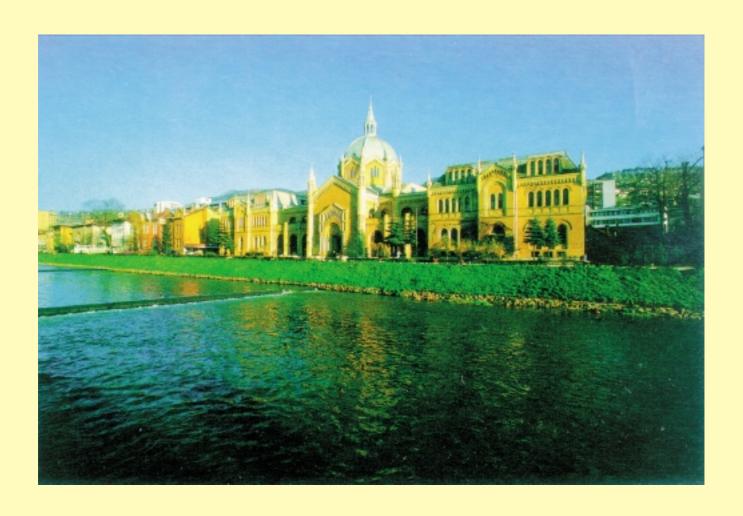
DANUBE POLLUTION REDUCTION PROGRAMME

NATIONAL PLANNING WORKSHOP BOSNIA AND HERZEGOVINA

Sarajevo, November 2 - 5, 1998



Ministry of Agriculture, Water Management and Forestry

in cooperation with the

Programme Coordination Unit UNDP/GEF Assistance





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Preface

The present report is based on the results of the National Planning Workshop, held in Sarajevo, Bosnia-Herzegovina from 2 to 5 November 1998. The main goal of the workshop and its report is to provide a comprehensive presentation of analysis concerning problems and solutions for reduction, as well as control of water pollution and its effects. The result is a national contribution to the development of the Danube Pollution Reduction Programme and a revision of the Strategic Action Plan (SAP) of the ICPDR.

The workshop has been supported by the Ministry of Physical Planning and Environment. It was prepared by the Country Project Coordinator Prof. Dr. Mehmed Saric, with the assistance of the facilitators Mrs. Anda Hadziabdic and Mrs. Esena Kupusovic. A team of national experts, who elaborated National Review Reports, was present to guide the participants in scientific and technical matters.

The National Planning Workshop was attended by participants from various sectors. There have been representatives of ministries, institutes, universities, NGOs etc. The list the organizations and participants is attached to this report in Annex.

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A team of international experts from UNDP/GEF, Maxime Belot and Marcela Fabianova, 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.

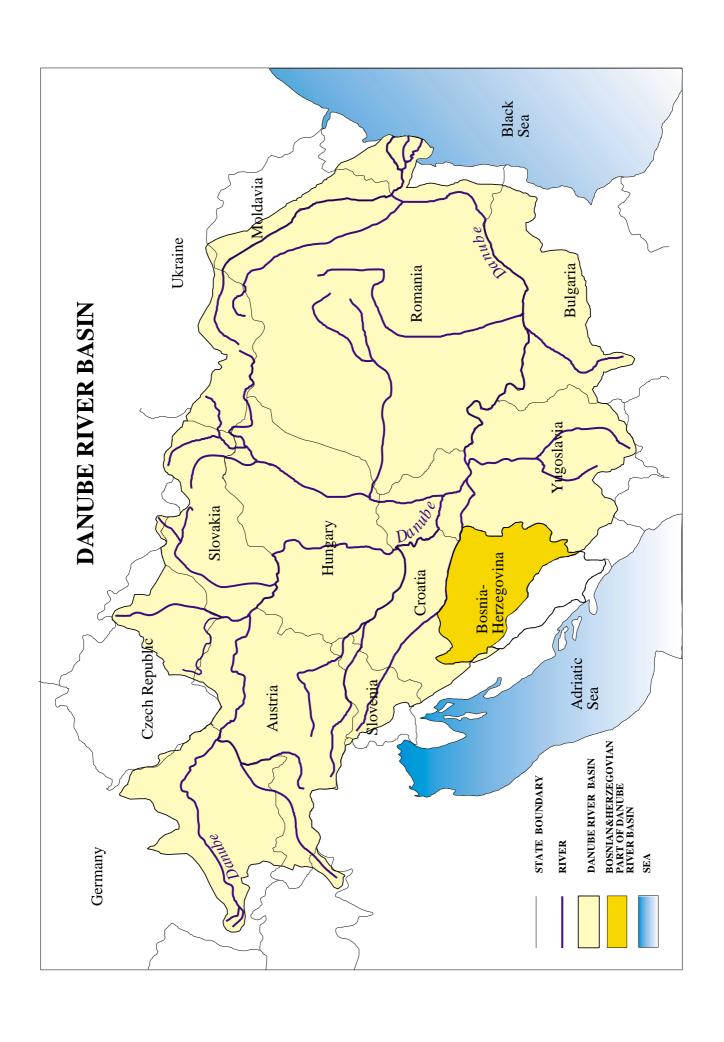


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Executive Summary

In the frame of the Environmental Danube Programme of the ICPDR and with the assistance of UNDP/GEF, a team of Bosnia-Herzegovina experts has elaborated National Reviews, providing information on water quality, analyzing financing mechanisms, describing social and economic framework conditions and developing projects and programmes 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 Sarajevo, Bosnia and Herzegovina, from 2 to 5 November 1998. It is one of 11 national workshops, which have been organized in all the participating countries, signatories of the Danube River Protection Convention or adhering to its principles.

The Danube River receives water from 76% of the whole Bosnia and Herzegovina territory. This region is one of Europe's richest areas in available water resources.

The most important river in the Danube River catchment area is Sava River, which flows along the boundary between Bosnia and Herzegovina and Croatia with its main tributaries as follows: Una, Vrbas, Bosna, Drina. Improper water management and insufficient environmental protection significantly influence quality conditions in the Bosnia and Herzegovina tributaries of the Danube River. Some of these rivers carry high pollution loads, however, it is noted that, practically, there is no difference between the entering and leaving water quality in the Bosnia and Herzegovina sector of Danube River. Transboundary adverse impact on the river morphological status can be identified - the intensive river bed and bank erosion because no activities on the river banks protection were undertaken in the last 7 years, i.e. during the war and up to now.

Bosnia and Herzegovina sector of the Danube River Basin (DRB) actually has not been divided into geographical regions, but politically into two entities: the Federation of Bosnia and Herzegovina and Republic of Srpska according to Dayton Agreement. Catchment area of the river Sava and catchment areas of its tributaries are cut by the boundary between entities. For example: the upper course of the river Drina belongs to the Republic of Srpska, middle course of the same river belongs to the Federation of Bosnia and Herzegovina as well as to Republic of Srpska, downstream belongs to the Republic of Srpska. The similar situation is with other rivers. The rivers in the Federation of Bosnia and Herzegovina are also cut by the cantonal boundaries.

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 land management and agriculture, industry and urban settlements sector. Based on the sector analysis, the core problem of "Inadequate activities leading to water pollution and degradation of resources in Bosnia-Herzegovina part of the Danube River Basin" was identified.

Direct causes of the core problem were described as "inadequate land management and inappropriate agricultural practices", for the sector of land management and agriculture; "pollution of water through re-launching of obsolete industrial technologies" for the industry sector and "improper disposal of solid waste and wastewater in urban areas" for the urban settlements sector.

A number of effects of activities leading to decrease of environmental quality in the Sava River Basin with negative transboundary effects were identified, including pollution of ground and surface waters, soil, eutrophication, degradation of structure and composition of biocenose and toxic substances in food-chain. Consequently, these effects result in reduced availability of water for different purposes, damage of fauna and flora and health risk.

Considering the result of the problem analysis, the programme objective was defined as "Unpolluted waters in Bosnia-Herzegovina part of the Danube River Basin", which will contribute to the overall goal of the UNDP/GEF Danube Pollution Reduction Programme: "Achievement of Sustainable Development in the DRB".

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

In the sector **Land Management and Agriculture** as the main causes of inadequate land management and inappropriate agricultural practices, the inadequate use and application of pesticides, uncontrolled use of fertilizers in lowland, discharge of liquid waste from farms without treatment and accelerated run-off generating erosion have been identified.

In order to apply appropriate land management and suitable agricultural practices, it is required to:

- ➤ adopt adequate use of pesticides through ensuring proper use of pesticides; setting monitoring of the application of pesticides; controlling the import of pesticides and undertaking training, promotion and organizational activities for ensuring proper use of pesticides.
- > adopt adequate use of fertilizer sin lowland areas by ensuring training of users; reinforcement of the capacities of agricultural extension services and inspection services and undertaking activities and measures for optimum use of fertilizers.
- > treat properly liquid waste from farms through implementation of rational use of byproducts from farms and ensuring proper pre-treatment of wastewater from farms.
- **prevent accelerated run-off generating erosion** by controlling the cutting of forests; stopping the farming on slopes over 15°; clearing land mines; preventing erosion of river banks and prevention of flooding.

In the sector **Industry**, the use of dirty and obsolete technologies, discharge of wastewater without pre-treatment, inadequate management of enterprises and inadequate disposal of solid hazardous substances, have been identified as the main causes of pollution of water through re-launching of obsolete industrial technologies.

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

- introduce clean technologies through elimination of hot-spots and replacing the old technologies by the new ones.
- implement pre-treatment of wastewater through installation of the wastewater treatment plants; putting existing treatment plants in operation and enforcement of the legal regulations.
- resure adequate management of enterprises through adapting the status of enterprises to market economy principles; upgrading the performance of industrial enterprises and making available financial resources.
- dispose properly hazardous substances in landfills by ensuring landfills for hazardous and harmful substances; classification of the industrial waste and enforcement of regulations

In the **Urban Settlements** sector the main causes of improper disposal of solid waste and wastewater in urban areas are improper drainage of wastewater, discharge of municipal wastewater without previous pre-treatment and improper disposal of solid waste.

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

- **collect adequately wastewater** by building new sewage system; rehabilitation of existing sewage system and ensuring proper collection of wastewater from individual users.
- > treat municipal water before discharge through building new wastewater treatment plants; rehabilitation of damaged plants and ensuring efficient operation of plants.
- **dispose adequately solid waste** through building new sanitary landfills; enforcement of legal frame and raising public awareness.

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

In the Land Management and Agriculture sector:

- ➤ Construction of Wastewater Treatment Plant Farm in Nova Topola
- Construction of Wastewater Treatment Plant Farm "Spreca"

In the **Industry sector**:

- Construction of Wastewater Treatment Plant in Soda Factory in Lukavac
- Construction of Wastewater Treatment Plant in Cellulose Factory "Celpak" in Prijedor

In the **Urban Settlements sector**:

- Reconstruction of WWTP Sarajevo
- Construction of Sewage System with Central Wastewater Treatment Plant in Banja Luka

1. Introduction

1.1. Background

It is known that Bosnia and Herzegovina belongs to the group of former socialist countries. The economy of the country is undergoing a major transition from a centralized to a market economy. Especially in the post war period the scope and timing of environmental improvements is closely linked to the success of this transition. The context of environmental policy will be determined by the profound economic changes.

The most serious environmental problems in Bosnia and Herzegovina are localized in specific areas - hot spots - where point sources of pollution cause hazards to the health of the local population. In the future, the pollution in hot spot areas will be specially intensified because of the re-launching of the heavy industries. It is also important to emphasize that mostly all wastewater treatment plants are destroyed during war activities. About 57% of the population of Bosnia and Herzegovina live in hot spot areas.

The competent bodies in the field of water management in Bosnia and Herzegovina are the following institutions: Ministry of Agriculture, Water Management and Forestry, Ministry of Physical Planning and Environment, Public Water Management Enterprise in Sarajevo, Public Water Management Enterprise in Mostar, 10 Cantonal Ministries of Agriculture, Water Management and Forestry, Ministry of Health, Ministry of Energy, Mining and Industry and two Government 's Institutions in the Federation of Bosnia and Herzegovina and two ministries in the Republic of Srpska: Ministry of Town Planning, Housing, Civil Engineering and Ecology and Ministry of Agriculture, Forestry and Water Management.

The Federation of Bosnia and Herzegovina and the Republic of Srpska regulate water management with their own Water Laws, where it is proclaimed that waters are exclusive state property. The waters have to be managed in the interest of the citizens and society.

In reviewing the hierarchy of the existing legislative basis of investigation, use and protection of waters in Bosnia and Herzegovina we can distinguish two groups:

- > general legislation
- > legislation of institutional and inter-institutional significance

Effective water management depends, to a considerable degree, on the legislative basis and implemented management mechanisms.

Above all, Bosnia and Herzegovina has not a status of an associated country of the European Union yet, due to recently ended war activities. It is well known that the first priority of the country in order to become a EU member is to strictly carry out EU regulations.

All activities, through which EU environmental norms and standards will be introduced, will result in supplementing the horizontal legislation, i.e. drafting the laws for the various components of the environment:

- air and water management,
- conservation of bio-diversity and sustainable management of natural resources,
- > environment in the inhabited areas,
- public works activities in the regional aspect,
- reduction of the harmful impact of waste.

Before the war, the framework of the Environmental Protection Law was adopted, based on some fundamental principles:

- > "polluter-pays"
- right of the public to have information
- "preventive control"

The new Chapter of Law provides "far a procedure for environmental impact assessment".

The Water Law Act, which is the legislative basis in the field of water protection, came into force after the war.

By the recent changes in the Government structure the management of the water quality in the Federation of Bosnia and Herzegovina is divided between two Ministries:

- Ministry of Agriculture, Water Management and Forestry (and Public Water Management Enterprise)
- ➤ Ministry of Physical Planning and Environment

The Ministry of Agriculture, Water Management and Forestry and two Public Water Management Enterprises are responsible for the water quality. Both above mentioned Ministries have agreed that the national policy should integrate water management.

Serious steps have been taken to modernize and improve water management policy in new Water Law, framed by the Ministry of Agriculture, Water Management and Forestry.

A river basin approach and financial mechanisms are stipulated in the new Law. This means full cost recovery and approval of taxes for the water use as a valuable resource is established.

The necessity of keeping high quality of the water management in Bosnia and Herzegovina is also provoked by some international documents regarding Danube River protection. Both, Ministry of Agriculture, Water Management and Forestry and Ministry of Physical Planning and Environment endorsed an Environmental Action Programme for Central and Eastern European Countries.

The important international agreement, the Danube River Protection Convention has been signed by the Representative of Bosnia and Herzegovina. The signing of the Convention is accepted in Bosnia and Herzegovina as one of the ways of leading the country into EU membership and it is definitely one of the instruments for achieving harmonization with European water quality standards. Beforehand, the signatories to the Convention agreed that they will start implementing activities and programmes that relate to the principles and clauses of the Convention. Currently the Government is going towards the ratification of the Convention. The Convention is to be reviewed and discussed in the Council of Ministers and in due course submitted to the Parlament. Parlamentary support is expected, since the will of the country seems to be that Bosnia and Herzegovina should become a full member of the Convention. The ratification is seen as a mean to become a member of the EU and, thus, the country could profit from all benefits that flow from it. Through the ratification of the Convention, Bosnia and Herzegovina will confirm its readiness to fulfil its commitments step by step but will also gain access to international projects and programmes designed to solve the ecological problems of the Danube basin. The Danube River Protection Convention falls within the framework of the Convention on the Protection and Use of the Transboundary Water Courses and International Lakes (Helsinki, 1992).

This report is a part of the activities under UNDP/GEF. Together with its predecessor, the "National Review of Bosnia and Herzegovina" of June 1998, it is an important step towards the establishing of regular reporting routine on the state of the environment in the Bosnia and Herzegovina Danube River Basin.

1.2. Methodological Approach

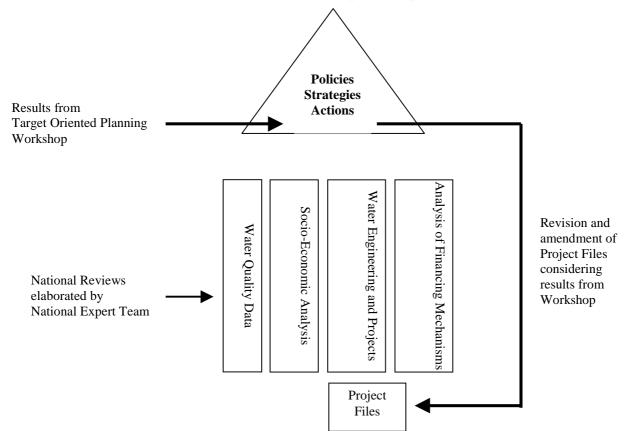
The organization of the National Planning Workshop in Bosnia-Herzegovina is part of the planning process to develop the Danube Pollution Reduction Programme in line with the policies of the Danube River Protection Convention. UNDP/GEF gives its technical and financial support to organize a country-driven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

The first step of this process consisted of the elaboration of National Reviews, with particular attention to the collection of viable water quality data, the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects for pollution reduction. For this purpose, a team of national experts for water quality data, water engineering, socio-economic analysis and financing mechanisms has been established within the Ministry of Environment, with agreement of the Ministry of Agriculture, Water Management and Forestry, and under the guidance of the Country Programme Coordinator. The results of these studies represent the baseline information for participants of the National Planning Workshop. Moreover, they constitute the national contribution, in technical, economic and financial terms, for the elaboration of the Danube Pollution Reduction Programme with particular attention to transboundary issues and the development of an investment portfolio.

To assure wider participation in the planning process, prior initiatives have been taken to organize an NGO-Consultation Meeting, which took place in Zenica from 15 to 16 June, 1998. At this occasion, the representatives of thirteen Non-Governmental Organizations have discussed common strategies and priority measures for pollution reduction and designated their participants for the National Planning Workshop, as well as for the forthcoming regional meeting of the Danube Environmental Forum (regional NGO with the participation of all Danube countries).

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

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



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

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

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

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

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

2. General Frame of Analysis

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

Bosnia-Herzegovina is located on the Balkan Peninsula and has the area of 51.129 km² with 3.798.333 inhabitants. It became independent state with two entities – the Federation of Bosnia-Herzegovina and Republic of Srpska – just recently. War that lasted from 1992 to the end of 1996 brought a lot of destruction and damage to the country and its people in all aspects.

Even before the war environment pollution and unhealthy conditions were great social, economic and health problem. It is very important, for the country that just enters the period of reconstruction and long-term development, to start to develop more responsible relation of population to nature and environment.

Rivers of Bosnia-Herzegovina belong to two catchment areas - the Black Sea and the Adriatic Sea. The Sava River Basin represents the Danube River Basin on the territory of Bosnia-Herzegovina.

Physical Aspects

The Sava River Basin covers 38.719 km^2 (about 75,7% area of Bosnia-Herzegovina). The main tributaries of the Sava, which is 355 km long in Bosnia-Herzegovina, are: Una -214 km (9.130 km² or 23,6% of the whole Sava catchement area), Vrbas -240 km (6.386 km² or 16,5%), Bosna -271 km (10.457 km² or 27%) and Drina -346 km (7.240 km² or 18,7%).

The terrain ranges from mountain region in the south part of the basin (altitude above 700 m above sea level) through hilly part in the middle (300-700 m above sea level) to lowlands in the north, along the Sava River.

Regarding the climate, the Sava River Basin is under continental climate influence. Precipitation increases from north (about 770 mm) towards south (about 1.100 mm), and from east towards west, but an average is 950 mm/year. An average of about 940 m³ goes to the Sava River. Average temperatures vary from +12°C in lowlands to +9°C in mountainous region. Winters in mountains are long and cold, and summers are mild and short. Lowlands have dry and mild winters and long, hot summers.

The joint characteristic of all the Sava tributaries is big height difference between their source in mountainous region and mouth in lowlands, as well as large water quantities what makes them fast and strong. The result is significant hydropower potential. These rivers are also used for water supply, irrigation, fishery and tourism.

Demography/Social Background

Compared to 1991 census, today in Bosnia-Herzegovina live 9,8% less population. Most of that number, i.e. 2.945.770 or 73,7% of total population, lives in the Sava River Basin. All bigger towns and settlements are located along the watercourses. Population density in the Basin is 70 inhabitants per km². About 80% of population live in urban settlements nowadays. This is result of big migration from villages to cities during the war. Before the war about 53% of total population lived in settlements with less than 2.000 inhabitants.

About 50% of population are connected to public water supply systems, while the rest of population use alternative water sources. Losses in water supply systems are very big, 30-70%, because of damages and non-maintenance during the war. Only about 35% of population are connected to sewerage systems (57% of urban population is connected to sewerage systems). 90% of urban wastewater is discharged directly into the watercourses, without previous treatment, due to

non-existence of wastewater treatment plant or their destruction by war activities. In whole Bosnia-Herzegovina only six city wastewater treatment plants operated before the war (in Sarajevo, Trebinje, Ljubuski, Gradacac, Celinac and Trnovo), while two were about to be put into operation (in Grude and Odzak).

Transboundary Effects (as perceived/produced))

Unfortunately, no water quality monitoring has been set in Bosnia-Herzegovina in post-war period, so waters can not be controlled.

Before the war there were 58 water quality stations in Bosnia-Herzegovina, out of which 53 were in the Sava River Basin. Water quality had been recorded from 1965. It can be assumed that water quality has improved during war period, because factories have not been working or worked with reduced capacity, meaning pollution was decreased, but no exact data are available.

We can assume that certain amount of pollution comes by the Sava River from Croatia and the Drina River from Federal Republic of Yugoslavia (municipal and industrial wastewater), but we are not in position to measure pollution inflow, as well as outflow downstream from Bosnia-Herzegovina.

