DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP HUNGARY

Visegrad, May 11-14, 1998

Ministry of Environment
Ministry of Transport, Communication and Water Management

in cooperation with the

Programme Coordination Unit
UNDP/GEF Assistance

DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP

HUNGARY

Visegrad, May 11-14, 1998

Ministry of Environment
Ministry of Transport, Communication and Water Management

in cooperation with the

Programme Coordination Unit

UNDP/GEF Assistance

Preface

The present report is based on the results of the National Planning Workshop, held in Visegrad, Hungary from 11 to 14 May 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.

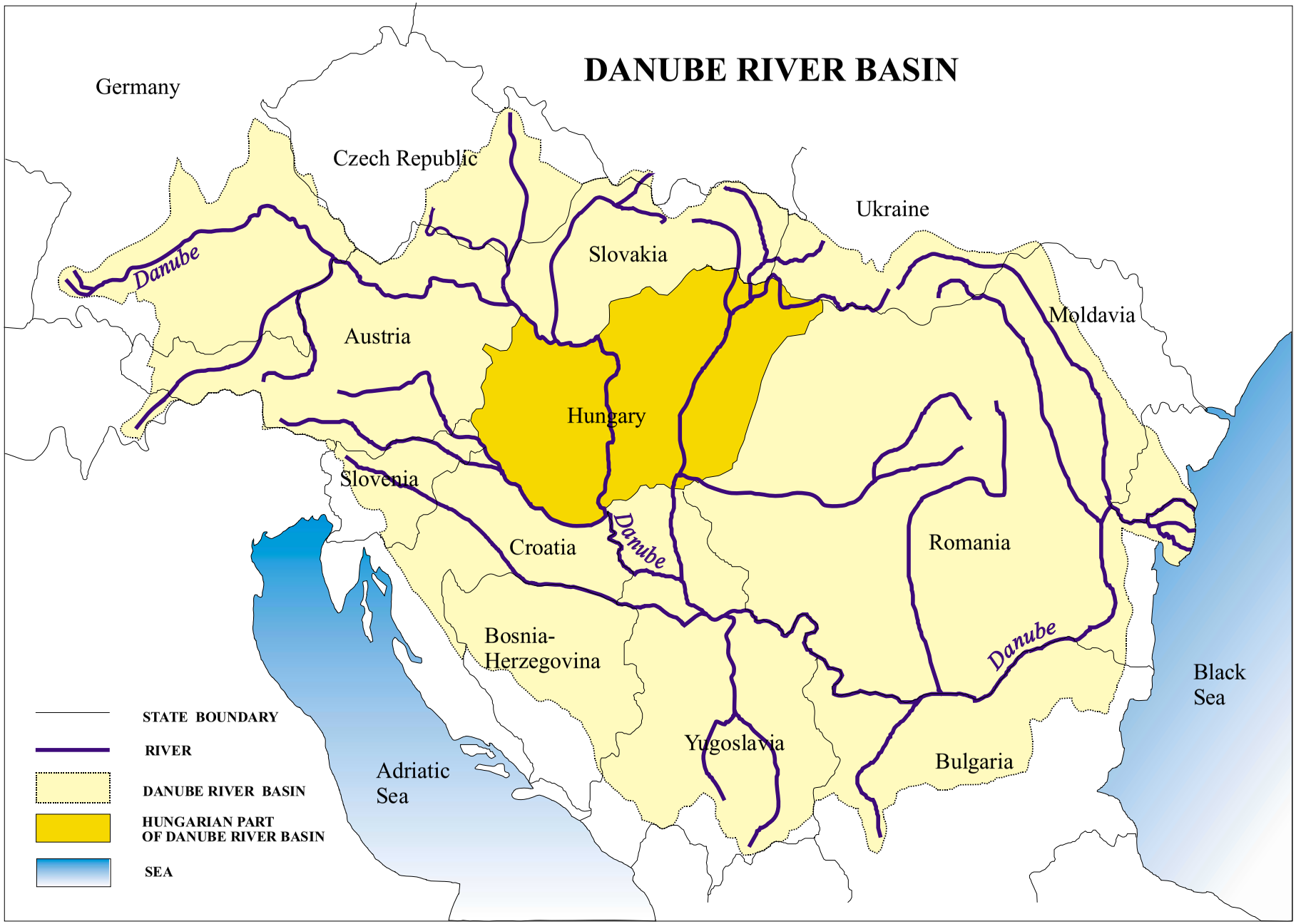
The Hungarian was the first one in the series of the national workshops and as such had the features of an experimental one. The applied preparatory and organization related method/technique - according to the Hungarian evaluation (see more detailed at the end of this report)- resulted that the workshop had rather methodological value than concrete supplementary contribution to the finalization of the national experts work. It should be also emphasized that the findings of the workshop are based on the judgements of national experts and reflect the improvised personal ideas of the participants. The conclusions drawn and the national extrapolations of the workshop outcomes should be harmonized with the national data evaluation prepared by the Hungarian expert team.

The experience gained and lesson learnt from the Hungarian workshop contributed to further adjustment of the next National Workshops' preparation and improved adaptation of the original methodology to the other countries individual conditions.

The workshop was prepared by the Country Programme Coordinator, Maria Galambos and facilitated by Dr. Anna Vári, Mr. László Karas and Dr. Judit Rákosi (member of the national expert team) under the guidance of the GEF team. This Report was prepared by the facilitators and the other national experts: Ms. Klára Tóth, Mr. Sándor Kisgyörgy, Dr. György Pintér supported by Mr. Péter Csathó and Dr. Péter Pásztó (participants of the workshop) and adjusted by the GEF team afterwards.

The National Planning Workshop was attended by participants from various sectors. List of participants is given in Annex 5.

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


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


pontok
1. FELSŐ-TISZA
5. BADACS-HERNÁD
2. FELSŐ-DUNA
3. SZŐ-VÁDOR
4. ALFÖLD
6. BALATON

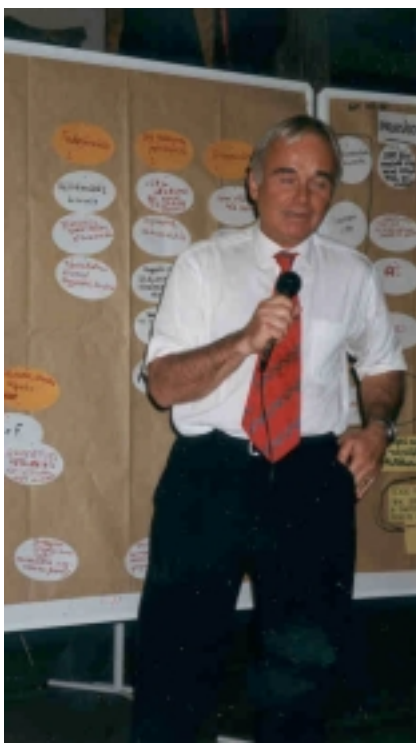


Table of Contents

Executive Summary

In the frame of the Environmental Danube Programme of the ICPDR and with the assistance of UNDP/GEF, a team of Hungarian 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 Visegrad, Hungary, from 11 to 14 May 1998. It is one of 11 national workshops, which have been organized in all participating countries, signatories of the Danube River Protection Convention or adhering to its principles.

The water management and insufficient environmental protection measures of the upstream countries, from where 96% of the surface water resources (rivers) enter the country, particularly influence water quality conditions of surface water in Hungary. Some of these rivers carry high pollution loads, however, it was noted that there are no significant differences in the entering and leaving quality of the river waters in Hungary or, in other words, transboundary effects are minimal. The problems of the waters in the Hungarian part of the Danube River Basin (DRB) are rather of local nature.

Although the Hungarian water and environmental administration has divided the country into 33 river basin units, only six pilot areas with major pollution sources and water quality management problems were selected for this planning exercise, covering 80% of the total pollution area. The six selected river basin areas are the Middle Danube area, the Sed-Nador catchment area, the catchment area of the Altater Creek, Lake Balaton, the upper Tisza region and the Tisza-Maros confluence area. 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 and transport activities and the urban sector. Based on the sector analysis, it has been identified as core problem that ***"Human activities lead to deterioration of water quality in the Danube River Basin"***. Direct causes of the core problem were described as "significant pollution", both from the municipal sector, as well as from industry and transport and " inadequate agricultural practices". A number of effects of activities leading to deterioration of water quality in the DRB were identified, among them increased microbiological, toxic and oil pollution, as well as increased salt, nitrate and phosphorous concentration in the water.

Considering the result of the problem analysis, the program objective was defined as ***"Improvement of water quality in the Hungarian part of the DRB"*** which should contribute to the achievement of "*Sustainable development in the DRB*".

Regarding **agriculture**, which is the cause of about 15% of total surface water nitrogen and phosphorous load, major problems are improper practice of plant cultivation and animal husbandry, as well as inadequate framework conditions.

Therefore, the sector objective is to "apply ecologically sustainable agricultural strategies". In order to achieve this objective, it is necessary to:

- ***implement ecological plant production practices*** through reconsideration of system of strategic planning; undertaking measures for developing sustainable production, water management technologies, appropriate lad management and ecosystem protection; modernization and consistent enforcement of legal frame; and elaboration, refining and application of economic incentives.

- ***apply appropriate animal husbandry practices*** through reconsideration of the system of strategic planning; undertaking measures for developing and applying sustainable animal husbandry technologies; introduction of appropriate fish farming practices; and development of proper storage and use of animal manure
- ***reinforce institutional capacities*** by development of institutional system; and development of human resources and public awareness.

The **industry sector** produces 18% of total wastewater in Hungary. This sector is also believed to have transboundary effects. The most important sources of pollution are the chemical, petrol, steel and paper industry, metallurgy and water transport.

The causes of pollution were identified as inappropriate technological conditions and improper disposal of solid and liquid wastes, in the case of industries, failures of product transport lines and economical and financial constraints, though, the main reason is shortages of institutional capacities. In order to achieve "ecological sustainable industrial production", being the sector objective, it is required to:

- ***apply appropriate technologies and pollution reduction measures in the chemical and oil industry*** through development of technologies in the chemical industry; changing attitude in education; strengthening legal frameworks, authority and civil control; and establishment of economic background
- ***control water pollution, resulting from shipping and harbor activities*** through reviewing, reconstruction and modernization of ports and shipyards; strengthening legal framework and authority for river transport control and establishment of economic background to reinforce river transport under economic and ecological conditions.

The **municipal sector** has the most important impacts, leading to both surface and ground water pollution. The effects on water include the pollution of drinking water resources, eutrophication of waters and degradation of flora and fauna.

Wastewater discharge is the major source of pollution, caused by improper handling of both, municipal solid and liquid waste. While 96% of the population live in areas with public utility water supply, only 45% are connected with public sewage systems. In order to reach the sector objective, "the implementation of appropriate municipal waste water management systems", it is necessary to:

- ***adopt public waste water collection and treatment systems*** through development of appropriate and efficiently functioning institutional system; raising awareness, education and training; strengthening and enforcement of legal framework; development of technologies; and development of economic incentives
- ***improve individual disposal of household waste water*** through encouraging development of public sewer system where technologically ad economically feasible; providing incentives to households for connecting to public sewage system where available; reinforcing development and practice of using individual sewer system (septic tanks); an ensuring control of compliance in utilizing individual system.

The results of the workshop are clearly needed. Some ideas have been developed to this end in the sector based small groups during the workshop (see relevant chapters later).

The priority projects preliminarily identified by the Expert team have been supported by the participants, and two new project proposals have been agreed upon to be additionally put in this list. These are the BORSODCHEM Industrial plant WWT and the Danube-Drava wetland management and rehabilitation project".

1. Introduction

1.1. Background

Hungary is entirely situated in the Danube River basin and due to her hydrogeographical location, basin like character the annual average quantity of water flowing through the country is the highest per capita in the world. Its water resources both quantitatively and qualitatively, depend on the activities of the neighboring countries. Therefore a well established cooperation with them as well as at the Danube River basin level is of vital importance for the country.

Beyond her traditional bilateral activities in this field Hungary has always paid initiative and active role in the development of Danube basin level governmental/international activities: joined the Bucharest Declaration, the Tisza river protection agreement, later, in 1991 organizing a Danube conference initiated the elaboration of a Danube agreement with ecological approach, became party to the Helsinki Convention, in 1994 signed, and amongst the first countries ratified the Danube Protection Convention and has actively participated in the related interim period work, supporting it with modest voluntary financial contribution as well.

Being an experienced country in transboundary cooperation Hungary can confirm that drawing up transboundary agreements should be followed by their implementation, enforcement and also revision in conformity with the related developments. This can be only a step by step process in which special attention should be given to survey of pollution sources, elaboration and implementation of joint pollution reduction programmes, realization of polluter pays principle, setting of common water quality objectives.

Hungary from the very beginning takes part in the Danube River basin Environmental Programme started in 1992, resulting in several river basin wide activities and elaboration of the Strategic Action Plan (SAP) in its first phase. The second phase of the Programme intends to contribute to the implementation of the SAP through the EU PHARE and TACIS supported Strategic Action Plan Implementation Programme and through the UNDP/GEF supported Danube Pollution Reduction Programme (DPRP). Hungary with certain reservation supported the launching of the DPRP with the hope that it will in a demand driven way pave the way to a well based comprehensive programme for the Danube Protection Convention on one hand and to concrete measures, including investments on the other.

The first step and basic part of the DPRP is the preparation of National Reviews. It is to be done by four experts per countries, whose work is guided by an international expert team responsible for the Danube River basin transboundary analysis to be prepared on the basis of the national materials. This process is supported by the national workshops to provide possibility for the stakeholders to contribute to the planning process with intersectoral approach. Later a similar workshop will take place at the Danube River basin level as well.

In order to achieve the goals set in the Danube Protection Convention and the SAP, national level activities are of relevant importance. In Hungary the water management as well as nature conservation have their long tradition, achieving significant results in legislation as well as in elaboration and implementation of programmes.

Out of the latest ones one can mention the new acts on environment, on water, on nature conservation, the national environmental programme and its implementation plan and also the regional - in Hungarian terms - programmes which are in line with the targets aimed at in the framework of the Danube Protection Convention and the Danube Programme. During the recent years intensive studies and planning activities were carried out in the field of decreasing the water pollution impacts of polluting sources to improve available background information for pollution

reduction programs, etc. Investment programs to develop the wastewater treatment of several important polluting sources have been started. Detailed information on all of them is included in the four parts of the National Reviews and their Executive Summary prepared in the framework of the DPRP.

1.2. Planning approach

General context of planning approach

The organization of the National Planning Workshop in Hungary 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.

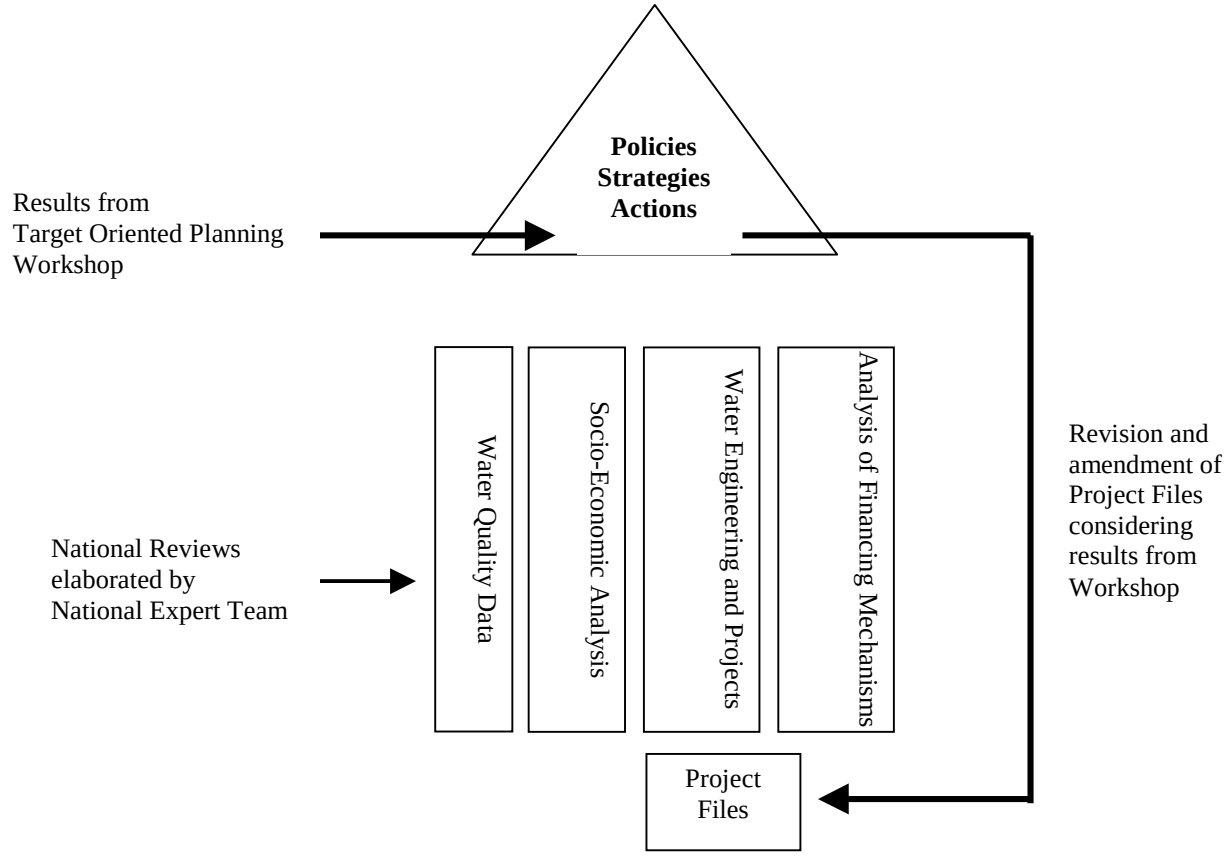
The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects 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 under the guidance of the Country Programme Coordinator and supported by the Ministry of Environment and Regional Policy. 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 Szentendre. At this occasion, the Non-Governmental Organizations have discussed common strategies and priority measures for pollution reduction and designated their participants for the National Planning Workshop, as well as for the forthcoming regional meeting of the Danube Environmental Forum (regional NGO with the participation of all Danube countries).

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

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

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



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

- **Target oriented planning methodology,** which allows defining problems and objectives in a logical frame while taking constraints and limits into consideration. It promotes a systematic, step-by-step approach based on well-focused, task-oriented discussions. This facilitates the description of expected results and actions, the finding of innovative solutions, the definition of assumptions and of impact indicators to support, at later stage, monitoring of programme implementation;
- **Team approach**, which draws on the knowledge, ideas, experience, and judgments of the participants. The collective effort of decision-makers, planners, implementing agents, and beneficiaries is likely to lead to better results than unilateral decision making. The method builds on group interaction aimed at consensus building; it promotes communication and collaboration between participants in all stages of analysis;
- **Visualization of results** in form of colored cards, which are integrated into formal structures, presenting the various aspects of group discussion so that each stage of the analysis is clearly visible to all participants. Cards also serve as the basis for the documentation of the deliberations and the preparation of the final report;
- **Elaboration of Workshop Report,** presenting in written form the results of the workshop and strictly the charts and planning tables elaborated in consensus by the participants and taking into account the arguments and reasons developed during the discussions.

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

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

2. General Frame of Analysis

Water quality conditions of surface water in Hungary are influenced by water management and environmental protection activities of the upstream countries, from where 96% of the surface water resources (rivers) enter Hungary. The regular water quality monitoring system have 24 entering control sections on rivers at the border, while there are only three which leave the country on the River Danube, Dráva and Tisza.

This specific situation of the country results in the fact that the cooperation with the neighboring countries in the field of water management and pollution control is of outstanding importance.

Some of the rivers entering from abroad (Hernád, Bodrog, Szamos, Kraszna, Maros) carry high pollution loads originating from industrial, municipal and agricultural polluting sources in the upstream part of the catchment area. Transboundary accidental water pollution incidents are also a cause for temporary water quality deterioration along these rivers.

Due to the high diluting effects of the big rivers in Hungary (Danube, Dráva and Tisza) their quality conditions are influenced by rather unfavorable values of the microbiological parameters. In spite of local water quality problems along the River Danube, in general, there are no significant differences in the entering and leaving quality of the river water in Hungary. The situation is somewhat similar in the case of the River Tisza, however its orthophosphate content in the leaving section is much higher compared to the entering level.

The quality conditions of the smaller tributaries of the river system reflect severe pollution problems in several areas, where the relatively limited flow conditions of the recipients are coupled with high pollutant loads of the municipal or industrial emissions. These areas are clearly illustrated by the water quality classification map enclosed to this report.

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

The River Basin Approach in Hungary

Hungary, being in the middle of the Carpathian basin, belongs to a single watershed, the Danube catchment area. Thus, in extreme, the country can be handled as a single big watershed.

It is also characteristic that the delineation of a watershed is not too easy in a lowland country, where canals transport the water among the regions and drain big areas in wet season.

The 12 regional water directorates in the district area basically follow the watershed borderlines. The data on water management are collected and evaluated on that level and integrated up to national level. The same area of jurisdiction belongs to the twelve Environmental Inspectorates. The data collection limitations give the possibility of evaluation on directorate level.

The Hungarian water- and environmental administration decided to develop the river basin concept in water administration. They divided the country into 33 river basin units. The regional water management development programme, which was designed to end in five years, has only started. Therefore, it cannot give enough information for national evaluation to date.

