ Final landfill Chalmová - VI. construction	

RESULT 2.3.: Legislation and financial mechanisms adequately implemented

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 2.3.1. Improve legislation	➢ Prepare the proposal for the change of tax system with the aim of supporting the implementation of new technologies ➢ Prepare the proposal for supporting the industrial environmental measures from the State Environmental Fund ➢ Ensure the process of approximation of legislative with the directives of EU ➢ Amend the Effluent Standard No 242/93			
➢ 2.3.2. Improve financial mechanisms	➢ Propose the revolving fond for supporting the environmental activities ➢ Optimize the finance distribution from the State fond of Environment back to the subjects who contribute to the income of the fond ➢ Change the system of paying the fines and penalties			
➢ 2.3.3. Make available funds (loans)	➢ Introduce the system of incentives ➢ Propose the change of the system of paying the penalties – decrease the penalty during the investment for a new environmental technologies ➢ Lower the interest rate of loans for environmentally sound technologies			

RESULT 3.1.: Sufficient treatment of wastewaters implemented

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 3.1.1 Perform treatment of all discharged wastewaters in required level according to legal standard	➢ Ensure reconstruction, intensification and extension of WWTP ➢ Support for municipalities in process of transformation of ownership of water and sewerage companies ➢ Application of new wastewater treatment technologies (alternative technologies) ➢ Ensure sufficient level of N, P removal in WWTP ➢ Ensure sufficient sources for operation and maintenance of sewerage system and WWTP ➢ Re-evaluate and assess designed technical solution of recently prepared designed WWTP and those under construction	➢ Sewerage system Košice, finalizing of biology treatment step ➢ Sewerage system Nitra, finalizing WWTP and sewerage system ➢ Finalizing of WWTP Svidník ➢ Trenčín right side - building a new WWTP ➢ Banská Bystrica - finalizing of WWTP and sewerage ➢ Humenné –finalizing of extension and N, P removal step in WWTP ➢ Michalovce – finalizing of extension and N, P removal step in WWT ➢ Liptovský Mikuláš - upgrading and reconstruction of WWTP ➢ Rožňava – completing the ongoing construction of WWTP	➢ Topoľčany - upgrading and extension of WWTP	
➢ 3.1.2 Achieve a balance between a number of inhabitants connected to public waterworks and sewerage works and sewer system	➢ Re-evaluation of waste categorization (in relation to septics) ➢ Rational phasing of sewerage system building ➢ Building of small WWTP where are not other possibilities			➢ Pilot study with implementation on-site treatment systems for individual residences in rural or unsewered areas ➢ Develop the manual of practice for design, construction and operation of small WWTP
➢ 3.1.3 Undertake measures for reconstruction and finalizing of insufficient sewerage systems	➢ Create overview of sewerage systems (municipality, water work enterprises) ➢ Create database of sewerage system and of objects in it ➢ Support rain waters infiltration in urban units prior to discharge into sewerage ➢ Reconstruction of insufficient sewerage system	➢ Sewerage system Nitra, finalizing WWTP and sewerage system ➢ Banská Bystrica – finalizing of WWTP and sewerage system ➢ Modeling of sewer system in Lučenec using MOUSE	➢ Malacky - reconstruction of sewerage system	➢ Pilot project to demonstrate the benefits of implementation of sewer models and database (e.g. VaKBASE)

RESULT 3.1.: Sufficient treatment of wastewaters implemented

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.1.4 Provide funds to WWTP construction and reconstruction	➢ Establish revolving fund to finance the investments ➢ Application of subsidy criteria (priorities) ➢ Joining of finance in local level ➢ More realistic water fees and discharge fees			
➢ 3.1.5 Increase utilization of sludge	➢ Solving of sludge hygienisation ➢ Re-evaluate hygienic regulation for sludge use ➢ Ensure decrease of sludge contamination	➢ Monitoring of production and quality of sludge generating at municipal WWTP operating by Water and Sewage companies In SR - Research (WRI Bratislava)	➢ Bioleaching of sludge and sediments contaminated by heavy metals (STU Bratislava)	➢ Introduce the hygienisation technologies of sludge at WWTP - pilot project
➢ 3.1.6 Reduce quantity of wastewater and mixing other wastewaters with sewage	➢ Using of existing models ➢ Design of overview for water collection ➢ Use of retention capacity of sewerage system ➢ Reducing the amount of rain waters discharged into public sewerage system and their pollution ➢ Thorough keeping of sewerage regulations	➢ Monitoring of existing sewer systems and overflows during wet periods (STU Bratislava, WRI)		➢ Implementation of vortex separators in combined sewer system ➢ Methods and technologies supporting the reduction of run-off - pilot project