Human/Economic activities

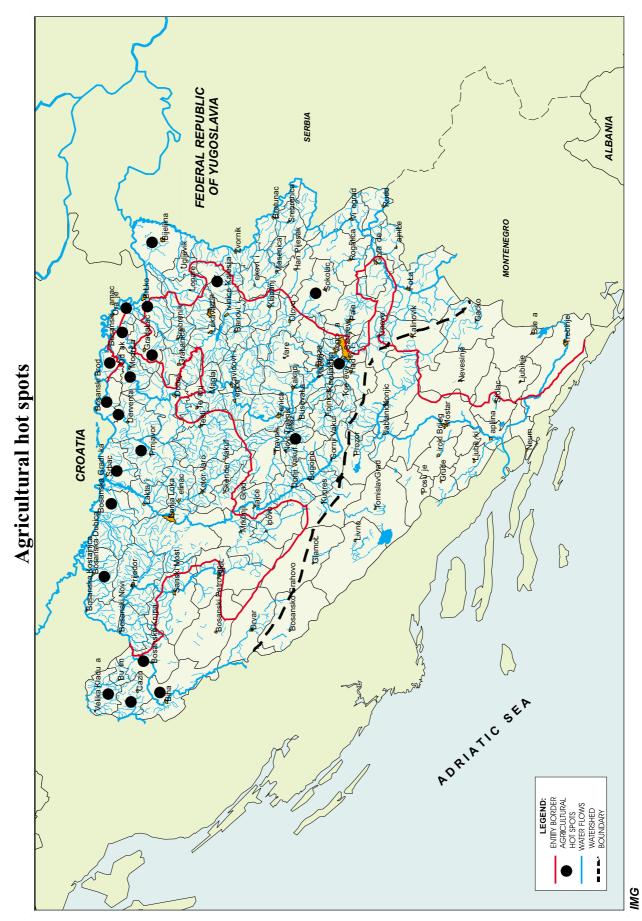
The lowlands on the north of the Sava River Basin represent the most fertile part of Bosnia-Herzegovina. Excessive use of fertilizers and pesticides caused pollution of soil and water. Inappropriate land use, together with extensive wood cutting, led to soil erosion. The stockbreeding farms usually do not have wastewater treatment facilities and discharge their waste directly to watercourses.

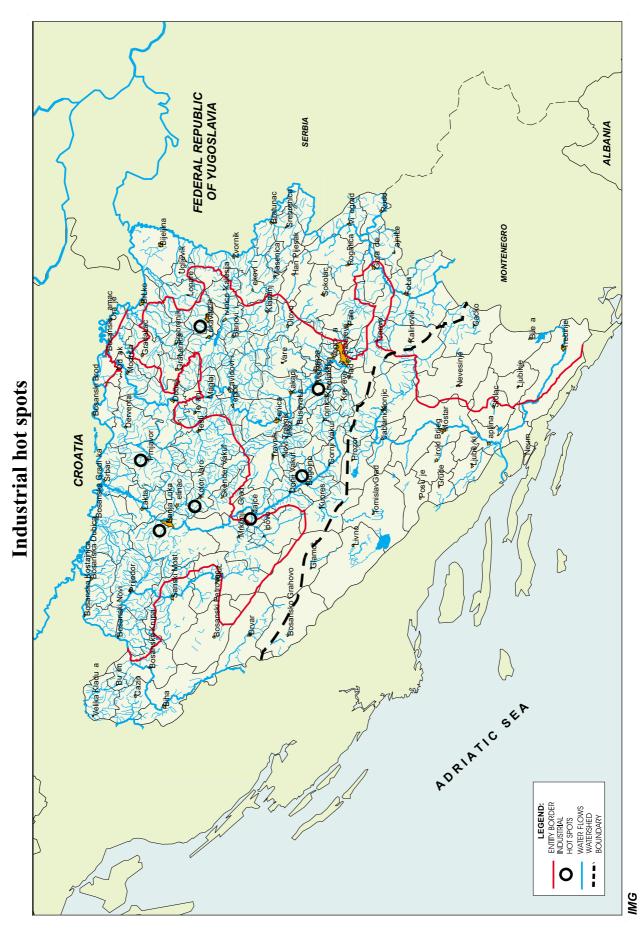
The human activity that has the biggest negative impact on environment is industry. All kind of industries can be found in the Sava River Basin – food, textile, leather, chemical, wood, metal processing, mining etc. In post-war period only 15-20% of factories have restarted their production. Most of them do not have wastewater treatment plants. Even before the war only 27, out of total 122 industrial wastewater treatment facilities operated with satisfactory results.

Wastewater and solid waste from urban areas present constant threat to environment, because minority of households is connected to central sewerage systems, there are no wastewater treatment plants or sanitary landfills, all of which cause further pollution of water and soil and present health risk for population.

FEDERAL REPUBLIC YUGOSLAVIA ALBANIA SERBIA MONTENEGRO Main catchment Areas in Bosnia & Herzegovina CROATIA Watershed Boundary
between the Black
Sea and the Adriatic
Sea Catchment Area ADRIATIC SEA LEGEND: I

IMG





2.2. Problem Analysis

2.2.1. Core Problem

The following was identified as the core problem:

"INADEQUATE HUMAN ACTIVITIES LEADING TO WATER POLLUTION AND DEGRADATION OF RESOURCES IN BOSNIA-HERZEGOVINA PART OF THE DANUBE RIVER BASIN"

2.2.2. Direct Causes of the Core Problem

The following direct causes leading to the core problem were identified

- ➤ Inadequate land management and inappropriate agricultural practices due to: inadequate use and application of pesticides; uncontrolled use of fertilizers in lowlands; discharge of liquid waste from farms without pre-treatment and accelerated run-off generating erosion.
- Pollution of water through re-launching of obsolete industrial technologies due to: use of dirty and obsolete technologies; discharge of wastewater without pre-treatment; inadequate management of enterprises and inadequate disposal of solid hazardous substances.
- ➤ Improper disposal of solid waste and wastewater in urban areas due to: improper drainage of wastewater; discharge of municipal wastewater without previous pretreatment and improper disposal of solid waste.

Scheme of Problem

Reduced water availability for different purposes Damage of fauna and flora in watercourses Health risk

INADEQUATE HUMAN ACTIVITIES LEADING TO WATER POLLUTION AND DEGRADATION OF RESOURCES IN BOSNIA-HERZEGOVINA PART OF THE DANUBE RIVER

Land Management and Agriculture

Inadequate land management and inappropriate agricultural practices

Industry

Pollution of water through relaunching of obsolete industrial technologies

Urban Settlements

Improper disposal of solid waste and wastewater in urban areas

2.2.3. Effects of the Core Problem

These following direct consequences of the core problem have been identified

> Reduced availability of water for different purposes

Pollution of ground water reduces the quantity of water suitable for intake and for potable water supply. Due to appearance of eutrophication, water is not suitable to be used for the recreation purposes.

Damage done to fauna and flora in water courses

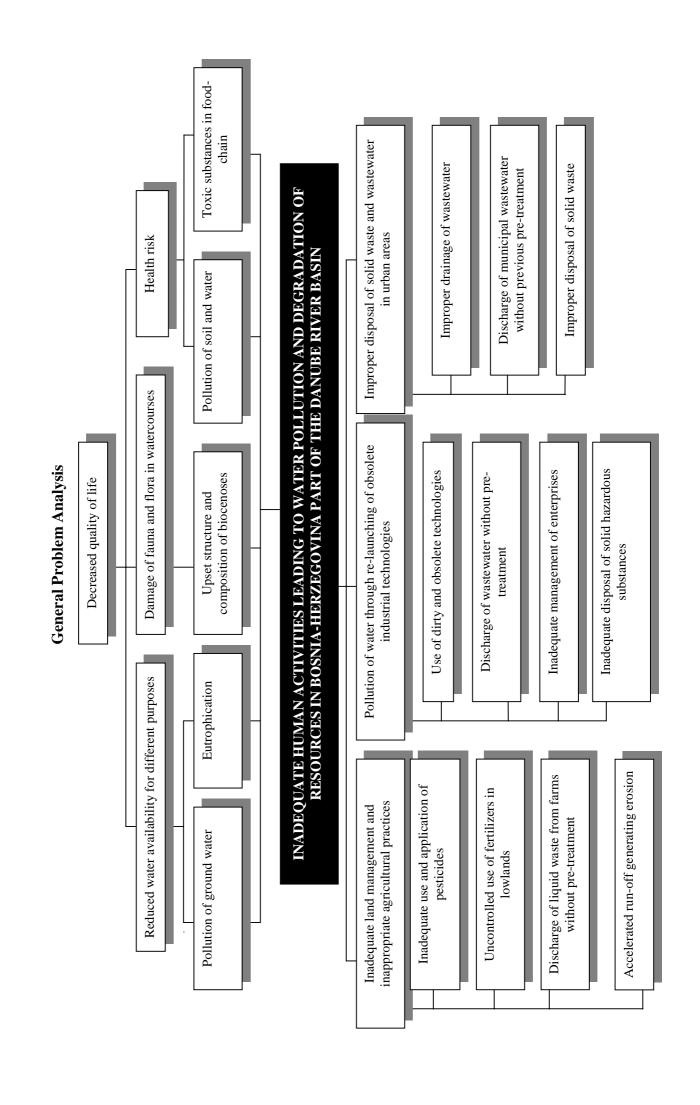
Disbalance in the structure and composition of biocenoses leads to destruction of fauna and flora in watercourses.

> Health risks

Due to soil and water pollution and appearance of toxic substances in food, health is under risk.

> Lower quality of life

All the above-mentioned leads to lowering the quality of life.



2.3. Analysis of Objectives and Identification of Priority Sectors

2.3.1. Description of Objectives

The objective analysis in the three sector groups gave the participants the opportunity to convert their vision about the desired state. The means-ends relationships analysis between the proposed main activities, expected results and sector objectives led to the following statement of the programme objective:

"UNPOLLUTED WATER IN BOSNIA-HERZEGOVINA PART OF THE DANUBE RIVER BASIN"

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

"ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT IN THE DANUBE RIVER BASIN"

In order to assure unpolluted waters in Bosnia-Herzegovina part of the Danube River Basin, specific objectives have been identified for the following sectors:

- **Land Management and Agriculture: Appropriate land management and suitable agricultural practices applied**
- > Industry: Significant reduction of water pollution through implementation of clean industrial technologies
- > Urban Settlements: Wastewater and solid waste from urban areas adequately disposed

Scheme of Objective

Water availability for different purposes increased Damage of fauna and flora in watercourses prevented Health risk eliminated

UNPOLLUTED WATERS IN BOSNIA-HERZEGOVINA IN THE DANUBE RIVER BASIN

Land Management and Agriculture

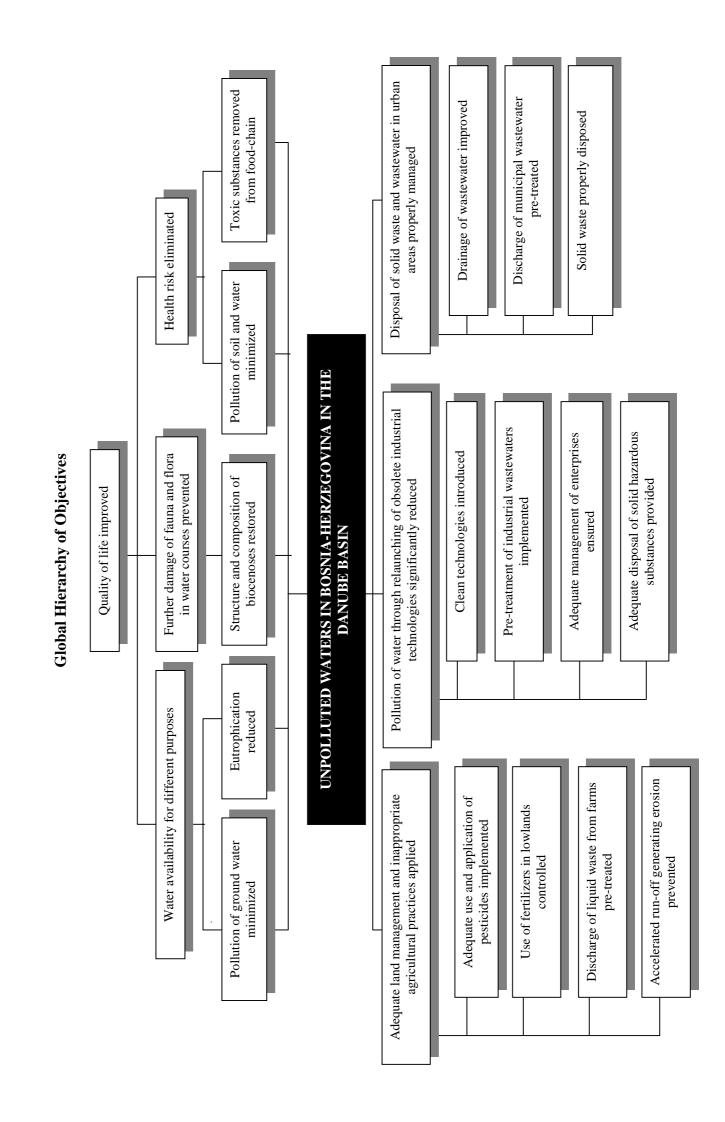
Adequate land management and inappropriate agricultural practices applied

Industry

Pollution of water through relaunching of obsolete industrial technologies significantly reduced

Urban Settlements

Disposal of solid waste and wastewater in urban areas properly managed



2.3.2. Identification of Priority Sectors

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

A. Land Management and Agriculture

Agriculture in BH is not developed to the measure it could be, if judged by natural resources. The measures that stimulate adequate practices in the agricultural sector, and measures for curbing the pronounced process of erosion caused by bad land management, make the set of measures to be undertaken in this sector. It is required to:

- > adopt adequate use of pesticides
- > adopt adequate use of fertilizers in the lowland areas
- treat properly liquid waste from farms
- prevent accelerated run-off generating erosion

B. Industry

Before the war, in Bosnia and Herzegovina there was active a large number of industrial capacities, which used dirty technologies. In order to check the present pollution and to prevent further one, measures, which relate to introduction of clean technologies instead of dirty ones, can be undertaken. It is required to:

- > introduce clean technologies
- > implement pre-treatment of wastewater
- > ensure adequate management of enterprises
- > dispose properly hazardous substances in landfills

C. Urban Settlements

The migration of rural population to urban areas, particularly pronounced for the past few years, led to the concentration of population in cities. Proper disposal of wastewater and solid waste is the main objective of this sector. In order to achieve this objective, it is foreseen to:

- > collect adequately wastewater
- treat municipal wastes before discharging
- dispose suitably solid waste

2.3.3. Important Assumptions for Programme and Sector Objectives

Important assumptions are factors that are important for the success of the programme but they lie outside of the scope of the programme and not under its direct control. Therefore, they are external factors, which will ensure the success of the programme and the sustainability of its results.

The following assumption for the programme objective has been identified:

Strengthening cooperation between the Federation of BH and the Republic of Srpska

Four main tributaries of Sava River in BH (Una, Vrbas, Bosna, Drina) in their upper course flow through the territory of the BH Federation and in the lower course through the Republic of Srpska. Integral management at the level of the basin implies the cooperation of the two BH entities, and there has lately been a significant progress achieved to that sense.

The following important assumptions for the sector objectives are necessary to achieve the programme objective:

For Sector Land Management and Agriculture

Rational land management remains a government priority

For the past few years, the uncontrolled cutting of forests has been creating the problem of very pronounced erosion. The resolution of this problem falls under the competence of the Ministry of Agriculture, Water Management and Forestry and the Ministry of Physical Planning and Environment. Rational land management is mainly the priority task of the government, which should ensure its protection and optimum use in order to arrive at satisfactory level of agricultural production and prevent pollution of environment.

> Implementation of adequate agricultural practices remains a government priority

People in BH are not motivated to live in villages and to engage in agriculture in an adequate way. Stimulation of the development of agriculture and adequate practices make agriculture economically attractive and acceptable from the point of view of protection of environment. Defining the strategy of development of agriculture is a priority task of the government, which must reorient the agricultural production from the traditional subsistence agricultural farming to market oriented economy.

For Sector Industry

Sustainable behavior of the managers

The top management of industrial capacities, apart from direct economic profit, should also take care of the impact of the production on environment. By adopting the standards, which are in line with principles of environmental protection, the managers protect environment, at the same time ensuring long-term production.

The approach of management to running both the production processes and systems of environmental protection has a decisive influence upon the attitude of other employees in industrial enterprises. It is taken as assumption that, among else, the behavior of the manager must be brought in harmony with the efforts invested into establishing healthier and more environmentally friendly production, thus to provide elements for sustainable progress.

> Implementation of clean technologies remains a priority for the government

In the post-war period, the industrial capacities have for the major part been out of function. In such situation the government should provide incentives for application of clean technologies and prevent the re-launching of capacities, which through their dirty technologies cause great harm to the environment.

As the direct interdependence between the reduction of pollution and implementation of clean industrial technologies has been established as a fact, this being one of the essential objectives of the Programme, unavoidable elements in implementation of the Programme policy for industry sector are the following:

- Laws brought concerning the implementation of clean technologies, with priority list established
- Acceptable and reasonable approach on the part of administrative structures

In case that at the level of the government relevant legal regulations governing the application of clean technologies, along with the priorities set for their introduction, be not prepared and adopted, then it will not be possible positively to influence the reduction of pollution nor to maintain the water quality level in the BH part of the Danube River basin (which has improved considerably in comparison to the pre-war level).

The present set of circumstances should fully be taken advantage of, by maintaining the present status precisely through the means of legal regulations. The present propitious moment for the undertaking of transformation of industrial enterprises on sound basis is a unique one and should not be wasted.

For Sector Urban Settlements

> Environmental protection on policies continues to be a priority for government

The policy of sustainable development, incorporated into the activities of the government, is a precondition to a proper environmental protection.

Sustainable behavior of the population

Population, as well as all level of authorities (cities, cantons and state), should be informed and educated through mass media that conducting of environmentally friendly policy and respecting of related legal regulations leads to more healthy and safer life, cleaner water, soil and air.

Local sources of funding available

Under post-war conditions, when the mechanisms of financing have not yet been developed in the state, Bosnia and Herzegovina is receiving a large assistance from the international community. The parallel development of local sources of financing will ensure sustainable and proper disposal of the wastewater and solid waste.

Authorities need to support cooperation between all stakeholders and encourage mutual efforts in implementation of water protection measures and water quality control by introducing adequate financial mechanisms within users.

2.3.4. Impact Indicators for Programme and Sector Objectives

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

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

Significant reduction in the pollution of soil ground and surface waters leading to increased amount of water available for different purposes, reduced health risk and preservation of bio-diversity by the year 2005 in the Sava River Basin.

The impact indicator for the land management and agriculture sector have been identified as follows:

➤ Increase of the percentage of users applying adequate agricultural practices while at the same time meeting production plan, which covers 50% of the country's need for food (15% - 2005; 20% - 2010; 30% - 2015)

By establishing agricultural extension services (system of soil fertility control, prevention and a quarantine services and pest control services, education of users, etc.) and by properly using the land, conditions will be created for gradual increase in production of food, which will satisfy about 50% of the BH population needs in essential foodstuffs.

The impact indicator for the industry sector have been determined as follows:

Reduction of water pollution by 70% of industries implementing clean technologies and at the same time decrease of water pollution reaching second class of bonity in the entire catchment area of the Sava River Basin

By separating harmful suspended matter, toxic organic substances and heavy metals from the effluents to satisfactory levels, their presence in waters of watercourses is also eliminated.

The effects of achieved objectives of the Programme for Industry Sector can be expressed through two basic indicators:

- preserved flora and fauna in water courses
- unpolluted ground water

These effects reflect on the preservation of eco-systems, biodiversity, and elimination of hazardous factors that affect the health of people.

The impact indicator for the urban settlements sector have been identified as follows:

➤ BOD5 in the water courses of the Sava River Basin reduced by 20% by the year 2005 against 1998, leading to decreased health risk and improved living conditions for river flora and fauna

BOD5 parameter is a water quality parameter, through the measured value of which conclusions can be drawn about the presence of organic matter. The lower values of BOD5 will be reached through treatment of wastewater from urban settlements.