Due to the constraints referred to above, as well as the limited time frame, the workshop has chosen a representative survey method. Selected pilot areas where major pollution sources exist and some other territories where water quality management problems are characteristic can serve as a basis for nationwide extrapolation. The experts participating in the workshop reviewed these areas. Six

sensitive catchment areas or river stretches where major polluters are located in the field of industries, the public sector and agriculture, were selected for discussions. It was generally agreed that approximately 80 % of the total pollution load are covered by this approach.

It should be emphasized that the findings of the workshop are based on the judgements of national experts, and reflect the personal ideas of the participants. The conclusions and national extrapolations of the workshop should be harmonized with the national data evaluation prepared by the Hungarian expert team.

The preparatory materials prepared for the meeting by the four experts working on the updating of the previous National Review of Hungary provided brief background information on the existing situation in the country. This information covered the overall characteristics on demography, water quality and corresponding legal/economic and financial mechanisms serving the pollution reduction activities in Hungary.

The local knowledge and experiences of the participants extended this basic information. The discussions resulted in the agreement of the selection of six different river basin areas of the country:

- Middle Danube
- Séd-Nádor
- Általér
- Lake Balaton
- Upper Tisza
- Maros Szeged - Tisza

Within these areas, the pollution reduction planning problems and its interrelations with different influencing factors can be analyzed.

(i) Middle Danube

Physical-Geographical Characteristics:

The area covers the direct catchment area along the river between Budapest and Dunaujváros. The river has a medium flow in this stretch, approximately 2300 m^3/s, with a relatively stable water regime. The flow of the river is large compared to used water/waste water discharges. Ráckeve-Soroksár side branch is the second largest of the river, where water level control is independent from the main river. The Danube gravel terrace is an important drinking water resource.

Socio-Demographic Characteristics:

The area is a densely populated and urbanized region. The most important town in the region is the capital of the country, Budapest, with population of about 2 million and a significant mixed industry. Other important cities are Dunaújváros (40 000 pop.) and Százhalombatta. The concerned area has a relatively low level of unemployment.

Transboundary Effects as Perceived:

Usually the effects of upstream transboundary pollution effects do not reach this region. The entering river pollutants into this region are nutrients and microbiological pollutants. Dissolved and non-degradable pollutants leave this area downstream. There are no transboundary pollution impacts from this region.

Human/Economic Activities:

Characteristic industrial activities of the capital are chemical, machinery, leather, paper and food industry, as well as power generation plants. Most of the industrial wastewater is discharged into the municipal sewer. The oil industrial plant in Százhalombatta and the paper industry, as well as iron works in Dunaújváros emit significantly into the river. Recreation and tourism are also important factors here. Agriculture has water uses for irrigation purposes. Lastly, fruit production is also significant in this area.

(ii) Séd-Nádor

Physical-Geographical Characteristics:

The watershed of the Creek Séd and the Nádor Canal is a fully domestic and hilly area. This watercourse system is a secondary tributary of the Danube. The watercourses have a low discharge and, therefore, no diluting effects for waste water effluents. Agricultural lands are of good quality. There are also large carstic areas with a harmful decrease of carst-water level.

Socio-Demographic Characteristics:

Highly populated, urban areas (the towns of Várpalota, Veszprém and Székes-fehérvar), as well as large villages are located in this area. The size of the population is stagnant. The living standard is better than the national average.

Transboundary Effects as Perceived:

None

Human/Economic Activities:

Large chemical units are operating in the area; aluminium industry is also present. Agricultural activities with water demands for fish farms and irrigation. Intensive nature conservation activity is carried out in the region.

(iii) Általér

Physical-Geographical Characteristics:

The creek is a primary tributary of the Danube in the upper Hungarian-Danube stretch. It is a fully domestic watershed of hilly character with woodlands. Carstic areas are also located here with a harmful decrease of carst-water level. The water regime of the creek is disturbed by human impacts and intensive flood waves are characteristic for this area. A significant establishment is the Vértes Landscape Conservation Area.

Socio-Demographic Characteristics:

The region depicts a typical rural area with villages larger than average in Hungary. The number of inhabitants in this area is stagnant. Unemployment is decreasing, partly, due to the shutdown of units of the mining industry. Unclear ownership is a disturbing factor in the area. Developing towns in this area are Tatabánya, Oroszlány and Tata.

Transboundary Effects as Perceived:

None.

Human/Economic Activities:

Characteristic industrial activities are coal mining and the production of the engineering industry. Tourism and recreation is also important (Lake Tata). Significant non-point source pollution is loading the creek.

(iv) Lake Balaton

Physical-Geographical Characteristics (Watershed characteristics and hydrography):

The watershed area is about12.000 km2 , the size of the water surface is about 600 km2, and the amount of water quantity is 2.109 m3. The biggest tributary discharging to the lake is the River Zala having a catchment area of approximately 6000 km2 with a mean flow of about 6 m3/sec. All the other small tributaries have the same total discharge into the lake. The average through-flow (retention time) is about 10 years, which is faster during dry years. It is a shallow lake with an average depth of 3 m (maximum is 10 m). There is an intensive water level control to maintain optimal conditions for the lake. The coastline is 230 km long, of which 100 km are residential areas.

Factors modifying the water quality

The Kisbalaton - Reservoir acts as a "pre-treatment plant" at the mouth of the River Zala, which represents one of the main emission sources into the lake. There is also a significant land runoff from the catchment area under agricultural cultivation and a nutrient accumulation effect due to the characteristics of the basin. The different types of coastal "developments" are also an influencing factor.

Socio-Demographic Characteristics:

Coastal zone

The lake-area is intensively utilized for seasonal tourism. It is also known as an international recreation site. The seasonal increase of the population represents a significant overloading. There is also an increasing number of people in the coastal cities around the lake where business activities are based mainly on tourism.

Background watershed

The public supply level in the watershed areas, located away from the lake, is lower than that of the coastal zone. Land use is mainly agriculture.

Transboundary Effects as Perceived:

None

Human/Economic Activities:

Agriculture, food industry

Intensive fishing and reed cutting are those activities carried out in the lake area. The agricultural production activities (fruit, vegetable growing, vineyards, animal husbandry) on the watershed result in considerable land runoff and an increase of the nutrient load entering the lake.

Industry

Significant industrial sites are located in the watershed of the Zala River (food industry). The wastewater discharge of the outstanding chemical industrial plant in Balatonfûzfõ is transferred to a recipient of another neighboring watershed for the protection of the water quality of the lake.

Tourism/Sport

The lake is a popular site for recreation, fishing and water sports with significant tourism. Motorboats and Jet Ski are not allowed.

Municipal services

The region has relatively developed public utilities (especially in the coastal zone). A regional sewage system is in operation, which partly transfers the wastewater load to other watersheds. The pollution load is coming mainly from municipal and some industrial sources. A significant city in the Zala watershed is Zalaegerszeg with a wastewater discharge of 16.000 m3/day. Regular anti-mosquito treatments are carried out in the coastal areas. A potential pollution problem is the solid waste disposal.

(v) Upper Tisza

Physical-Geographical Characteristics:

The area of the watershed of the selected river catchment is approximately 4.000 km2, which is equal to 5% of the total area of Hungary. The region covers the river stretch from the entrance of Hungary downstream to the town of Tiszabecs, including also the Hungarian catchment area of River Sajó, Bódva, Hernád, Túr, Szamos, Kraszna and the Lónyai Canal. Two third of the watershed of the Túr, Szamos and Kraszna Rivers belongs to Romania, and there are Latorca, Ung from the Ukraine and Ondava-Tapoly from Slovakia. One characteristic part of the area is the Nyirség sand plateau. The annual rainfall is about 700 mm per year; the average temperature is relatively high. Due to water pollution impacts drinking water resources are potentially endangered.

Socio-Demographic Characteristics:

The area is considered as a crisis area: Unemployment is above the national average, emigration is significant and existing manpower is poorly qualified. Disadvantaged cities are located primarily on the left bank.

Transboundary Effects as Perceived:

The water quality of the tributaries of the Tisza is determined by transboundary pollution impacts (organic BOD (Biological Oxygen Demand) from Slovakia, Romania and Filamentous Fungi from Slovakia).

Túr River: Heavy metal pollution arrives from untreated mine water.

Kraszna River: Organic pollution and Filamentous Fungi from food industry.

Szamos River: Organic pollution from Deji Paper Works Co. and also contamination of municipal origin from the City of Szatmárnémeti.

Other transboundary pollutants entering the country: Hydrocarbon (Slovakia, Romania), heavy metal (Slovakia, Romania), high salinity (Romania) and soil (suspended solid load from Ukraine.

Human/Economic Activities:

Agricultural activities consist of intensive fruit production (polluting effect: chemicals) and livestock farming (dilute manure). The "extensive" type agriculture activity results in a reduced use of fertilizers. Water uses for irrigation is taken from the Eastern Canal. Significant settlements and towns produce substantial municipal wastewater loads of the recipients. Large units of chemical industry are situated in this area (Borsodchem, Sajóbábony and TVK). Untreated wastewater is discharged from food industry. Lastly, thermal power generation produces disposal problems of sludge water.

(vi) Maros Szeged - Tisza

Physical-Geographical Characteristics:

The area covers part of the territory of Békés and Csongrád County, including the biggest town in the region: Szeged. This is the warmest region in Hungary with the highest number of sunny hours. Only 20% of the watershed of the River Maros are in Hungary, 80% is in Romania and the river has extremely variable discharges. The rivers have lower basin characteristics in this region. Subsurface waters are of good quality.

Socio-Demographic Characteristics:

Extensive rural areas are located here with relatively poor people. Population concentrates in big cities (Szeged), however the number of inhabitants is decreasing.

Transboundary Effects as Perceived:

The polluted conditions of the Maros River determine water quality of the Tisza River in this region. The pollutants of Maros are ammonia, nitrite-nitrate contamination, high heavy metal content and high salinity.

Human/Economic Activities:

Characteristic for the agricultural production in this region is fruit production (chemicals) and livestock farming (liquid manure). Significant units of food industry are located in this region: Pick, canning factory (untreated waster water) as well as light industry (textile, rope). Petrol industry is also important. Large municipal wastewater discharge comes from the town Szeged, where industrial wastewater is discharged into the sewage system. At present, no wastewater treatment plants are operating in Szeged.

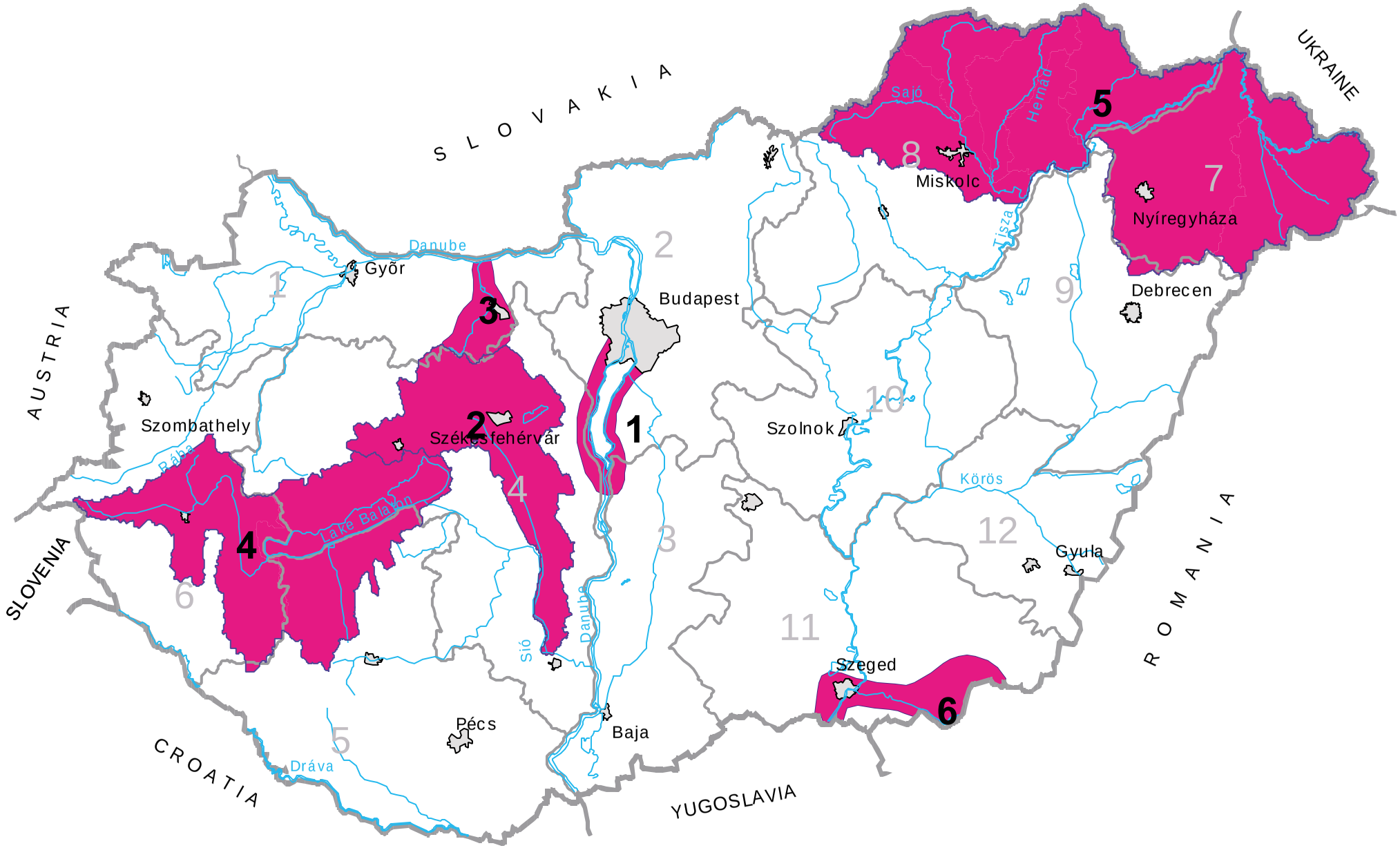


Figure 2 Watersheds analyzed in details

20 0 20 40 60 80 100 Kilometers

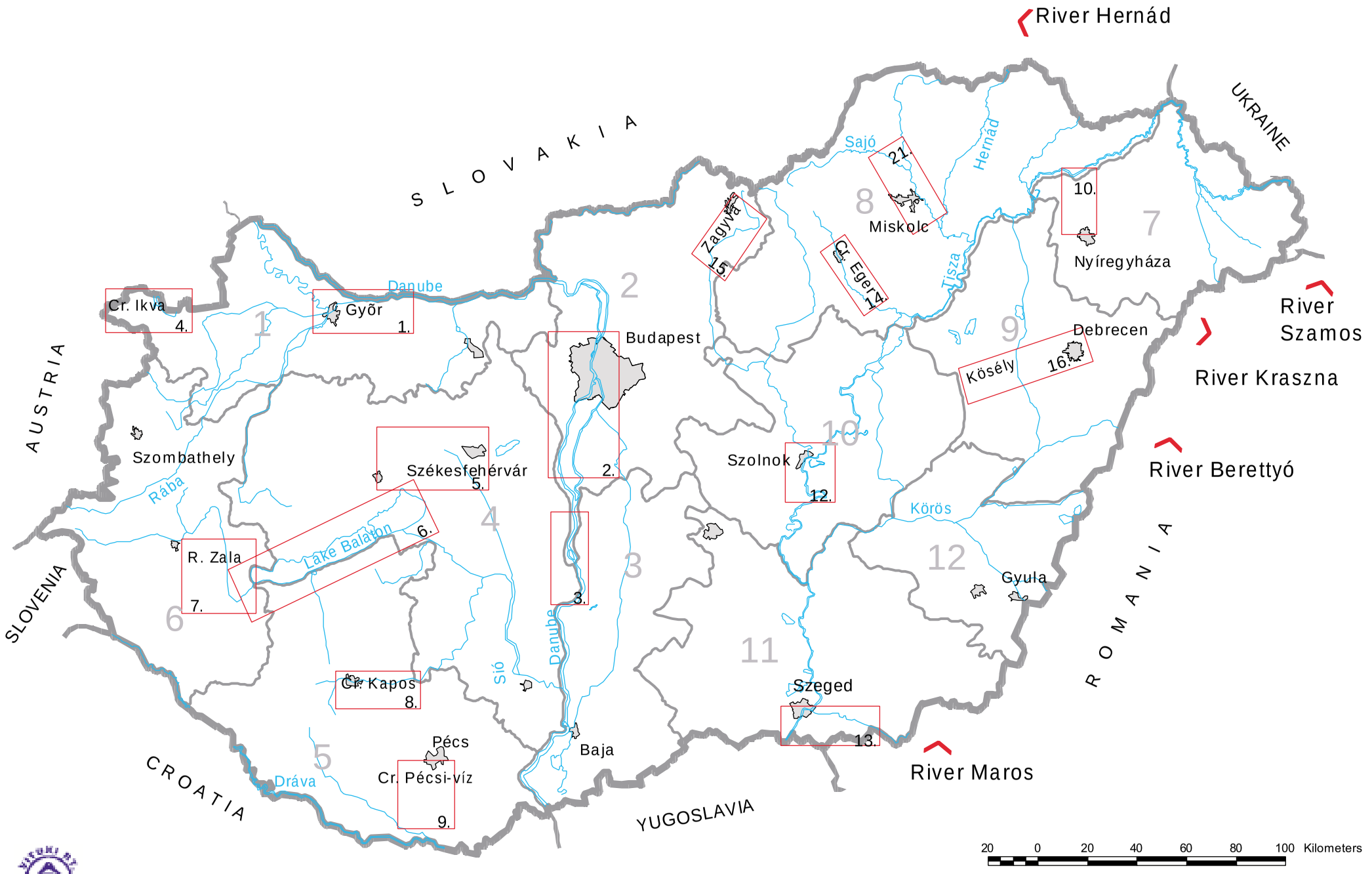


Figure 2-1 Water quality problem areas in Hungary caused by polluting sources

2.2. Problem Analysis

Selected pilot areas where major pollution sources exist and some other territories where water quality management problems are characteristic can serve as a basis for nationwide extrapolation. The experts participating in the workshop reviewed these areas. Six sensitive catchment areas or river stretches, where major polluters are located in the field of industries, the public sector and agriculture, were selected for discussions. It was generally agreed that approximately 80 % of the total pollution load are covered by this approach.

It should be emphasized that the findings of the workshop are based on the judgements of personal experts, and reflect the personal ideas of the participants. The conclusions and national extrapolations of the workshop should be harmonized with the national data evaluation prepared by the Hungarian expert team.

As a result of the discussions the core problem was identified together with the direct causes to the core problem. Effects of the core problem will also be delineated below.

The linkages between the core problem, the direct causes and effects of the core problem are presented in the General Problem Hierarchy diagram further.

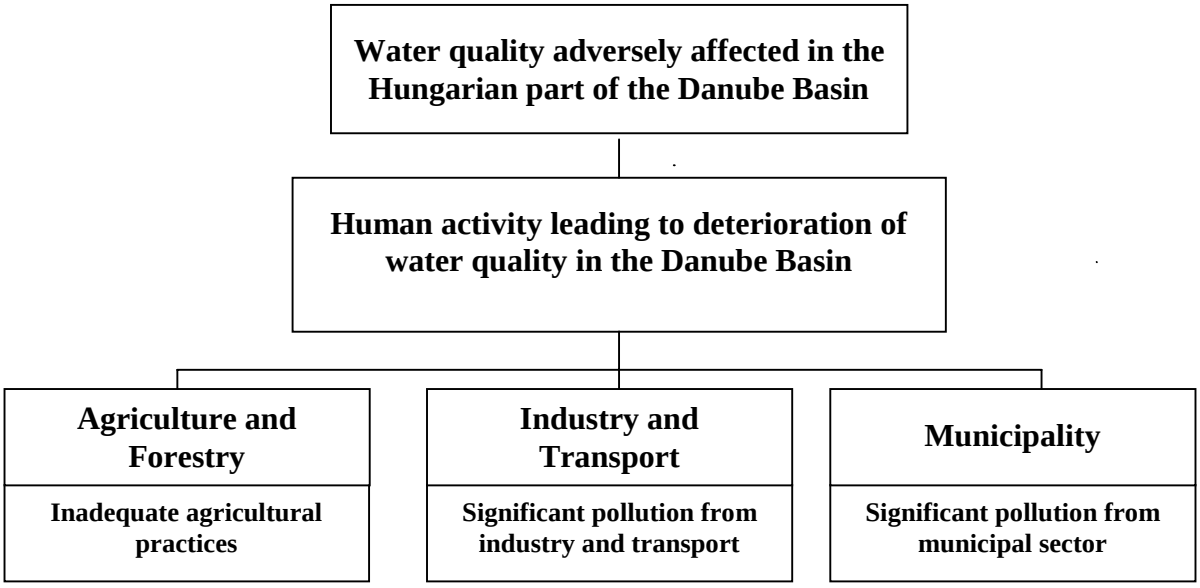
2.2.1. Core Problem

On the ground of the important problems identified in the different sectors and, especially, as a result of the three working groups the following core problem was identified:

"HUMAN ACTIVITIES LEADING TO DETERIORATION OF WATER QUALITY IN THE DANUBE RIVER BASIN"

This core problem outlines the situation in environmental problems in the Hungarian part of the Danube River Basin.