STU - Slovak Technical University WRI - Water Research Institute

RESULT 3.2.: Optimal handling with solid communal waste achieved

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.2.1 Create conditions for separate waste collection	➢ Financial benefit of secondary raw material use in production ➢ Establishment of separate waste collection in schools ➢ Different VAT for separated and non-separated waste collection ➢ Introduce waste separation as a part of environmental education at schools			➢ Project of separation and processing of plastic package ➢ Pilot projects in villages for separation , supported by NGO and municipalities
➢ 3.2.2 Make available financial support for investments in recycling technologies	➢ Financial benefit and promotion of products produced from secondary raw materials ➢ Make lobby for adopting of law about packaging ➢ Subsidy for recycling technologies, e.g. subventions of interests ➢ Taxation of hardly recyclable packages and creation of fond for packages processing			
➢ 3.2.3 Apply appropriate methods for solving old environmental loads (old dumpsites)	➢ Updating of database of originators, owners of old environmental load ➢ Decontamination and recultivation of old uncontrolled waste dumps ➢ Legislative solution for problem of liquidation of old waste dumps by originator of environmental load (responsibilities)			

RESULT 3.3.: Optimal institutional and legislative framework implemented

Activities	Important Elements	Projects		
		Existing	In Preparation	Proposed
➢ 3.3.1 Undertake measures for efficient state control and improving cooperation between executive and control authorities and bodies	➢ Ensure and improve overall system of monitoring, collecting and data processing ➢ Continuous training of state administration staff and municipalities staff in environmental area with certificates ➢ Remove legislative barriers during environmental controls ➢ Strengthen the role of Slovak Inspection for Environment, department of waste and water protection ➢ Establishment of integrated environmental information system			➢ Establish the regular training courses for District Environmental Authorities staff ➢ Harmonization of monitoring of waste and surface waters (nutrients, heavy metals and specific pollution) between Ministry of Environment and Soil Management
➢ 3.3.2 Improve professional skills of WWTP and sewerage operators	➢ Establish training center for operation and maintenance of sewerage system ➢ Gain practical experiences with WWTP operation in abroad ➢ Establish control system for specialized operation of WWTP		➢ Training center for WWTP operators (MoE SR)	
➢ 3.3.3 Implement system of eco-education and eco-labeling (household chemicals and detergents)	➢ Implement environmental education in schools in all levels ➢ Increase/improve „Ecolabeling“ (whole system including sufficient promotion – information) ➢ Subsidy / price benefits of ecological products (phosphate free detergents) ➢ Finalizing of education basis about environmental load by wastes ➢ Pilot project of waste separation in schools ➢ Support for non-profit-oriented educational activities of NGO			➢ Project of campaign to promote and support use of phosphate free detergents

Annex 5. Workshop Organization

5.1. Agenda of the Workshop

5.2. List of Participants

5.3. Evaluation of the Workshop

5.4. Opening Speech of the Minister

GEF- Danube Pollution Reduction Program

National Planning Workshop
June 2-5, 1998, Bratislava

Tuesday 2nd of June

9.30-10.00	Opening Introduction	Plenary
Break		
10.50-12.30	Presentation and discussion of work and results of water quality and socio-economic experts	Plenary
Lunch		
14.00-15.00	Presentation and discussion of work and results of water engineering expert	Plenary
Break		
15.20-17.00	Presentation and discussion of work and results of financial expert	Plenary

Wednesday 3rd of June

9.00-10.30	Methodology – Introduction	Plenary	Identification of river basin areas	Plenary
Break				
10.50-12.00	Identification of river basin areas	Plenary	Situation Analysis Introduction	Plenary
Lunch				
13.30-15.00	Situation analysis Continue	Groups		
Break				
15.20-17.00	Situation Analysis Presentation	Plenary		