Program Planning Matrix

Summary of Objectives and Activities	Impact Indicators	Important Assumptions
V Overall Objective: Sustainable development in the Danube River Basin		
Program Objective: Unpolluted waters in Bosnia-Herzegovina part of the Danube River Basin	Significant reduction in the pollution of soil ground and surface waters leading to increased amount of water available for different purposes, reduced health risk and preservation of bio-diversity by the year 2005 in the Sava river basin.(PO)	Republic of Srpska(PO)
Sector Objectives: 1 Land Management and Agriculture: Appropriate land management and suitable agricultural practices applied 2. Industry: Significant reduction of water pollution through implementation of clean industrial technologies 3 Urban Settlements: Wastewater and solid waste from urban settlements adequately disposed	1. Increase the percentage of users applying adequate agricultural practices while at the same time meeting production plan, which covers 50% of the coutry's need for food (15% - 2005; 20% - 2010; 30% - 2015) (SOLMA) 2. Reduction of water pollution by 70% of industries implementing clean technologies and at the same time decrease of water pollution reaching second class of bonity in the entire catchment area of the Sava River Basin (SOI)	 ▶ Rational land management remains a government priority (SOLMA) ▶ Implementation of adequate agricultural practices remains a government priority (SOLMA) ▶ Sustainable behavior of the managers(SOI) ▶ Implementation of clean technologies remains a priority for the government (SOI) ▶ Environmental protection on policies continuos to be a priority for government (SOUS) ▶ Sustainable behavior of the population (SOUS) ▶ Local sources of funding available (SOUS)
**Results/Outputs: 1. Land Management and Agriculture 1. Land Management and Agriculture 1. Adequate use of pesticides adopted 1. 2. Adequate use of fertilizers in the lowland areas adopted 1. 3. Liquid waste from farms properly treated 1. 4. Accelerated run-off generating erosion prevented 2. Industry 2. I Clean technologies introduced 2. 2. Pre-treatment of wastewater implemented 2. 3. Adequate management of enterprises ensured 2. 4. Hazardous substances properly disposed in landfills 3. Urban Settlements 3. Urban Settlements 3. Municipal wastes treated before discharging 3. 3. Solid waste suitably disposed	River Basin reduced by 20% by the year 2005 against 1998, leading to decreased health risk and improved living conditions for river flora and fauna (SOUS)	(These assumptions will be described within the sector strategy)
PO - Program Objective SOLMA - Sector Objective Land Management and Agriculture	Agriculture SOI - Sector Objective Industry	sstry SOUS - Sector Objective Urban Settlements

3. Sector Strategies

3.1. Land Management and Agriculture

3.1.1. Situation Analysis

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

Characteristics in regard to BH and Danube basin, pre-war and post-war period

Land potentials and way of use

Out of total land resources in BH which cover 5.112.900 hectares (51.129 km²) agricultural land covers 2.525.000 hectares or 49,4%, forests cover 2.368.700 hectares or 46,3% and unproductive land takes 219.200 hectares or 4,3%. Concerning the structure of agricultural land, arable land covers 1.125.000 hectares or 44,6%, grassland covers 1.400.000 hectares or 55,4%, where 1.018.000 hectares or 40,3% goes for plowland, 99.000 hectares or 3,9% goes for fruit orchards and vineyards, 468.000 hectares or 18,6% goes for meadows, 932.000 hectares or 37,0% goes for pastures, and 4.000 hectares or 0,2% goes for wetlands and reed marshes.

Types of soil and their characteristics

Automorphic soils, encompassing 89%, dominate in the area of Bosnia and Herzegovina and consequently in the BH part of Danube basin, while hydromorphic soils make 11% of the area. Acid soils comprise 43% of the area. The soils are for major part shallow and highly sloped, mainly lighter in texture, arenaceous and loamy, medium pervious, medium to highly humid, of low fertility, poor in available phosphorus (P_2O_5) and with medium contents of potassium (K_2O).

Structure of ownership and size of property lots

Agricultural land comprises 45% of land in BH out of which, according to data for 1991, 29% are owned by state and social sector, while the private sector possesses 71%. Landed property was owned by 534.528 households, so that in average one household possessed about 3,41 hectares of land. The table below gives a summary review of the size of property lots and the number of households in 1991.

No.	Size of land	No of households	%
1	without land	5.945	1,1
2	up to 1 ha	180.460	33,4
3	1.1 – 3.0 ha	178.299	33,0
4	3.1 – 5.0 ha	86.448	16,0
5	5.1 – 8.0 ha	57.272	10,6
6	8.1 – 10.0 ha	16.749	3,1
7	10.1 and more ha	15.128	2,8
TOTAL		540.301	100,0

From the above it is clear that only 16,5% of households possess land of 5 ha in size, on which market-oriented production can be developed. It is also of significance to note that a considerable number of households, 67,5% of them, possess farming lands smaller than 3 ha in size.

Population

According to the 1991 census, there were 4.377.033 inhabitants living in the territory of Bosnia and Herzegovina, out of which number the agricultural population made only 13,1%, while in 1961 the agricultural population made 50% of the population. This means that there was a considerable decrease in the number of people engaged in agriculture in Bosnia and Herzegovina for the last 30 years up to the recent war. There is 0,58 ha of agricultural farming land per capita, 0,27 ha of arable land and 0,24 ha of ploughland per capita (this being slightly above the world average, which is 0,40 ha of agricultural farming land per capita, and 0,17 ha of ploughland per capita).

The following table shows the breakdown of cultivated acreage per capita by categories in Bosnia and Herzegovina in 1991.

Serial No.	Category	ha/ capita	No of municipalities	%
1	I - Very low	< 0,10	15	13,8
2	II - Low	0,11-0,17	18	16,5
3	III - Medium	0,18-0,24	13	11,9
4	IV - High	0,25-0,30	17	15,6
5	V - Very high	> 0,30	46	42,2
OVERALL B	Н	0,27	109	100,0

It is obvious that the figures for almost 1/3 of municipalities are lower than the world average, yet the overall situation is rather favorable, since we fall into IV category, i.e. high category, with overall average of 0,27 ha/capita.

Topographic relief and analysis by regions

In regard to topographic relief forms, mountainous areas and high-mountain regions predominate, covering about 80% of the area of Bosnia and Herzegovina. The terrain is highly sloped, with slopes steeper than 15°. The stretches, which are either flat or mildly sloped, are mostly found in river valleys and karstic fields, covering about 16% of the land surface of Bosnia and Herzegovina. The lowlands cover 577.758 ha or 11%, mountainous areas 1.344.693 ha or 26,3%, high-mountain regions 2.924.579 ha and Mediterranean lands take 265.870 ha or 5,2%.

The following table gives a brief review of topographical regions in their relation to overall and agricultural land surface.

Ser.	Type of region	Altitude in m	Surface area	of BH %	Agricultura ha	al land %
1	Lowlands	<300	577.758	11,3		18,3
2	Mountainous	300-700	1.344.693	26,3		27,5
3	High-mountain	> 700	2.924.579	57,2		48,1
4	Mediterranean	< 700	265.870	5,2		6,1
TOTA	L		5.112.900	100,0		100,0

As the surface area of the Danube basin covers 3.871.900 ha or 75,7% of the surface area of BH, comprising lowlands, which cover 577.758 ha or 14,9%, mountainous areas covering 1.344.693 ha or 34,7%, and high-mountain areas covering 1.949.449 ha or 50,4% of the surface area of the basin, it follows that the mountainous and high-mountain regions cover about 85% of the basin area.

Comparative order of coverage by topographical regions:

	BH	high-mountain>mountainous>lowlands>mediterranean
>	agricultural land	high-mountain > mountain ous > low lands > mediterrane an

➤ Danube basin high-mountain>mountainous>lowlands

Climate characteristics

The influence of temperate continental and mountain climate, for major part characteristic for the Danube and Black Sea basin area, is predominating. The average total annual precipitation amounts to 960 mm, with unequal distribution of precipitation over the year, ranging from 770 mm in the lowlands up to 1100 mm in the high-mountain areas. The average annual temperatures vary from $+12^{\circ}$ C in the lowlands to $+9^{\circ}$ C in the high-mountain areas. In the high-mountain areas the winter seasons are long and cold, and summer seasons are temperate and short, while the winter seasons in the lowlands are dry and mild, and the summer seasons are long and hot.

Hydrological characteristics

The hydrological characteristics of the Danube basin area are as follows:

-	annual water surplus	182 - 694 mm	average 438 mm
-	annual water shortage	15 - 124 mm	average 69 mm
-	potential evapotranspiration (PET)	616 - 718 mm	average 667 mm
-	actual evapotranspiration (AET)	523 - 655 mm	average 589 mm
-	drought coefficient (AET/PET)	0,81 - 0,96	average 0,88

Dewatering (drainage)

In the Danube basin area, the land engineering measures for regulation and protection of land were undertaken, and the system of main and minor infiltration drains built, primarily in the lower courses of Una, Vrbas, Bosna, Spreča and Drina River, and to a highest degree in the immediate zone of Sava River (Lijevce, Posavina and Semberija). The figures follow:

	built	potential drainage
main drains (I, II and III order drains)	106.273 ha	238.941 ha
minor drains (IV order drains)	10.990 ha	92.417 ha
TOTAL	117.263 ha	331.358 ha
	35,4%	100,0%

Although the drainage systems cover about 35% or 1/3 of the potential 331.358 ha, at present, as consequence of war activities and due to impossibility to adequately maintain the systems, the drainage systems are not fully in operation. Therefore emergency works should be undertaken in order to rehabilitate and clean the system of main infiltration drains.

Irrigation

Agricultural land was very scarcely irrigated up to now. Where irrigation did take place, mainly the systems using rainfall and flood irrigation of plots were applied. As in the case of drainage, irrigation too was applied mainly in the lowlands, as follows:

	Irrigated	could be irrigated
Lijevce polje	5.000 ha	
Posavina	800 ha	
Semberija	6.800 ha	
IN TOTAL	12.600 ha	123.700 ha
	10,2%	100,0%

As shown above, the irrigation system is very scarcely applied in these territories – only 10,2% of the potential capacities are used. Presently, due to fact that the land is damaged and mined, 30% of the previously irrigated land is not being irrigated.

In order to obtain correct data about the land from the area of the Danube Basin, which could be irrigated (taking into account other catchment areas of the Sava River the overall surface would amount to 123.700 ha), it is necessary to prepare a research programme. This would contribute to increasing food production considerably.

In relation to irrigation potentials in this area, it is also necessary to provide sufficient quantities of good quality water for irrigation to the amount of about 3.000-3.500 m³/ha. It is important to note here that there are significant quantities of water in ground reserves, which could be used for irrigation in Lijevce polje and Semberija, and therefore it is of key importance to protect this water from pollution.

Flood control

The system of flood control in the Danube basin consisted of dykes, containment (perimeter) drains and infiltration drains (training of waterbeds). In the area of Danube basin flood control is applied mainly in the area of Sava River and its important tributaries.

The following table gives an overview of training works and areas, where flood control measures are applied in the Sava River basin.

Ser.	REGION	Dyke	es in	Drai	ns in	Water C	ourses in
No.	REGION	km	%	km	%	km	%
1	Bosansko-Dubička plain	36,0	10,3	15,3	6,3	1,5	1,3
2	Lijevce polje	61,0	17,4	48,9	20,0	6,4	5,7
3	Srbačko-Nožička plain	15,7	4,5	11,0	4,5	4,7	4,2
4	Ivansko polje	40,0	11,4	13,2	5,4	ı	0,0
5	Odžačka Posavina	31,4	9,0	16,7	6,8	1	0,0
6	Central Posavina	56,6	16,2	47,1	19,3	3,0	2,7
7	Semberija	38,9	11,1	69,8	28,6	4,0	3,6
8	Una River	16,4	4,7	16,2	6,6	24,5	21,8
9	Vrbas River	5,0	1,4	1	0,0	4,8	4,3
10	Bosna River	35,0	10,0	6,0	2,5	55,7	49,7
11	Drina River	13,7	3,9	1	0,0	7,5	6,7
TOT	AL	349,7	100,0	244,2	100,0	112,1	100,0

The above overview shows that the dykes are built in total length of 349,7 km, mainly in the area of Lijevce polje (61 km or 17,4%) and Central Posavina (56,6 km or 16,2%). The network of drains has been built in the length of 244,2 km, encompassing mostly Semberija (69,8 km or 28,6%, Lijevce polje (48,9 km or 20,0%) and Central Posavina (47,1 km or 19,3%). The training of watercourses has been applied to the length of 112,1 km, mainly in Bosna River valley (55,7 km or 49,7%) and Una River valley (24,5 km or 21,8%).

Consolidation of land

Land has been up to now consolidated in the area covering 56.009 ha (1,7% of the Danube basin area in Bosnia and Herzegovina or 11,2% of lowlands of Posavina and Semberija), where the combined measures of land improvement were undertaken (consolidation of land, building of draining and road network, drainage and flood control).

The following table gives a brief review of the areas where land consolidation was applied.

Ser. No.	Amelioration area	Surface Area in ha	%
1	Semberija - Bijeljina	33.081	59,1
2	Posavina – Brčko	15.514	27,7
3	Posavina – Orašje	4.360	7,8
4	Central Posavina – Odžak	3.054	5,4
TOTAL		56.009	100,0

The above figures indicate that the largest land consolidation area is Semberija – Bijeljina, which participates with 38.081 ha or almost 60% of the overall land consolidated.

This also indicates that intensive farming could be applied in these areas, whereby the water of the Danube basin would be increasingly polluted.

Land engineering and reclamation

Land engineering and reclamation in the area of the Danube Basin in Bosnia and Herzegovina was performed by the means of building dykes (flood walls), drainage and training of water courses. These measures were implemented in the area of the Sava River Basin.

The following table gives the overview of these melioration regions selected (of the overall area of 308.086 ha), along with the measures undertaken in the Danube Basin area in BH.

C	24.11	Surface	Em	nergency area	in ha	Drained	Inninata d
Ser. No.	Melioration region	Area in ha	flooded	controlled ha	uncontrolled ha	ha	Irrigated ha
1	Semberija	32.940	18.800	16.000	2.800	24.040	6.800
2	Gnjica-luk.	9.800	2.800	-	2.800	1.000	-
3	Tinja-Brka	28.000	7.800	1.400	6.400	13.000	-
4	Central Pos	46.940	24.500	24.500	-	18.700	800
5	Odžač. Pos	18.500	9.740	5.740	4.000	8.340	-
6	Ivanjsko p.	7.300	6.800	6.000	2.800	5.450	-
7	Ukrina-vij	4.600	4.050	-	4.050	390	-
8	Srbac plain	10.200	3.300	2.600	700	2.900	-
9	Lijevce p.	40.776	25.119	17.910	7.209	18.203	5.000
10	Dubica pl.	6.130	6.130	6.130	-	4.350	-
11	Una basin	46.300	15.500	3.600	11.900	600	-
12	Vrbas b.	12.000	1.000	-	1.000	-	-
13	Bosna b.	33.100	5.500	600	4.900	-	-
14	Drina b.	11.500	2.300	=	2.300	-	-
ТОТ	ΓAL	308.086	133.339	84.480	50.859	96.973	12.600

The above figures show that the overall surface area of the meliorated land amounts to 308.00 ha, this representing 8,0% of the Danube basin area in Bosnia and Herzegovina, i.e. 53,3% of lowlands. Out of this, 133.339 ha in danger of being excessively wet (flooded), while in 84.480 ha flood control measures were undertaken (controlled) and in the area of the remaining 50.059 ha flood control measures need to be undertaken. The drainage in this area has been performed by the means of drainage networks, covering 96.973 ha, while only 12.600 ha are irrigated by means of irrigation systems.

Deterioration of soil

The most significant aspects of deterioration of soil in these territories comprise contamination, degradation, destruction and damages caused by war.

Contamination of soil comprises *diffuse pollution* caused by uncontrolled use of protective means and fertilizers in agriculture, as well as by presence of ashes, sulfur and NO_x compounds generated by thermo power plants, cement factories and other industries. Other type of pollution is *concentrated pollution* caused by flue gases (heavy metals) and defrosting salts used on roads, or generated by flooding of polluted rivers. Third type is *local pollution* caused either by accidents, in which harmful and hazardous substances from utilities, sewerage, landfills and dump sites are spilled or uncontrollably discharged into the soil or by incidental situations, disasters etc. Among the significant water and soil pollutants are heavy metals and sulfur compounds, acid rains, radionuclides, wastewater sludge, municipal and industrial waste, mineral fertilizers and pesticides.

Degradation of soil here implies increasing of soil density and degeneration of its texture and other characteristics, caused by improper cultivation of wet soil during its being prepared for sowing by means of heavy machinery (very frequent case in these parts). Milder forms of erosion also lead to water-induced degradation of soil due to improper way of cultivation of land on slopes steeper than 15^o or improper exploitation of forests.

Destruction of soil (pedocide) is the extreme form of deterioration of soil and it can be of temporary or permanent nature. It is caused by human activities, i.e. building of urban settlements, construction of factories, roads or artificial reservoirs, utilization and exploitation of ores and raw materials, discharge and disposal of waste and by-products.

Damages done to the soil by war activities comprised the construction of fortification facilities (trenches, bunkers, etc), destruction of land by explosive devices, movement of troops, artillery and armored vehicles over the land, planting of land mines, destruction and cutting of forests, etc.

Use and application of pesticides

Before the war, 365 active pesticide substances and over 3000 preparations were used in the Republic of BH. Level of usage per unit surface area was 2,5 kg per ha on private farms, up to 5-6 kg per ha on socially owned farms, which was much lower in comparison to European countries. That is to say as much as three times lower since figures speak of usage of 12,5 to 15 kg per ha in the world. The consumption of pesticides in BH before the war amounted to 2100 to 2500 tons per year. The most used pesticides were insecticides, then fungicides and then, least of all herbicides, while the other groups, like for example limicides, were used in the quantity of only 10 tons per year. Among the pesticides, herbicides are the strongest pollutants of soil and water, while insecticides and fungicides are chemically more stable and pollute water to a lower degree.

The cultivation and protection of crops is mainly performed on intensively farmed agricultural lands in the lowlands. It is mainly conducted by means of protective means, which are imported, since we do not have pesticide producing plants. Due to the low level of development of services in charge of plant protection and prevention and quarantine services, the application of pesticides is not being controlled and they are used mainly on the basis of unqualified instructions of salesman and instructions for use given by producers and dealers. There is no established system for monitoring the situation concerning the residue of protective means in soil, water and plants, so that there are no data regarding the pesticide contamination of Danube basin waters. There are also no reliable data about the types and quantities of pesticides presently being applied in these territories.

Use of fertilizers

Application of fertilizers in these territories did not up to now contribute to a significant measure to the pollution of soil and water, in other words the pollution caused by the fertilizers is still at low level. Mineral fertilizers are used to provide 14 essential elements needed for plant nutrition (macro and microelements), which the plants absorb from the soil. The major part of them are low mobility compounds, with the exception of nitrogen compounds, which are very mobile in water solutions and, if present in such a form in excess, may pollute the ground waters. Fact is that the standards for the use of fertilizers used up to now were very low and that mostly NPK fertilizers (15:15:15) were used, as well as pure nitrogen fertilizers 27% KAN and 46% urea, and therefore the pollution of soil and water was insignificant. The control of the use of fertilizers in agriculture was conducted only partially, through systematic control of the fertility of the land. The control of the fertility of the land in the pre-war period was mainly applied on the socially owned farms in BH lowlands, where the level of saturation of soil with basic nutrients and chemicals was regularly monitored. Based upon the results of the surveys the fertilization plants for cultivated crops were prepared for all the land lots in the socially owned sector. Less than 2% of overall agricultural land, or less than 10% of lowlands, was covered by such control. Although the agricultural farms also comprised cattle breeding farms and therefore had available significant quantities of rotted manure, this manure was rarely used for dressing and mineral fertilizers were mainly used instead. This led to acidification of the land and significant decrease in the humification of the land. Low norms of land dressing were mostly applied, amounting to 80 kg/ha of pure dressing, with nitrogen fertilizers predominating. The studies relating to the impact of fertilizers, performed up to now have shown that the pollution of the ground waters is very low, i.e. almost nil, yet however, more attention should be given to the survey of leachate (seepage wastewater from farms), which are directly discharged into the recipient waters, i.e. flow directly into the water of the Danube Basin.

Cattle breeding farms

Larger farms of milk cows and fattened heifers and hogs are mainly found in the low lands (Lijevce, Odžak, Modriča, Posavina, Semberija, Spreča, Sokolac, Sarajevo, etc). These are mainly standard farms of indoor shed type, in which the wastewater is not treated but directly discharged into watercourses, causing pollution. The manure is mainly being rotted and as of lately it is increasingly used for dressing, therefore not presenting serious problems. The greatest problem is a pig-breeding farm in Nova Topola in Lijevce polje, which uses the wet system of rotting and disposal of the liquid waste into pools ("lagoons"), which are potentially the greatest danger concerning the pollution of water in this area.

It would be very important to procure and install farm leachate wastewater filtering and treatment plants, also in order to provide the possibility to use the by-products for agricultural purposes.

Agricultural extension services

Although neither existing as governmental agencies nor established as such in BH, there are still however certain institutes and organizations, which are active in the field of research and promotion of agricultural production. Yet however, the latter are neither linked to each other nor coordinated in their work so that quality monitoring and control of use of artificial substances in agriculture does not exist. As the majority of these institutions was either totally destroyed or damaged by the war and as they possess obsolete or worn out equipment, apart from being short in funds, there is a need to equip these institutions and raise their capacities.

Also, too little attention is given to education and general training of farmers and to their being trained in properly using the available resources and machines, particularly in applying modern technologies in agriculture. Before the war, a certain number of brochures and magazines for farmers were being published and these served the purpose of educating a small number of progressive farmers.

Legal regulations and transformation of ownership

Although there is a certain number of laws governing the sector of agriculture and forestry, these laws were mainly taken over from the previous systems and therefore need to be revised and adopted to the process of transition toward the market economy. It is necessary to bring the relevant regulations and prescribe the standards, which should be harmonized with the international ISO standards. They should allow for the transition from the previous socially negotiated to the market economy.

The following is a selection of some of the important laws, which relate to the use of the land.

- Law on Protection and Use of Agricultural Land (Official Gazette of SR BH 16/85, 27/91 and F BH 2/98)
- Law and Decree on Mining (Official Gazette of SR BH 4/84,20/88, 23/93)
- Law on Urban Planning (Official Gazette of SR BH 9/87, 23/89, 24/89, 10/90, 14/90, 15/90, 14/91 and R BH 16/92)
- Law on Water (Official Gazette of SR BH 41/75, 36/85 and 10/90)
- Law on Building Sites (Official Gazette of SR BH 1/90)
- Law on Electric Power Management (Official Gazette of SR BH 16/78)

Apart from the above laws there is also a number of laws, which deal in detail with certain areas concerning economy, trade and environment, which need to be revised, as well as a number of laws, which are waiting for adoption.

3.1.1.2. Current Strengths/Assets

Taking into consideration identified activities leading to water pollution the following strengths/assets have been identified in the sector of land management and agriculture.

> Reduced use of pesticides

Reduced volume of production and lack of propitious conditions for intensive plant farming, as well as the impact of war activities, have led to a decrease in the use of pesticides. This is also largely due to traditional ways of extensive farming, lack of proper machinery and reduced choice of quality means for protection of crops. It is to be expected that the use of pesticides will rise in the period to come because a large number of diseases and pests resistant to these means have appeared meanwhile.