Scheme of Problem



2.2.2. Direct Causes of the Core Problem

The direct causes of the core problem were identified by each sector as follows:

- **Inadequate agricultural practices** due to improper practice of plant cultivation, animal husbandry and inadequate framework conditions
- **Significant pollution from industry and transport** because of inappropriate technological conditions, economical and financial and institutional constraints
- **Significant pollution from municipal sector** related to improper handling of municipal solid water and municipal waste waters

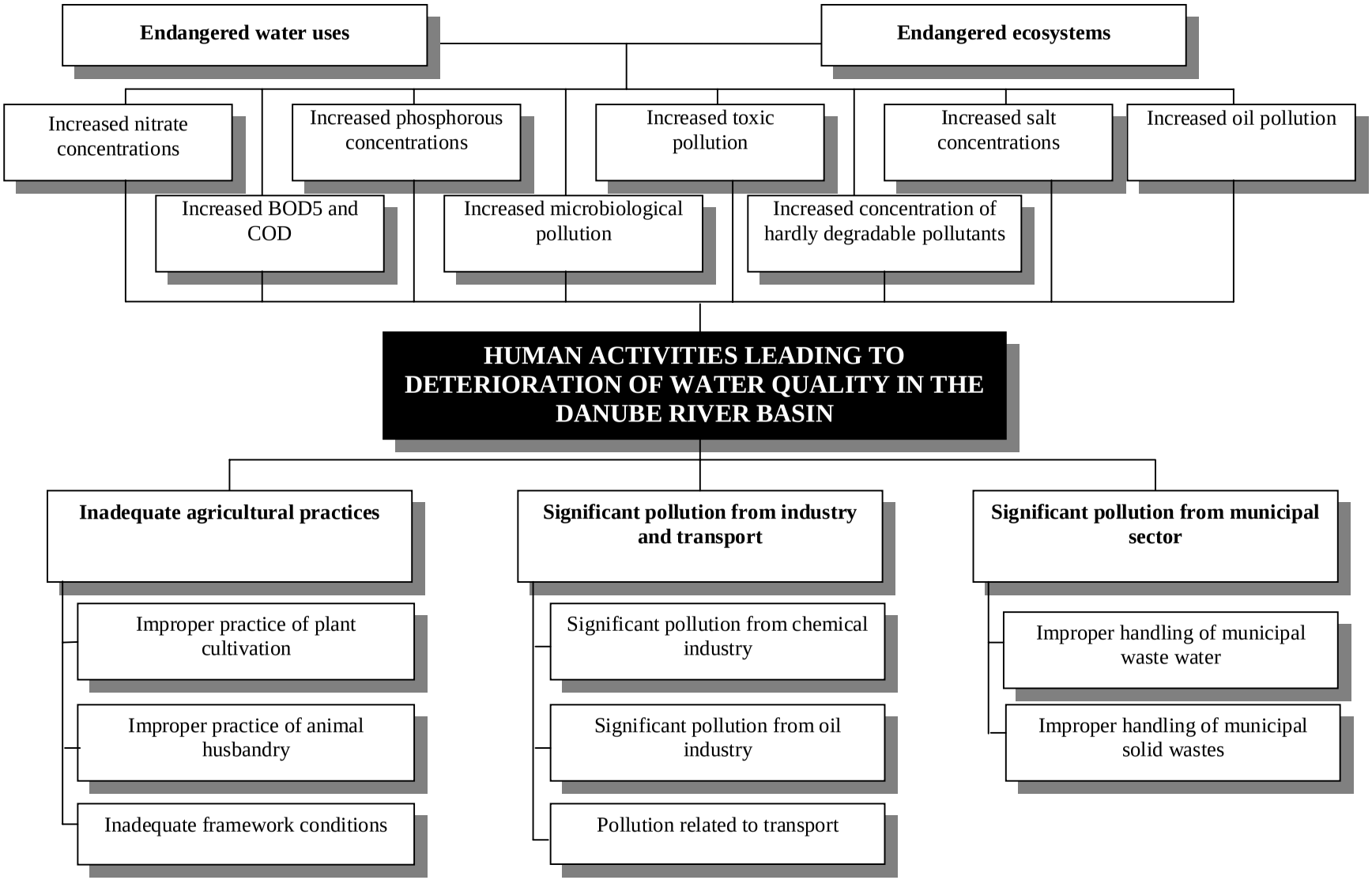
2.2.3. Effects of the Core Problem

The effects of the human activities leading to deterioration of water quality in the Danube river Basin were listed as follows:

- increased BOD5 and COD
- increased microbiological pollution.
- increased salt concentration
- increased nitrate concentration
- increased phosphorous concentration
- increased toxic pollution (micro pollutants)
- increased pollution of hardly degradable pollutants
- increased oil pollution

These effects ultimately result in endangered water uses and endangered ecosystems in the Danube River Basin.

General Problem Hierarchy



2.3. Analysis of Objectives and Identification of Priority Sectors

Based on the problems analyzed, the participants developed desirable and realistic objectives to address the causes of problems identified. This was also linked to the identification of priority sectors.

2.3.1. Description of Objectives

The participants defined the following program objective:

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

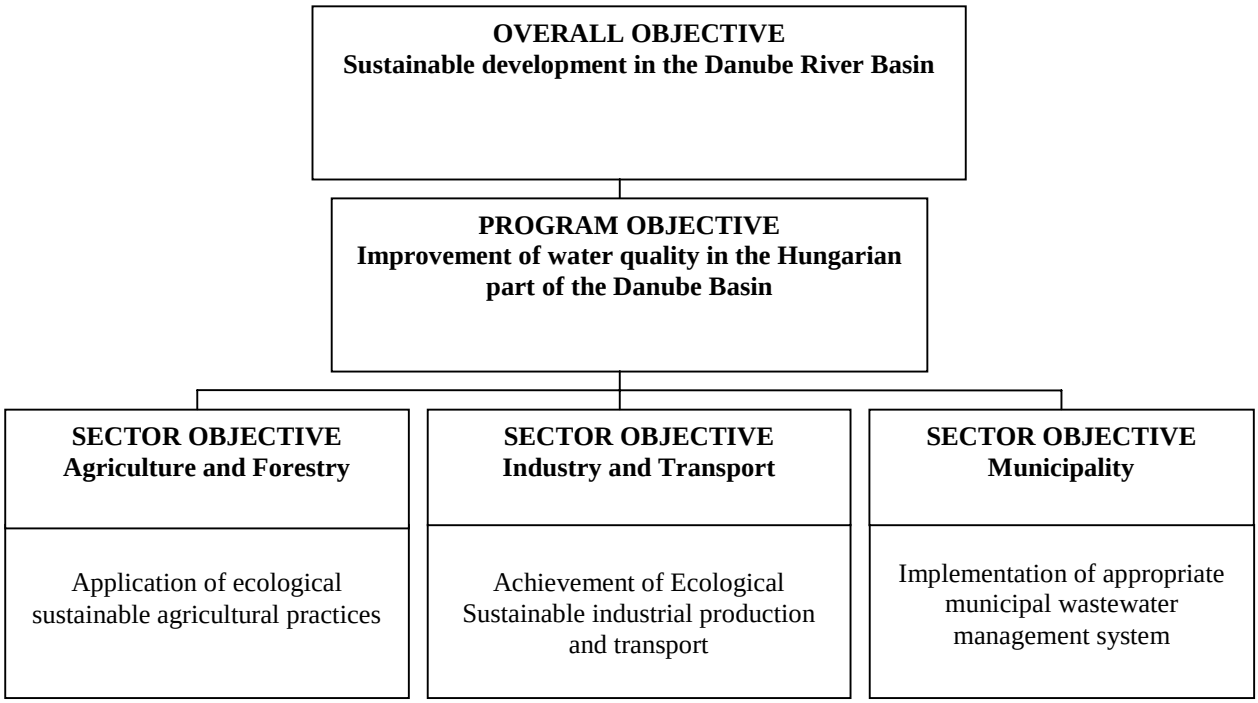
This objective should contribute to the achievement of:

"SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN"

In order to assure the long-term improvement of water quality in the Hungarian part of the DRB, specific objectives have been identified for each sector:

- **Agriculture and Forestry:** Application of ecological sustainable practices
- **Industry and Transport:** Achievement of Ecological sustainable industrial production and transport
- **Municipality:** Implementation of appropriate municipal waste water management system

Scheme of objectives



2.3.2. Identification of Priority Sectors

In order to achieve the objectives in each sector, the following measures have to be undertaken:

1. Agriculture and Forestry

In order to apply the ecological sustainable practices it is required to:

- implement ecological production practices;
- apply appropriate animal husbandry;
- reinforce the institutional capacities.

2. Industry and Transport

In order to achieve the ecological sustainable industrial production it will be necessary to:

- apply appropriate technologies and pollution reduction measures in chemical industries;
- apply appropriate technologies and pollution reduction measures in oil industry ;
- control water pollution resulting from shipping and harbor activities.

3. Municipality

In order to implement appropriate municipal wastewater management system, it is required to:

- adopt public waste water collection and treatment system;
- improve individual disposal of household wastewater.

Expert opinion was expressed during the workshop that there are differences in the magnitude of priority sectors contributing to the water pollution. In this respect, the municipal sector is of utmost importance, followed by industry and transport, with relatively smaller impacts from agriculture and forestry in Hungary.

2.3.3. Important Assumptions for Program and Sector Objectives

The objective setting was assisted by considering important assumptions: external factors which are important for the success of the program but lie outside its scope and not under the direct control of the program. These external factors may affect the implementation and long-term sustainability of the program.

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

The following two assumptions were identified for the **program objective**:

- Sustainable waste management achieved
- Consumption patterns developed to sustainable level

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

- Appropriate legal environment and enforcement structures established (agriculture)
- Legislation harmonized to EU legalization (industry)
- Information regarding pollution is available (industry)
- Appropriate administrative and financial structures established (municipal sector)

- Administrative integration of environmental protection and water management (municipal sector)
- Appropriate legal and economic regulations (municipal sector)
- Efficiency of the system of controlling institutions and tools (municipal sector)

2.3.4. Impact Indicators for Programme 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 results 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. They were designed to measure the extent to which objectives have been realized.

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

- **Water quality in the six selected DRB catchment areas in Hungary is increased to relevant EU standards by 2O1O.**

Impact indicators for the **sector objectives** were defined as follows:

- **Among the substances washed into the waters, concentration of the pesticides and fertilizers should be decreased to 75% (pesticides) by the year 2010 in the Zala Zagyva rivers and to 90%(fertilizers) by the year 2005at locations not affected by other polluters (agriculture).**
- **In the Sajó, Tisza and Nádor channel the water quality will be improved to EU standards by 2010 (industry).**
- **In Budapest and four selected cities (Dunaújváros, Gyor, Szeged, Szolnok) the water treatment will be improved by 60% and 100% respectively by 2010 (municipal sector).**

Program Planning Matrix

Summary of Objectives and Results	Impact Indicators	Important Assumptions
➢ **Overall Objective:** Sustainable development in the Danube River Basin achieved .	➢ Ecosystems and human life sustained and the most important waste users are satisfied in the Danube River Basin	
➢ **Program Objective:** Water quality in the Hungarian part of the Danube Basin improved.	➢ Water quality in the 6 selected DRB catchment areas in Hungary is increased to relevant EU standards by 2010 (PO)	➢ Sustainable waste management achieved (PO) ➢ Consumption patterns developed to sustainable level (PO)
➢ **Sector objectives:** **1 Agriculture and Forestry:** Ecological sustainable agricultural practices applied **2 Industry and Transport:** Ecological Sustainable industrial production and transport achieved **3 Municipality:** Appropriate municipal waste water management system implemented	➢ 1. Among the substances washed into the waters, concentration of the pesticides and fertilizers should be decreased to 75% (pesticides) by the year 2O1O in the Zala Zagyva rivers and to 90%(fertilizers) by the year 2005at locations not affected by other polluters (agriculture). (SOAF)	➢ Appropriate legal environmental and enforcement structures established (SOAF) ➢ Legislation harmonized to EU legislation (SOIT) ➢ Information regarding pollution is available (SOIT) ➢ Appropriate administrative and financial structures established (SOM) ➢ Administrative integration of environmental protection and water management (SOM) ➢ Appropriate legal and economic regulations(SOM) ➢ Efficiency of the system of controlling institutions and tools (SOM)
➢ **Results/Outputs:** **1. Agriculture and Forestry** 1.1 Ecological plant production practices implemented 1.2 Appropriate animal husbandry practices applied 1.3 Institutional Capacities reinforced **2. Industry** 2.1 Appropriate technologies and pollution reduction measures applied in chemical industries 2.2 Appropriate technologies and pollution reduction measures applied in oil industries 2.3 Water pollution resulting from shipping and harbor activities controlled **3. Municipality** 3.1 Public waste water collection and treatment system adopted 3.2 Individual disposal of household waste water improved	➢ 2. In the Sajó, Tisza and Nádor channel the water quality will be improved to EU standards by 2O1O. (SOIT) ➢ 3. In Budapest and four selected cities (Dunaujváros, Gyor, Szeged, Szolnok) the water treatment will be improved by 60% and 100% respectively by 2010 (SOM)	

PO - Program Objective SOAF - Sector Objective Agriculture and Forestry SOIT - Sector Objective Industry and Transport SOM - Sector Objective Municipality

3. Sector strategies

3.1. Agriculture and Forestry

3.1.1. Situation/Stakeholder Analysis

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

In Hungary agriculture represents 7.1 % of GDP; 8.3 % of the population is engaged in agricultural production (Source: Statistical Yearbook 1996).

The participants of the workshop discussed the activities leading to water pollution and agreed on the following two major polluting sources:

- plant production
- animal husbandry

Plant production contributes as a diffuse source and animal husbandry as a point source type of pollution.

According to recent evaluations the sector of agriculture leads to about 15% of total surface water nitrogen and phosphorus load and the majority of this load comes from diffuse sources.

Agricultural diffuse N and P loads can come from three sources:

- the natural N and P content of the soils,
- N and P coming from fertilizer application,
- N and P coming from farmyard manure and slurry application.

According to estimations, due to 20 years of intensive P fertilization (in the 70’s and 80’s) about 20 % of total Ps of the soil come from former fertilizer and manure application.

Due to the economic recession in the late 80's and early 90's N fertilizer application dropped to 20-30 %, and P fertilizer application to 5-10 % of the volume applied in the intensive period. As a consequence, N and P balance of the agriculture (applied through fertilizer and manure minus plant uptake) became strongly negative in the 90's. Agricultural N and P load of surface waters can lead to eutrophication and agricultural N load of subsurface waters and to contamination of the drinking water sources.

Besides intensive use of fertilizers, pesticide application was also significant during the 70's and 80's. Due to the economic recession in the 90's fertilizers application dropped to 30-40 % of the amount applied in the intensive period.

Inadequate storage of farmyard manure and slurry (liquid manure) produced in animal husbandry can lead to nutrient loads of both surface and sub-surface water. In the 90's, the total number of livestock dropped to 50 % of the 70's and 80's. Due to this fact, many of the former livestock units have been closed.

Because of improper structure of agricultural production plant production farms and animal husbandry farms operate in many cases separately. Therefore, the problem of discharge of farmyard manure and slurry onto the agricultural fields is often not solved.

Since the 60's, serious efforts have been made to increase the agricultural production and to export it to the COMECOM countries. Consequently, large grassland areas were turned into arable lands even in the hilly areas. The aim was also to increase the cereal (wheat, barley, maize, etc.) production this way. As a result, the erosion damages increased strongly in those regions.

Waste water emission of agriculture is 1.2 million m^3/year, that is less than 1 % of total waste water emission. This explains the lesser importance of agricultural point source load compared to the other two sectors: communal and industrial.

During the transition period starting in the early 90's significant changes took place in the agricultural land ownership. Large fields of the former socialist cooperatives have been turned into smallholder's lands as a result of privatization and compensation. Many of those new smallholders have insufficient education and skills. Moreover, they lack environmental awareness.

3.1.1.2. Stakeholders involved

The participants of the workshop discussed the possible stakeholders with interest and input in the issues of the inappropriate agricultural practices in the groups of organizations, polluters and affected.

Organizations

The organizations are those which operate in the decision making process and may have an effect on pollution reduction. The group chose the organizations below:

- ministries (especially Ministry of Environment and Regional Policy, Ministry of Agriculture, Ministry of Finance, Ministry of Internal Affairs, Ministry of Labor, Ministry of Transport, Communication and Water Management)
- municipalities
- environmental inspectorates and water authorities of the region
- NGOs
- scientific and professional organizations
- research and educational institutions
- mass media

Polluters

The group of polluters consists of:

- the polluting agricultural units (cooperatives and state farms),
- private farmers (many of them are new, non-educated ones with a lack of environmental awareness),
- household farming,
- gardeners.

Affected

To the group of affected by the environmental consequences of inappropriate agricultural activities belongs:

- the whole population in the affected areas because of health risks, especially children and babies via water consumption (nitrate);
- the fauna and flora;
- the water utility companies and water users, who suffer economic damages, because of higher water prices.

3.1.1.3. Current Strengths/Assets

It was agreed among the members of the working group that the following assets and achievements are available in Hungarian agriculture for pollution control and reduction:

- System of subsidies (allocated on the regional basis)
- Knowledge, skills, experience and expertise
- Environmentally friendly chemicals
- Specialized research and educational institutions
- Appropriate IT systems (computers, telephones, etc.)
- Publication of water quality data
- Non-governmental organizations, local patriotism
- Mass media

3.1.1.4. Analysis of Transboundary Effects

The environmental effects of agriculture have not only domestic consequences but also transboundary impacts. Nitrogen, phosphorus and pesticide loaded into the surface water can leave the country through the main rivers (Danube, Tisza). The nitrate pollution of the ground water may have also transboundary impact via moving sub-surface waters to the neighboring countries (Croatia, Serbia, and Romania).

With respect to transboundary effects, it is difficult to separate the agricultural N and P loads from other polluters' discharge (i.e., communal and industrial). As it was stated earlier, according to recent evaluations, agriculture contributes to the surface water N and P load in about 15 % of the total load. The same percentage can be applied to the N and P loads via transboundary water flows.

3.1.2. Sector Problem Analysis

3.1.2.1. Core Problem

For the agricultural and forestry sector the following core problem has been retained by the participants:

"INADEQUATE AGRICULTURAL PRACTICES"

3.1.2.2. Causes Leading to Environmental Problems

The causes leading to the inadequate agricultural practice are:

- improper practices of plant cultivation,
- improper practices of animal husbandry,
- inadequate framework conditions

They can contribute to eutrophication of surface waters (via increased nitrate and phosphorus concentration) and can endanger the drinking water (via increased nitrate concentration).

(i) Improper practices of plant cultivation

The main elements leading to improper practices of plant cultivation are, apart from improper land use pattern on areas sensitive to erosion:

- inefficient agricultural water management
- improper use of fertilizers and manure, as well as pesticides.

All of the above mentioned can occur due to either a lack of environmental awareness, a low level of technical education and technological errors. Excessively depreciated machinery also contributes to the problem.

(ii) Improper practices of animal husbandry

Concerning inadequate practices of animal husbandry the main weaknesses are:

- improper separation of plant production farms and animal husbandry farms (point pollution source)
- inadequate storage of manure and slurry (point pollution source)
- overfeeding of fish in fish ponds (diffuse pollution source).

(iii) Inadequate framework conditions

In addition to the improper practice of plant cultivation and animal husbandry, inadequate framework conditions in general and **inadequate conditions for environmental protection** in particular represent very important causes of inadequate agricultural practices.