Thursday 4th of June

9.00-10.20	Planning Matrix Introduction	Plenary	Sector Planning Matrix	Groups	
Break					
10.40-12.00	Sector Planning Matrix – Continue	Groups	Presentation of Summary of Objectives and Activities from sector planing matrix	Plenary	
Lunch					
13.30–15.00	Assumptions Introduction	Plenary	Assumptions Development	Groups	Assumptions Presentation
Break					
15.20–17.00	Objectively verifiable indicators Introduction	Plenary	Objectively verifiable indicators Development	Groups	Objectively verifiable indicators Presentation

Agenda of the Workshop **Annex 5.1.**

Friday 5th of June

9.00–10.20	Sector Planning Matrix Presentation	Plenary		
Break				
10.40–12.00	Activities, important elements and projects	Groups		
Lunch				
13.30-15.30	Activities, important elements and projects	Plenary	Discussion about results, conclusion	Plenary

GEF - DANUBE POLLUTION REDUCTION PROGRAM

National Planning Workshop

June 2 – 5, 1998, Slovakia, Bratislava

	NAME	ORGANISATION
1	**Ing. LADISLAV SLEBODNÍK**	Ministry of Environment SR, Head of Bureau
2	**Ing. MILAN MATUŠKA**	Ministry of Environment SR, Department of Water Protection
3	**Ing. ZDENA KELNÁROVÁ**	Ministry of Environment SR, Department of Water Protection
4	**Ing. ZUZANA GERGELOVA**	Ministry of Soil Management, Department of Water Management
5	**Ing. IVAN SOJKA**	Ministry of Economy SR
6	**Ing. DAGMAR KLEMENTOVÁ**	Ministry of Economy SR
7	**Ing. PETER MINÁRIK**	Danube River Basin Authority
8	**Ing. PETER RUSINA**	Danube River Basin Authority
9	**Ing. JÁN ZEMÁNEK**	Váh River Basin Authority
10	**Ing. KAROL KUČERA**	Water Work and Sewage Works, s.e. Bratislava
11	**Ing. RÓBERT WENDL**	Regional Office Bratislava
12	**Ing. EMÍLIA KUNÍKOVÁ**	Water Research Institute
13	**Ing. BUJNOVSKÝ**	Soil fertility Research Institute
14	**Ing. MARIÁN VAGAČ.**	Association of Industrial Ecology in Slovakia
15	**RNDr. PAVOL MIKLÁNEK, CSc.**	Slovak Committee for Hydrology
16	**Mgr. PAVLA PEKÁROVÁ**	Hydrology Institute Slovak Academy of Science
17	**Mgr. RASTISLAV VRBENSKÝ**	Regional Environmental Center
18	**RNDr. VLADIMÍR HUDEK**	Regional Environmental Center
19	**RNDr. BARBORA MARHOLDOVÁ**	NGO –Bratislava Regional Protection Center
20	**RNDr. JÁN ŠEFFER, CSC.**	NGO – Daphne
21	**ING. MICHAL KRAVČÍK**	NGO – People and Water
22	**RNDr. JAROSLAV ŠÍBL**	NGO – Slovak River Network
23	**RNDr. NATÁLIA MIHALECHOVÁ**	Lucn
24	**Ing. ROLAND TÓTH**	Phare Office for Slovakia

25	**Ing. Dalibor KYSELA**	United Nations Development Programme
26	**Ing. ANDREA GONDOVÁ**	Slovak Agency for Environment
27	**Ing. JANA DRÁPALOVÁ**	House of Nature Protection, Brno – Facilitator CR
28	**Ing. RADEK BOUCNÝ**	Observer – CR
29	**RNDr. JÁN HANUŠIN, CSC.**	Slovak Academy of Sciences, Geography Institute – Facilitator
30	**Doc. JURAJ NÁMER**	National Expert
31	**Ing. ZDENA ZEKEOVÁ**	National Expert
32	**Ing. DAGMAR PETRÍKOVÁ**	National Expert
33	**Ing. DÁVID ĽUPTÁK**	National Expert
34	**JANA VOLFOVÁ**	Národná Obroda – News
35	**HELENA LORENCOVÁ**	Hospodárske Noviny – News
36	**Ing. BORIS MINÁRIK, CSC.**	Focal Point
37	**Ing. RENÁTA MAŠÁNOVÁ**	Tambor – Facilitator
38	**JOZEF TURČAN**	Danube PCU Phare
39	**JOACHIM BENDOW**	GEF
40	**MAXIME BELOT**	GEF
41	**ANDY GARNER**	GEF