Existence of educational institutions

Even before the war there existed competent institutions in Sarajevo, Mostar, Banja Luka, Tuzla, Bihać, Doboj, Brčko, Bijeljina, etc., which have unfortunately been devastated during the recent war, their capacity for quality work and involvement dropping low. It is therefore necessary to equip them and build their capacity in all respects, both in terms of technology and in terms of human and financial resources. This refers to system of schooling in high schools and faculties for agriculture and forestry technology, which should provide proper professionals, specialized in different fields needed in this sector. The system of schooling should also develop practical training courses for education of farmers and other users of land resources.

> Used only in limited (narrow) areas

The intensive agricultural farming mainly takes place in lowlands, where the land is of best quality (Lijevce, Posavina, Semberija, Spreča valley). (Unfortunately the quality land is very scarce). Additional factors contributing to the situation being as it is are considerable damages done to the land by construction works and exploitation of raw materials and a high number of land mines in about 15% of the territory of the basin area.

> High level of qualified human resources

Although there exist considerable human resources and qualified staff, due to the low level of organization and lack of relevant services, such as agricultural extension services, etc., as well as due to the present political situation in the post war period, which is reflected in the low level of coordination and cooperation of the agencies and institutions of the Federation and the RS, these human resources remain unused.

Existence of relevant institutions

Apart from faculties and educational institutions there also exist relevant institutes and other agencies, which are however devastated and damaged due to war, possessing obsolete equipment and means of work. Mainly old methodologies, adjusted to previous systems of standards and regulations, are being applied.

Built network of channels

There is a built network of drains, mainly in the lowlands. However, it is dilapidated, and not being run properly, since it is poorly maintained, all this having negative impact on agricultural production. The reasons for this are mainly the lack of financial resources and presence of land mines.

Existence of permeable-alluvial soil

It is exactly in the valleys of the rivers, which belong to the Danube basin that we find alluvial soils (fluvisols), mainly of lighter physical texture, which are permeable and well drained. This can however lead to pollution of ground waters, due to higher soil infiltration.

> Existence of pumping stations

A certain number of pumping stations for evacuation of excess water are either not in operative state or not complete, and therefore not serving their purpose, which affects to a considerable extent adequate draining of surplus water, which appears during fall and spring periods, this also having a negative impact on agricultural production in low lands. It is also important to note here that their proper operation depends on the availability of power sources and financial resources. In addition, war damages and presence of land mines also contributes to the situation being as it is.

Existence of built embankments

Embankments (dykes) built along Sava River and at the mouths of larger water courses are in very bad condition because they are poorly maintained and many of them were damaged during the war, since they had been used for construction of fortifications (bunkers, trenches, ditches, roads, etc.), this presenting a threat in these areas, which are in danger of being flooded. Minefields make the situation even worse since they prevent rehabilitation works to be carried out. Financial resources are also lacking.

3.1.1.3. Analysis of Transboundary Effects

The transboundary effects are grouped into incoming and outgoing ones, manifesting themselves in the pollution of soil and water in the Sava, Drina and Una River basins. Incoming and outgoing waters are not properly surveyed and the monitoring system has not been established, so that the effects, which otherwise could be given through the analysis of water quality and effluents, are unknown.

The transboundary effects might primarily reflect on ground waters, causing pollution and thereby presenting a threat to health of people, who mainly use this water for drinking (frequent case in Posavina and Semberija). This also affects the water used for irrigation of agricultural crops, this further entailing pollution of soil and plants, and, consequently, human and animal organisms.

The following transboundary effects have been considered:

Effects on ground water - Pounje - Posavlje - Semberija - Podrinje

The pollution of surface and infiltration of water also affects the quality of ground waters, this having a direct negative impact upon the health of human beings and animals using these waters, especially in areas with permeable soil and gravelly geological substrate.

> Reduced capacity of irrigation

The pollution of water also decreases the possibility of its being used for irrigation without previous treatment. Although the water resources of the Danube basin are considerable, they are still only scarcely used for irrigation, this having a significant negative impact on the high yield of quality crops, namely, if the system of irrigation was used the yield of crops could increase for 30% in these areas, this in itself increasing the overall agricultural production for about 10%.

> Reduction in biodiversity of Una and Sava

The reduction of water pollution, which was the result of reduced industrial activities during the war, has improved the quality of the living world in water and, consequently, of biodiversity, and therefore the relaunching of industry would again make the situation worse and reduce the biodiversity of waters of the Danube basin (Sava basin).

> Effects on agrophytocenosis

The pollution of waters, their mud silting and increased erosion of soil will boost the negative impact on agrophytocenosis, which will be considerably changed due to the soil deterioration, and this will in turn also affect the structure of agricultural production.

> Impossibility to use Sava River for recreation and for agricultural purposes

Due to the pollution of the Sava River it will not be possible to develop tourism, especially fishing and fish breeding, and therefore the possibilities for development of recreational tourism on Sava River will be reduced, this in turn affecting the utilization of agricultural potentials.

> Pollution of Sava River

The pollution of Sava River and its tributaries has direct impact upon the pollution of Danube, which may affect the basin downstream from Drina estuary and considerably affect the riparian zone of Sava and Danube River.

> Disbalance of plant and animal systems

The pollution of water will inevitably lead to disbalance in plant and animal world, both in water and in riparian zones.

> Negative impact on flora and fauna

Flora and fauna in river basins will also be affected, because the disbalance in biocenoses will also lead to disbalance in the structure of flora and fauna of the Danube basin.

> Increased sedimentation in Sava and Danube water reservoirs

Due to stronger effects of erosion processes, enhanced by cutting of forests, the waters of the Danube basin will be mud silted, this in turn leading to increased sedimentation in Danube water reservoirs.

Impact on structure of biogenesis and biodiversity

The changes in the quality of water will inevitably reflect in the structure of biocenoses, thus also affecting the biodiversity in the area of Sava and Danube River basin.

Material damages in agriculture

The negative impact, i.e. the damage done to agriculture may be seen as direct damages arising from erosion of soil and flooding of farming land, i.e. destruction of material goods, and as indirect ones, arising from the decrease in the crop yield and therefore, decrease in the income, due to pollution of waters and impossibility to use them for irrigation. This negative impact will also reflect in the pollution and destruction of the land itself.

➤ Negative impact on stability of water levels of Sava and Danube

These impacts primarily reflect in the changes of the stability of water flow over the year, which may be caused by erosion of soil and cutting of forests, due to which surplus quantities of water may appear during spring and fall and shortage of water may appear during the summer season.

Risk of contamination of soil and water

The pollution of water opens the possibility that the soil also be polluted in the catchment area (floods), this leading to pollution of ground water, which certainly may have a wider impact downstream in the valleys of Sava and Danube.

3.1.2. Sector Problem Analysis

3.1.2.1. Core Problem

The following core problem has been identified:

"INADEQUATE LAND MANAGEMENT AND INAPPROPRIATE AGRICULTURAL PRACTICES"

Due to inefficient and disorganized utilization of land, excessive exploitation of forests and inappropriate agricultural practices, water and soil are increasingly being polluted, which might have far-reaching consequences in terms of health of people and animals in the Danube basin. This pollution of soil and water is mainly due to application of inappropriate agricultural measures for cultivation and protection of crops through use of inappropriate pesticides in concentrations that are not allowed as well as through the excessive and uncontrolled dressing of land with nitrogen fertilizers and liquid waste from the farms. Another form of bad management practices is the abusive utilization of land for construction of urban and industrial zones and building of roads on high quality soils, this leading to pollution of soil and water by municipal and industrial waste, increased concentrations of flu gases and blinding of surfaces along the roads. Third form of inadequate management is denudation of land caused by uncontrolled cutting of forests, this leading to erosion and floods.

3.1.2.2. Causes Leading to Environmental Problems

The following direct causes of the sector core problem have been identified:

- ➤ Inadequate use and application of pesticides
- > Uncontrolled use of fertilizers in lowlands
- > Discharge of liquid waste from farms without pre-treatment
- Accelerated run-off generating erosion

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

(i) Inadequate use and application of pesticides

Unprofessional use and application of pesticides results in several serious problems:

a. Excessive use of pesticides per unit of area

The use of excessive doses of pesticides per unit area leads to accumulation of residual substances in the soil, this having as consequence pollution of plants and infiltration waters, which in turn pollute ground waters and water courses in the Danube basin. This is due to unclear instructions and warnings on the parts of the producers concerning the use of pesticides also the lack of knowledge concerning the basic characteristics of pesticides because of the low level of training in use of pesticides in agriculture.

b. Unsatisfactory capacity of institutions in charge of surveillance

Lack of equipment with institutions and unsatisfactory system of control of the use of pesticides caused by the shortage of funds leads to uncontrolled application of pesticides, this further leading to excessive pollution of waters and soil. Other important problems in this context are the poor organization of institutions in charge of the monitoring of the use of pesticides and the observance of a monitoring system of service department in charge of control of the use of pesticides.

c. Insufficient control of import of pesticides

Unsatisfactory and inadequate control of borders and the possibility to import illegally the inappropriate pesticides make it possible that the latter be applied both in the territory of the RS and the Federation. This insufficient control is generated from the inaptitude of the custom services because of the lack of equipment and instruments in laboratories. Sufficient number of qualified check points for control of import does not exist. In this context it is also important to underline the lax behavior of customs department officers.

d. Inappropriate use of pesticides in agriculture

The most important causes are the insufficient knowledge as well as the non-observance of instructions concerning the use of pesticides. This insufficient knowledge is due to the lack of training in the use of pesticides in agriculture.

People are not informed of the existing legal regulations and of the harmful effects of pesticides and their circulation in the nature. Furthermore the level of environmental awareness is low.

(ii) Uncontrolled use of fertilizers in lowlands

The overuse of organic manure, wastewater from the farms and mineral nitrogen fertilizers in dressing the land increases the quantity of nitrogen in soil and water in the lowlands, where intensive farming is being applied.

a. Unskilled staff

This is due to undeveloped agricultural extension services. Because of the low level of capacity and the lack of organization, there is also a lack of training of the users concerning the adequate and proper application of fertilizers. Very frequently land is being excessively dressed with manure, this leading to pollution of soil and water.

As the system of control of fertility of soil does not exist, the fertilizers are not being properly used, i.e. there is no system for monitoring and giving instructions as to the use of fertilizers for cultivation of crops.

b. Increase of N-fertilizers – KAN 27%, Urea 46%

Mineral nitrogen fertilizers are the potential source of pollution of soil and water, these fertilizers, which contain high levels of total N, being the ones most used in intensive farming of crops. If these fertilizers are used excessively, and at the same time all at once, they might lead to the increase in the levels of nitrogen in soil, and thereby in water as well. This is due to the lack of knowledge concerning the quality and characteristics of soil and the low level of training of agricultural producers.

(iii) Discharge of liquid waste from farms without pre-treatment

The great majority of farms in these territories do not possess wastewater treatment plants and they therefore discharge the wastewater into the land or into the water, thus polluting soil and water, as well as ground waters.

a. Overuse of by-products

As the liquid waste treatment plants and appropriate equipment for applying such waste on agricultural lands do not exist, and as there is no regular monitoring or control of the fertility of land, the by-products of agricultural farming also can not be rationally used.

b. No treatment of wastewater

The main cause is the lack of funds to be used for procurement and installation of plants for treatment of wastewater from the farms, which would prevent pollution of soil and water and at the same time, allow the production of certain quantities of organic manure, which could be used as fertilizer. The other cause is the technology of the cultivation itself and the system of manure rotting, used on farms ("wet rotting"), which has for consequence the increased quantities of liquid waste from the farms.

(iv) Accelerated run-off generating erosion

The causes of the accelerated run-off, which generates the erosion are inclination of the terrain, quantity of precipitation, vegetation coverage, length of slopes, size and length of catchment area, etc. Some of these factors can not be changed, but the application of appropriate measures may serve to stabilize the annual flow of water in the Danube basin.

a. Uncontrolled deforestation

The non-existence of law on forests and insufficient control of the deforestation and the non-application of relevant measures for protection and conservation of forest resources, as well as illegal exploitation are the cause of excessive and uncontrolled destruction of forest resources.

b. Farming slopes over 15°

Highly steep slopes and high predominance of mountainous and high-mountain areas had as a consequence very frequent utilization of land on slopes steeper than 15% for production of row crops and cereals, this directly enhancing erosion.

c. Existence of land mines

Although there are not precise data concerning the presence of land mines, the estimates of the MAC agency indicate that about 10% of the land of the Sava catchment area is a highly risky area due to existence of mine fields. The clearing of mines will for long be a great problem, and the estimates are that this process will take more than fifty years. This process will require enormous financial resources.

d. Erosion of river banks

Due to untrained riverbeds and the lack of control and stabilization of the flow of water, very frequently the riverbanks slide and are carried away. The reason for this is the lack of financial resources and partly, presence of land mines in the area.

e. Flooding

Floods are frequent in this area, and their appearance, apart from the natural factors, is also caused by the non-existence of the system of flood control, like for example, the system of stabilization of flow by the means of mini-dam reservoirs in the upper part of water courses, building of perimeter drains, building of dykes, training of water beds and banks, forestation of bare soils, changing the ways soil is being cultivated on steep slopes, etc.

3.1.2.3. Environmental Effects

The environmental consequences of inappropriate activities are the following:

Pollution of soil and water

The intensive agricultural farming along with the uncontrolled use of excessive quantities of means for protection of plants, contribute to increased pollution of soil and water, and consequently, of plants, animals and people.

Eutrophication

It indicates that there has been a change in the quality of water due to its being overloaded by pollutants, which led to changed conditions in water environment and therefore to changed structure of the living world in the water.

Disbalance in structure and composition of biocenoses

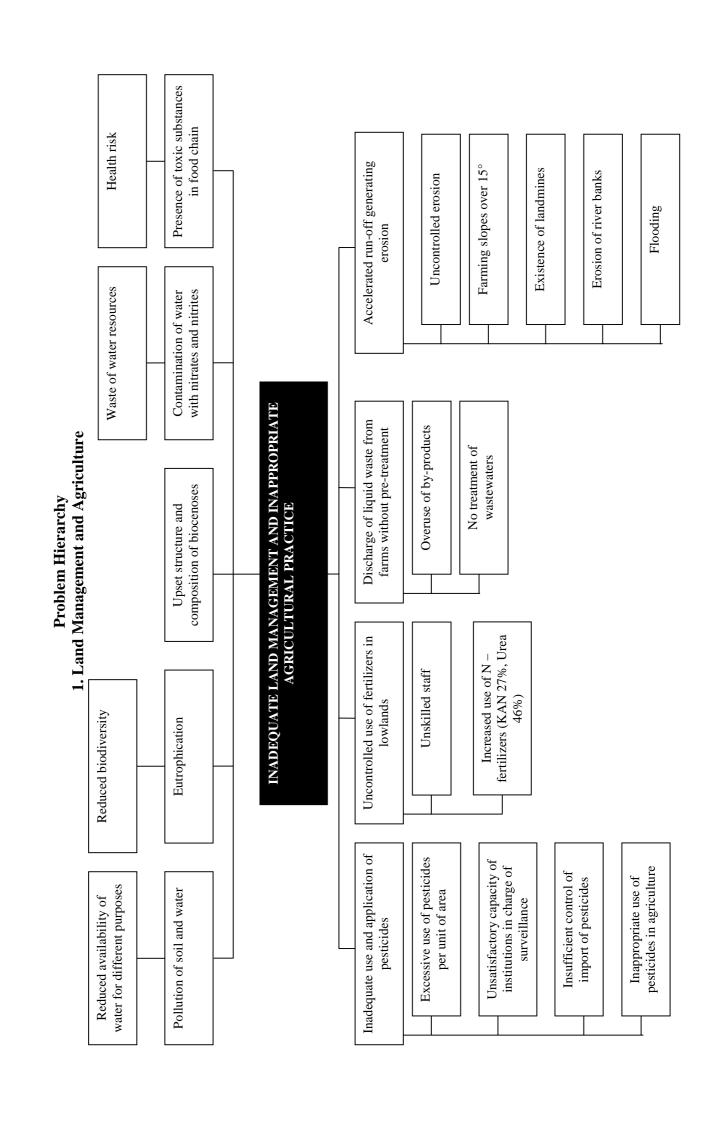
The changed quality of water also induces changes in the composition of biocenoses as the result of changes in flora and fauna in Danube basin waters.

> Contamination of water with nitrates

Contamination of water with nitrogen compounds provokes changes, which as a direct consequence lead to eutrophication of water in changes in the composition of biocenoses, this also affecting the biodiversity.

> Presence of toxic substances in food chain

The increased pollution of soil and water inevitably leads to the pollution of food also caused by cultivation of agricultural crops on such land, this also jeopardizing human health.



3.1.3. Objectives, Expected Results, Actions and Related Projects

The following sector objective have been identified

"APPROPRIATE LAND MANAGEMENT AND SUITABLE AGRICULTURAL PRACTICES APPLIED"

In order to achieve the sector objective, the following results have to be accomplished:

- Adoption of adequate use of pesticides
- Adoption of adequate use of fertilizers in the lowland areas
- Proper treatment of liquid waste from farms
- Prevention of accelerated run-off generating erosion

(i) Adoption of adequate use of pesticides

Professional use and application of pesticides has for its purpose the rational use of protection means in order to achieve satisfactory level of food production, without polluting soil, water and plants. This also serves to avoid the use of those pesticides, which remain for long in the soil, i.e. to promote the application of pesticides with shorter life.

In order to achieve this result, several activities have to be undertaken in the following fields:

- > use of pesticides
- monitoring
- > control
- training and education

It is necessary to:

- ensure proper use of pesticides. It is of key importance to professionally and adequately apply the appropriate pesticides in order to conduct adequate protection of plants for the purpose of preventing the appearance of pests and plant diseases and at the same time to achieve high yield, without polluting soil, water and food. In this context it is necessary to bring rules and regulations governing the use of pesticides and to enforce their consistent application. All pesticides should be accompanied with a clear manufacturer's certificate (declaration), specific documents and instructions containing the warning and instructions for use of the pesticides. The plans for the proper use of pesticides should be prepared and introduced, along with the plans for raising the awareness as to the basic characteristics of pesticides. Furthermore, measurements of the contents of residual substances in soil and water will be conducted.
- set up monitoring of the application of pesticides. It is necessary to equip and build the capacity of the relevant institutions for application of the measures of proper protection and cultivation of crops and introduce the appropriate agricultural and forecasting services in order to regularly monitor the situation and implement the proper measures of protection and cultivation of crops. The laboratories will be equipped with appropriate equipment and instruments and the agricultural extension and prevention services organized to monitor the appearance of the pests and application of pesticides. A system of monitoring and control of the effects of the pesticides used has to be established.

In addition to the above mentioned measures, relevant international standards in the area of phytopharmacology should be introduced and pest reporting, forecasting and quarantine services established.

- control the import of pesticides. It is important to undertake proper control of import of pesticides in order to prevent the import of low quality and forbidden pesticides, which might cause damage to soil and water. It is also of key importance to import only quality pesticides with short life. This can be achieved through adequate customs professional services, which will have enough qualified and professional staff and proper equipment and instruments for surveying the import of pesticides and consistent application of rules and regulations. Measures have to be undertaken to ensure that the staff working in agricultural pharmacies is adequately trained and qualified.
- with decreasing pollution of soil, water and food. It is necessary to be familiar with the legal regulations prescribed. Popular publications will be prepared and disseminated. Furthermore the instructions on the use of pesticides have to be followed. It is also foreseen to get acquainted with the harmful effects of pesticides and their circulation in nature and to bring all this in line with high degree of environmental awareness, and provisions defined through legal regulations.

For this result, the following projects have been identified:

Proposed Project(s)

- Establishment of the system of monitoring of pesticides
- Pesticides in the chain of food and their influence upon the health of people
- Presence of pesticides in agricultural products
- Presence of pesticides in agroaquatic eco-systems and agrophytocenoses
- Level of contamination of soil and water with pesticides in the Danube basin
- Environmental and agricultural potentials for production of "sound food"

(ii) Adoption of adequate use of fertilizers in the lowland areas

Through controlled use of fertilizers in intensive farming areas, rationalization of agricultural production is obtained, in such a way as to use the natural advantages for reaching high and stable yield without polluting soil, water and plants. In such a way, considerable amounts of money would be saved because large quantities of fertilizers would not be unreasonably thrown away and the unnecessary involvement of staff and machines would be reduced to minimum. In order to achieve this result, several the activities are required in the following areas:

- > training of users
- extension and inspection services
- > optimum use of fertilizers

It is necessary to:

ensure training of users. By achieving higher level of training of farmers in regard to the use of fertilizers for the purpose of obtaining optimum yield of cultivated crops, the wasting of inadequate and inappropriate primarily mineral fertilizers would be prevented. At the same time the quantity of fertilizers used per unit area would be reduced, this having for purpose cost effective and profitable production through proper management and use of land. It is demanded to develop agricultural extension services for education of users through organizing infrastructure for users training, preparing the relevant needed literature on the use and application of fertilizers. Training on the implementation of legislation will be provided and the public informed through mass media. Additional measures have to be undertaken in order to raise environmental awareness.