Inadequate conditions for environmental protection are related to the lack of:

- skills of farmers, due to gaps in education system supporting the farmers to conduct their activities in a sustainable way
- funds due to insufficient economic incentives, stimulating water pollution reduction activities
- legislation and enforcement of existing regulations because of inefficiency of governmental bodies
- adequate pollution control

3.1.2.3. Environmental Effects

The following environmental consequences of inappropriate agricultural practice have been identified:

- increase of nitrate and phosphorus concentration of the water leading to eutrophication,
- increase of nitrate concentrations in ground waters leading to endangering of drinking water resources

In addition to the direct consequences mentioned above, the following has also been identified:

a. Concerning **deterioration of water quality in surface waters:**
- endangering of local fauna
- ecosystem distraction
- reduction of biodiversity
- sedimentation
- pesticide releases to surface waters
- overpopulation of certain species

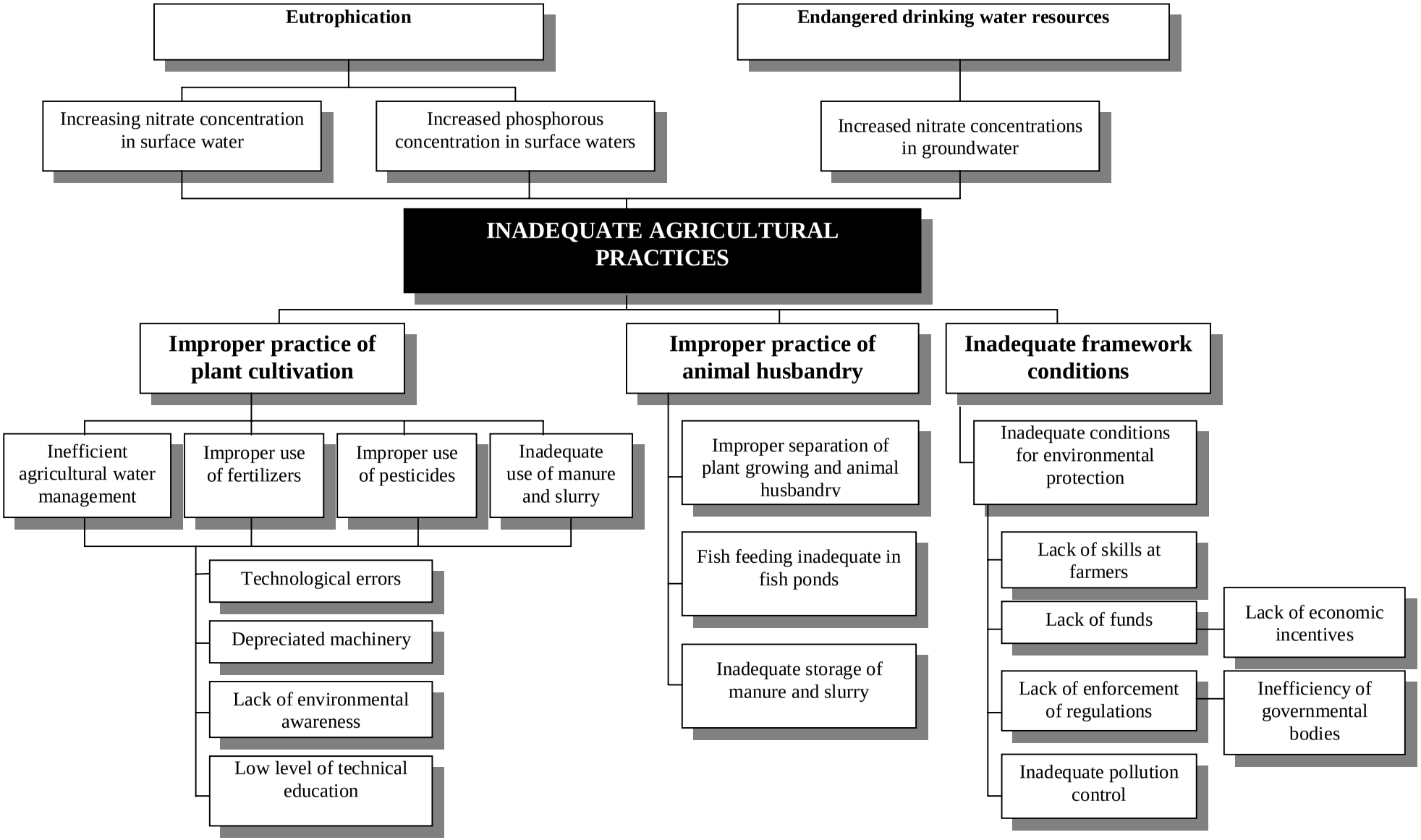
b. Concerning **deterioration of water quality in ground waters:**

- infiltration (leaching) of nitrate
- possible deterioration of drinking water resources

Among environmental effects listed above, plant production contributes mostly to diffuse (non-point) source loads, while animal husbandry causes point-source pollution.

Problem Hierarchy

1. Agriculture and Forestry



3.1.3. Objectives, Expected Results and Actions

Taking into account the situation analysis and the problem analysis, the following objective has been defined for the agricultural and forestry sector:

"APPLICATION OF ECOLOGICALLY SUSTAINABLE AGRICULTURAL PRACTICES"

Three results/outputs have been foreseen to respond to the immediate objective:

- Implementation of ecological production practices
- Application of appropriate animal husbandry practices
- Reinforcement of institutional capacities

(i) Implementation of ecological plant production practices

In order to implement ecological plant production practices, several activities will be necessary in the following fields:

- system of strategic planning
- sustainable plant production , water and land management and ecosystem protection
- legal frame
- economic incentives

It is foreseen to:

- **reconsider the system of strategic planning.** Concerning the strategic planning, it is desirable to **optimize the volume of plant production**. Therefore, the domestic and external market situation, as well as environmental protection principles have to be considered.
- **undertake measures for developing and applying sustainable plant production, water management technologies and appropriate land management and ecosystem protection.** First, it is necessary to assess previous pollution, second, to develop ecologically **sustainable plant production** and to promote **new technologies**. In environmentally sensitive areas, intensive agricultural practice has to be restricted. The economic losses of farmers and agricultural units ought to be covered from central funds. **Sustainable plant production practices**, having a minimal environmental load, need to be introduced through using technologies elaborated by research and development institutions.

  In order to record the environmental changes, it is necessary to widely implement the **soil monitoring system**. Environmental **damages**, inherited from the former system, have to be **assessed** and **eliminated** in accordance to the economic potential of Hungary. Furthermore, funds have to be obtained from foreign and international financial institutions. These measures should also facilitate the elimination of damages caused.

  It was agreed that the water related ecosystems should be protected with higher attention in the Danube river basin. The improvement of **ecomorphologic conditions** of small- and medium size watercourses should be included into the water quality action program.

  Specific attention was given to the **rehabilitation of the wetlands and floodplains** in the Duna-Dráva National Conversational Area. A part of that area - the Dráva Delta - is an endangered territory with high ecological value. It seems to be important to include this region into the group of hotspots in order to examine it in more details.

According to the concept that the water body, the riverbed and the bank of the river should be considered as one entity, higher attention should be paid to landscape harmonization and landscape planning

- **modernize and consistently enforce the legal frame.** It is equally important to modernize and enforce consistently the laws and regulations related to agriculture. **Legal harmonization with the EU** is in a process that needs to be completed as soon as possible. The municipalities have to increase their efficiency in the area of **control and supervision of the regulatory framework** in force. Therefore, it is necessary to implement national monitoring system.
- **elaborate, refine and apply economic incentives.** The driving force for the realization of the determined sector objective is the development of more efficient economic **incentives** and the introduction of environmental **taxes**.

(ii) Application of appropriate animal husbandry practices

In order to apply appropriate animal husbandry practices, it is necessary to undertake action in the following areas:

- system of strategic planning
- sustainable animal husbandry technologies
- fish farming practices
- storage and use of animal manure

It is necessary to:

- **reconsider the system of strategic planning.** Considering the strategic planning for appropriate animal husbandry practices, the domestic and external **market situation**, as well as **environmental protection** principles, have to be taken into account.
- **undertake measure for developing and applying sustainable animal husbandry technologies.** It is necessary to, firstly, assess **previous pollution** and later develop **sustainable animal husbandry** practices and promote new **technologies** in order to eliminate damages caused.
- Among the above-mentioned activities priority has to be given to the elimination of N and P loads to surface and ground waters, originated from animal husbandry farms, producing slurry. Those farms situated in the vicinity of streams, rivers, lakes, etc. need to be taken distinctively into consideration
- **introduce appropriate fish farming practices.**
- **develop proper storage and use of animal manure.**

(iii) Reinforcement of institutional capacities

Two areas where the capacities require reinforcement have been identified:

- institutional system
- human resources and public awareness

In order to reinforce institutional capacities, it is required to:

- **develop an institutional system.** The **institutional background** of spreading sustainable agricultural technologies (in the field of plant nutrition, plant protection and soil conservation), elaborated by domestic research institutions, should be established. It is equally important to study and adopt the **existing legal framework** for subsidizing the sustainable agricultural practice and to **encourage farmers and agricultural units** to work accordingly.

  Improvement of **authority control** and enforcement via environmental policy is also required. Measures to improve **domestic legislation** in order to harmonize it with EU legislation, have to be taken. Moreover, consequent application of environmental laws, definition of **clear scopes of the authorities**, as well as entering **international conventions** is necessary.
- **develop human resources and public awareness:** Agricultural research and education in Hungary have a strong and high level tradition. In this way, **the elaboration of sustainable technologies** and **education** of the farmers to conduct their activities in an environmentally friendly way can be realized. The **transfer of** this **knowledge** ought to be organized by educational and research institutions. All activities will be supported by the **media** and **public awareness** campaigns. It is crucial to involve the population when establishing sustainable agricultural production as an overall goal.

In addition to the above mentioned activities, it is foreseen to:

- encourage consultations which facilitate sustainable management
- implement strict technological requirements (quality assurance)
- intensify PR activity
- increase public awareness
- educate before imposing fines
- improve professional education.

3.1.4. Important Assumptions for the Sector

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

The important assumptions or external factors must be taken into consideration if the objectives defined at (the next) higher level are to be achieved. The following assumption at the **results/outputs** level, was identified:

- **Appropriate legal environmental and enforcement structures established.**

In the **activities** level the following assumptions were defined:

- **Information on the pollution, caused by plant production is accessible.**
- **Information on the pollution, caused by animal husbandry is accessible.**
- **Highly educated professionals on research, development and technology transfer are available.**

The recent legislation already provides a substantial base for the two first assumptions at the activities level.

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 impact indicators have to be used to assess the progress towards attaining the targets:

- **Among the substances loading the surface waters the concentration of the pesticide residues should be decreased to 75 % by the year 2005 at the estuary of the Zala and Zagyva rivers.**
- **Among the substances loading the surface waters the concentration of the fertilizers should be decreased to 90 % by the year 2005 at locations not affected by other polluters, e.g., at Asvanyraro.**
- **The concentration of slurry N and P load into surface waters should be decreased by 20 % by the year 2010 at the inlet of the Ipolytarnoc Agricultural Units' pig farm.**
- **The number of farm advisory staff, which successfully completes the extension service training should increase by 25 % annually. Thus, it can be ensured that approximately 95 % of the farm advisory staff will acquire the appropriate approach by the year 2003.**

3.2. Industry and Transport

3.2.1. Situation/Stakeholder Analysis

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

The members of the workshop agreed that the general contribution of industry to water pollution is influenced by the fact that its share from total wastewater production is 18% (cooling water excluded). Generally, all the factories have their waste water treatment plant or discharge their wastewater into the public sewer on the basis of a utility contract. The level of treatment should be increased in a lot of cases considering existing effluent regulations. Future needs should be taken even further into account. There was mutual agreement that, with respect to pollution reduction of the Danube River, the most important industrial sources are the chemical, oil, paper and steel industry, as well as the metallurgy.

Regarding the fact that the major target is the water quality of the Danube, water transport should also be taken into our considerations, together with logistical utilities. This includes harbors loading and unloading, maintenance and fuel supply etc., both on land and on water.

The transport of hazardous substances on the river shed can cause considerable harm for the surface waters entering the Danube. The statistics of these events show that this is a real danger not only with national but also transboundary effects.

Some other activities should also be examined as the heat contamination of the atomic power station plant at Paks. This issue will be further examined when discussing the major polluters.

An important remark came to light in the discussion. In the case of examining the activities endangering the Danube, we should not limit ourselves to the water only but we should also take into account the riverbed and the banks of the river as one entity, as a supra individual organization.

The industrial water pollution may be differentiated according to the way pollution is caused: as direct or indirect contamination or whether pollution occurs via soil or air.

3.2.1.2 Stakeholders involved

Three groups of different stakeholders interested in industrial water pollution reduction have been identified: organizations, polluters and affected.

There are institutions responsible for water pollution control and civil organizations, which are, although not responsible, but could, in certain cases, contribute to pollution control. The same refers to professional chambers, also non-governmental organizations, but having rights and responsibilities in order to control the activities belonging to their jurisdiction. The polluters themselves also belong to the affected parties and, those damaged by the water pollution, should be regarded too. Moreover, the auditors and users of the water environment were mentioned as organizations having a role in water pollution control.

Organizations

The following are organizations responsible for legal matters and pollution control. The institutions, having the responsibility of water related permitting are:

- the municipalities in the field of land use and usually regarding the permit for activity,
- public health agencies for health risk and working safety
- environmental agencies,
- river water authorities,
- national park inspectorates in their specific area of responsibility.

Lastly, the users of the environment were mentioned as organizations having a role in water pollution reduction.

Polluters

The number of potential polluters in the specific area chosen seemed to be too high to be examined inside the framework of the workshop. Thus, the members of the working group overviewed briefly the proposal of the industrial hotspots proposed by the experts. The proposal was approved but a further chemical company, BORSODCHEM, was added. The group proposed to include it into the group of industrial hotspots so that it can be examined in detail, in the form of project files.

The industrial working group examined further the following factories as major users of surface water environment. These factories were[1]:

- Balatonfûzfõ - Nitrokémia, chemical industry (1.1)
- Tiszaújváros chemical industry (TVK) (1.1)
- BorsodChem RT – Kazincbarcika (1.1)
- Százhalombatta, oil industry (MOL)

Moreover, the nuclear power station in Paks was mentioned because of its huge freshwater intake from the Danube, which is used for cooling purposes.

There was general agreement that other industrial pollution sources in this sector can certainly be found but the participants only had information about the mentioned factories.

[1] The numbers in brackets give reference to the interconnections regarding the further discussion.

Affected

The aquatic ecosystem is the most important element damaged by industrial pollution. The effects can hardly be separated from that of other sectors. The working group proposed that, beyond the detailed examination of the sectors mentioned, a multi-sector effect analysis is also needed. An example is the Danube-Dráva-water- related ecosystem, which is worth specific care.

The local population is also affected by water pollution depending on its water uses. The inhabitants of the Capital should be mentioned as they get the drinking water from bank filtration areas which are vulnerable and sensitive for human activities. Other important water uses are irrigation on the Great Hungarian Plain and bathing waters on recreational areas. Furthermore, industrial water uses are also important but their criterias towards water quality varies in wide range depending on the industry: from the strict quality requirements(e.g. food industry, electronics) to the less strict ones (e.g. cooling water). The needs of future generations should be considered ("Our grandchildren won't see it!").

Agricultural water uses could be affected by water pollution. Further, the interest of water supply companies, fishing industry, tourists and tourist services, as well as swimmers were mentioned. The members of the working group were not able to give enough proof to specify any direct effects or responsibilities, but agreed on the need for detailed examination of causative interrelationships.

3.2.1.3. Current Strengths/Assets

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

- **Industrial and energy strategy**

  It was mutually agreed among the members of the working group that a realistic industrial and energy strategy could be considered as an asset for water pollution reduction in the Hungarian part of the Danube river basin.

- **Legal background**

  Efficient legislation is a need for pollution reduction. Therefore, the group overviewed the existing regulation on the basis of information available in the framework of the workshop.

  The most important regulations, listed below, were defined as major tools of water pollution reduction:

  - Act on waste water and sewage fine
  - Environmental Act
  - Nature Conservation Act,
  - Act on Forestry
  - Mining Act,

  and all the respective enforcement orders belonging to the higher regulations mentioned above.

- **Technical knowledge**

  It was agreed that the technical knowledge necessary for pollution abatement is an important resource, which is basically available in Hungary. The know-how transfer is also an important resource, especially in the field of pollution abatement techniques (BAT, BATNEEC).

- **Public environmental awareness**

  Increasing public environmental awareness can give a real input for pollution reduction activities, too.

- **Financial resources**

  Financial resources play a major role in all above-mentioned activities. The most important among them is the own source of the water user in relation with the polluter-pays-principle. It was common view that the State should maintain its role in financing water pollution reduction efforts, even in the industrial sector, in the form of the existing State funds, such as:

  - Central Environmental Fund,
  - Water Fund,
  - Specific- and Target-oriented Funds.

  The Foreign help can give further input for pollution reduction activities in Hungary in the form of international funds, loans, financial and technical assistance (PHARE, GEF/UNDP, bilateral co-operation etc.)

- **Non-governmental control**

  Non-governmental control can help keeping water pollution abatement issue in the middle of interest for all parties.

3.2.1.4. Analysis of Transboundary Effects

Some effects have not only national but also transboundary effects. These are recipient overloads, accumulating pollutants (e.g. heavy metals) and bio-concentration of toxic substances. The direct responsibilities of different sectors can not be separated; only the integrated effects can be examined as it appears in the river. The affected downstream countries are Croatia (Transdanubian region), Yugoslavia (The region between the Danube and Tisza).

3.2.2. Sector Problem Analysis

3.2.2.1. Core Problem

The water quality of the Danube River System is adversely affected by industrial and related transport activities. As a result of these activities, significant pollution load enters into the recipient water bodies, specifically from the units of the chemical and petrol industry and also from related transport supplies.

The participants have retained the following core problem for the industry and transport sector:

“SIGNIFICANT POLLUTION FROM INDUSTRY AND TRANSPORT”

3.2.2.2. Causes Leading to Environmental Problems

The causes leading to significant pollution from industry and transport are:

- inappropriate technological conditions
- institutional constraints
- economic and financial constraints

Most of these direct causes are common for the chemical and petrol industry, as well as for transport activities supplying these industries. Special regard is given to the transport by navigation because of its direct pollution effect on the river system.

There are other direct causes affecting only one of the industrial sectors discussed. In the case of the petrol industry, for example, a potential cause for the pollution of subsurface water bodies is when wastewater is pumped back into subsurface strata to maintain the necessary pressure in the layer.

(i) Inappropriate technological conditions

Concerning the industry and transport sector, it was recognized that one of the most important direct causes of water pollution is **inappropriate technological condition** in this respect. These conditions usually generate major problems when trying to maintain environmentally friendly operations. The participants emphasized that technology should include not only production processes but also necessary treatment technologies of liquid and solid waste materials (emissions) which are released to the recipient environment. Inappropriate technological conditions are reflected in the following causes:

a. Technological regulations not respected

Pollution impacts on the recipient aquatic environment are often increased when strict requirements of the production technology are not met. Such a failure could significantly increase the quantity of dangerous pollutants in the wastewater, causing problems in the efficiency of pre-treatment before its discharge into public sewage systems or, at the wastewater treatment plant of an industrial unit, before discharging the emission into the recipient river.

b. Process failure/breakdown

Breakdowns or failures of process technology could be the source of an unexpected high pollution load such as accidental water pollution incidents. To avoid such incidents it is outstandingly important to be prepared. This includes the continuous maintenance and the existence of detailed emergency plans, etc. The lack or poor quality of these preventive measures represents a potential danger of pollution incidents.

c. Improper disposal of solid and liquid wastes

This is a rather frequent cause of pollution. Emissions are released into the environment without meeting the regulations and issued standards of the competent authorities. In this respect, especially the naval transport should be considered because it is believed that the frequent oil pollution incidents on the Danube River system from unknown polluting sources are mostly caused by naval transport vehicles.

d. Obsolete technologies

The lack of up-to-date and environmentally friendly production technologies usually has unfavorable consequences, both in economic and environmental protection areas. Economic disadvantages are the higher costs caused by high energy and water consumption, while environmental disadvantages are the relatively high amount of waste water, emission containing high amount of dangerous, toxic or non-degradable pollutants. Serious problems arise in the disposal of solid and liquid wastes to meet the related regulations.

e. Specific pollution related transport

Concerning the transport sector there are also some specific causes of pollution:

- Failure of product transport lines

  The breakdown or failure of production lines always cause severe water pollution problems when the transported media enters the environment. Causes of such incidents could be the lack of necessary maintenance, or the lack of guarding against unauthorized actions. The operation rules of transport lines have to be met properly.

- Pollution by navigation and its logistic hubs

  Oil pollution incidents are frequently observed on the navigable part of the Danube River and, in most cases, the discharges can not be identified, as mentioned above. The lack of necessary developments in the river harbors to store and treat oily wastes also contributes to this kind of water pollution.

(ii) Institutional constraints

Institutional constraints are reflected in the following causes:

a. Lack of an efficient driving force behind pollution reduction activities of the polluters

It was agreed that shortages of institutional capacities are the major reason for industrial water pollution today in Hungary. This can generally be regarded as a lack of an efficient driving force behind pollution reduction activities of the polluters. In some circumstances the social, political and economic considerations are playing the governing/controlling role and have given priority instead of the environmental ones

b. Limited enforcement capacity of the existing regulations

Some experts believed that the limited enforcement capacity hinders the utilization of possibilities of the existing regulations.

c. Lack of clear distinction of the responsibilities among authorities

The lack of clear distinction of the responsibilities among the different authorities weakens the institutional capacity. The fines have lost their restraining efficiency as major driving forces behind pollution standard compliance. The survival of the old approach can sometimes be experienced when the users of the environment try to solve their wastewater pollution reduction problems in a political way, with reference to their importance regarding production and employment.

(iii) Economic and financial constraints

Economic and financial constraints are reflected in the following causes:

- **Lack of baseline funding**

  These constraints represent the main factor to solve the above problems within the selected three industrial sectors. A significant number of industrial units have no available base-line budget to finance the necessary development of their technologies or upgrade them.

  On the other hand economic incentives are not strong enough (or missing in certain cases) to force the industry to carry out modernization in technologies.

- **Lack of economic incentives**

  It is clear that money and capital shortage can be a direct institutional reason for limited water pollution reduction efforts. It is felt to be more characteristic that the level of interest in pollution investment extends to the extent of state subsidies due to the lack of obligation regarding the treatment of municipal wastewater. The limited affordability of wastewater management services is a real limiting factor in Hungary.

- **Lack of public awareness**

  Public awareness is not too high regarding the problems connected with the lack of proper wastewater utilities. A good example is that local authorities prescribe closed wastewater storage tanks in areas with no sewage system. About 95 % of these tanks work as illegal onsite infiltration facilities, as the wastewater transportation expenses are unaffordably high. There was no example of non-governmental action regarding this issue in spite of the fact that this practice is extremely dangerous for underground drinking water resources on vulnerable areas. In environmental forums the public shows sometimes indifference towards water quality when their drinking water is not directly endangered by water pollution.

3.2.2.3. Environmental effects

The members of the working group agreed that environmental effects of industrial pollution may be differentiated according to the fact that some of them are characteristic for all industrial activities examined here, others are relevant only for one or more of the mentioned industries. These differences will be referred to later according to this differentiation.