Annex 5.3.

Evaluation of the Workshop

The analytical frame of TOPP method allows the elaboration of coherent reports indicating policies, strategies and actions with particular attention to pollution reduction at point and diffuse sources and the improvement of water quality taking into account national concerns and transboundary analysis for sustainable management of international waters and aquatic ecosystems.

The participants have evaluated the workshop as follows:

Organization	Methodology	Results
➢ Good ➢ Good ➢ Good ➢ Excellent facilitators ➢ Good ➢ Good ➢ Good ➢ Good ➢ Excellent ➢ Negative: Insufficient representativeness of invited participants	➢ Creatively stimulating ➢ Unusual ➢ Methodology ➢ Unconventional methodology, relatively complicated ➢ Suitable, further development needed after experiences ➢ Interesting and new ➢ Specific ➢ Unusual ➢ Sometimes unclear ➢ At the beginning discouraging, in next phase interesting ➢ Properly provided with auxiliaries	➢ Relevant to structure of participants ➢ It could be better (not attendance of invited participants) ➢ Partially : excellent Generally: average ➢ Difficult to evaluate ➢ Insufficiently stressed further development of results and their ensuring ➢ Results not very convincing ➢ Results have to be completed in final phase

Annex 5.4.

Opening Speech
by Mr. Ladislav Slebodník
Head of Minister of Environment Bureau.

Dear ladies and gentleman,

Allow me to welcome you on behalf of Ministry of environment of the Slovak Republic and I in this workshop, which will deal with problemacy of Slovakia within the project supported by GEF - Danube Pollution Reduction Programme.

Up to now several projects have taken place within framework of Environmental Programme for the Danube River Basin and these were focused mainly on technical supports. It can be documented by activities during realization of international monitoring system in the Danube Basin, as well as international early warning system established in the same region. Slovakia participates also at work of another expert group, which solve issue of identification and assessment of discharged wastewaters from important pollution sources. The first phase of applied research oriented towards main problems in the whole Danube Basin has been closed.

In October of last year another project of different type has started. It will prepare complex information about situation in region, concerned water quality aspects and decisive pollution sources on one side and on the other side the socio-economic effects of existing and reduced pollution of waters, as well as financial issues, which will allow realization of improvement measures. Hence within this project, which has regional point of view, there is also requirement for priority ranking for measures, which will have transboundary effects.

Considering, that it is a complicated system, it is necessary to start with analysis and solutions proposal according to countries. Experts have prepared the first view on these issues and it will be discussed during this workshop, however additional, respectively some new proposals within context of the problem are not excluded. Therefore besides conventional way of presentation also a procedure of planning process with participation of all involved subjects according to EU strategy, will be part of this workshop. It is new approach ant therefore it is interesting for us. We are used to plan already for many years, however planing processes were and are very often sector problems to which interested subjects may give an opinion, but they do not actively participate in the whole process

The results of this national workshop are important, because they will enter as one part into mosaic of problems of water pollution reduction in whole region of the Danube. The final product will be a document, which will serve as a basis for negotiation with „green banks“ and other financial institutions during next year. This negotiation should facilitate financing of investment, which significantly influence pollution of waters in the Danube River Basin with special attention to its transboundary effect. It means application of solidarity within Danube countries, which consider themselves but do not forget about others, which are situated in downstream region and they are depending on water quality coming from upper parts of the basin.

At the end, please allow me, dear ladies and gentleman to wish you fruitful and useful meeting which will be an asset for all of you, for Slovakia for other countries in the Danube region.

Thank you for your attention.