- reinforce the capacities of agricultural extension services and inspection services. Through the control of soil fertility, i.e. through establishment of monitoring, exact indicators of the contents of nutrients in the soil would be obtained, which would allow that the appropriate plans for fertilization of cultivated crops be prepared. Optimum standards for fertilization would be recommended and the appropriate type of fertilizer would be selected. In order to build the capacity and to organize the work of agricultural extension services for control of the application of fertilizers modern management techniques will be introduced and the staff trained. It is necessary to strengthen the control on the part of inspectors along with surveillance. It is foreseen to ensure funding in order to provide equipment for extension and inspection services.
- undertake activities and measures for optimum use of fertilizers. Through the proper use of nitrogen fertilizers, optimum life cycle of nitrogen in the soil is obtained, that is to say that only necessary quantities of these fertilizers are introduced in order to obtain a satisfactory yield, without having these substances appear in surplus in soil and water. Very important factor in all this is also the quality of soil, i.e. its permeability and humification, and therefore the introduction of nitrogen should be performed in several turns in order to avoid its accumulation in soil, water and plants. Tests will be conducted in order to facilitate the monitoring of soil and water quality. Training of agricultural producers will be undertaken in order to stimulate the use of organic fertilizers.

For this result, the following projects have been identified:

Existing/On-going Projects

- Influence of N-compounds from soil and from ground waters on the appearance of human nephritis in the area of Posavina and Semberija.

Proposed Project(s)

- Nitrogen compounds and their contents in water and soil of the lowlands of the Danube basin
- Introduction of the system of control of the fertility of soil of the lowlands in the Danube basin
- Identification of contaminated areas and areas, which could be used for production of "sound food"

(iii) Proper treatment of liquid waste from farms

The preliminary treatment of liquid waste from farms before their disposal would decrease the pollution of water and soil and enable the production of certain quantities of organic manure, which could be partly used on the agricultural land itself. This could have a double effect: the unnecessary overloading of soil and water would be reduced and at the same time certain quantities of organic manure would be procured.

In order to achieve this result, several activities are required in the following areas:

- use of by-products
- > treatment of wastewater from farms

It is necessary to:

implement rational use of by-products from farms. The optimum use of by-products from the farms would largely contribute to having a more rational agricultural production. At the same time the pollution of environment, primarily of water, air and soil would be reduced. The timely ploughing-in of manure would prevent the escape of nitrogen in the air, and at the same time soil would be enriched with this element. In this context it is necessary to design and pass legal regulations and to ensure the control on the part of

inspectors. It is also necessary to provide sufficient financial resources in order to procure proper equipment. The users will be educated by publishing relevant thematic brochures. It is foreseen to raise the awareness by using media.

implement proper treatment of wastewater from farms. By properly treating the wastewater, conditions would be created to start using them in agriculture and at the same time preventing their harmful influence on water and pollution of environment. In this context it is necessary to bring regulations governing to the wastewater treatment. The saturated sludge, which is a by-product of treatment of wastewater from farms, could also to a certain degree be used for dressing the land. The control on the part of inspectors has to be ensured. In order to ensure treatment of wastewater from farms, necessary financial resources and technical equipment will be provided.

For this result, the following projects have been identified:

Planned Projects

- Plants for treatment of waste and wastewater from main sewer
- Treatment of wastewater from farms in Brčko
- Treatment of wastewater from farms in Spreča-Kalesija
- Treatment of wastewater from farms in Butmir-Sarajevo
- Treatment of wastewater from farms in Bijeljina

Proposed Project(s)

- Treatment of wastewater from mini farms
- Presence of poisonous substances in farms
- Use of waste and by-products from farms in agriculture

(iv) Prevention of accelerated run-off generating erosion

By stabilizing the flow and run-off of water over the year uniform flow of water would be obtained, and at the same time the appearance of erosion and floods would be reduced. These measures, which require considerable financial resources, have for their purpose preventive action aimed at reducing the deterioration of soil and water courses, as well as prevention of pollution and mud silting of Sava and Danube waters.

In order to achieve this result, several activities are required in the following areas:

- cutting of forest
- > farming on sloped areas
- land mines
- > river bank erosion
- flooding

It is necessary to:

- control cutting of forests. By preventing the uncontrolled cutting of forests, conditions would be created to keep and stabilize the flow of water and at the same time preventing the sliding (erosion) of land. This would prevent the undesirable effects which otherwise might appear in the waters of the Danube basin. It is necessary to bring relevant legal regulations and forest management plan. It is foreseen to replant forest with trees. The inspection service will be reinforced through strengthening the work of inspectorates and judiciary bodies, in particular by controlling the cutting of forest trees.
- > stop farming on slopes over 15°. By introducing changes in the way that the land on the slopes is being used the effects of the negative impact of the erosion of land would be reduced. At the same time, this would reduce the excessive use of pesticides and

fertilizers, thereby reducing the pollution of Sava and Danube waters. Lands on slopes should not be used for agricultural farming, but they should rather be turned into meadows and pastures or forested. It is necessary to implement optimum grazing methods on such slopes (prevent excessive grazing). Through media and relevant publications the users will be advised about the harmful effect of using the sloped terrain for cultivation.

- clear land mines. Clearing mines would create conditions for undertaking proper measures for prevention of damages done to the soil, vegetation, drains, dykes, pumps, roads, etc., and the cleared areas could be used for production of food and accommodation of returnees. This would also prevent that the mines slide away together with eroded earth, thereby preventing subsequent damages in those areas where the water takes these mines. In this context, it is very important to educate and inform the population about risk from land mines.
- **prevent erosion of river banks.** Prevention of erosion of river banks would result in reducing the loss of land, and at the same time would reduce the pollution and silting of waters and prevent the migration of soil and its deposition in the water reservoirs of the Danube basin area. Besides the regulation and the management of riverbeds, wire and concrete fences will be built. It is necessary to apply the appropriate land reclamation measures. It is foreseen to plant trees on sloppy terrain and in the direct vicinity of the eroded riverbanks.
- **prevent flooding.** By controlling the floods, considerable stretches of land would be preserved, material damages avoided, agricultural crops preserved and pollution of soil and ground waters prevented. Prepare appropriate flood control programmes. The regulations have to be enforced. Small water reservoirs in the upper course of rivers and a drainage system have to be built. It is also necessary to build and maintain basic canal networks and systems in order to regulate and manage watercourses. In addition to the above mentioned measures, it is foreseen also to build minidams and also to build and maintain dikes.

For this result, the following projects have been identified:

Existing/On-going Projects

- Impact of water dam lake Višegrad upon riparian zone.
- Monitoring of erosion of Snagovo catchment area of the river Spreča near Zvornik *Proposed Project(s)*
- Cadaster of eroded areas of the Danube basin in BH
- Rehabilitation of eroded areas in the Danube basin in BH
- Monitoring of erosion of Save basin catchment areas in BH
- Identification of erodibility of land and preparation of the map of the eroded areas of the Danube basin in BH

3.1.4. Important Assumptions for the Sector

Important assumptions are factors that are significant for the success of the programme but they cannot be envisaged as activities to be undertaken within the frame of the programme as they lie outside its scope and not under its direct control. Therefore, they could also be described as external factors. However, they are pre-conditions, which will ensure the success of the programme and the sustainability of its results.

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

A sufficient amount of acceptable fertilizers and pesticides in keeping with standards available

Provide sufficient quantities of quality fertilizers and pesticides in order to make them available to farmers or users.

> A sufficient number of available high-quality machines and equipment

Provide the appropriate machinery needed for use and application of fertilizers and pesticides and make it available to the farmers in order that these pesticides and fertilizers be properly used in agriculture.

Funding and staff for mine-clearing available

Clearing of mines from high quality agricultural plots of land and from facilities for flood control would ensure an increase in agricultural production and would allow the repair of damaged dykes, drains and pumping stations.

> Favorable weather conditions

The use of fertilizers and pesticides depends to a large extent on favorable climatic conditions upon which certain influence could partially be exerted by establishing hail control services in order to prevent damages incurred by hail.

For this sector at the **results/output** level the following assumptions have been identified:

Effective cooperation with international financing institutions

It is necessary to provide sound financial resources with favorable interest rates of 3-5%, that the agriculture is able to repay, as well as deferred payment with 1-2 years grace period, in view of the fact that the turnover coefficient is very low in agriculture.

> Successful transition of ownership

It is necessary to effect the transition of ownership of the socially owned farms, which cover about 4% of agricultural land in BH. It is also necessary to transform the present cooperatives, which had been formed as socially-owned enterprises.

Clear strategy for development of agriculture in place

Clearly defined strategy of agricultural development in the area of Danube basin should indicate the structure and volume of production and prospective lines of development of agriculture.

> Successful elimination of war damage

The repair of war damages also implies the establishment of mini-farms, recovery of livestock, procurement of proper machinery and spare parts, repair of roads, equipping and capacity building of professional institutions, etc., all aimed at creating the conditions for optimum agricultural production.

> Transition from state directed to market economy

The transition to market economy would create conditions for production of marketable goods and better organization of agricultural farms, along with the transition of property, which would enable more extensive agricultural production.

> Stabilization of the political situation in the country

The stabilization of the political situation would ensure better conditions for work, better control and regulation of import, wider exchange between entities (FBH, RS).

3.1.5. Impact Indicators for Sector Results

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

For the result 1.1:

The level of maximum allowed concentration in soil and water maintained without degrading water quality as compared with the year 1998 through controlled use of pesticides at the locations of Una-Sana valley, Lijevce Polje, Posavina, Semberija, Spreca valley, Podrinje, Bosna and Vrbas valley in the period from October 1999 to 2005

The use of pesticides can be controlled by analyzing the contents of residual substances in soil, water and plants, task, which can be performed by analytical departments, agricultural extension services and quarantine services in charge of the protection of plants. In order that these measures be implemented it is necessary to bring legal regulations, procure quality pesticides, equip professional institutions and secure sound financial means.

For the result 1.2

Acceptable concentrations of nitrogen in soil and water maintained (not exceeding those of 1998) through optimum use of mineral fertilizers at the locations of Una-Sana valley, Lijevce Polje, Posavina, Semberija, Spreca valley, Podrinje, Bosna and Vrbas valley in the period from October 1999 to 2005

Maintenance of acceptable levels of nitrogen compounds in soil and water can be obtained through regular surveillance and control of the fertility of land and through determining the quantities of the particular micro and macro nutrients as well as by giving advice as to the proper dressing of cultivated crops in order to avoid pollution of lowlands in the Danube basin up to 2005.

For the result 1.3

Pollution of water reduced without degrading water and soil pollution quality against 1998 by increasing by 30% the use of pretreated liquid waste from farms in the period from 1999 to 2005 at the locations of Una-Sana valley, Lijevce Polje, Posavina, Semberija, Spreca valley, Podrinje, Bosna and Vrbas valley

By regularly monitoring and measuring the levels and quality of liquid waste from the farms at the point of their being disposed into soil and recipient waters precise data will be obtained as to the extent, to which they contribute to the pollution of waters of the Danube basin. This will also serve to determine the quantity of this liquid waste that can be used and applied in agricultural farming.

For the result 1.4

Level of erosion and flooding reduced by 30% against 1998 by implementing erosion and flood control measures in the period from 1999 to 2005 at the location of Unsko-Sanska valley, Vrbas valley, Bosna and Spreca valley, Drina and Sava valley

By regularly measuring the quantities of silted mud at the outgoing parts of the catchment areas of particular tributaries of the Sava basin, quantity and structure, as well as the quality of eroded materials which load the waters of Sava and Danube basin will be established and the extent to which it contributes to the clogging of beds of water reservoirs in the Danube basin will be determined.

3.2. Industry

3.2.1. Situation Analysis

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

In the framework of former Yugoslavia Bosnia and Herzegovina (BH) held a significant place as central republic with great potentials in raw materials (ores, mines, forests and water resources), and it was out of these reasons that the basic industry and industrial facilities, which used the undesirable "dirty" technological processes (still existent) were located here.

In view of these facts, it is obvious that the intensive exploitation of mines, forests and water resources gradually led to the degradation of environment, with water pollution having a prominent place in this process.

All the watercourses of Bosnia and Herzegovina are divided into two river systems: Sava River catchment area, which belongs to the Danube basin, and the Adriatic Sea area, i.e. Mediterranean area. The catchment area of Sava River, which in terms of surface area occupies 75,7% of the total area of BH and is characterized by extraordinary richness in water, accommodates the major part of industrial capacities which, all things taken into account, has a significant place in regard to the overall pollution of water, soil and air.

It is necessary to underline here that the analysis of the situation should be undertaken from two different standpoints:

- Analysis of the pre-war situation
- Analysis of the situation in the post-war period

The analysis of the water quality of the watercourses, which was made in 1991 for the needs of the long-term Water Protection Programme has shown the negative effects of the discharge of untreated industrial wastewater on surface water resources. Although the pollution of water in watercourses was self-evident, fact is that this was not corroborated by satisfactory evidence since the number of samples was too small, with inadequate number of registered indicators of pollution given, so we can not take the pre-war analysis of the situation as quantitatively and qualitatively satisfying basis for evaluation.

The specific characteristic of the post-war period is the drastic reduction of pollution, both of surface and ground waters, which was the result of the fact that the industrial plants totally stopped working, either because of war activities, or because they were destroyed and were afterwards, up until this moment, very slow in renewing their production. We need not mention what significance today, in times of reconstruction and relaunching of economy, have the renewal of all the existing and opening of new industrial capacities for development of economy, which is to secure the overall development and prosperity of the state.

For illustration, we have given here a review of the structure of industrial capacities by branches, in terms of percentage, for the key industrial sectors in the pre-war (1991) and the post-war period (1995 and 1997). Unfortunately, data were available only for the area of the BH Federation. There are nine dominant industrial branches, which are at the same time the greatest polluters of water. The following table shows the share of particular industrial branches in the overall industrial capacities.

Structi	ire of production in BH Federation in pre-war a	nd post-wa	r period*	
				Ī

Ser. No.	Branch of Industry	1991.	1995.	1997.
1.	El. power management	12,54	39,57	no data
2.	Coal production and processing	6,01	16,27	10,63
3.	Exploitation and processing of mineral ores		no data	2,40
		9,44		
4.	Metal-processing industry	9,19	1,30	no data
5.	Basic chemical products production and processing			
		6,51	0,65	1,79
6.	Wood, wood pulp and paper production and processing			
		12,53	3,48	6,23
7.	Textile industry	10,20	5,32	0,88
8.	Leather and fur production and processing			
		3,00	2,37	9,00
9.	Foodstuffs and beverages production			
		10,22	15,02	16,43
10.	Other industry	20,36	16,02	52,64

^{*}Data taken from "Physical Planning Strategy of BH Federation" – I phase

The key problem is how to harmonize the requirements and needs of industry and state with global rules of management of resources under sustainable development conditions. It is clear that the policy of management of water resources in the newly created situation, adopted or under adoption, must necessarily follow the trends, which have been generally adopted in Europe and in the world, thus contributing to the integration of the state into the general currents striving to create a better and healthier environment.

The policy of management of resources should contribute to the development of appropriate strategy and direct the process of transition of economy in general, and industry in particular, toward a market economy and maximum participation of private property.

Properly oriented policy of the revival of industry, along with the adoption of clean technologies and modern principles of management of resources in general, will lead toward the reduction of harmful environmental impacts, and consequently, the reduction of the level of degradation of water resources.

Four main activities, causing pollution of water streams, have been defined:

- 1. Use of dirty and obsolete technologies
- 2. Discharge of industrial wastewater without previous treatment
- 3. Lack of technological discipline
- 4. Improper disposal of hazardous solid waste

Use of dirty technologies. The consequence of the previous self-management system was that the production in industrial plants was not cost-related, building of industrial facilities was often the result of political decisions, approvals were being given to introduction and running of dirty plants, all this having as consequence the impossibility to implement the legal regulations concerning the disposal of wastewater into sewerage or watercourses and, parallel to that, general tendency to avoid building of treatment plants.

Discharge of industrial wastewater without previous treatment. Before the war there were only 125 industrial wastewater treatment plants in BH built. The functioning of these plants was partly satisfactory, depending on local circumstances. The majority of them was integral part of metal processing industry plants, where the toxic effects of untreated water becomes obvious shortly after discharge. In other industrial plants the wastewater was regularly discharged into watercourses or sewerage. Unlike the municipal wastewater, the industrial wastewater does not enter into process of self-purification, this leading to transmission of pollution through watercourses and creation of disbalance in eco-system.

Lack of technological discipline. Lack of technological discipline in the process of running the production, starting from the management bodies, which often try to avoid using the existing wastewater treatment plants (high costs of treatment) up to the operators of treatment plants who are not educated enough to understand that the slightest negligence might lead to disastrous environmental consequences, quickly leads to pollution.

Improper disposal of hazardous solid waste. Finally, harmful and hazardous solid and liquid waste (cyanide and nitrite salts from tempering plants, dehydrated sludge from heavy metals salts, utilized waste oils or oil emulsions, pharmaceutical waste) is being uncontrollably disposed on improvised locations, where due to inappropriate packaging and unsecured disposal conditions on dumps, it gradually dissolves and leaches, infiltrating ground water aquifers.

3.2.1.2. Current Strengths/Assets

Taking into consideration the activities leading to water pollution, several strengths/assets have been identified in the industrial sector. In particular, the following have been considered as the most important ones:

> Awareness of the harmful effects of obsolete technologies

It should be said from the outstart that the existing potentials are very scarce. The presence of *dirty and obsolete technologies* is a burden both for the space and time, in which the revival of industry is expected to take place to the aim of creating employment and enticing the overall economic progress of the state. The positive trends in education of human resources, designed to raise the awareness and develop transparency may, to a certain extent, alleviate the situation.

For some time already in the pre-war period, thanks to visually obvious signs in waters of watercourses, not only the employed staff in the related industries but the population as such, have become aware of the deterioration of their environment. However, the fact that people become used to such situation and the lack of opportunities to improve the situation in the pre-war system, has maintained the existing technologies in the state they were in. Today, when new opportunities are being opened due to the processes of transition and privatization, and revival of industry, there exists a firm basis for the realization of these objectives.

Existing equipment not put in operation

For the activity of *discharge of industrial wastewater without previous treatment* the assets are the existing plants, which were built shortly before the war without being put into operation, or the plants, which after minor interventions could be brought into operative condition. It is expected that these assets could be activated with some engagement on the part of staff and minor investments.

As these existing treatment plants are mainly metal-processing industry wastewater treatment plants, along with few biological treatment plants, they just need reconstruction and rehabilitation to eliminate the consequences of the war.

Potential of existing human resources and existence of trained staff

Through strict enforcement of rules and regulations, once they are brought and adopted, the existing human resources will build their capacities through education and information systems and overtake the responsibility in managing the processes. Both the production and wastewater treatment processes, and the *technological discipline* will thus be raised to a higher level.

> Transition

The newly arisen post-war situation, along with concurrent transition of economy to modern world cost-effective economic principles of organizing, managing and operating, gives a basis for positive action towards environmental protection and, consequently, protection of water resources.

> Impact of media in relation to resolving the environmental issues and in raising the environmental awareness

The system of information of the population through independent media, its getting acquainted, through the process of privatization, with the movement toward healthier and cleaner environment, is under the newly created conditions and elements, upon which to base the future processes of changes in environmental policies.

The existing independent media, by informing the public and the population about the environmental effects, which may become reality, could play a significant role in raising the public awareness, and are therefore the potential, which should be used in this transition period.

3.2.1.3. Analysis of Transboundary Effects

Sava River is the river that serves as boundary between the Republic of Croatia and Bosnia and Herzegovina. Pursuant to the Decree on the Categorization of the Part of Watercourse Passing Through the Boundary Zone, the watercourse was categorized as class II, which must be maintained along the whole course. Upstream from the point of entry into the boundary territory, there are hot spots in the Republic of Croatia and even in Slovenia, where the source of Sava River is. Apart from larger cities (Zagreb, Ljubljana, Karlovac, Sisak), where also no wastewater treatment is provided for, the pollution hot spots are the industries like Sisak Foundry, Chemical Industry Kutina, nuclear power plant Krško, which degrade the water quality even before it enters BH. During its flow through the boundary zone, Sava River receives the tributaries Una, Vrbas, Bosna and Drina. Apart from Drina, which is also a boundary river toward FR of Yugoslavia, the other tributaries, throughout their courses, flow through BH. Each of these streams brings into Sava specific pollution, which more or less reflects upon the quality of Sava River.

The following transboundary effects have been considered:

Cr Ions from leather industry

Leather industry is located mainly in the upper streams of Vrbas and Bosna River. There are altogether 5 tanneries, of which only one has a built wastewater treatment plant. All these tanneries, during the process of tanning, use chrome tanning agents, and therefore discharge large quantities of chrome compounds, which have strong toxic effects upon the living world of water streams.

> Chlorinated carbohydrates

In the region of Tuzla there are industrial capacities, which are extremely undesirable from the environmental point of view. These are the Chlor-alcaline Complex I and II, i.e. its Poliurethane chemistry plants-organic and inorganic parts, and Lye Factory in Lukavac, where no wastewater treatment was ever even considered, except for occasional neutralization. The presence of significant levels of chlorinated carbohydrates and

increased values of pH and suspended substances in wastewater discharged from the lye factory have totally destroyed the living organisms in the water courses of Spreca and Jala, Bosna tributaries, which now, under present conditions, when industry is not working, shows the signs of recovery.

➢ Mercury (Tuzla region)

The Electrolysis plants use the mercury electrodes, so that occasionally mercury might appear in wastewater, then to be further carried into the watercourses. Similar electrolytic plants exist in Elektrobosna factory in Jajce and Incel factory in Banja Luka, upon the Vrbas River.

> Organic substances - benzene, toluene, phenols, ammonium, (TPK Tuzla)

In Coke plant Lukavac, during the production of coke, large quantities of wastewater are produced, which is then treated biologically, with satisfactory results.

> Organic substances and lignosulphonates from wood pulp production processes

Wood pulp and paper factories as well as viscose plants, produce significant quantities of very polluted wastewater. In Prijedor, on Sana River, tributary of Una, wood pulp and paper factory is located, in which wastewater pollution to the amount of 1.200.000 equivalents was determined, without any wastewater treatment. On Vrbas River in Banja Luka there are wood pulp, paper and viscose factories, where certain wastewater pre-treatment is applied, but not always with satisfactory results. The registered number of equivalents is up to 2.000.000. Wood pulp and paper factory Natron in Maglaj possesses a built plant for treatment of black and white wastewater. The white wastewater treatment plant did not work with satisfactory effects while the black wastewater treatment plant was giving the satisfactory results before the war. Presently, only Paper factory is operating.