Primary effects

The usual effects of the examined industrial activities are that persistent pollutants appear in the water environment (chemical, paper, oil and steel industry). Direct examples can hardly be found due to the weakness of the effluent monitoring system.

According to the understanding of the working group, the increasing salt concentration is connected with the examined industries, especially with the chemical, and steel industry. seemed to be important from this point of view. The BORSODCHEM Company was mentioned as a specific example, where the disposal of concentrated salty wastewaters causes problems in the downstream water uses.

Oil pollution causes also serious effects on the environment. The responsible sector is not only the oil industry but also other industries make a considerable contribution. Here, the role of water transport was emphasized, with special regard to the illegal release of oil and ballast water of the ships.

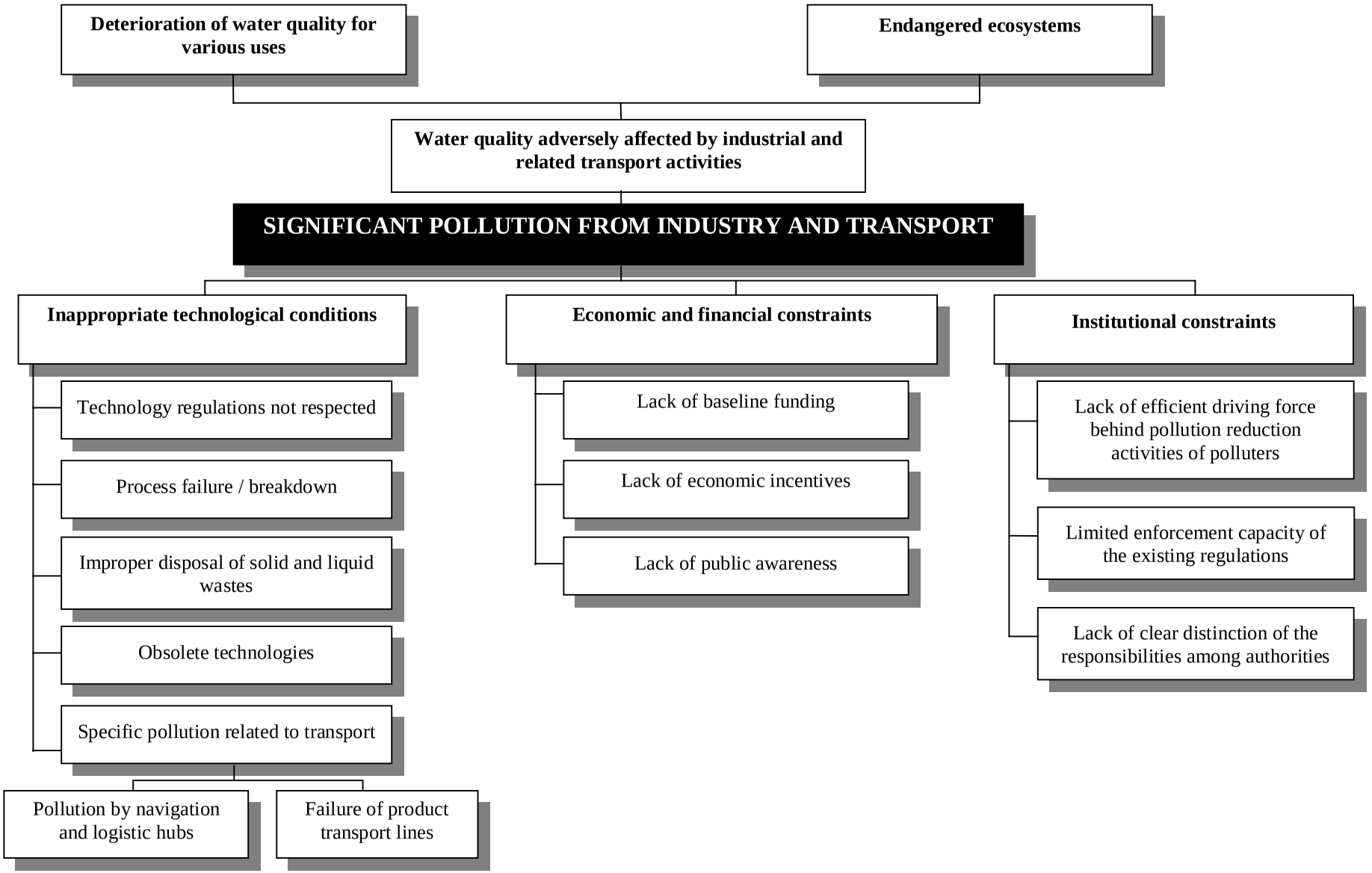
The toxic pollution of surface waters may be partly owed to the examined industries (chemical, oil and steel industry and hazardous material transport)

The general amenity of surface waters is also affected by industrial sector. This should be added to the inventory of effects, as the working group had a strong view that the state of surface waters should be evaluated together with the river bed and surrounding landscape.

Secondary effects

Secondary effects of pollution load discussed before are the recipient overload, potentially accumulating pollutants (e.g. heavy metals) and bio-concentration of toxic substances. The results of these effects can be seen as problems connected with limited satisfaction of the water needs and ecosystem impairment.

Problem Hierarchy
2. Industry and Transport



3.2.3. Objectives, Expected Results and Actions

Considering the above-mentioned problem, the following sector objective has been retained:

"**ACHIEVEMENT OF ECOLOGICAL SUSTAINABLE INDUSTRIAL PRODUCTION AND TRANSPORT**".

In order to achieve the immediate objective three results have been expected:

- Application of appropriate technologies and pollution reduction measures in the chemical industry
- Application of appropriate technologies and pollution reduction measures in the oil industry
- Control of pollution from shipping and harbor activities

(i-ii) Application of appropriate technologies and pollution reduction measures in the chemical and oil industries

The results expected will be achieved by carrying out activities in the following fields:

- chemical and petrol industry.
- education
- legal framework, authority and civil control
- economic background

It is foreseen to:

- **develop technology in the chemical and oil industry.** This should be realized through the modification of **raw material uses** and encouraging **recycling/reuses**. Measures for minimizing **emissions** and implementing **pre-treatment systems** for main polluters will be taken. The development of wastewater treatment technologies for water protection purposes is of outstanding importance. Moreover, the **integration of wastewater treatment** into production technology should be considered too.

  The increase of separated sewage systems in industrial plants can be also considered as an important concept for wastewater reduction.
- **change attitude in education.** In this area it is retained to change the **concept of engineers' training**. Wide public education programs may increase the efficiency of water pollution reduction measures. These activities could be extended towards increasing public awareness, emphasizing the importance of environmental education within the family.
- **strengthen the legal framework, authority and civil control.** The most important action needed is to fill the gaps of regulation (environmental tax, modification of 3/84.regulation on wastewater fine, etc.) through **stricter regulations** and their enforcement. In order to strengthen the legal framework and authority control it is also foreseen to develop **technological limit** values and **monitoring**. In this way, the improvement of water quality in the recipient should be facilitated.

  There was general agreement that the development of legislation should be connected with the increase of necessary control capacities and a clear definition of the scopes of different authorities determined by the regulation.

  Hungarian regulations should be harmonized with EU regulations. The ISO standard system should also be adopted. The water pollution control should change the end-of-pipe-concept towards checking the material balance of production technologies, with respect to water management.

The State should take specific responsibility for the so-called inherited pollution. This pollution is the result of industrial activities in the last fifty years, mostly due to the activities of former State-owned companies, as well as Russian- and Hungarian Military Corps.

Strengthening civil control will be facilitated through reinforcement of technical / professional background and **NGO responsibility**.

- **establish economic background.** It is recommended to **activate international funding** and to promote operating **information and consulting system**

The expansion of the product fee system could increase the interest for waste material recycling and, thus, reducing the pollution risk by this means.

The State should have an important role in **funding** the pollution reduction investment programs, according to foreign experiences. The development of the State subsidy system (Central Environmental Fund, Specific and Target-oriented Funds) was regarded as an important step to further increase the interest in water pollution reduction of the industrial sector.

State support should be extended to the environmental industry in an indirect way, by providing secure markets for this sector.

The State should spend a higher percentage of the GDP on water pollution. The use of international resources for Hungarian water pollution reduction programs should draw greater attention.

(iii) Control of water pollution resulting from shipping and harbor activities

In order to achieve control of water pollution resulting from shipping and harbor activities it is required to:

- review, reconstruct and modernize ports and shipyards;
- strengthen the legal framework and authority for river transport control;
- establish an economic background to reinforce river transport under economic and ecological conditions.

A prerequisite of all of these activities is to ensure **information availability** for all stakeholders of pollution reduction in the industrial sector.

The participants had the strong view that international cooperation can lead to better general circumstances for industrial pollution reduction

Projects were proposed to support the implementation of the above activities and, in more detail, the realization of their important elements (see Annex 4).

3.2.4. Important Assumptions for the Sector

The selected industrial sector – consisting of the chemical and petrol industry and related transport services – has been analyzed in details and important assumptions have been generated. The assumptions were summarized and indicated in the planning matrix of the industry and transport. These assumptions concern external factors which are important for the success of the sector strategy but lie outside its scope and not under the direct control of the program. They may affect the implementation and long-term sustainability of the sector strategy.

The following assumptions have been identified at **results/outputs** level to achieve the sector objective:

- **EU-conform legal harmonization and structure is taking place (institutional side).**
- **Information regarding pollution is available for further actions (industrial side).**

The following assumptions at the **activity** level have been determined:

- **The authority transfers scientific knowledge as requirement to the users for consideration.**
- **The income of industrial units and also environmental fees cover the costs of the needed environmentally friendly developments (industrial side)**
- **Operation of monitoring systems in the chemical industry**
- **Readiness for cooperation of industrial companies**

3.2.5. Impact Indicators for Sector Results

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

The following impact indicators were designed to assess the progress towards attaining the overall sector objectives for the industry and related transport in the Hungarian part of the Danube basin:

- **The quality of the recipient waters with regard to COD, total salt and ammonium should improve by one quality class by components by the year 2010 in the River Sajó at Kazincbarcika, in the River Tisza at Tiszapalkonya and in the Séd-Nádor Channel system.**
- **The water quality concerning THP and inorganic micro-pollutants should improve by one quality class by the year 2010 in the River Tisza at Tiszapalkonya and in the Danube at Százhalombatta.**
- **The frequency of observation of oil film floating on the surface of water should be reduced to 0 by the year 2010.**

3.3. Municipal Sector

3.3.1. Situation/Stakeholders Analyses

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

The members of the workshop agreed that the municipal sector represents one of the most important sector leading to both surface and ground water pollution.

The importance of the municipal sector in connection with water pollution is based on the fact that the amount of municipal wastewater discharged into surface waters exceeds 80% of the total amount of wastewater to be treated. This amount is approximately four times higher than the industrial wastewater to be treated, which is discharged directly into surface water and several

thousand times higher than the wastewater discharge originated from agricultural point sources. (The amount of industrial discharge to public sewage systems is half of the amount discharged directly to the rivers). In addition, it must be mentioned that the rate of the suitable treated water is the same, both in the case of industrial and municipal wastewater, about 40%. Examining the question from the other side, the importance of water contamination originated from the population is shown by the fact, that the 60-70% of nutrient load (N,P) is the result of population load.

Within the sector, municipal wastewater discharge is the major pollution source. Municipal wastewater discharge consists of wastewater discharged by households, institutions and industrial facilities. Untreated wastewater discharge of households, institutions and industries in canalized areas cause significant surface water pollution. The majority of sewage is either not purified or if it is, not adequately. (The ratio of biologically treated municipal wastewater is less then 40%, while that of advanced treated municipal wastewater is below 3%). Especially the capital and some big cities lag behind.

Different kinds of activities result in waste water discharge by households: fulfillment of biological necessities, discharge of household chemicals, used edible oils, detergents and washing up liquids into the sewer, but also the cultivation of the household plots.)

Illegal wastewater release into the river system is not a rare event in Hungary.

Population originated pollution in ground water is important. Because there is a lack of sewers, households use the method of desiccation. While 96-97 % of the population lives in areas with public utility water supply, the percentage of those connected to public sewage systems is only 45%, the gap being more than 52%.

Pre-treatment processes of industrial plants are often missing.

There was a general agreement that an important institutional or public service discharge source is hospital waste.

Another source of pollution is that fact that surface rainwater is conducted into the recipient (e.g. in case of intensive precipitation).

Municipal solid waste discharges also mean a polluting activity. Only 30 % of the landfills are conform to the currently valid public sanitation and environmental protection regulations. The problem is similar in regard to the unsuitable treatment of septic tanks.

3.3.1.2. Stakeholders Involved

Three groups of different stakeholders involved in municipal water pollution reduction have been determined: organizations, polluters and affected.

Organizations

The main task of government organizations is to ensure the legislative background. The control of pollution belongs to regional authorities (environmental, water and health authorities). The municipalities are responsible for local issues, such as sewage service and waste management.

Since 1990, local governments are responsible for the tasks connected with water, sewage and municipal waste service, as well as population activities have got to the authorization of local governments. It was recognized that most of the environmental problems are of local or regional character, so that local governments must play a greater role.

The NGOs play an important role in the decision-making process on environmental solutions. Professional associations have significant tasks regarding environmental technologies. Environmental education should begin in kindergarten. Schools and universities provide well-trained environment experts.

The media and telecommunications play an important role.

Well-trained and equipped sewage and waste treatment plants and water utility operators have a great effect on the level of sewage service and the aquatic environment.

Polluters

In cities, the main polluters are the inhabitants, in rural areas the stock farmers. There are services, which also have a high waste discharge into the sewage system (e.g. hospitals, laundries carwashers, filling stations etc.). Moreover, Illegal disposal of wastes means a great problem. Operators of wastewater treatment plants can also cause pollution via inefficient operation activities. Big cities count as the biggest polluters (Budapest, Szolnok, Szeged, Dunaújváros, Gyor).

Affected

Among the affected are the people themselves but also the human environment (quality of life). Special emphasis could be put on local inhabitants and people living in downstream settlements.

Different water users, not only water supply, but also industry, agriculture, sport and recreation activities, belong also to the group of affected stakeholders.

Last but not least, the aquatic flora and fauna are also threatened.

3.3.1.3. Current Strengths/Assets

In the municipal sector, the following assets and achievements have been determined:

- **Professional knowledge**
  In addition to education and R+D (Research and Development) background, introduction of up-to-date technologies and professional experiences are also important. Professional knowledge and expertise are necessary for pollution reduction and it is already an important resource in Hungary.
- **Technologies**
  Wide range of possibilities related to water quality control, such as wastewater treatment and reduction technologies, are basically available in Hungary.
- **Financial resources for development and operation**
  The environmental goals are hard to realize without financial resources and state support. In Hungary there are different kinds of subsidies (e.g. targeted subsidy), funds (e.g. Central Environmental Fund, Water Fund) and economic incentives for promoting environmental protection investments.
- **Public awareness**
  Public awareness also plays an important role from the point of view of responsibility, information and recognizing the problem of water pollution.
- **Legal approach**
  Compliance of acts and rules is necessary for the environment. There are several new and updated regulations related to water protection in Hungary but the enforcement of those regulations is rather weak.

3.3.1.4. Analysis of Transboundary Effects

The environmental consequences of municipal activities result also in transboundary effects. Hungary transfers polluted water to the neighboring (downstream) countries through three major rivers (Duna, Tisza, Dráva). The wastewater treatment in Szeged aims at finding a solution to this problem. Beyond this permanent pollution there are accidental ones (e.g. spilt oil or algae bloom caused by unfavorable meteorological situations).

3.3.2. Sector Problem Analysis

3.3.2.1. Core Problem

The core problem identified in the municipal sector is:

"SIGNIFICANT POLLUTION FROM THE MUNICIPAL SECTOR"

3.3.2.2. Causes Leading to Environmental Problems

Direct causes of significant pollution from the municipal sector are:

- improper handling of municipal solid waste,
- improper handling of municipal waste water

(i) Improper handling of municipal solid waste

Improper handling of municipal solid waste is caused by a **lack of appropriate disposal sites for solid wastes**. The lack of suitable disposal of solid wastes has a negative effect on the environment (soil, water, vegetation).

Only 30% of the 2700 community disposal sites meet the regulations. Free disposal capacity is low and no modern procedures are applied. There is no legal requirement and practice for systematical recultivation of abandoned landfills. Significant portion of landfills (20-30%) is located in areas dangerously close to the groundwater table or surface waters. Part of the problem is also, that the **wastewater sludge disposal practices of the municipalities are not appropriate**.

In the opinion of the working group the reason for improper handling of municipal solid waste is also the lack of financial resources and inadequate public awareness. Inadequate solid waste management of municipalities is a critical activity leading to pollution.

(ii) Improper handling of municipal waste water

The improper handling of municipal wastewater is caused by:

- failures of public system
- improper individual disposal of household waste waters

These two main elements - the failures of the public system and the inadequate disposal of household wastewater by individuals - are important for the problem of improper handling of municipal liquid waste.

a. Failures of public system

The reason for the failures of public system is closely related with discharges of public service waste waters and industrial waste waters into municipal sewer without pre-treatment and discharges from households.

Municipal wastewater discharge is due to untreated wastewater of public services, industrial facilities, household causes pollution to the environment. It is either because wastewater is discharged into the recipient or because there are no wastewater plants, or, in the case of existing wastewater plants, because the applied waste water treatment practices are insufficient.

Lack of wastewater treatment is the most important cause of surface water pollution in the municipal sphere. Another reason for municipal pollution is the discharge of households resulting from illegal practices of discharging either to the separated precipitation canal or directly to the sewer. The underlying factor to this behavior is the unwillingness of the individuals to comply with legal regulations.

b. Improper individual disposal of household waste waters

Since only 45 % of the households are connected to the sewage system, the majority of household waste water is desiccated, however, it is characteristic in Hungary that **septic tanks are very often improperly managed** causing infiltration of waste water into the ground and subsurface water. The low level of canalization significantly contributes to inappropriate desiccation of household wastewater. In areas with canalization water pollution is caused by the **low level of willingness to connect to the municipal sewage system**, because people can hardly afford the high sewage prices. Therefore, there is generally a very low utilization of operating municipal sewers and waste water treatment plants, causing water pollution in Hungary

The very general cause for weak water protection performances is the lack of resources and possibilities, mainly the lack of financial resources. Recently, people's behavior and the lack of knowledge lead to inappropriate desiccation of household wastewater and illegal wastewater discharge.

Inadequate public awareness of the problem and of the consequences of bad habits and practices and the **lack of financial resources** for funding the required investments have been identified as two basic underlying causes, that affect each and every factor of municipal water pollution.

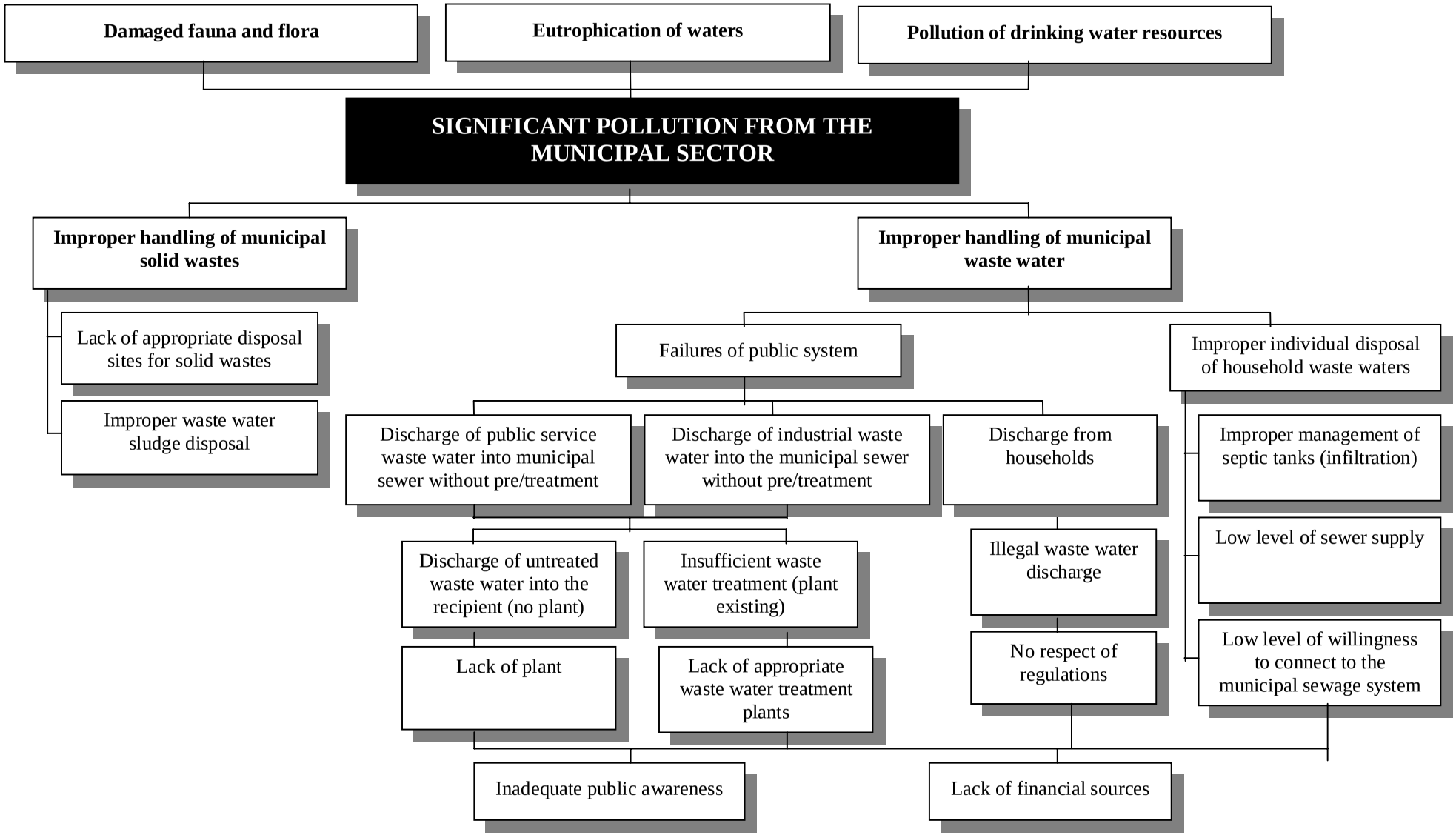
3.3.2.3. Environmental Effects

The main environmental effects are the following:

- pollution of drinking water resources
- eutrophication in surface water (algae bloom)
- damage to flora and fauna.

Problem Hierarchy

3. Municipality



3.3.3. Objectives, Expected Results and Activities

The objective for the sector is:

"IMPLEMENTATION OF APPROPRIATE MUNICIPAL WASTE WATER MANAGEMENT SYSTEM"

In order to achieve this objective two sector results are expected:

- Adoption of public waste water collection and treatment system
- Improvement of individual disposal of household waste water

(i) Adoption of public waste water collection and treatment system

To facilitate the adoption of public wastewater collection and treatment system and to decrease pollution it is necessary to develop activities in the following fields for the whole sector:

- institution development
- awareness raising
- legal regulation and enforcement development
- technological development and investment
- economic investment, provision of financial resources

It is necessary to:

- **develop an appropriate and efficiently functioning institutional system.** Institutional development means, on the one hand, the modernization of governmental and local authorities and institutions and, on the other hand, the development of organizational and institutional systems of public companies and public utilities. Three important elements are necessary to improve effectiveness:
  - increasing the quality of sewer service
  - improving the quality of operation of waste water treatment facilities
  - developing the system of authority institutions

  In connection with institution development, there are a lot of programs and projects ongoing. Also, other projects are suggested to be developed in order to improve institutional development. (See Annex Proposed Projects related to Activities)
- **raise awareness, education and training.** It is important to increase the interest on equipping the people with adequate information and knowledge. They can realize the importance of proper waste water treatment and the connection to the sewage system, wherever the system is available or, in case the system is not available, the importance of properly maintaining the septic tanks to avoid infiltration in non-canalized areas.

  The level of pollution in municipal wastewater depends on the behavior of the population. Important elements are:
  - improving vocational training and increasing the qualification level
  - involving public
  - transformation of customer behavior
  - information on alternative low cost processes
  - social and consumer control
- **strengthen and enforce the legal framework.** It is required to achieve the results in order to decrease significantly direct and indirect discharge of untreated wastewater into the Danube. It is necessary to improve legal regulation and enforcement. Feasible

regulations, implementation and enforcement of regulations including compliance control and increasing the frequency of authority controls help to reduce all the pollution causes deemed to be important by the group. This can be realized trough the important elements outlined below:

- passing the law on the protection of waters
- modernizing legal regulations
- defining target conditions and target dates for catchment planning
- improving the efficiency of enforcement
- individual treatment of polluters

- **develop the often obsolete technologies.** Introducing up to date technologies for the treatment of waste water and implementation of pollution control investments should be realized through the following important elements:
  - building waste water treatment facilities
  - modernizing waste water treatment facilities
  - treatment and remediation of liquid wastes
  - building environmentally sound individual waste water treatment facilities
  - wider application of waste water reuses
  - introduction of alternative low cost waste water treatment technology
  - introduction of natural waste water treatment
  - pre-treatment of municipal rainwater
  - improving background industry
  - Improving industrial pre-treatment
  - Improving R+D

  The group agreed that the implementation of water pollution mitigating investments is one of the most important sets of measures.

  Programs for wastewater sewerage, waste water treatment and investments for water quality control are elaborated, and have already started. A lot of investments must be finished in the time frame of these programs. The establishment and scheduling of the execution of these programs depend, to a great extent, on the amount of Hungarian and international financial resources, on the fund raising and the social-economic conditions. The order of magnitude of the sewage system and treatment program of Hungary can be estimated through the fact that until 2010 about 1000 milliard HUF must be ensured.

  It was agreed that a very new program is needed in order to improve individual treatment of household waste water:

  The general opinion of the working group is that greater attention must be paid to modern, cheap and environmentally sound wastewater sewerage and treatment methods.

- **develop economic incentives.** Economic investment, provision of financial resources encourage the implementation of wastewater treatment investments. Other pollution control investments are also important for this activity.

  This activity can be connected to every proposed program as, in the absence of economic incentives and suitable financial resources, the sector objective and results cannot be reached.

  An important group of measures contain economic incentives. With incentives creating appropriate interests, financial resources could be established. Also, the attitude of the population could be changed. Since pollution reduction in this field could be achieved primarily via government investments (construction of municipal sewerage and wastewater treatment facilities), the subsidizing of municipalities is also necessary.

Through an appropriate price policy a system of water and sewer tariffs could be established. This pricing system, on the one hand, would ensure the increase of financial resources, while on the other hand it would influence the behavior of the population in a way that it improves their willingness to connect to the sewerage.

(ii) Improvement of individual disposal of household waste water

In order to improve individual disposal of household wastewater it is also necessary to undertake activities in the following fields:

- institution development
- awareness raising, education and training
- legal regulation and enforcement development
- technology development and investment
- economic investment, provision of financial resources

In addition, to achieve this result, it is also required to:

- encourage the development of public sewage systems where technologically and economically feasible
- provide incentives to households in order to connect them to the sewage system where available
- reinforce development and practice of using individual sewage systems (septic tanks)
- assure control of compliance in utilizing individual systems

3.3.4. Important Assumptions for the Sector

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

In the municipality sector the following assumption at the **result/output** level has been identified:

- **Appropriate administrative and financial structures established**
- **Administrative integration of environmental protection and water management**
- **Appropriate legal and economic regulations**
- **Efficiency of the system of controlling institutions and tools**

At the **activities** level the following assumptions were defined:

- **Social commitment towards finding a solution to the problems**
- **Improving the solvency of the population**
- **Interdisciplinary approach**
- **Financial improvement of the municipalities**
- **Coordinated state funds of appropriate size**
- **Appropriate educational institutions**
- **Improving/increasing the availability of target-oriented loans.**

3.3.5. Impact Indicators for Sector Results

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

With the help of the following indicators the achievement of objectives and sector results can be measured and verified:

- **Out of the microbiological indicators the coliform number should be reduced to "Grade III" by the year 2010 at the town of Mohács (southern border section).**
- **By the year 2010 the biological oxygen demand (BOD) at Mohács should remain under 5 mg/l.**
- **As a result of implementing wastewater treatment facilities for settlements with population of above 2000, the proportion of treated/untreated sewage will be 67% in the catchment area by 2010.**
- **The proportion of treated/untreated wastewater in the case of indirect discharge into the Danube will be 90%, in Budapest 60 % and in the four selected cities (Szeged, Szolnok, Gyor, Dunaújváros) 100 %.**

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. Middle Danube

1.2. Sed-Nador

1.3. Altaler

1.4. Balaton

1.5. Upper Tisza

1.6. Maros Szeged - Tisza

Identification of River Basin Areas **1. Middle Danube** **Annex 1.1.**

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
➢ RSD; water level control independent of the main branch ➢ the second largest side branch of the Danube within the sector: RSD ➢ reduced outflow, small watercourses ➢ highland and lowland conditions ➢ RSD: bed conditions ➢ Upper section: narrow and shallow ➢ Middle section: dredging is required ➢ Lower section: wide and large water-plane ➢ side branch damming: 57 km ➢ constant slope ➢ gradual bed subsidence ➢ Danube, Budapest: ➢ MediumQ ~ 2300 m^3/sec ➢ LowQ ~ 800 m^3/sec ➢ HighQ ~ 8000 m^3/sec ➢ Relatively stable water level ➢ large discharge volumes compared to used water/waste water releases ➢ separates neighboring regions ➢ being "under" Budapest ➢ luss walls (City of Dunaújváros) ➢ Danube Gravel Bed: important drinking water base	➢ varying load along the sector due to varying density of the population ➢ bridges: primarily in Budapest ➢ ports: primarily in Budapest ➢ various settlements: urban, recreational (RSD), rural ➢ very dense population, urbanized ➢ Budapest 2,000,000 people ➢ 300,000 m^3/d min ~ 3,5 m^3/sec 200 t/d ➢ ??? ~ 2,3 kg/sec ➢ ΔC_{COD} = 2300/2300 ~ 1 g/m^3 ➢ extremely important town within the sector: Budapest ➢ the branch has an upper limit with respect to loadability ➢ other important cities: Százhalombatta and Dunaújváros ➢ Dunaújváros: 40,000 people, Q_{ww}=6.000 m^3/d ➢ ~ 69 l/sec, dilution 29,000-fold ➢ heavy waste water load ➢ Budapest: industrial center ➢ Q ~ 200-400 thousand m^3/d ➢ mixed industry ➢ many make their living from tourism ➢ relatively low level of unemployment ➢ appropriate employment ➢ personal income level: medium or above average	➢ heat pollution 12000 MW, heating ➢ dissolved pollutants ➢ nondegradable contaminants ➢ normally, incidental river pollution events in Hungary will not trigger transboundary effects ➢ nuclear station in Mohi? ➢ Paks nuclear power station? ➢ normally, effects of contamination from the "upper" countries will not reach the Budapest region (oil contamination) ➢ typical pollution: nutritive and microbiological	➢ food industry: abattoir, etc. ➢ chemical industry ➢ engineering industry ➢ water uses for irrigation ➢ irrigation ➢ fruit production ➢ pesticides ➢ navigation ➢ energy industry ➢ recreation ➢ tourism, week-end houses waste water treatment ➢ BUDAPEST: ➢ most of the industrial waste water is released into the municipal sewer ➢ waste water releases ➢ waste disposal ➢ leather industry ➢ paper industry ➢ gravel mining around the area ➢ iron works ➢ cement works ➢ infiltration from industrial soil contamination

Identification of River Basin Areas **2. Sed – Nador** **Annex 1.2.**

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
➢ main activity: industry ➢ lands of good quality ➢ watercourses of domestic origin ➢ highland watercourses ➢ low discharge, no natural water supply, diluting water is missing ➢ karstland ➢ harmful decrease of karstwater level	➢ highly populated, urban areas ➢ better than average living standard ➢ "black" tenure of land ➢ large villages ➢ developed towns (Székesfehérvár, Veszprém, Várpalota) ➢ size of population is stagnant	none	➢ fertilizers (nitrate) ➢ ammonia ➢ Nitrokémia (company) ➢ aluminium industry ➢ water needs: fishing farms, irrigation ➢ chemical industry ➢ nature conservation

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
➢ Lake Tatai-Öreg stormwater storage ➢ domestic watershed ➢ Vértes Landscape Conservation Area ➢ highland watershed ➢ woodland ➢ agriculture is important ➢ human impact on the flow ➢ karstland ➢ harmful decrease of karstwater level ➢ intensive flood waves	➢ typical rural area ➢ larger than average villages ➢ size of population is stagnant ➢ unclear ownership ➢ unemployment due to shutdown of the mines ➢ decreasing unemployment ➢ developing towns: Tatabánya, Oroszlány, Tata	none	➢ mining industry ➢ engineering industry ➢ significant pollution from non-point sources ➢ significant tourism (Lake Tatai) ➢ Lake Tatai-Öreg: fishing, recreation, stormwater storage

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
HYDROGRAPHY ➢ area: 595 km^2 ➢ large and shallow (average depth 3.0 m.; maximum depth: 11.0 m) ➢ coastline: 230 km; from which residential areas along 100 km. ➢ Water level control ➢ "two lakes", "channel", "tube" ➢ varied (north: primarily hilly, south: highland and lowland) **GEOLOGY** ➢ geological inclination, reasoned for the depth of the northern and southern coasts **FACTORS MODIFYING THE WATER QUALITY** ➢ Kisbalaton -"treatment plant" ➢ Significant surface infiltration ➢ Nutriment accumulation effect due to the characteristics of basin ➢ Different types of coastal "development" ➢ Prevailing wind direction: N, NW ➢ Basin **WATERSHED CHARACTERISTICS** ➢ watershed area approx. 12.000 km^2 ➢ Zala approx. 6000 km^2 ➢ AREA: 600 km^2 ➢ Amount of water 2.109 m^3 ➢ tributaries: ➢ Zala approx. 6 m^3/sec ➢ Smaller watercourses appr. 6m^3/sec ➢ short waves, specific wind direction ➢ average througflow: 10 years, ➢ faster during dry years ➢ output: through the Sió Canal	**COASTAL ZONE** ➢ used for seasonal tourism ➢ permanent population vs. holiday season population (overloading!) ➢ varied burden due to the season ➢ high seasonal population ➢ increasing pollution in the coastal cities ➢ great number of tourists ➢ business based on tourism ➢ well-off people ➢ people seasonally visiting the population of nearby areas **BACKGROUND WATERSHED** ➢ lower supply level in the watershed areas located away from the lake as compared to that of the coastal zone ➢ agricultural area	none	**AGRICULTURE, FOOD INDUSTRY** ➢ fishing ➢ reed cutting ➢ navigation ➢ shipbuilding industry ➢ agricultural activities in the watershed (infiltration of nutritive substances) ➢ fruit and vegetable growing ➢ wine production ➢ dilute manure ➢ **TOURISM, SPORT** ➢ significant tourism ➢ water sports ➢ fishing ➢ recreation **INDUSTRY** ➢ meat factory ➢ significant industrial activity in the watershed of the Zala River (waste water releases) ➢ transfer of industrial waste waters to another watershed (Balatonfűzfő) ➢ chemical industry **MUNICIPAL SERVICES** ➢ City of Zalaegerszeg: 16.000 m^3/day ➢ Pollution mainly of municipal and partly of industrial origin ➢ Relatively developed public utilities (especially along the coast) regional canalization ➢ Collection and removal of the waste water from the watershed (implemented only in part) ➢ Anti-mosquito treatment ➢ Waste treatment, drying

Identification of River Basin Areas **5. Upper Tisza** **Annex 1.5.**

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
➢ Medium section characteristics **AREA** ➢ area appr. 4.000 km^2 ➢ equal to 5% of the total area of Hungary **RIVERS** ➢ Tisza, until the City of Tiszabecs ➢ Sajó, Túr, Szamos, Kraszna, Lónyai ?? ➢ Bodrog, Hernád, Bódva ➢ endangered drinking water base ➢ two third of the watershed of the Túr, Szamos and Kraszna Rivers belongs to Romania ➢ Latorca, Ung (Ukraine) ➢ Slovakia: Ondava-Tapoly ➢ Nyirség sand plateau ➢ annual rainfall: appr. 700 mm ➢ Bodrog : Q = 104 m^3/sec ➢ Kraszna: 4,81 m^3/sec ➢ average temperature in August beyond the border (Romania): 14°C ➢ average temperature in August: 21°C	➢ villages ➢ emigration ➢ crisis area ➢ disadvantaged cities are located primarily on the left bank ➢ unemployment above the national average ➢ Poorly qualified work force	➢ water quality is determined by transboundary pollution ➢ organic BOD (Slovakia, Romania) ➢ filiform fungi (Slovakia) ➢ Túr River - heavy metal (untreated mine water) ➢ Kraszna River - organic pollution - filiform fungi (food industry) ➢ Szamos River - organic pollution from Deji Paper ➢ Works Co. - contamination of municipal origin, ➢ City of Szatmárnémeti ➢ hydrocarbon (Slovakia, Romania) ➢ heavy metal (Slovakia, Romania) ➢ high salinity (Romania) ➢ oil (floating) (Ukraine)	➢ intensive fruit production (chemicals) ➢ stock-farming (dilute manure) ➢ "extensive" type agriculture (reduced use of fertilizers) ➢ water uses for irrigation (Eastern Canal) ➢ municipal waste water ➢ chemical industry: ➢ Borsodchem ➢ Sajóbábony ➢ TVK ➢ food industry (untreated waste water) ➢ thermal station (sludge water) ➢ City of Záhony: unavailable alluvial fan under the surface

Identification of River Basin Areas **6. Maros Szeged -Tisza** **Annex 1.6.**

Physical–Georraphical Characteristics	Socio-Demographic Characteristics	Transboundary Effects as Perceived	Human/Economic Activities
➢ Békés and Csongrád County ➢ the warmest region in Hungary ➢ 20% of the watershed is in Hungary, 80% is in Romania ➢ highest number of sunny hours in Hungary ➢ lower section characteristics ➢ extremely variable discharges (Maros) ➢ good water quality under the surface	➢ extensive rural areas ➢ poor people ➢ concentration in big cities (Szeged) ➢ diminishing number of inhabitants	➢ pollution of the Maros River determines water quality of the Tisza River ➢ Maros: ammonia, nitrite-nitrate contamination ➢ high heavy metal content ➢ high salinity	➢ fruit production (chemicals) ➢ stock-farming (dilute manure) ➢ food industry: Pick, canning factory (untreated waster water) ➢ light industry (textile, rope) ➢ significant hydrocarbon production ➢ municipal waste water, ➢ discharge into the municipal sew ➢ industrial waste water ⇒ discharge into the municipal sewer ➢ no waste water treatment plant in Szeged

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

2.1. Agriculture and Forestry

2.2. Industry and Transport

2.3. Municipality

Situation/Stakeholder Analysis Leading to Water Pollution in Specific areas 1. Agriculture and Forestry Annex 2.1.

Activities leading to water pollution	Stakeholders			Assets And achievements	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	**Polluters**	**Affected**					
PLANT CULTIVATION ➢ application of pesticides ➢ application of fertilizers - viticulture - fruit growing - plant growing on arable lands ➢ large scale production - farming (erosion) - changes in the owner-ship and economic conditions ➢ agricultural water management - inland water management - irrigation –implement highland storage - flood protection **STOCK BREEDING** ➢ stock breeding (manure disposal, ponds) ➢ fish farming ➢ dead wells **WETLAND MANAGEMENT** **FARMING WITH FOOD PROCESSING MAINTENANCE OF AGRICULTURAL MACHINES, TRANSPORT** ➢ waste oil from agricultural machinery ➢ chemical storage ➢ storage of empty containers of chemicals ➢ food processing (farm level) - cleaning - manufacture of diary products - abattoirs - transport ➢ agricultural buildings used as illegal disposal sites **IMPROPER FORESTRY (CUTTING AREAS EXPOSED TO EROSION** **IMPROPER GRASS/LAWN MANAGEMENT** **ILLEGAL WATER USES**	➢ legislative Parliament certain ministries: (M. for Environment and Regional Development, M. of Agriculture, M. of Finance, M. of Internal Affairs, M. of Labor, M. of Transport, Communication and Water Affairs) ➢ NGOs ➢ companies ➢ associations of companies ➢ agricultural factories ➢ consultants (village manager), etc. ➢ authorities ➢ scientific and professional organizations ➢ municipalities ➢ education, provision of information ➢ kindergarten => university ➢ WHO ➢ mass media ➢ chemical companies, environmentally friendly chemicals	➢ agricultural plants ➢ manufacturers and suppliers of fertilizers or pesticides ➢ agricultural cooperatives ➢ Biatorbágy Coop. ➢ Séd or Általér ➢ Nagytétény Pig Farm ➢ privatized, new incompetent owners	➢ human population - babies - descendants to be born ➢ water supply companies ➢ fauna and flora ➢ water users	➢ funding systems based on regional principle ➢ knowledge ➢ expertise ➢ respectable experts ➢ research institutes (Soil Research Institute) ➢ appropriate IT systems ➢ (computers, telephones, etc) ➢ publication of water quality data ➢ restricted financial resources ➢ non-governmental background for problem resolving ➢ local patriotism ➢ mass media	**WATER QUALITY IMPAIRMENT OF SURFACE WATERS** ➢ Fine particle sedimentation ➢ increasing nitrate ➢ concentration ➢ fish death ➢ eutrophication (algal boom) ➢ pesticide ➢ releases to surface waters ➢ overpopulation of certain species ➢ disappearance of other species ➢ endangering the local fauna ➢ ecosystem destruction (insignificant) ➢ reduction of biodiversity (insignificant) **WATER QUALITY IMPAIRMENT OF GROUND-WATER** ➢ infiltration of ➢ nitrate ➢ impairment to drinking water resources of the local population ➢ potential damages to the flora and fauna	➢ transboundary effects of eutrophication occurring in Hungary ➢ pollution of subsurface abstraction areas (transboundary abstraction areas) ➢ plant overproduction ➢ pollutant export	➢ lack of money ➢ lack of economic incentives ➢ erosion, deflation ➢ climatic ➢ factors ➢ lack of forests ➢ lack of environmental awareness ➢ lack of ➢ problem assessment (sources ➢ of pollution) ➢ inefficiency of the governmental bodies ➢ separation of the plant growing and stock-breeding activities (lack of manure use)	**PROHIBITION, FINES (NON-SUSTAINABLE)** ➢ improved authority control ➢ improving enforcement = environmental police ➢ authority control ➢ test cases ➢ shift of cultivation methods (arable land ⇒ grass, forests) on sites exposed to erosion **MANAGEMENT (SUSTAINABLE)** ➢ implementation of waste water treatment plants ➢ best available technology ➢ introduction of environmental taxes ➢ encourage consultations ➢ consultations facilitating sustainable management ➢ strict technological requirements (quality assurance) ➢ quality assurance **MIXED/INTERMEDIATE** ➢ legislation ➢ harmonization ➢ application of environmental laws ➢ introduction of economic incentives ➢ defining clear scopes for the authorities ➢ PR ➢ implementation of national monitoring system ➢ optimization ➢ funding ➢ international conventions ➢ increasing public awareness ➢ educate before imposing fines ➢ education (professional)

Situation/Stakeholder Analysis Leading to Water Pollution in Specific areas 2. Industry and Transport Annex 2.2.