> Increased transboundary pollution

There are no transboundary effects at the moment since the industrial plants are not operating. Unless such industrial revival strategy is adopted as to eliminate the key polluters of water in watercourses, either through replacement of obsolete production processes, total extinction of production or building of wastewater treatment plants in those places, where it is possible to do it in accordance with the EU standards, we might expect renewed increase of pollution of water in watercourses very soon.

> Possibility of transboundary pollution

The danger of pollution exists in all those cases, where production is renewed under prewar conditions

The most important industrial plants, which cause the appearance of hot spots, are:

- Wood pulp and paper factories in Prijedor and Banja Luka. It is necessary to prepare and implement the programmes of reconstruction and changes in production processes, build and expand the present wastewater treatment systems in order to reduce the pollution to acceptable levels.
- Industrial complex in the region of Tuzla, including Lukavac. Like in previous case, introduce changes in the process of production, get rid of all those technologies that can not brought in line with the state-of-the-art principles and standards in the area of environmental protection, and to build plants, which shall guarantee proper quality of treated water.
- Elektrobosna factory in Jajce. To do away with the outdated process of electrolysis, replacing it with the modern one, in which the mercury electrodes are not used and build wastewater treatment plant, which uses the updated treatment technologies.
- Tanneries (obsolete tanning technology). Modify the technology of leather tanning replacing it with vegetable tanning materials and at the same time introduce the proper wastewater treatment systems.

3.2.2. Sector Problem Analysis

3.2.2.1. Core Problem

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

"POLLUTION OF WATER THROUGH RE-LAUNCHING OF OBSOLETE INDUSTRIAL TECHNOLOGIES"

The core problem, leading to pollution of water, are the obsolete technologies, which had been introduced before the war and which are now being abandoned everywhere in the world and replaced by the processes, which are not environmentally harmful and the by-products of which (wastewater, solid waste) can through proper disposal or treatment be made environmentally harmless. The situation, in which BH was immediately after the war, during which all industry was out of operation for years, has continued up until now, producing positive effects upon the pollution of water in watercourses. The majority of very polluted streams have recovered, as shown by the presence of a certain biological species, characteristic of streams of higher categories (I and II class), which was not the case for dozens of years in the past. However, the re-launching of prewar industrial plants with markedly harmful effects, presents a danger of relapsing into previous situation. Therefore, it is necessary to insist that strategy be prepared during revival of industry, which would be in accordance with the EU standards that relate to protection of environment through sustainable development.

3.2.2.2. Causes Leading to Environmental Problems

Causes leading to degradation of environment, although numerous, may be grouped around four key elements:

- Use of dirty and obsolete technologies
- > Discharge of wastewater without pre-treatment
- > Inadequate management of enterprises
- Inadequate disposal of solid hazardous substances

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

(i) Use of dirty and obsolete technologies

The use of old and obsolete technologies before the war caused the appearance of a number of hot spots and concentrated blows against the environment. The re-installation of these plants would lead to reactivation of hot spots, the direct result of which would be the degradation of environment and water resources.

a. Re-launching hot spots

Very tight financial resources at the level of the state, which are used for the process of revival of industry, which has to provide **jobs to the local population**, very frequently leads to non-observance of regulations and measures, which related to environmental protection. Therefore, in order to be able to eliminate the hot spots it is necessary to focus on the following elements:

- search the possibilities of financial support,
- define instruments for control and inspection and
- impose penalties and design measures for stopping the production in cases of violation of regulations.

In this context, the **need for economic development** is also seen as important issue.

b. Replacement of outdated technologies is not a priority

At present, the replacement of out-dated technologies is not taken as priority in the process of revival of industry at the national level. When putting in operation the industrial plants, care is not taken to bring into working condition or to build new wastewater treatment plants at the same time. Also, in the majority of cases, the possibility of **introducing such changes** in the process of production that would indirectly lead to reduction of pollution of wastewater **is not seriously considered**. It is because of the **lack of funds** for purchase of new technologies in general and **the fierce competition for funds** in particular. The endeavors that the state makes toward establishing a modern, well-organized society that tries to incorporate the EU production standards as soon as possible must also be reflected in endeavors to reach the equilibrium between sustainable development and environmental protection.

(ii) Discharge of wastewater without pre-treatment

Discharge of wastewater without previous treatment may also be seen as result of a number of factors. The primary cause is the **insufficient number of built wastewater treatment plants**. The pre-condition, which should be taken as primary when putting into operation an industrial plant should be a clear, unambiguous and legally prescribed requirement that state-of-the-art wastewater and solid waste treatment system be installed. The relevant legal regulations must urgently be defined and set down along the POLLUTER PAYS principle. This would, partly at least, provide sources of financing for construction of new treatment plants and maintenance of the existing ones.

a. Lack of wastewater treatment plants

There is a very small number of built wastewater treatment plants in BiH. At present almost no one of them is operating. When reviving the production it is necessary:

- to bring the existing plants into proper and operative condition, concurrently with the renewal of production processes and
- to install the wastewater treatment plants in those production plants, which did not have them, prior to re-launching these production plants.

In both cases the problem is the lack of funds needed for the realization of the set aims.

b. Existing treatment plants not used

The existing treatment plants are not used presently because there is **no production**. Before the war, the treatment plants were more or less successfully functioning, but occasionally came to a halt. This discontinuity was caused by different reasons – **shortage of resources for maintenance**, negligence of employed personnel, inadequate motivation and **lack of market**.

c. Inadequate compliance with legislation

Although legal regulations did exist before the war as well, instruments for their implementation were not strong enough to enable the implementation. Fines for non-observance of the regulations were very low, while the checks were rare and inefficient.

Besides the **underdeveloped inspection service**, it is necessary to underline in this context the **low penalties**.

(iii) Inadequate management of enterprises

Managing enterprises so as to avoid enforcement legal regulations, as well as irresponsible behavior of personnel in the plants, are practices that are inherited from the old system of organization and management of enterprises.

a. Negligence on the part of managers and employees

Negligent attitude towards production is also a result of **unresolved question of ownership** in the state-owned firms, in which the process of privatization has not yet been completed and the **personnel** of which is therefore **not motivated for profitable and successful operating** and for **procurement of instruments for financial support and stimulation**, as the case is in the majority of enterprises today.

b. Financial constraints (costly treatment)

Lack of funds is the element that appears as the most frequent one among the observed causes. It was a limiting factor in the past and today it is even more so.

Shortage of financial resources is understandable, in view of the fact that the country is impoverished by the war, economy destroyed, unemployment enormous, all this calling for **large investments** into all the sectors of economy, particularly in industry. Under such conditions, building of expensive wastewater treatment plants and their **costly maintenance** provoke resistance, both on the part of administrative authorities and the employees.

(iv) Inadequate disposal of solid hazardous substances

a. Non-existence of landfills for hazardous substances

Although the wastewater of industrial origin has undoubtedly a considerable impact on pollution, yet however the indirect pollution of water resources through uncontrolled disposal of solid waste can not be disregarded. At present, **there is not a single specialized landfill for disposal of toxic substances in BiH**. Therefore they are being disposed on city dumps and other green-field dumps, often in a very unprofessional way and in inadequate packaging, all this making them potential sources of pollution for soil, and indirectly, for ground and surface waters.

b. Absence of classification of industrial waste

The first step in overcoming this problem is the bringing of relevant legal regulations concerning the proper disposal of such waste in accordance with methodology prescribed. Besides the lack of suitable regulations a classification of types of waste is not prepared and appropriate locations for disposal of special types of hazardous solid waste are not determined.

3.2.2.3. Environmental Effects

There is no need here to speak about the impact on the environment of various types of waste, which reach the environment, especially water, either carried by through wastewater or through polluted soil. Pollution has been registered in almost all watercourses, very often in ground water as well, so that the quantity of pure water, which could be used for the needs of population and industry drastically decreases daily. It is thus of a vital importance to make a thorough change in the way of management of water resources and to adopt a policy and strategy that would ensure preservation of the remaining virgin resources and gradual recovery of degraded watercourses.

➤ Increased levels of suspended matter in watercourses

During the process of exploitation of various mineral ores, processes of wet separation of ores and minerals are being used. Although larger or smaller sedimentation facilities

frequently do exist, their effectiveness however is unsatisfactory, so that large quantities of suspended matter reach the watercourses.

Increased levels of toxic substances in water

Toxic substances originating from electrolysis plants, chemical industry, metal-processing industry are present in leachate from solid waste landfills, wherefrom they reach water and cause pollution.

> Increased levels of organic substances from industry

Organic substances are being discharged with wastewater from chemical industry plants (Chlor-alcaline Complex in Tuzla, wood pulp, viscose and paper factories, Food-Processing Combine in Brčko, Sugar Refinery in Bijeljina), which do not possess wastewater treatment plants.

> Increased levels of heavy metals in water

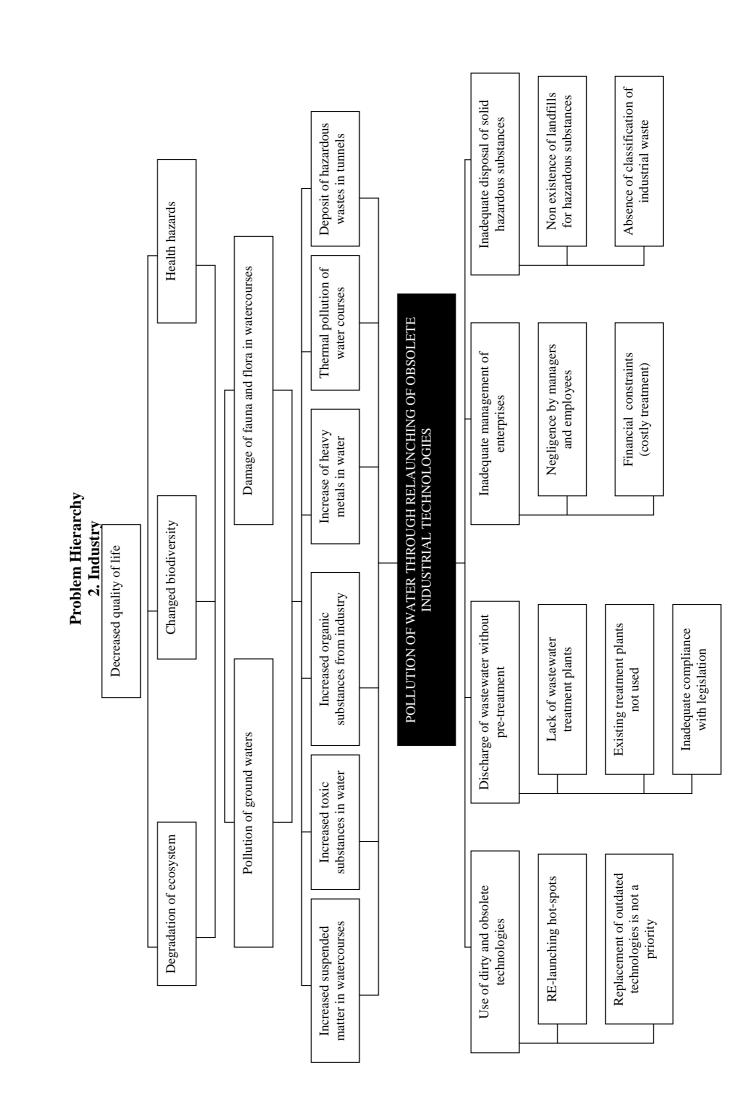
Increased levels of heavy metals appear at points of discharge of wastewater from metal processing plants in those cases, when there are no wastewater treatment plants or when they operate unsatisfactorily.

> Thermal pollution of watercourses

Thermal pollution is generated by cooling system of industrial plants, most frequently thermo power plants. Occasional abrupt thermal pollution has an immediate negative effect upon the living organisms in watercourses.

Deposition of hazardous waste in tunnels

Deposition of hazardous wastes on improperly built dumping sites pollutes ground and surface waters. Sources of potable water supply are in danger of being polluted and the health of human beings likewise.



3.2.3. Objectives, Expected Results, Actions and Related Projects

The final objective of the identification of all the problems, performed on the basis of analyses made in pre- and post-war situations, is to attain a significant reduction in the pollution of water of the Danube basin. The realization of this objective should and could be achieved through implementation of the first and foremost activity from this programme, defined on the basis of the past experience, efforts aimed at future and raised awareness of the population as to the necessity of preservation of environment.

The following sector objective has been identified

"SIGNIFICANT REDUCTION OF WATER POLLUTION THROUGH IMPLEMENTATION OF CLEAN INDUSTRIAL TECHNOLOGIES"

Introduction of clean technologies accompanied by proper treatment of industrial wastewater is an unavoidable element in the protection of water from pollution. As Bosnia and Herzegovina is burdened with its heritage from the previous period, this problem is certainly not an easy one, yet the positive side to it is certainly the fact that during the recent war period industries with obsolete technologies stopped producing. The greatest achievement of the present moment would be to preserve such situation and to undertake appropriate measure designed at preventing the renewal of those industrial facilities that are still at the pre-war level, if the production that takes place in them reintroduces danger of their polluting the environment again.

In order to achieve the sector objective, the following results have to be accomplished:

- Introduction of clean technologies
- > Implementation of pre-treatment of wastewater
- Ensuring adequate management of enterprises
- Proper disposal of hazardous substances in landfills

(i) Introduction of clean technologies

The implementation of the principle adopted – to select and introduce clean technologies, both in the existing and in the newly planned industries – and the adoption of legal regulations that would ensure that the above principle is respected, either through enforcing the closing down of plants or imposing of penal sanctions at the cooperate or individual level in cases of non-observance would have as the result either a decrease in the level of pollution in relation to the pre-war period, or preservation of the situation as it was immediately after the war.

In order to achieve this result, several activities have to be undertaken in the following fields:

- Hot spots
- Technologies

It is necessary to:

eliminate hot spots. In order to eliminate the hot spots it is necessary to define and adopt legal regulations, which would prescribe the rules and conditions for obtaining certificates for commissioning particular industrial facilities. It would be particularly important to establish services that would continuously perform the inspection of their operation, and inspectorates that would be appropriately stimulated to prevent the avoidance of positive legal regulations. It is necessary through legal regulations to define priorities and guidelines regarding the elimination of hot spots, in other words priorities concerning the introduction of new technologies and replacement of the obsolete technologies by new ones, incorporating in all reproduction processes worldwide recognized and recognizable norms along with that.

replace the old technologies with the new ones. In order to replace the old technologies with new ones, it is necessary to bring and adopt consistent laws governing the elimination of out-dated processes or closing down of certain plants, providing at the same time the financing instruments, which would stimulate the transformation of production toward adoption of state-of-the-art solutions.

These laws should be incorporated in framework laws on the processes of transition of industrial facilities in order to be able efficiently to intervene at the key moment of transition to the market oriented economy and private property.

The financial resources are provided at the level of executive bodies of governmental authorities strongly supported by mechanisms designed to facilitate transition.

Within the framework of these laws, priorities have been established concerning the introduction of new technologies, brought in harmony with EU standards, and acceptable from the point of view of protection of environment.

For this result, the following projects have been identified:

Proposed Project(s)

Changes in the process of production toward environmental protection are proposed as priorities for the following industries, which at the same time, are hot spots:

- Chlor-alcaline Complex I i II. (Tuzla)
- Electrolysis mercury electrodes (Tuzla, Jajce Banja Luka)
- Tanneries tanning method (Bugojno, Visoko, Kotor Varoš, Prnjavor, Banja Luka)

(ii) Implementation of pre-treatment of wastewater

In order successfully to start building wastewater treatment plants, a **cadaster** (**registry**) **of polluters** will be prepared, which would serve to rank the hot spots on the basis of their impact upon environment, and **list of priorities** made, which would locate the industrial facilities, which need emergency interventions.

In order to achieve this result, several activities are required in the following areas:

- installation of WWTPs
- > operation of WWTPs
- legal regulations

It is necessary to:

- install the wastewater treatment plants. On the basis of cadaster of polluters, a list of industries has to be made, which need new wastewater treatment plants and a list of building priorities has to be set up. The elements, concepts and guidelines regarding the way of designing these plants have to be established, depending on the location and way of disposal of wastewater after its treatment. Furthermore, it is foreseen to provide incentives to factories to build treatment plants and to make available financial funds through international mechanisms.
- > put the existing treatment plants in operation. Concurrently with the preparation of the cadaster of polluters, a **list of existing treatment plants** has to be made and degree of war damages assessed, whereby it will be possible to put them back into operation and to stimulate their efficient performance by measures of financial and other nature. In order to put the existing treatment plants into operation, measures have to be undertaken to train the staff.

• enforce legal regulations. By adopting the principle "POLLUTER PAYS" and costefficient operation as the next step, by which the financial resources are provided and recirculated for further capital growth, the resources for financing and crediting those that are next on the list of priorities have been secured.

The **system of monitoring** installed at wastewater discharge outlets in each of the industrial plants proved of extraordinary importance, providing at the same time, through sound economic policies, the possibility to collect funds for implementation of protection of water from pollution program. The monitoring allows continuous, simultaneous surveillance and registering of characteristic parameters of pollution and quantities of treated wastewater discharged. For the purpose of properly running the system of monitoring it is important **to strengthen the inspectorate services** and design stimulative measures for newly established system of control and operation of plants.

For this result, the following projects have been identified:

Existing/On-going Projects

The final phase of installation of equipment at the Wastewater treatment plant and Sludge disposal and treatment plant in Thermo Power Plant Kakanj is presently in course.

Planned Projects

- Reconstruction of treatment plant in Zenica Foundry
- Building of treatment plant in Lye Factory Lukavac
- Building of treatment plant in Teslić Distillery
- Building of pre-treatment plant in Foča Fibre Board Factory
- Reconstruction of treatment plant in "Natron" Maglaj
- Reconstruction of existing treatment plant of Wood pulp and viscose factory in Banja Luka
- Reconstruction of treatment plant in Chlor-alcaline Complex in Tuzla
- Building of treatment plant in Wood pulp and Paper Factory in Prijedor.
- Proposed Project(s)
- Building of wastewater treatment plant in Brewery Banja Luka
- Reconstruction of wastewater treatment plant Brewery Bihać
- Building of wastewater treatment plant Elektrobosna Jajce
- Building of wastewater treatment plant Leather and Textile Industry Visoko
- Building of wastewater treatment plant in Tannery Kotor Varoš
- Building of wastewater treatment plant Oil and Meat Processing Combine Brčko
- Reconstruction of wastewater treatment plant in Leather Factory Prnjavor
- Building of wastewater treatment plant Wood Processing Industry Lignošper Bosanski Novi
- Building of wastewater treatment plant Tannery Banja Luka.

(iii) Ensuring adequate management of enterprises

Following the privatization, i.e. after changes in the structure of ownership of companies, which were previously state-owned, adequate management of enterprises has been ensured through introduction of technological discipline by means of stimulative measures. Training and education of employees has been performed, whereby the level of responsibility of staff was raised, stimulative resources have been provided and modern management instruments have been applied in practice.

In order to achieve this result, several activities have to be undertaken in the following fields:

- > status of enterprises
- > performance of enterprises
- > financial sources availability

It is necessary to:

- **adapt the status of enterprises to market economy principles.** The enterprises in Bosnia and Herzegovina have not as yet been privatized, but are still owned by the state. In order to effect the transition to market economy, it is necessary to complete fully the process of privatization, according to the programme established, while at the same time taking into account the list of priorities, set up on the basis of registered polluters.
- ➤ upgrade the performance of industrial enterprises. Adoption of modern management principles in the work of enterprises is effected through training and education of employees, applying at the same time both the stimulative and repressive measures designed to establish the technological discipline. All the above mentioned measures are necessary to upgrade the performance of industrial enterprises.
- make available financial resources. The appropriate financial resources, intended for effecting the process of transition within the companies, have to be provided through efficient and cost-effective plant operation, and markets secured with the help of support given to those industries that accept changes in accordance with the standards of environmental protection.

For this result, the following projects have been identified:

Proposed Project(s)

- Project of education of employees
- Preparation of instructions and guidelines establishment of proper plants

(iv) Proper disposal of hazardous substances in landfills

Through agreeing on the location of and building of satisfactory landfills for hazardous substances, which represent safe and long-term solution to the problem of industrial waste, substantial progress has been made in the overall efforts to protect water from pollution..

In order to achieve this result, several activities have to be undertaken in the following fields:

- disposal of hazardous substances
- industrial waste classification
- > enforcement of regulations

It is necessary to:

- ensure landfills for hazardous and harmful substances. In order to determine the sites, where to build the landfills, a consensus must be reached regarding the choice of location, law must determine the selection, and financial resources have to be secured for the realization of this project. The existing dumpsites have to be rehabilitated. If this rehabilitation may be done in a satisfactory way, or, if not, then these dumpsites must be totally abolished and properly closed down.
- classify the industrial waste. The classification of hazardous waste allows that the levels of waste are estimated and categorized, which in turn then helps in selecting the locations by type and quantity of waste disposed. An information campaign must obligatorily be conducted, for the purpose of informing the industries concerned about the locations and procedures of disposal prescribed.

- Enforcement of regulations
- In order to enforce regulation, it is necessary first to prepare the laws. Measures have to be undertaken to strengthen the inspection services through establishment of the system of monitoring and determination of pollution indicators.

These above-mentioned measures would facilitate the monitoring activities related to hazardous wastes.