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**					
INDUSTRIAL WATER POLLUTION ➢ (A) indirect pollution ➢ (B) direct water pollution - chemical industry (1.1) - paper industry (1.2) - oil industry (1.3) - steel industry, metallurgy (1.4) ➢ (C) pollution via soil and air **WATER POLLUTION FROM TRANSPORT** ➢ navigation, logistic centers on the coast (2.1) ➢ transport of hazardous substances (2.2) **LANDSCAPE POLLUTION**	➢ NGOs ➢ -chambers ➢ Permits: -municipalities -Public Health Agencies -National Park Inspectorates -Environmental Agencies -RWAs ➢ Auditors ➢ environment users	➢ Balatonfüzfő - Nitrokémia, chemical industry (1.1) ➢ Tiszaújváros TVK, (1.1) ➢ BC RT – Kazincbarcika (1.1) ➢ Százhalombatta - MOL,(1.3) ➢ Paks (energy industry) - chemical industry (1.1)	➢ aquatic ecosystems ➢ local inhabitants ➢ future („our grandchildren won't see it!") **WATER USES:** ➢ water supply companies ➢ fishing, agriculture ➢ suppliers of tourist services ➢ people on holiday, swimmers	➢ industrial and energy strategy ➢ legal background: ➢ regulations: - 3/84; 4/84 - 152/1995 - Environmental Act - Nature Conservation Act, - Forestry Act - 102/1996 - Mining Act,(respective enforcement orders) ➢ technical knowledge - know-how (BATNEEC) ➢ increasing public environmental awareness own resources (Central Environmental Fund, water funds, specific and target-oriented funds) ➢ financial resources international fund - financial, technical (PHARE, GEF/UNDP) ➢ non-governmental control	**GENERAL** ➢ recipient overload ➢ potentially accumulating pollutants (eg. heavy metals) ➢ bioconcentration of toxic substances ➢ unsatisfiable water needs ➢ ecosystem impairment **SPECIFIC** ➢ Hardly degradable pollutants (1.1-1.4) ➢ Increasing salt concentration (1.1; 1.4) ➢ increasing oil pollution (1.1;1.3; 2.1) ➢ toxic pollution of water (1.1, 1.3, 1.4, 2.2) ➢ „feeling" or aesthetic level (3)	➢ Croatia (Transdanubian region) ➢ Yugoslavia (Duna-Tisza) ➢ Recipient overload ➢ potentially accumulating pollutants (e.g. heavy metals) ➢ bioconcentration of toxic substances ➢ unsatisfiable water needs ➢ ecosystem impairment	**GENERAL** ➢ shortages of regulation ➢ lack of measures to force environmental compliance ➢ unclear scopes of authorities ➢ fines without restraining effect ➢ obsolete waste processing ➢ process limitations ➢ inherited contamination ➢ unsuitable water management ➢ lack of waste water pre-treatment ➢ survival of the traditional approach ➢ social indifference ➢ lack of sense of responsibility (polluters) ➢ money and capital shortage ➢ limited tolerance to load of the society and the polluters ➢ lack of non-governmental control **SPECIFIC** ➢ waste water pumping to subsurface strata (in order to maintain the pressure) (1.3) ➢ obsolete production and transport technologies (1.1-1.4; 2.1; 2.2; A, B) ➢ waste and waste water sludge disposal ➢ (1.1-1.4; A) ➢ unsuitable storage of hazardous wastes ➢ (1.1-1.4; A) ➢ lack of compliance with process specification /discipline (1.1-1.4; 2.1; 2.2; A, B) ➢ faulty hydrocarbon product lines (1.1; 1.3; 2.1; 2.2; A, B) ➢ process breakdown (1.1-1.4;2.1;2.2; A, B)	➢ measures and regulation on the protection of the water, the groundwater and the soil ➢ filling of regulation gaps (environmental tax, modification of 3/84., etc.) ➢ increasing the control capacities ➢ clear scopes determined by the regulation ➢ ISO expansion ➢ checking of material balance diagrams with respect to water management ➢ expansion of the product fee system ➢ development of the supporting system(Central Environmental Fund, specific and target-oriented funds) ➢ supporting the background environmental industry, economical incentives ➢ removal of inherited contamination ➢ development of treatment technologies for water protection purposes (screening) ➢ implementation of separated sewage systems ➢ education, increasing public awareness ➢ education within the family ➢ improvement of ecomorphologic conditions of watercourses ➢ recultivation, landscape harmonization, landscape planning ➢ ensuring information availability ➢ increasing GDP percent spent on water ➢ use of international resources ➢ operation of the Danube Valley Alarm System

Situation/Stakeholder Analysis Leading to Water Pollution in Specific areas 3. Municipality Annex 2.3.

Activities leading to water pollution	Stakeholders			Assets And achievements	Environmental Consequences of Economical activities	Transboundary effects	Causes leading to inappropriate activities	Measures to be undertaken
	Organizations	**Polluters**	**Affected**					
MUNICIPAL WASTE WATER DISCHARGE ➢ 1/1.household waste water discharge into the sewer system ➢ 1/2. desiccation of household waste water ➢ 1/3. illegal waste water discharge ➢ 1/4.institutional waste water discharge ➢ 1/5. industrial waste water discharge into the sewer system ➢ 1/6. disposal of sewage-sludge **UNSUITABLE TREATMENT OF SOLID WASTES** **SURFACE RAINWATER CONDUCTED INO RECIPIENT** **UNSUITABLE TREATMENT OF LIQUID WASTES**	➢ governmental organizations (legislation) ➢ authorities - Environmental Agency - RWAs - Public Health Agencies NHS ➢ local government ➢ NGOs - professional association ➢ Education ➢ press, TV, etc. ➢ operator	➢ people - farmers ➢ factories - carwashing - galvanic factory ➢ organizations - hospital ➢ illegal disposal of hazardous wastes ➢ service suppliers ➢ inefficient wastewater treatment plant ➢ main polluters e.g. Budapest, Szolnok, Szeged, Dunaújváros, Győr	➢ people - local inhabitants - downstream settlements ➢ water users: (drinking water supply, industry, agriculture, sports, recreation, abstraction areas) ➢ aquatic flora and fauna	➢ natural resources ➢ professional know-ledge - R+D background - operational experience ➢ waste water treatment and waste reduction technologies ➢ financial resources for development and operation ➢ public awareness - responsibility - information - recognizing water pollution - knowing whom to apply to ➢ legal approach	➢ pollution of drinking water resources ➢ endangering of drinking water ➢ algae boom ➢ eutrophication in surface water-courses ➢ damage to the flora and fauna	➢ contaminated effluent (several effects) ➢ accidental pollution	➢ A) lack of resources (1,2,3,4) ➢ B) people's behavior and lack of knowledge (1/2, 1/3) ➢ C) lack of waste water treatment (1/1,1/4, 1/5, 4) ➢ D) level of canalization (1/2) ➢ E) improper individual waste water management facilities (1/2) ➢ F) low level willingness to be connected to the municipal sewerage (1/2) ➢ G) lack of suitable disposal of solid wastes (2)	➢ feasible regulation (A,B,C,D,E,F,G) ➢ authority force (A-G) - compliance control (A-G) - increasing the frequency of authority controls (A-G) ➢ economic incentives (A,B) - supporting development by local governments (A,C,D) - price policy (A,B,F) ➢ public awareness increasing (B) - PR (B) - environmental responsibility (B) ➢ High-Priority Development Project Program (C,D) ➢ R+D (A) ➢ regional waste disposal with physical enclosure (G) ➢ elimination of unsuitable dump sites, recultivation (G) ➢ organic degradation in desiccation pits (e.g. enzymatic) (E) ➢ introduction of inexpensive alternative solutions (E,C)

Annex 3. Sector Planning Matrix

3.1. Agriculture and Forestry

3.2. Industry and Transport

3.3. Municipality

Sector Planning Matrix — 1. Agriculture and Forestry — Annex 3.1.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program Objective:** Water quality in the Hungarian part of the Danube River Basin improved	➢ Water quality in the 6 selected DRB catchment areas in Hungary is increased to relevant EU standards by 2010 (PO)	➢ Sustainable waste management achieved (PO) ➢ Consumption patterns developed to sustainable level (PO)
➢ **Sector Objective:** Ecological sustainable agricultural practices applied	➢ Among the substances washed into the waters, concentration of the pesticides and fertilizers should be decreased to 75% (pesticides) by the year 2O1O in the Zala Zagyva rivers and to 90%(fertilizers) by the year 2005at locations not affected by other polluters (agriculture). (SOAF)	➢ Appropriate legal environmental and enforcement structures established (SOAF)
➢ **Results/Outputs:** 1.1 Ecological plant production practices implemented 1.2 Application of appropriate animal husbandry practices applied 1.3 Institutional capacities reinforced	➢ 1.1 Among the substances loading the surface waters the concentration of the pesticide residues should be decreased to 75 % by the year 2005 at the estuary of the Zala and Zagyva rivers ➢ 1.1 Among the substances loading the surface waters the concentration of the fertilizers to 90 % by the year 2005 at locations not affected by other polluters, e.g., at Asvanyraro. ➢ 1.2 The concentration of slurry N and P load into surface waters should be decreased by 20 % by the year 2010 at the inlet of the Ipolytarnoc Agricultural Units' pig farm. ➢ 1.3 The number of farm advisory staff successfully completing the extension service training should increase by 25 % annually. Thus it can be ensured that approximately 95 % of the farm advisory staff will acquire the appropriate approach by the year 2003	➢ Information on the pollution caused by plant production is accessible (1.1) ➢ Information on the pollution caused by animal husbandry is accessible (1.2) ➢ Highly educated professionals on research, development and technology transfer are available
➢ **Activities:** 1.1.1 Reconsider the system of strategic planning 1.1.2 Undertake measures for developing and applying sustainable plant production, water management technologies, appropriate land management and ecosystem protection 1.1.3 Modernize and consistently enforce the legal frame 1.1.4 Elaborate, refine and apply economic incentives 1.2.1 Reconsider the system of strategic planning 1.2.2 Undertake measures for developing and applying sustainable animal husbandry technologies 1.2.3 Introduce appropriate fish farming practices 1.2.4 Develop proper storage and use of animal manure 1.3.1 Develop institutional system 1.3.2 Develop human resources and public awareness		

PO - Program Objective SOAF - Sector Objective of Agriculture and Forestry

Sector Planning Matrix — 2. Industry and Transport — Annex 3.2.

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
➢ **Program objective:** Water quality in the Hungarian part of the Danube river basin improved	➢ Water quality in the 6 selected DRB catchment areas in Hungary is increased to relevant EU standards by 2010 (PO)	➢ Sustainable waste management achieved (PO) ➢ Consumption patterns developed to sustainable level (PO)
➢ **Sector Objective:** Ecological Sustainable industrial production and transport achieved	➢ In the Sajó, Tisza and Nádor channel the water quality will be improved to EU standards by 2O1O. (SOIT)	➢ Legislation harmonized to EU legislation (SOIT) ➢ Information regarding pollution is available (SOIT)
➢ **Results/Outputs:** 2.1 Appropriate technologies and pollution reduction measures applied in chemical industries 2.2 Appropriate technologies and pollution reduction measures applied in oil industries 2.3 Water pollution resulting from shipping and harbor activities controlled	➢ 2.1 The quality of the recipient water with regard to COD, total salt and ammonium should improve by one quality class by components by the year 2010 at Kazincbarcika (Sajo River), Tiszapalkonya (Tisza River) and Balatofuzfo (Nador channel)	➢ The authority transfers scientific knowledge as a requirement to the users for consideration(2.1, 2.2) ➢ The incomes of the companies and the environmental fee cover the costs (2.1-2.2) ➢ Operating monitoring system in chemical industry (2.1) ➢ Readiness for cooperation of the companies (2.1-2.2)
➢ **Activities:** 2.1.1 / 2.2.1 Develop technology in the chemical industry 2.1.2 / 2.2.2 Change attitude in education 2.1.3 / 2.2.3 Strengthen legal framework, authority and civil control 2.1.4 /2.2.4 Establish economic background 2.3.1 Review, reconstruct and modernize ports and shipyards 2.3.2 Strengthen legal framework and authority for river transport control 2.3.3 Establish economic background to reinforce river transport under economic and ecological conditions	➢ 2.2 The water quality concerning THP and inorganic micro-pollutants should improve by one quality class by the year 2010 at Tiszapalkonya (Tisza River) and Szazhalombatta (Danube) ➢ 2.3 The frequency of observation of oil film floating on the surface of water should reduce to 0 by the year 2010	

PO - Program Objective SOI - Sector Objective for Industry and Transport

Sector Planning Matrix — 3. Municipality — Annex 3.3.

Summary of Objectives and Activities	Indicators	Important Assumptions
➢ **Program Objective:** Water quality in the Hungarian part of the Danube River Basin improved	➢ Water quality in the 6 selected DRB catchment areas in Hungary is increased to relevant EU standards by 2010 (PO)	➢ Sustainable waste management achieved (PO) ➢ Consumption patterns developed to sustainable level (PO)
➢ **Sector Objective:** Appropriate municipal waste water management system implemented	➢ In Budapest and four selected cities (Dunaujvaros, Gyor, Szeged, Szolnok) the water treatment will be improved by 60% and 100% respectively by 2010 (SOM)	➢ Appropriate administrative and financial structures established (SOM) ➢ Administrative integration of environmental protection and water management(SOM) ➢ Appropriate legal and economical regulation(SOM) ➢ Efficiency of the system of controlling institutions and tools (SOM)
➢ **Results/Outputs:** 3.1 Public waste water collection and treatment system adopted 3.2 Individual disposal of household waste water improved	➢ 3.1, 3.2 Out of the microbiological indicators the coliform number should be deduced to "Grade III" by the year 2010 at the town of Mohacs (southern border section) ➢ 3.1, 3.2 By the year 2010 the Biological Oxygen Demand (BOD) at Mohacs should remain under 5 mg/l ➢ 3.1, 3.2 By the implementation of sewage treatment for settlements with population over 2000, the proportion of treated/untreated sewage will be 67% by 2010 on the catchment area ➢ 3.1, 3.2 The proportion of treated/untreated waste water in the case of indirect discharge into the Danube will be 90% in Budapest and in four selected cities (Dunaujvaros, Gyor, Szeged, Szolnok) 100%)	➢ Social commitment ➢ Improvement in the solvency of the population ➢ Interdisciplinary approach ➢ Financial improvement of the municipalities ➢ Coordinated state funds of appropriate size ➢ Appropriate educational institutions ➢ Improving/increasing the availability of target-oriented loans
➢ **Activities:** 3.1.1 Develop appropriate and efficiently functioning institutional system 3.1.2 Raise awareness, education and training 3.1.3 Strengthen and enforce legal framework 3.1.4 Develop technologies 3.1.5 Develop economic incentives 3.2.1 Encourage development of public sewer systems where technologically and economically feasible 3.2.2 Provide incentives to households for connecting to public sewage systems where available 3.2.3 Reinforce development and practice of using individual sewer systems (septic tanks) 3.2.4 Assure control of compliance in utilizing individual systems		

PO - Program Objective SOM - Sector Objective of Municipality

Annex 4. Activities, Important Elements and Projects

4.1. Agriculture and Forestry

4.2. Industry and Transport

4.3. Municipality

Result 1.1.: Ecological plant production practices implemented

Activities	Important Elements	Projects		
		Existing/Ongoing	**In Preparation**	**Proposed**
➢ 1.1.1 Reconsider the system of strategic planning	➢ Optimize the volume of plant production	➢ Program for the network of sensitive natural areas ➢ Duna-Tisza Sand Plateau Alföld project ➢ Development of the consulting network for the environmentally friendly use of fertilizers ➢ WB-Japan international tender for flood protection development ➢ National remediation program	➢ Application of GIS in Agricultural, Environmental Protection ➢ Asses the quantity of n, p, heavy metals, pesticides, herbicides in the surface waters in catchment areas caused by animal production ➢ Issues of Agricultural plant growing and water management in Kisalföld ➢ Target program for water use ➢ Forecast damages caused by draft	➢ Mathematical model for support the calculation of environmental damages caused by agriculture ➢ Develop program for Agriculture related emergencies (with special attention to issues of financing ➢ Develop joint Hungarian-Croatian Program for the protection of the Dráva river ➢ Develop forest and grass plantation program in the interest of the protection of rivers
➢ 1.1.2 Undertake measures for developing and applying sustainable plant production, water management technologies , appropriate land management and ecosystem protection	➢ Asses previous pollution of surface and subsurface waters caused by plant production ➢ Review technology ➢ Develop and apply sustainable technologies of plant production ➢ Promote new technologies ➢ Apply state-of-the-art methods of agricultural water management ➢ Apply soil monitoring ➢ Eliminate environmental damages caused by plant production ➢ Specific attention for rehabilitation of wetlands and landscape planning and harmonization	➢ Program for the network of sensitive natural areas ➢ Duna-Tisza Sand Plateau Alföld project ➢ Development of the consulting network for the environmentally friendly use of fertilizers ➢ Galgahévíz project (environmentally-friendly agriculture) ➢ National remediation program ➢ Backwater program ➢ Best Agricultural Practices" Program ➢ Forest planting program ➢ AGRO-21	➢ Develop a sustainable EU-conform system of fertilization consulting ➢ Prepare a survey on issues connected to the agriculture in the Danube-section downstream to Budapest ➢ Possible reduction of deflation losses ➢ Application of GIS in Agricultural, Environmental Protection ➢ Asses the quantity of n, p, heavy metals, pesticides, herbicides in the surface waters in catchment areas caused by animal production ➢ Issues of Agricultural plant growing and water management in Kisalföld	➢ Mathematical model for support the calculation of environmental damages caused by agriculture ➢ Methods of decrease erosion losses ➢ Examination of P and sorption and disruption conditions in domestic soils ➢ Connection between building reservoirs in hills and environment friendly agriculture production ➢ Prepare a study on border line, inland and transboundary waters
➢ 1.1.3 Modernize and consistently enforce the legal environment	➢ Legal harmonization with the EU ➢ Increase the efficiency of the control and supervision by the municipalities	➢ EU -harmonization		
➢ 1.1.4 Elaborate, refine and apply economic incentives	➢ Develop efficient economic incentives ➢ Introduce environmental taxes		➢ Develop economic incentives	

Result 1.2.: Appropriate animal husbandry applied

Activities	Important Elements	Projects		
		Existing/Ongoing	**In Preparation**	**Proposed**
➢ 1.2.1 Reconsider the system of strategic planning	➢ Take into account domestic and external market situation ➢ Consider environmental protection principles	➢ Program for the network of sensitive natural areas ➢ Duna-Tisza Sand Plateau Alföld project	➢ Application of GIS in Agricultural, Environmental Protection ➢ Asses the quality of N, P, heavy metals in surface and subsurface waters caused by animal husbandry ➢ Issues of Agricultural plant growing and water management in Kisalföld ➢ Target program for water use ➢ Forecast damages caused by draft	➢ Mathematical model for support the calculation of environmental damages caused by agriculture ➢ Develop program for Agriculture related emergencies (with special attention to issues of financing ➢ Develop joint Hungarian-Croatian Program for the protection of the Dráva river ➢ Develop forest and grass plantation program in the interest of the protection of rivers
➢ 1.2.2 Undertake measures for developing and applying sustainable animal husbandry	➢ Assess previous pollution ➢ Develop sustainable animal husbandry practices ➢ Promote new technologies	➢ Program for the network of sensitive natural areas ➢ Duna-Tisza Sand Plateau Alföld project ➢ Manure/slurry treatment and use – Bátonyterenye	➢ Application of GIS in Agricultural, Environmental Protection ➢ Asses the quality of N, P, heavy metals in surface and subsurface waters caused by animal husbandry ➢ Issues of Agricultural plant growing and water management in Kisalföld ➢ Establish measuring stations to control the P, NH3 emission of animal farms ➢	➢ Mathematical model for support the calculation of environmental damages caused by agriculture ➢ Connection between building reservoirs in hills and environment friendly agriculture production ➢ Prepare a study on border line, inland and transboundary waters
➢ 1.2.3 Introduce appropriate fish farming practices		➢ Program for the network of sensitive natural areas		
➢ 1.2.4 Develop proper storage and use of animal manure				➢ Develop economic incentives (animal husbandry)