For this result, the following projects have been identified:

Proposed Project(s)

- Projects of building of proper landfills for hazardous waste
- Project of classification of industrial waste

HIGH PRIORITY PROJECTS are:

- 1. Chlor-alcaline Complex I i II (Tuzla)
- 2. Electrolysis mercury electrodes (Tuzla, Jajce Banja Luka)
- 3. Tanneries way of tanning method (Bugojno, Visoko, Kotor Varoš, Prnjavor, Banja Luka)

3.2.4. Important Assumptions for the Sector

Important assumptions are factors that are significant for the success of the programme but they cannot be envisaged as activities to be undertaken within the frame of the programme as they lie outside its scope and not under its direct control. Therefore, they could also be described as external factors. However, they are pre-conditions, which will ensure the success of the programme and the sustainability of its results. At the **activities** level, the following assumptions have been identified:

Positive political decision concerning the transition process

Positive political decision at the level of the state, concerning the process of transition, makes possible undertaking of further activities on the implementation of the Programme. If the political decisions taken are not in harmony with the EU standards concerning the environmental protection, the strategy of transition of industrial enterprises will lapse into renewal of obsolete technologies. This regression will cause present situation to deteriorate, so that the natural recovery and improvement that was taking place will soon become irrecoverable past.

Effective cooperation of enterprises

During the transition process, the executive authorities should support the efficient cooperation between enterprises and stimulate the joint efforts aimed at implementation of water protection and water quality control measures. The lack of cooperation might result in harmful consequences in regard to quality of water in watercourses.

Effective cooperation of international financing institutions

A precondition to the above assumptions is a satisfactory cooperation of government and industrial enterprises with international financing institutions. The lack of financial support on the part of external sources of funding prevents the implementation of the planned activities.

Qualified staff available

When the process of education and training of staff is brought to close, the available staff will be able to overtake full responsibility in the management of production plants and wastewater treatment plants in such a way as to ensure that the process of production has a minimum negative impact upon environment and that the treatment process yields maximum effects, which was the objective of this programme.

For this sector at the **results/output** level the following assumptions have been identified:

Favorable economic conditions in the country (2.1-2.4)

The economic situation in the country is such that the state is not able to finance out of its own sources the process of transition and the process of replacement of outdated technologies with modern ones and in such a way autonomously to realize the objectives of the Industry Sector, set in the framework of the Programme. The industry, destroyed and dilapidated during the war, also does not possess the funds, which could be earmarked for this purpose. Therefore, in order to be able to attain the results aimed at, it is of crucial importance to establish favorable economic conditions in the country. Should this not be so, there is a risk that of falling short of the results expected.

> Successful elimination of war damages (2.1-2.4)

The elimination of war damages is the starting ground for the realization of the objectives of the Programme. Not a single one of the above objectives can be reached without prior elimination of the trailing consequences of war.

Continuation of cooperation with international financing institutions

The first assumption could be realized through the promotion of cooperation with international financing institutions and through continuous maintaining of this cooperation over a longer period of time. This would serve as support to the processes of transition to the market –oriented economy.

> Environmentally favorable industrial policy of the government

For successful implementation of the Programme, at the level of the government it is necessary to conduct an environmentally friendly policy of industrial development, along with the efforts invested into raising the awareness and responsibility of the staff in regard to industrial production and environmental protection.

3.2.5. Impact Indicators for Sector Results

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

Indicators for sector results are as follows:

1. Clean technologies introduced

By introducing clean technologies the following factors may have either positive, or negative influence on pollution:

- By changing the technological process, the use of harmful and toxic substances, which pollute wastewater to dangerous levels has been eliminated,
- > By making improvements in the process of production, the quantity of water that must be treated has decreased,
- > By introducing changes into the process, the quantity of harmful and hazardous matter in the wastewater has been reduced
- > By recirculating the water, the quantity of water discharged has become reduced

2. Pre-treatment of wastewater applied

Treatment of water prior to its being discharged has been provided:

- In industrial plants located in human settlements the wastewater is disposed into municipal sewerage and treated up to the quality level, which is detrimental neither for municipal sewerage system nor for the process of treatment of municipal wastewater.
- In industrial plants located in uninhabited areas plants have been built that ensure that the water quality is as required for the given stream at the point of discharge.

3. Adequate management of enterprises ensured

Managing bodies, which comply with the set rules and norms of management of production processes, wastewater treatment processes and hazardous waste disposal procedures in compliance with EU standards, have been set in place.

4. Hazardous waste appropriately disposed on proper landfills

➤ The pollution of soil caused by uncontrolled disposal of hazardous industrial waste eliminated through building of proper landfills, and as a result of this, the pollution of ground water has been significantly reduced.

The following impact indicators were identified for the results/outputs:

For the result 2.1:

Decreasing pollution at 25% of industrial plants by using clean technologies and at the same time decreasing pollution in water courses up to 90 % thus reaching quality of river water in compliance with European Union standards by 2010 in the catchment area of Sava River Basin.

It is expected that through the introduction of clean technologies in identified hot spots the pollution will be reduced up to 90% in relation to the pre-war situation. The successful implementation of planned measures and their effects will be assessed through the established system of monitoring of water discharged in water courses by monitoring and registering the values of pollution parameters, both standard and specific ones, at points of discharge in watercourses and at the existing check points in water courses.

For the result 2.2:

> Decreasing organic and anorganic substances up to 90 % by implementing pretreatment plants in compliance with regulations for discharged water quality (European Standards) by 2005 in the catchment area of the Sava River Basin.

Results obtained by building and using the wastewater treatment plants will be evaluated through the implemented monitoring system by monitoring the standard and specific pollution parameters.

For the result 2.3:

- > Compliance with established norms and regulations related to the implementation of clean technologies, pre-treatment of wastewater, proper disposal of hazardous wastes according to European Union standards by 2005 in the catchment area of the Sava River Basin.
- Through the policy of adoption and application of clean technologies, enforced through legal regulations, successful production in line with the principles of sustainable development is achieved, and, consequently, required level of protection of the Danube River basin secured.

For the result 2.4:

Decrease soil pollution by 70 % by disposing hazardous industrial waste at landfills in compliance with sanitary pollution and increasing water fit for supply by the year 2005 in the catchment area of the Sava River basin.

The resolving of the problem of hazardous and harmful industrial waste has as a consequence the decrease in pollution of ground water. Through periodic monitoring of water quality control in potable water sources, particularly on localities, where in the prewar period appearance of toxic and hazardous substances was observed, the effect of the results achieved will be determined.

3.3. Urban Settlements

3.3.1. Situation Analysis

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

Pollution and unhealthy environment are a great social and economic problem in BiH, which will become even more prominent after the renewal of all the activities in the post-war period. This cause numerous and serious dangers for environment throughout the Sava River catchment area. As the major part of the population lives in the fertile villages of Sava River and its tributaries mostly concentrated in larger cities, this contributes to a significant measure to pollution of environment, either through improperly collected and untreated wastewater or improperly disposed solid waste. It is estimated that in the immediate surroundings of the river course in larger cities live about 2.356.000 inhabitants, because during the war rural population migrated toward cities. This very fact contributes to further pollution of soil-water and air.

According to the estimates, about 57% of urban population is connected to sewerage systems, while the rural population discharges the waste in improper septic tanks (cesspools). Throughout the territory of BH the sewerage system for wastewater disposal is inadequate or damaged. There are only two wastewater treatment plants, in Sarajevo and Odzak, which are not in operation, so that all the wastewater, without any treatment, goes into the Sava catchment area. In the whole area of the basin there is not a single landfill built properly and in accordance with world norms. Therefore, the present situation concerning the wastewater and solid waste disposal in our country is below all the standards. The recent war has to a large measure contributed to this.

3.3.1.2. Current Strengths/Assets

As concerning the existing potentials, there are in BiH municipal utility companies in charge of running and maintenance of municipal sewerage and solid waste disposal. There are also legal regulations on city level. There are some laws on the state level as well. There are also relevant Institutes with qualified staff, but with obsolete equipment however.

Existence of research, design and construction agencies and companies There are relevant institutions for research, design and construction, yet lacking in modern equipment and instruments, and without adequate financial support.

➤ **High level of qualified and trained personnel**Qualified and trained personnel exists, yet it should be trained in application of new techniques and methods, in line with modern world norms and standards.

Conceptual framework for a long-term programme of water protection in BiH

At national level there exists a long-term programme for protection of water in BiH, dating from 1991, yet the existing programmes should be adopted and adopted to present rules and conditions, which have considerably changed after the war.

> Existence of legal regulations

There exist relevant legal regulation, which also should be amended and updated.

Existence of municipal utilities enterprises for maintenance and management

There are relevant municipal enterprises for maintenance and sanitation management but they have to employ qualified staff, introduce modern methods, materials and standards.

> Institution for research, design and construction

There are research, design and construction institutions but they have to employ qualified staff, introduce modern methods, materials and standards.

Public utility companies for solid waste treatment

The existing Public utility companies for solid waste management should be updated, additionally staffed, and provided with the equipment and other needed, in order for them to be able to maintain the level of prescribed world standards relating to the protection of environment from harmful effects of solid waste.

3.3.1.3. Analysis of Transboundary Effects

Transboundary effects of pollution of watercourses of river Sava by municipal wastewater from the BH Federation part of the Danube River basin are not pronounced.

The following transboundary effects have been considered:

Pollution of river Sava (slight)

The municipal wastewater passing through rather long course, with their waste substances being highly diluted and decomposed on their way, except for floating, visible impurities does not significantly contribute to the pollution of Sava River.

> Increased quantity of floating impurities

Visible pollution in Sava river basin appears in form of solid matter (plastics, wood and similar) which float and are visible both in the riverbed itself and in the riparian zones along the river courses.

➤ No recorded negative effects from municipal wastewater

As we do not have a system of monitoring, we can not express such pollution through figures, but taking into account the phenomenon of "self-purification", we can only conclude that the pollution of river Sava originating from municipal waters is insignificant.

3.3.2. Sector Problem Analysis

3.3.2.1. Core Problem

The following core problem in municipal sector has been defined:

"IMPROPER DISPOSAL OF SOLID WASTE AND WASTEWATER IN URBAN AREAS"

In bigger settlements and cities in the Sava River basin the existing sewerage systems cover only 50% of overall population, out of which figure the 90% of sewers discharge directly, without treatment, into water courses. The remaining population, especially from rural areas, discharges the waste directly into watercourses through improperly built "septic tanks" (cesspools).

As concerning the solid waste, the situation is even more difficult, because in the Federation part of Sava River catchment area there is not a single landfill built properly in compliance with the world standards.

3.3.2.2. Causes Leading to Environmental Problems

Environmentally hostile human activities cause the pollution of water and degradation of resources in the BH part of the Danube River basin. Apart from polluting water and soil, they reflect negatively on health of people, and flora and fauna of the basin.

The following direct causes of the sector core problem have been identified:

- improper drainage of wastewater
- discharge of municipal wastewater without previous pre-treatment
- improper disposal of solid waste

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

(i) Improper drainage of wastewater

Improperly collected wastewater, generated by population both in rural and urban areas, contribute to creating problems in the sector. There are three causes for the appearance of these problems: lack of built sewerage systems; broken down, dilapidated and damaged sewerage systems and inadequate collection of individual wastewater.

a. Non-existence of built sewage systems

There are no built sewerage systems for wastewater in the cities of Bijeljina, Drvar, as well as in many other BH cities. Particularly pronounced problem is the lack of built sewerage network in suburban areas of larger and smaller cities throughout the river Sava basin. It is necessary to underline, in this context, the absence of design and technical documentation.

b. Existing sewage systems broken down

The existing sewerage systems have largely been damaged, as part of the overall destruction of settlements and cities, by war activities and further ruined due to impossibility adequately to maintain the sewers during the war. Apart from that, the network itself is dilapidated, due to the fact that it was built of materials of low quality and worn out by time. Besides an inadequate management, the lack of financial resources and the lack of planning a technical documentation also contributed to the situation being as it is.

c. Improper individual discharge of wastewater ("septic tanks", cesspools)

The reason why the sanitation of individuals is improper is the fact that the population is still using improper cesspools. To this contribute the low environmental awareness of the population due to insufficient information, low level of education and the lack of financial support. Apart from that, the fact that there are no penal sanctions defined contributes to a large measure to such situation. The non-observance of technical rules and regulations during the construction of septic tanks because of poor work of inspectors and the insufficient financial resources is also very important problem.

(ii) Discharge of municipal wastewater without previous pre-treatment

The municipal waters are discharged into watercourses throughout the Sava River catchment area without being pre-treated previously. The reason for this is the non-existence of appropriate wastewater pre-treatment plants throughout the territory of the Federation. The existing plants (Sarajevo and Odzak) are not in operative state, due to their being damaged by war activities.

a. Inexistence of municipal wastewater treatment plants

The reason, why the wastewater treatment plants are non-existent lies partly in the fact that planning and technical documentation at the level of the BiH State does not exist. The main reason is the impossibility to access the sources of financing for construction of pre-treatment plants. This relates to all the territory of the river Sava catchment area. This absence of design and technical documentation is in particular due to an inadequate management.

b. Existing plants not in operable state

The municipal wastewater treatment plants, which have been built (Sarajevo, Odxak), are not operating, due to their being damaged. The lack of adequate financial resources to be used for repair and rehabilitation of plants and the up-grading of technologies, do not allow their putting into operation in a satisfactory way.

(iii) Improper disposal of solid waste

The solid waste is improperly disposed primarily because the landfills do not exist anywhere in the territory of BiH. Financial resources for design and construction are lacking. The environmental awareness of the population is very low. The low level of education and information is resulting in environmentally harmful human activities.

a. Non-existence of landfills (throughout the basin)

The reason for improper disposal of solid waste lies primarily in the fact that the landfills do not exist in any of the cities in the territory of BH. True, BH cities have city dumps, but they are not sanitary because they were not built in accordance with world norms and standards. The main reason is the lack of adequate financial resources and the absence of technical documentation due to inadequate management.

b. Inexistence of legal framework

There are no legal frameworks or regulations to govern a disposal of solid and toxic waste. Penal provisions and inspectorates for control of disposal of waste do not exist. The main reason in this context are the absence of a national strategy as well as a policy for the implementation of world standards concerning sustainable development.

There is no strategy for disposal of solid and toxic waste at the state level. The legal regulations do not exist on any of the levels of Federation, up to the cantons and municipalities.

c. Low level of environmental awareness

This low level of environmental awareness is also an important cause of improper disposal of solid waste. It is due to the fact, that the people are insufficiently informed in one hand and on the other side, because of the low level of education of the population.

3.3.2.3. Environmental Effects

Improper disposal of wastewater and solid waste has negative impacts upon environment, so that there is a pronounced pollution of soil, water, water of protection source fields, potable water sources, and finally watercourses. All this has a negative impact upon development of flora and fauna as well as upon human health

The environmental consequences of inappropriate activities are the following:

Polluted soil

Pollution of soil contributes to pollution of leachate and degrades soil preventing its possible use for production of food. It has harmful effects upon flora and fauna as well as upon the human health.

Polluted watercourses

The pollution of water throughout the basin contributes to degradation of environment. Leachate and wastewater from green-site dumping grounds pass into watercourses polluting them, and endangering flora and fauna in rivers.

> Polluted water sources and protection zones

Green-site dumping grounds are especially dangerous in the zones of sanitary protection of springs of potable water, and directly endanger health of people who use it for drinking.

Inexistence of landfills (through Inexistence of legal framework Low level of environmental Improper disposal of solid waste Polluted water sources and awareness protection zones the basin) Negative impact on human health (infection IMPROPER DISPOSAL OF SOLID WASTE AND WASTEWATER IN URBAN AREAS diseases) Discharge of treated municipal wastewater without Inexistence of municipal wastewater Existing plants not in operable state 3. Urban Settlements Polluted water courses Problem Hierarchy treatment plants previous treatment Negative impact on flora and fauna (extinction of fish) Polluted soil Improper individual discharge Inexistence of built sewerage Existing sewerage systems broken down of wastewater (septic tanks) Improper drainage of wastewater systems

3.3.3. Objectives, Expected Results, Actions and Related Projects

The main objectives in the sector of urban areas are to properly collect the liquid and solid waste from settled areas with concentration of population. The objective set should be realized through provision of real assumptions.

The following sector objectives have been identified

"WASTEWATER AND SOLID WASTE FROM URBAN AREAS ADEQUATELY DISPOSED"

In order to achieve the sector objective, the following results have to be accomplished:

- Adequate collection of wastewater
- > Treatment of municipal water before discharge
- Suitable disposal of solid waste

(i) Adequate collection of wastewater

Collection of wastewater in a proper way, enforcement of legal regulations and introduction of penal measures can significantly reduce environment pollution.

In order to achieve this result, several activities have to be undertaken in the following fields:

- New sewage system
- Existing sewage system
- Collection of wastewater

It is necessary to:

- **build new sewage system.** Firstly the existing planning and technical documentation has to be evaluated in order to elaborate long-term water protection plan on the level of BiH, with defined concept, guidelines and priorities regarding construction of new sewage systems in cities. Corresponding technical documentation should foresee use of up-to-date construction materials and standards. The financial resources have to be provided at national and local level through appropriate financing mechanisms.
- rehabilitate existing sewage system. In order to rehabilitate existing sewage systems, war damage assessments and technical documentation, considering improved up-to-date materials, standards and new technology for reconstruction, need to be carried out first. Provision of appropriate financial resources is very important.
- ensure proper collection of wastewater from individual users. Pollution of soil and water from individual users' discharge would be decreased by educating and informing population about consequences of environment degradation. Users could be stimulated to build proper individual septic tanks (cesspools) according to the world norms and standards by favorable financial measures (credits). The population will be assisted by building of individual treatment facilities. Inspection service should check in field if septic tanks are built in accordance with the regulations. If not, severe penal measures should be applied. It is also foreseen to enforce the legal regulations.

For this result, the following projects have been identified:

Existing/On-going Projects

- Institutional strengthening of water sector
- Elaboration of Master Plan for Water Supply and Sewage System of the Canton of Sarajevo

Planned Projects

- Construction of the regional sewage system Sarajevo-Visoko
- Construction of the regional sewage system Gornji Vakuf-Bugojno-D. Vakuf
- Construction of main sewer along the river Pliva and Plivsko lake near Jajce
- Construction of the regional sewage system Tuzla-Lukavac
- Construction of regional sewage system Travnik-Vitez
- Construction of sewage system with treatment plant in Bijeljina.

Proposed Project(s)

- Construction of sewage system Gradiska-Topola-Laktasi
- The project for stimulation of construction of proper septic tanks through favorable credits
- To make the programme of protection of waters in BiH

(ii) Treatment of municipal water before discharge

Wastewater from urban areas need to be treated before discharge to watercourses, regardless whether they originate only from households or from city industry (butchery, dairy, brewery etc) too.

In order to achieve this result, several activities are required in the following areas:

- New wastewater treatment plant
- Damaged plant
- Efficient operation of plants

It is necessary to:

- **build new wastewater treatment plants.** It is necessary first to elaborate a planning documentation with defined priority tasks and afterwards to prepare corresponding designs taking into account modern technologies and up-to-date methods of measuring and monitoring of effects of wastewater treatment. Special care should be given to the ecological aspect. Financing resources need to be provided trough appropriately developed financing mechanisms. For industrial plants located in human settlements the wastewater has to be disposed into municipal sewerage and treated up to the quality level, which is not detrimental neither for municipal sewerage system nor for the process of treatment of municipal wastewater.
- rehabilitate damaged plants. This activity includes evaluation of damages on plants and preparation of reconstruction designs in order to repair and renew wastewater treatment plants, which exist. Providing of financing resources is very important. In this context it is foreseen to develop financing mechanisms in order to ensure availability of funds.
- ensure efficient operation of plants. For efficient operation of plants it is important to establish sound management, which supports regulations related to water protection, introduce the elements of stimulating correct work of a plant, provide continuous monitoring of parameters of water pollution, inflow-outflow control, as well as penal stipulations for those, who do not meet the requirements. Measures have to be undertaken in order to provide educated qualified personnel needed for operation, maintenance and management. It is also planned to make available funds for operation and maintenance in order to ensure operation of plants.

For this result, the following projects have been identified:

Existing/On-going Projects

- Institutional strengthening of water sector
- Elaboration of Master Plan for Water Supply and Sewage of Canton of Sarajevo

Planned Projects

- Rehabilitation of the Sarajevo wastewater treatment plant
- Construction of central wastewater treatment plant for system Tuzla-Lukavac
- Construction of central wastewater treatment plant for system G. Vakuf-Bugojno D. Vakuf
- Construction of wastewater treatment plant for system along the Plivsko lake near Jajce
- Construction of wastewater treatment plant for system Travnik-Vitez

Proposed Project(s)

- Construction of wastewater treatment plant in Zenica
- Construction of wastewater treatment plant in Doboj
- Construction of wastewater treatment plant in Brcko
- Construction of wastewater treatment plant in Bihac
- Construction of wastewater treatment plant in Prijedor
- Construction of wastewater treatment plant in Banja Luka

(iii) Suitable disposal of solid waste

In order to achieve this result, several activities are required in the following areas:

- Landfills
- ➤ Legal frame
- Public awareness

It is necessary to:

- **build sanitary landfills.** This activity foresees elaboration of plan documentation and designs for modern sanitary landfills according to priorities in cities throughout the Sava River catchment area, as well as providing of appropriate materials basis and financial resources on time. Existing city dumps should be upgraded into sanitary landfills, which will be managed in accordance with ecological standards. The staff has to be trained permanently on latest technical developments.
- enforce legal framework. It is necessary to introduce new laws and regulations on the state level and to build a strategy of solid waste disposal for the whole state of BH, to introduce world norms and standards of sustainable development. The existing regulations related to work of utility companies at municipal level have to be revised. Stimulating and penal stipulations should be introduced and inspection service control established.
- raise the public awareness. It is planned to educate and inform the population about the legal frame and the consequences of environmental pollution through various publications. This should help to reduce pollution. The introduction of subject "Protection and Improvement of Environment" in elementary and high schools on the level on BiH should contribute to ecological public awareness raising. The introduction of ecological police will ensure enforcement of legal regulations.