Result 1.3.: Institutional capacities reinforced

Activities	Important Elements	Projects		
		Existing/Ongoing	In Preparation	Proposed
➢ 1.3.1 Develop institutional system	➢ Establishment of institutional background of spreading sustainable agricultural technologies ➢ Study and adopt existing legal framework for subsidizing sustainable agricultural practices ➢ Encourage farmers and agricultural units to work in sustainable way ➢ Improvement of authority control via environmental policy ➢ Improvement of domestic legislation – harmonization with EU ➢ Definition of clear scopes of the authorities ➢ Entering into international conventions			➢ Develop institutional responsibilities for the equal treatment of agricultural applications
➢ 1.3.2 Develop human resources and public awareness	➢ Elaboration of sustainable technologies and education of farmers ➢ Transfer of knowledge through educational and research institutions ➢ Support of media and public awareness campaign ➢ Encourage consultations facilitating sustainable management ➢ Implement strict technological requirements ➢ Intensify PR activities ➢ Increase public awareness ➢ Educate before imposing fines ➢ Improve professional education			

Result 2.1.: Appropriate technologies and pollution reduction measures applied in chemical industry

Activities	Important Elements	Projects		
		Existing/ongoing	In Preparation	Proposed
➢ 2.1.1 Develop technology in the chemical industry	➢ Modification of raw material uses ➢ Encouraging recycling/reuses ➢ Minimization of emissions ➢ Implementing pre-treatment system for main polluters ➢ Integrating waste water treatment into production technologies ➢ Reviewing technologies	➢ National Remediation Program ➢ Central Environmental Fund tenders ➢ Danube Valley Regional alarm System ➢ Watershed development –planning program ➢ National Program For Environmental Protection ➢ WWW Green Danube Program ➢ IUCN National Ecology Network, Aquatic Ecological Corridors ➢ Projects at major polluters		➢ Financial support for the environmental remediation of industrial facilities (e.g. Nitrokémia) ➢ Launching saline waste water reduction program ➢ Informing on and introduction of international state-of-the-art environmentally friendly technologies
➢ 2.1.2 Change attitude in education	➢ Change in the concept of training of engineers			➢ Developing the Central Environmental Fund tender system (financial and project development)
➢ 2.1.3 Strengthen legal framework, authority and civil control	➢ Stricter regulations and enforcement ➢ Develop technology limit values ➢ Monitoring of water quality in the recipient ➢ Improvement of water quality in the recipient ➢ Reinforcement of technical/professional background ➢ Reinforcement of NGO responsibility			➢ Protection program for smaller catchment areas ➢ Develop cooperation on transboundary watercourses ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc) ➢ Developing up to date databases for catchment areas, water protection, water management and regional policy ➢ Developing regional institutional system for water protection ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc) ➢ Developing regional institutional system for water protection
➢ 2.1.4 Establish economic background	➢ Operating information systems, consulting ➢ Activate international funding resources			➢ Financial support for the environmental remediation of industrial facilities (e.g. Nitrokémia) ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc) ➢ Launching saline waste water reduction program

Result 2.2.: Appropriate technologies and pollution reduction measures applied in oil industries

Activities	Important Elements	Projects		
		Existing	**In Preparation**	**Proposed**
➢ 2.2.1 Develop technology in the chemical industry	➢ Modification of raw material uses ➢ Encouraging recycling/reuses ➢ Minimization of emissions ➢ Implementing pre-treatment system for main polluters ➢ Integrating waste water treatment into production technologies ➢ Reviewing technologies	➢ National Remediation Program ➢ Central Environmental Fund tenders ➢ Danube Valley Regional alarm System ➢ Watershed development –planning program ➢ National Program For Environmental Protection ➢ WWW Green Danube Program ➢ IUCN National Ecology Network, Aquatic Ecological Corridors ➢ Projects at major polluters		➢ Financial support for the environmental remediation of industrial facilities (e.g. Nitrokémia) ➢ Informing on and introduction of international state-of-the-art environmentally friendly technologies
➢ 2.2.2 Change attitude in education	➢ Change in the concept of training of engineers			➢ Developing the Central Environmental Fund tender system (financial and project development)
➢ 2.2.3 Strengthen legal framework, authority and civil control	➢ Stricter regulations and enforcement ➢ Develop technology limit values ➢ Monitoring water quality in the recipient ➢ Improvement of water quality in the recipient ➢ Reinforcement of technical/professional background ➢ Reinforcement of NGO responsibility			➢ Protection program for smaller catchment areas ➢ Develop cooperation on transboundary watercourses ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc) ➢ Developing up to date databases for catchment areas, water protection, water management and regional policy ➢ Developing regional institutional system for water protection ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc) ➢ Developing regional institutional system for water protection
➢ 2.2.5 Establish economic background	➢ Operating information systems, consulting ➢ Activate international funding resources			➢ Financial support for the environmental remediation of industrial facilities (e.g. Nitrokémia) ➢ Develop water quality monitoring systems (e.g. biomonitoring, etc)

Result 2.3.: Water pollution resulting from shipping and harbor activities controlled

Activities	Important Elements	Projects		
		Existing/Ongoing	**In Preparation**	**Proposed**
➢ 2.3.1 Review, re construct and modernize ports and shipyards	➢ Ensure information availability for all stakeholders involved in pollution reduction	➢ Danube Valley Regional alarm System ➢ Watershed development –planning program ➢ National Program For Environmental Protection ➢ WWW Green Danube Program ➢ IUCN National Ecology Network, Aquatic Ecological Corridors		➢ Environmental program for navigation
➢ 2.3.2 Strengthen legal framework and authority for river transport control	➢ Ensure information availability for all stakeholders involved in pollution reduction			➢ Protection program for smaller catchment areas ➢ Develop cooperation on transboundary watercourses ➢ Developing up to date databases for catchment areas, water protection, water management and regional policy ➢ Environmental program for navigation ➢ Developing regional institutional system for water protection
➢ 2.3.3 Establish economic background to reinforce river transport under economic and ecological conditions	➢ Ensure information availability for all stakeholders involved in pollution reduction			➢ Environmental program for navigation

Result 3.1.: Public wastewater collection and treatment system adopted

Activities	Important Elements	Projects		
		Existing/Ongoing	**In Preparation**	**Proposed**
➢ 3.1.1 Develop appropriate and efficiently functioning institutional system	➢ Increasing the quality of sewer service ➢ Improving the quality of operation of waste water treatment facilities ➢ Developing the system of authority institutions	➢ Create and operation county-level regional development councils ➢ Operation of the National Environmental Council ➢ MATRA project (financed by Government of Netherlands, dealing with public utilities) ➢ Organize regional water management councils		➢ Further rationalization project for the institutional system of environmental protection and water management (M-7) ➢ Improvement management training for operators of waste water facilities (M-8) ➢ Improve PR activities (M-9) ➢ Project on optimal sizing of water utilities (M-10)
➢ 3.1.2 Raise awareness, education and training	➢ Improving vocational training and increase the qualification level ➢ Involving the public ➢ Transform customer behavior ➢ Information on alternative low cost processes ➢ Social and consumer control	➢ Public hearing ➢ Provide social involvement (e.g. at the preparation of documents submitted to Parliament, decrees of ministers) ➢ REC "small grant"...		➢ Improve PR activities (M9) ➢ Awareness raising needed for M-1, M-2, M-3, M-4, M-5, M-6, M-8
➢ 3.1.3 Strengthen and enforce legal framework	➢ Passing the law on the protection of waters ➢ Modernizing the legal regulations ➢ Defining the target condition and target date for catchment planning ➢ Improving the efficiency of enforcement ➢ Individual treatment of polluters	➢ Regulation of Public Water Utilities Hungary (Phare project) ➢ Waste water directives EU-harmonization ➢ Upgrading of Implementation and Enforcement of Hungarian Regulation (Phare project) ➢ Develop a system EU-conform technology limit values of water pollution (it is the base of the law on the water protection) ➢ Regional water management planning (it is defining the target condition and target date for catchment planning)...		➢ Program on the extension of environmentally sound individual waste water treatment facilities (M-4) ➢ Improve water pricing (M-6) ➢ Further rationalization project for the institutional system of environmental protection and water management (M-7) ➢ Project on optimal sizing of water utilities (M-10).

Result 3.1.: Public wastewater collection and treatment system adopted

Activities	Important Elements	Projects		
		Existing/Ongoing	In Preparation	Proposed
➢ 3.1.4 Develop technologies	➢ Build waste water treatment facilities ➢ Modernize waste water treatment facilities ➢ Treatment and remediation of liquid wastes ➢ Spread the use of waste water (if possible) ➢ Introduction of alternative low cost waste water treatment technologies ➢ Introduction of natural waste water treatment ➢ Pre-treatment of municipal rainwater ➢ Improve background industry ➢ Improve industrial pre-treatment ➢ Improve R+D	➢ Sewage Canalization and Treatment Program of Hungary ➢ Sewage Treatment Program of the Capital and Cities with County Right ➢ Targeted Program for the Protection of the Drinking Water Well-field Area ➢ National Remediation Program ➢ Program of Great Lowland ➢ Balaton Program ➢ Program for Small-Balaton ➢ Plan of Measures for the Improvement of the Water Quality Conditions of the Ráckeve-Soroksár Duna Branch ➢ Program of Water Supplement of Hilly Area of Mid Danube-Tisza Region	➢ Starting project: Project of Ministry for Industry, Trade and Tourism for the development of the support of background industry	➢ Project on the use of waste water (M-1) ➢ Spread natural treatment (M-2) ➢ Waste water treatment implementation program of five big towns Szeged, Szolnok, Győr, Dunaújváros, Budapest (M-3) ➢ Program on the extension of environmentally sound individual wastewater facilities M-4. ➢ Alternative new cost-effective waste water treatment project (M-5)
➢ 3.1.5 Develop economic incentives	➢ Increase the efficiency of the motivation system (waste water fine, load charge) ➢ Provide financial resources ➢ Economic incentives (taxes, environmental load fee) ➢ Establish pricing policy for water ➢ BAT incentives ➢ Let the regulatory role of the market prevail ➢ Support development of the municipalities	➢ Introduction of environmental load charges ➢ Improvement of subsidy system ➢ Preparation of Eco-tax system ➢ Pre-saving financial program for housing to assist the operation of public water associations ➢ Improving Water Fund tender system ➢ Improving Central Environmental Fund tender system		➢ every proposed program as in the absence of economic incentives and suitable financial sources the sector objectives and results can't be reached.

Result 3.2.: Individual disposal of household wastewater improved

Activities	Important Elements	Projects		
		Existing/Ongoing	In Preparation	Proposed
➢ 3.2.1 Encourage development of public sewer systems where technologically and economically feasible				
➢ 3.2.2 Provide incentives to households for connecting to public sewage system where available				
➢ 3.2.3 Reinforce development and practice of using individual sewer systems				
➢ 3.2.4 Assure control of compliance in utilizing individual systems				

Annex 5. Workshop Organization

5.1. Agenda of the Workshop

5.2. List of Participants

5.3. Evaluation of the Workshop

GEF- Danube Pollution Reduction Program
National Planning Workshop
11-14 May 1998, Visegrad

Monday

11.00 - 12.30	Plenary	Opening of the Workshop by state secretary
		Introduction to the workshop, Programme/Planning Process (Mr. Bendow)
		Summary of National Review (Expert team)
		Presentation of the work programme (facilitators)
12.30 - 14.00		*lunch*
14.00 - 14.20	Plenary	Methodological approach of TOPP (facilitator)
14.20 - 15.45	Plenary	Typology of River Basin Areas – EU approach to River Basin Management
		Methodology: -Physical aspects, Demography, Transboundary effects as perceived, Human activities/Economy
15.45 - 16.15		*coffee break*
16.15 - 17.30	Groups	Work in groups to describe types of River Basin areas
17.30 - 18.30	Plenary	Presentation of types of RBA

Tuesday

9.00 - 10.30	Plenary	Situation/Stakeholder Analysis
		Methodology: Actions leading to pollution will be proposed for each sector by facilitator
		Exercise applying the method
10.30 - 10.50		*coffee break*
10.50 - 11.00		Formation of Working groups (by sectors)
11.00 - 13.00	Groups	Situation/Stakeholder Analysis
13.00 - 14.30		*lunch*
14.30 - 15.45	Plenary	Presentation of results from group work
		Municipality sector
		Structure of Problems (Causes)
		Structure of Objectives and measures to be undertaken
15.45 - 16.00		*coffee break*
16.00 - 18.30		Presentation of results from group work
		Agriculture sector
		Industry sector

Agenda of the Workshop **Annex 5.1**

Wednesday

9.00 - 10.30	Plenary	Program Planning Matrix – structure of PM, example
		Methodology
		a) Sector objectives: proposed by facilitators out of situation (problem) analysis
		b) Results/Outputs: developed by participants out of the measures to be undertaken
10.30 - 10.50		*coffee break*
10.50 - 13.00	Groups	c) Definition of Activities in relation to Results/Outputs
		d) Definition of Important Assumptions
13.00 - 14.30		*lunch*
14.30 - 15.00	Plenary	e) Impact Indicators
		Methodology
		Exercise applying method
15.00 - 16.00	Groups	Definition of Impact Indicators for Results/Outputs
16.00 - 16.20		*coffee break*
16.20 - 18.30	Plenary	Presentation of Sector Planning Matrix
		Activities
		Important Assumptions
		Impact Indicators
		Overall Programme Objective

Thursday

9.00 - 9.20	Plenary	Activities, Projects and Important Elements
		Methodology
		Exercise applying methodology
9.20 - 10.50	Groups	Definition of Important Elements
		Existing and planned Projects in relation to Activities
10.50 - 11.10		*coffee break*
11.00 - 12.30	Plenary	Presentation of group work
		Important Element
		Projects in relation to identified Activities
12.30 - 13.00	Plenary	Closing Session
		Presentation of Overall Programme Planning Matrix (prepared by facilitators)
		Closing remarks
13.00		*Lunch*
15.00		Work of report writing

GEF - DANUBE POLLUTION REDUCTION PROGRAM
National Planning Workshop
11-14 May 1998, Visegrad, Hungary

	NAME	INSTITUTION
		Ministries, Authorities
1	**Endre Almassy**	*Ministry of Transport, Communication and Water Affairs*
2	**Miklos Bulla**	*Ministry for Environment and Regional Development, National Environmental council*
3	**Zsuzsa Buzas**	*Ministry of Transport, Communication and Water Affairs*
4	**Jozsef Csasaar**	*Ministry of Interior*
5	**Dr. Katalin Gara Nagy**	*Ministry for Environment and Regional Development*
6	**Marta Hibbey Joo**	*Ministry of Industry, Trade and Tourism*
7	**Gyula Hollo**	*Ministry of Transport, Communication and Water Affairs*
8	**Dr. Gyorgy Meszaros**	*Ministry of Agriculture*
9	**Dr. Peter Paszto**	*National Water Authority*
10	**Barnabas Peczka**	*National Inspectorate of Nature Conservation and Environmental Protection*
		Researchers
11	**Dr. Peter Csatho**	*Hungarian academy of Sciences, Institute of Soil Research*
12	**Dr. Kalman Buzas**	*Technical University of Budapest*
13	**Dr. Istvan Ijjas**	*Technical University of Budapest*
14	**Dr. Sandor Kerekes**	*University of Economics, Budapest*
		Regional Institutions
15	**Gyozo Buzetzky**	*Natural Protection Inspectorate, Pecs*
16	**Annamaria Konencsny**	*Upper Tisza Regional Water Authority, Nyiregyhaza*
17	**Maria Kvalla Csilics**	*Lower Danube Valley Regional Water Authority, Baja*
18	**Hedvig Novak Kovacs**	*Lower Tisza Regional Environmental Agency, Szeged*
19	**Mrs. Marko**	*North Hungarian Environmental Agency, Miskolc*
20	**Dr. Istvan Padar**	*East Tisza Regional Water Authority, Debrecen*
21	**Istvan Pinter**	*North Hungarian Environmental Agency, Miskolc*

22	**Gyula Raisz**	*North Hungarian Environmental Agency, Miskolc*
		Municipalities
23	**Miklos Nagypal**	*Municipality of Szeged*
24	**Erika Petrik**	*Municipality of Komarom-Esztergom County*
		Private Sector
25	**Dr. Endre Bukta**	*National Professional Association of Water and Canalization Works*
26	**Judit Fekete Nagy**	*BORSODCHEM Chemicals Inc.*
27	**Erzsebet Odor**	*CHINOIN Pharmaceuticals Inc.*
		NGOs
28	**Laszlo dzubay**	*Hungarian Employer's Association*
29	**Laszlo Juhos**	*Relistic Green Club*
30	**Tibor Kovacs**	*Bakonyalja Environmental Association*
31	**Janos Paszabi**	*Rakos Creek Environmental Protection Association*
		Organizers
32	**Gabriela Holovacs**	*Secretary*
	Henrieta Szabo	
33	**Laszlo Kabai**	*Techniciea*
34	**Laszlo Karas**	*Facilitator*
35	**Orsolya Molnar**	*Secretary*
36	**Erszebet Szaraz**	*Interpreter*
37	**Erika Szomor**	*Interpreter*
38	**Judit Tisza Volgyi**	*Interpreter*
39	**Dr. Anna Vari**	*facilitator*
		Guests
40	**Joachim Bendow**	*UNDP/GEF*
41	**Maxime Belot**	*UNDP/GEF*
42	**Andy Garner**	*UNDP/GEF*
43	**Kari Eik**	*UNDP/GEF*
		National Team
44	**Maria Galambos**	*CPC*
45	**Sandor Kisgyorgy**	*Expert*
46	**Dr. Georgy Pinter**	*Expert*
47	**Dr. Judit Rakosi**	*Expert*
48	**Klara Toth**	*Expert*

Evaluation of the Workshop

The main goals of the National Planning Workshop were defined by the Programme Coordinators as follows:

- Establish a **basis for developing a national Pollution Reduction Program**. Define main problems, objectives, proposed activities and projects, with special emphasis on transboundary concerns.
- Determine **tools for monitoring and evaluating the implementation** of the Program. Define objectively verifiable indicators and important assumptions to facilitate monitoring and evaluation.
- Develop a program, which is **widely supported** by various stakeholders, including central, regional, and local government authorities, business organizations, and non-governmental organizations.

Additional objectives suggested by the participants of the workshop included the following:

- Involving invited individuals in a highly participatory process. **Learning** a new decision support/conflict management method.
- Exchanging relevant information in an interdisciplinary setting. Developing know-how which participants can use in their own field.

With regard to the above mentioned goals, the following conclusions can be made. Developing a national Pollution Reduction Program is an enormous and difficult task, due, in large part, to the number of interconnected problems that must be addressed. The planning efforts integrate the analytical work conducted by the four-member expert team and the participatory process used in the national workshop. The workshop was planned to **complement rather than replace the work of the expert team.** For example, the preliminary study prepared by the experts served as an input for group discussions, while proposals made by workshop participants are to be further analyzed by the expert team.

Participants were rather divided about the usefulness of the participatory process. Some recognized the added value of the collective effort, especially the advantages of the multi-disciplinary, multi-sector approach. Several participants, however, disputed the competence of others and expressed a firm conviction that only a few people should be charged with composing the national program.

Some experts found it encouraging that most of their preliminary ideas were confirmed by the workshop. Others, however, were disappointed for not getting an answer to their questions because individuals, competent in these questions, were not present at the meeting, or those who were present did not bring the data with them. These questions (for example ongoing technological developments initiated by major polluters) need to be further investigated by the expert team.

As far as the evaluation of the various stages of the analysis is concerned, several participants expressed the view that the most useful discussions were conducted on the last day of the workshop when desired activities derived from the objectives were confronted with ongoing programs in order to define the missing elements and propose new projects. Some found the time devoted to this stage too short. The majority of the participants, however, claimed that the most important aspect of the discussions was not the identification of problems, objectives and proposals, but the **clarification of the complex cause-effect and means-end relationships** between them.

The most criticized stage of the meeting was the analysis of the selected river basins. Participants found it difficult to identify a handful of typical river basins, which would cover the most serious pollution problems together with the most urgent transboundary concerns. At the same time, the importance of the river basin approach was emphasized by several team members.

Another criticized component of the analysis was the sector approach. Participants claimed that the weight of agriculture, industry and municipal sector are of different magnitude from the point of view of contaminating the Danube River Basin.

In spite of the above criticism, it was acknowledged that the results of the workshop contain important new ideas and proposals, which are **supported by the majority of participants**. Small group discussions were found especially useful as a means for discussing and eliminating misunderstandings and disagreements.

Several participants acknowledged that they have learned a lot at the meeting, which can be applied in their future work. Almost everyone appreciated the opportunity to "learn a new decision support/conflict management method".

It was widely recognized that the workshop provided a good setting for an **exchange of ideas** between policy makers, experts, and other stakeholders, as well as between the representatives of the sponsoring international institutions and the Hungarian participants. Representatives of non-governmental organizations especially appreciated the opportunity to participate in such a dialogue.

It can be concluded that the most important achievement of the workshop was that it **promoted communication and collaboration** between experts and non-experts, and between the various levels of government, business and civil organizations on the highly complex issue of pollution reduction in the Danube River Basin. Thinking and working together in the framework of a workshop strengthened mutual understanding and empathy among the various social actors. The most important contribution of the workshop to the national planning process lies in **(i) defining and structuring** the main problems, objectives, proposed activities, indicators and assumptions, and in **(ii) raising questions** for further, more detailed investigations.

We propose that the results of the workshop will be considered as a starting point for future studies rather than final recommendations for the national program. We also propose that participatory analyses following the logic of the TOPP method be conducted on the level of river basins, with special regard to the transboundary ones.