For this result, the following projects have been identified:

Existing/On-going Projects

- Urgent works on the rehabilitation of Sarajevo landfill

Planned Projects

- Influence of Sarajevo landfill on pollution of soil

Proposed Project(s)

- Making of planning documentation in respect to the strategy of waste disposal
- Making of regulations for solid waste disposal according to world standards
- Formulating of strategy of solid and toxic waste disposal, on the state, regional and municipal level
- Programme of education of public on solid and toxic waste disposal

3.3.4. Important Assumptions for the Sector

Important assumptions are factors that are significant for the success of the programme. They are not undertaken within the framework of the program but they lie outside of the programme scope and not under its direct control. Therefore, they are external factors, which will ensure the success of the programme and the sustainability of its results.

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

▶ Government supports environmental protection policy

For successful implementation of the programme it is necessary to conduct an environmentally friendly policy at the level of the government. The policy should be in harmonization with EU overall environmental protection strategy.

Financial assistance from international community available

It is necessary to provide financial assistance from external resources through favorable, soft loans, with low interest rates, which will enable government to implement planned activities and repay the debt.

> Effective cooperation of population

Public should be actively involved in solving the problem of liquid and solid waste disposal in urban settlements. Importance of healthy and safe living in unpolluted environment should be pointed out in all media in order to raise public awareness.

Legislation related to environmental protection in place

It will not be possible to influence the reduction of pollution, nor to maintain acceptable water quality level without passing and enforcing relevant environmental legislation.

For this sector at the **results/output** level the following assumptions have been identified:

> Favorable economic conditions

Economic situation in the country is difficult and the state does not have its own sources for rehabilitation of damaged and construction of new sewage systems and wastewater treatment plants, as well as construction of sanitary landfills. The government needs to establish favorable, stable economic conditions in the country for this purpose.

Long term water protection programme in place

Positive attitude of authorities towards environment protection should result in clearly defined long-term strategy of water protection as well.

3.3.5. Impact Indicators for Sector Results

Impact indicators for obtaining results of the sector must exist and have to be measurable. They enable the implementation of results and success of the implementing activities. Indicators of measurement are attained by establishing monitoring on the characteristic places. Wastewater sampling and determining the parameters, which characterized hygienic correctness of water flowing into on the entire catchment. This can be observed in the reduction of coliform bacteria, BPK5, organic and other pollution, which are characteristic and measurable (by monitoring). The objectives and results we should achieve are as follows:

The following impact indicators were identified for the results/outputs:

For the result 3.1:

Percentage of hygienically unacceptable potable water samples in urban settlements in the Sava River Basin reduced by 30% by the year 2005 against 1998, leading to a substantial reduction of risk to human health

The reduction of hygienically unacceptable potable water samples could be achieved by eliminating pollution sources (wastewater spills) by reconstruction of damaged and construction of new sewage systems in urban settlements. Samples analysis is performed in laboratories and according to certain procedures, determining specific parameters.

For the result 3.2:

Number of coliform bacteria in the Sava River Basin water courses reduced by 35 % by the year 2005 against 1998, leading to increase of possibilities for recreation of people

Due to adequate treatment of wastewater before discharge in watercourses and control of effluent in treatment plants, the pollution with coliform bacteria will be reduced and rivers could be used for recreation and other purposes.

For the result 3.3:

The number of green-field sites in the territory of the catchment area of the Sava River is reduced by 35 % in relation to 1998, thereby reducing the ground water pollution and increasing the capacity of their utilization for the needs of the population (water supply and irrigation) by 2005.

By closing down or rehabilitation of green-field sites less drainage water from the sites will go into soil. That would lead to reduction of ground water pollution and possibility to utilize more of it for other human needs, such as water supply or irrigation, and those additional quantities of water delivered to consumers can be measured.

Annexes

- 1. Description of the Sava River Basin Area
- 2. Situation Analysis
- 3. Problem Analysis
- 4. Objective Analysis
- 5. Sector Planning Matrix
- 6. Activities and Important Elements
- 7. Results and Projects
- 8. Workshop Organization

Annex 1. Description of the Sava River Basin Area

1.1. The Sava River Basin Area

Identification of River Basin Areas

Physical-Geographical		Transboundary Impact	ry Impact	
Characteristics	Demographic Characteristics	INFLOW	OUTFLOW	Human Activities in the Basin
Terrain: ➤ Area: 38719 km² (75.7%) ➤ Altitude: 90 – 2800 masl ➤ Rivers: - Sava (14.2%) - Catch. Area - Una (23.6%) - Vrbas (16.5%) - Bosna (27.0%) - Drina (18.7 %) - Drina (18.7 %) - Drina (18.7 %) - Lower water course: Mountainous (Forest Eco-systems) - Lower water course: Flat (Agro Eco-Systems) - Water Accumulation Basins - Significant Hydro Power Potential - Groundwater - Landslides Numerical Parameters: - 940 m³/s, in average, goes to the Sava river - Precipitation: 950 mm/year	Population: ➤ 2.945.700 (77%) (UNHCR) ➤ Around 70 inhabit./km² ➤ Population decreased 9.8% from the 1991 ➤ Cities and bigger municipalities are situated along the watercourses are situated along the watercourses ➤ Big migration from the villages to the cities (in the war period) ➤ Urban population around 80% ➤ 57% of urban population Connected to the sewerage systems UNHCR ➤ 50% of population connected to the water supply systems ➤ 90% of urban waste waters are discharged directly into the watercourses ➤ No sanitary waste disposals ➤ Psycho-Sociological, cultural and health consequences	Waters are not controlled or monitored Waste Waters from Croatia (Zagreb, Kutina, Sisak) Waste Waters from SRJ (Drina river)	Waters are not controlled or monitored No water quality monitoring No effluents monitoring	Agriculture: Poultry Poultry Pest Prognostication Service Fruit Industry Cattle Breeding Pest Quarantine Service Pest Quarantine Service Industry: Wood Processing Industry Zavidovici Pood Stuffs Production - Bultcheries, Meat Production Ind Milk Processing Plants (Driaries) - Breweries - Fermentation Plants Preweries - Fermentation Plants Preweries - Reploitation of Mineral Raw Materials Mining (Tuzla, Central Bosnia Basin, etc) Metal Processing Industry Proposal Industry Cellulose & Viscose Industry (Drvar, Banja Luka, Prijedor, Maglaj, Cazin) Power Production Plants (Tuzla, Kakanj, Ugljevik) Urban Areas: Traffic (Roads) Urban Areas: Utilities (Communal Activities)

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

- 2.1. Land Management and Agriculture
- 2.2. Industry
- 2.3. Urban Settlements

Activities leading to water	Current	Environmental	Transboun	Transboundary effects	Causes leading to inappropriate	Marie
pollution	Strengths/Assets	consequences or economic activities	INFLOW	OUTFLOW	activities	Measures to be undertaken
Unprofessional use of pesticides in agriculture Una-Sana valley Lijevce plain Posavina Sanerija Spreca plain Vrbas river valley Bosna river valley	Reduced use of pesticides (1) Existence of educational institutions (4) Used only in limited (narrow) arreas	Pollution of water and soil Presence of offensive substances in food Health consequences Resistence of parasites Disbalance in biocenosis		PEffects on ground water Pounje Posavlje Semberija Podrinje Reduccion in biodiversity of irrigation PEffects on agrophytoceno sis Impossibility to use river Sava for recreation and in agriculture	 Ve of excessive quantities per unit surface (1) Lax instructions concerning the use of pesticides (1.1) Unclear instructions and warnings provided by pesticide producers (1.2) Use of inappropriate means and lack of knowledge concerning the basic characteristics of pesticides (1.3) Inadequate capacity of institutions in charge of surveillance (2) Lack of equipment and instruments in laboratories (2.1) Poor organization of institutions in charge of the use of pesticides (2.2) Absents of monitoring systems and systems for control of the use of pesticides (2.3) Poor control of pesticides during import (3) Inadequate inspectorate services (3.1) Low level of expertise of customs service in the area of pesticides (3.2) Lax attitude of custom officers (3.3) Insufficient number of properly equipped check points for control of imports (3.4) Low level of training in regard to the use of pesticides in agriculture (4) People not informed of existing legal regulations (4.1) People not informed of the harmful effects of pesticides and their circulation in nature (4.2) Non-observance of instructions regarding the use of pesticides (4.3.3) Low level of environmental awareness and lack of legal regulations (4.4) 	 Education of population concerning the presticides (1.1) Passing of relevant legal regulations concerning the use of pesticides (1.2) Clear instructions and warnings of producers regarding the use of pesticides (1.2) Harmonisation of standards and norms with ISO Standards (1.2) Consistent implementation of standards regulating this area (1.3) Use of proper (environmentally friendly) pesticides (1.3) Monitoring of pesticides (2.1) Provision of agricultural institutions with equipment and instruments (2.1) Provision of financial resources (2.1) Consistent application of regulations governing the establishment of institutions in charge of surveillance (2.2) Control of contents of residual substances in soil (2.3) Provision of technical conditions for control by inspectors (3.1) Control of import of pesticides (3.2) Training of customs department officers (3.3) Increase the number of check-points (3.4) Spreading of information concerning the legal regulations (4.1) Preparation of popular leaflets (4.2) Training (4.2) Advice given by extended services (4.3) Development of environmentally aware behavior (4.4)

1. Land Management and Agriculture

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Activities leading to water	Current	Environmental	Transboun	Transboundary effects	Causes leading to inappropriate	Mocesses to be undertaken
pollution	Strengths/Assets	consequences or economic activities	INFLOW	OUTFLOW	activities	Measures to be undertaken
2. Uncontrolled use of fertilisers (overdosing) in lowlands - Una-Sana valley - Lijevce plain - Posavina - Semberija - Spreca plain - Vrbas river valley - Bosna river valley	High level of qualified human resources (1) Existence of relevant institutions (1)	Disbalance in structure and composition of biocenosis Pollution of ground water Contamination of water with nitrites and nitrates Eutrophication	A	Sava river Sava river Disbalance of plant and animal systems	 ▶ Inadequate training of users (1) ▶ Undeveloped agriculture extension services (1.1) ▶ Lack of appropriate literature (1.2) ▶ Use without control (2) ▶ Untrained and undeveloped agricultural extension services (2.1) ▶ Insufficient and inadequate control by inspectors (2.2) ▶ Increased use of N-fertilisers (3) ▶ - K A N - 27 % N ▶ Lot a - 46 % N ▶ Lack of knowledge concerning the quality and characteristics of soil (3.1) ▶ Low level of training of agricultural producers (3.2) 	Establishment and capacity building of agricultural extension services (1.1) Preparation of appropriate literature (1.2) Controlled use of fertilisers (2) Provision of financial resources (2.1) Establishment and capacity building of agricultural extension services (2.1) Procurement of equipment for control of fertilisers (2.1) Procurement of equipment for control of fertilisers (2.1) Capacity building of inspectors' service (2.2) Optimum and proper use of the nitrogen fertilisers displaying control (3.1) Soil quality control (3.1) Passing of legal regulations (3.2)
3. Discharge of liquid waste from farms without previous treatment - N.Topola - Lijevce plain - Modrica - Brcko - Spreca- Kalesija - Travnik - Semberija - Sarajevo	High level of qualified human resources (1) Existence of relevant institutions (1)	Pollution of water courses Phosphates causing seepage Pollution of soil and water Disbalance in structure and composition of biocenosis Surplus of organic substances causes development of anaerobic processes	A	Negative impact on flora and fauna Pollution of river Sava	Excessive use of by-products (1) Lack of adequate equipment (1.1) Insufficient financial resources (1.1.1) Low level of education of users (1.2) Lack of appropriate publications (1.2.1) Insufficient spreading of information through media (1.2.2) No waste water treatment (2) Lack of financial resources (2.1) Lack of technical equipment (2.2)	Preparation of legal regulations (1) Procurement of equipment (1.1) Education of users (1.2) Treatment of waste water from farms (2) Provision of financial resources (2.1) Procurement of equipment for waste water treatment (2.2)

1. Land Management and Agriculture

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Activities leading to water	Curront	Environmental	Transboun	Transboundary effects	Conses looding to inannrongists	
pollution	Strengths/Assets	consequences of economic activities	INFLOW	OUTFLOW	activities	Measures to be undertaken
4. Accelerated run off of water causing erosion	High level of qualified human resources available Built network of channels Existence of permeable-alluvial soil Existence of pumping stations Existence of pumping stations Existence of built embankments	➤ Depletion of water reserves ➤ Impact on river water level stability ➤ Causing floods ➤ Jeopardising traffic routes ➤ Pollution of water courses ➤ Destruction and denudation of soil ➤ Disbalancing biocenosis ➤ Washing away and spreading of contaminants	A	P Increased sedimentation in Sava and Danube water reservoirs Impact on composition of biocenosis and biodiversity Material damages in agriculture N Negative impact on stability of water levels of Sava and Danube Risk of contamination soil and water	Excessive and uncontrolled cutting of forests (1) Absence of relevant legal regulations (1.1) Poor work of inspectorates (1.2) Cultivation of soil on slopes greater than 15 2 Cultivation of agricultural crops (2.1) Existence of soils with slopes greater than 70 – 80 % (3) Low level of education of users (3.1) Low level of information through media (3.2) Lack of publications (3.3) Mined areas (4) Impossibility to apply measures of prevention against erosion (4.1) Damages done to the soil during activation and explosion of land mines (4.2) Moving away of mines to far-away areas (4.3) Erosion of river banks (5) Undeveloped amelioration measures (5.1) Destruction of forests by floods (5.2) Floods (6) Absence of built dewatering systems (6) Absence of small-size water reservoirs (6) Inexistence of flood protection programmes (6)	Passing of legal regulations (1.1) Intensify the work of inspectors (1.2) Conduct proper agrotechnical measures (1.2) Conduct proper agrotechnical measures (1.2) Transform arable land into pastures and fruit orchards (2.1) Cultivation of land in belts according to the configuration of the terrain (2.1.1) Proper grazing (2.2) Forestation of extremely sloped terrain (3) Education of users (3.1) Increase the amount of information given through media (3.2) Preparation of publications (3.3) Removal of land mines (4) Urgent removal of mine fields from hasardous areas (4.1) Whelioration and regulation of river beds (5) Application of amelioration measures (5.1) Flood protection (6) Enforcement of legal regulations (6) Securing financial resources (6) Preparation of relevant technical documentation (6) Building and maintenance of basic channel networks and systems (6) Whelioration and regulation of water courses (6) Whelioration and regulation of water courses (6) Building and maintenance of embankments (6)

2. Industry

Situation Analysis

A ofivition loading to	Cumont	Taxinommontol concounter	Transbou	Transboundary effects	Consec loading to incommentate	
water pollution	Strengths/Assets	of economic activities	INFLOW	OUTFLOW	activities	Measures to be undertaken
1. Use of dirty and obsolete technologies	Awareness of the harmful effects of obsolete technologies (1) Existence of trained staff (2)	 ▶ Increase in pollution load from industrial plants ▶ Destruction of eco-systems ▶ Degradation of water overloading the slow water courses ▶ Occasional cases of extreme pollution ▶ Damage to flora and fauna in water courses ▶ Increase: Chlorinated hydrocarbonates Mercury (Tuzla region) Increase organic substances and lignosulphates from pulp and paper factories Changes in biodiversity Nogative effects on health of people Increase organic substances lncrease crions from leather industry Increase Cr ions from leather industry Increased extent of quantity of load of pollution in water courses Degradation of soil water courses, ground water ★ Human health hazards 		Cr Ions from leather industry Chlorinated hydrocarbonates Mercury (Tuzla region) Organic substances - bensole, toluene, phenols - ammonium (TPK Tuzla) Organic substances and lignosulphates from wood pulp processes Iron wood pulp processes Iron processes Pincreased transboundary pollution Possibility of transboundary pollution	Heritage from previous political system (1) Problem of outdated technologies linked with process of transition (1) Obsolete technologies (1) Lack of financial resources (1) Lack of resources for procurement of up-to-date technologies (2) Non observance of legal regulations when procuring the equipment (3) Restarting the pre-war environmentally hostile industry Previous hot-spots, such as: Tuzla, Zenica, Maglaj, Banja Luka	Replacement of obsolete technologies to the maximum extent possible (1) Application of up-to-date production technologies in newly built facilities (1) Introduction of equipment which satisfies the environmental standards (1) Plans for selective and global extinction of "dirty" technologies (1) Provision of financial resources (2) Preparation of precisely defined legal regulations (3)

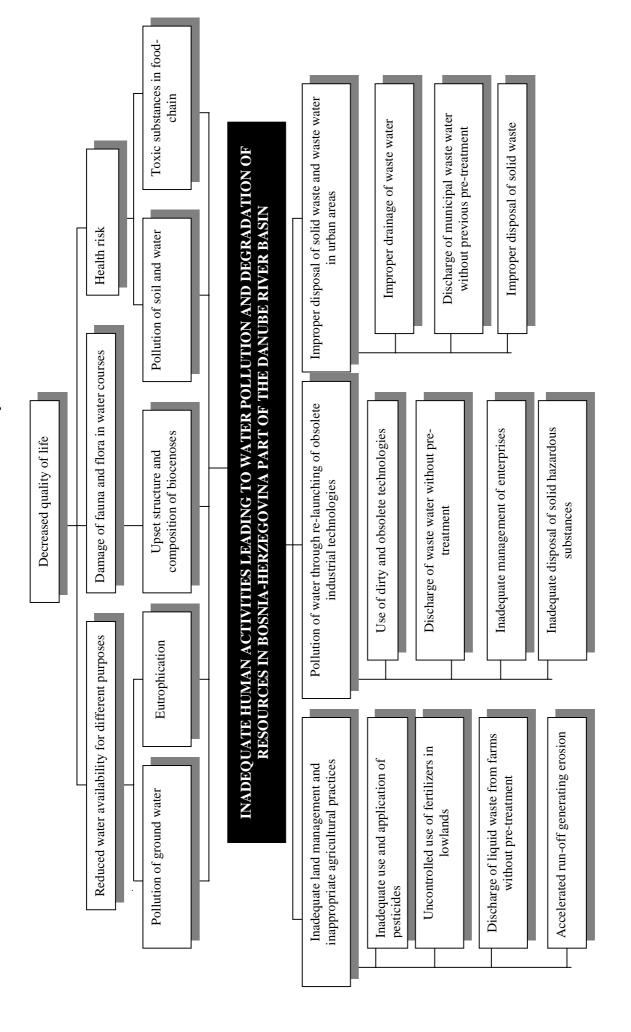
Activities leading to	Current	Environmental consequences	Transbo	oundary effects	Causes leading to inappropriate	Maseuras to be undartokan
water pollution	Strengths/Assets	of economic activities	INFLOW	OUTFLOW	activities	Measures to be unuertanen
2. Discharge of industrial waste water without previous treatment	Existing equipment not put in operation (1) Experience in managing the process of treatment (2)	A		A	 Lack of treatment plants (1) Sporadic production in industrial plants (2) Non-enforcement of legal regulations (3) 	 Stimulation of cooperative industries (1) Strict observance of norms regarding the use of raw materials in production processes (1) Building of new waste water treatment plants (1) Repair and putting in operation of existing waste water treatment plants (2) Establishment of monitoring in factories and water courses (2) Increase the level of information technologies in ecology (3) Strict application of legal regulations (3) Passing of regulations concerning the discharge of effluents and waste water (3) Establishment of pollutants catastre (3)
3. Lack of technological discipline	➤ Unused potential of existing human resources (1) ➤ Developed information system (1) ➤ Increased responsible behavior of population due to system of education (1) ➤ Transition (2)			A	► Low level of general awareness of employees (1) ► Untrained workers (1) ► Inadequate financial stimulation (2) ► Lack of motivation (2) ► Undefined status of state owned companies (3)	discipline (1) Capacity building of inspection department officers (1) Provision of financial means (2) Privatise the enterprises (2) Stimulate measures and education (2) Training of employees (3)
4. Inappropriate disposal of hazardous waste	Media raising the environmental awareness (1) Impact of media in relation to resolving the environmental issues				b Inexistence of proper landfills for disposal of hazardous waste (1) No classification of industrial waste (1) Lack of financial means (2)	 Urgently rehabilitate the existing dump sites (1) Identify and prescribe certain landfills for respective types of industrial waste (1) Sanation and revitalization of polluted soil (?) Passing of legal regulations regarding the waste disposal (2) Establishment of control by inspectors (2)

Activities leading to		Environmental	Transboun	Transboundary effects	Causes leading to inappropriate	;
water pollution	Current Strengths/Assets	consequences of economic activities	INFLOW	OUTFLOW	activities	Measures to be undertaken
1. Uncontrolled and inadequate discharge of water	Existence of research, design and construction agencies and companies (1) High level of qualified personnel (1) Conceptual framework for a longterm programme of water protection in BIH (1) Existence of legal regulations (2) Existence of municipal utilitie enterprises for maintenance and management)	Pollution of soil and water (Bijeljina, cities in Posavina and Lijevce polje) Pollution of drinking water sources and protection zones (Donji Vakuf) Negative impact flora and fauna (extinction of fish,) Impact on human health (infectious diseases)		No recorded negative effects from municipal waste waters Pollution of river Sava (slight)	Lack of built sewerage systems (Bijeljina, suburban areas of all larger cities, Drvar) (1) Lack of design and technical documents (1) Existing sewerage systems in major part of cities and settlements are damaged (Maglaj, Olovo, D.Vakuf, Samac) (2) Inadequate maintenance (2) Lack of funds for maintenance (2) Lack of funds for maintenance (2) Lack of funds for waintenance (3) Los of improper "septic" tanks Low public awareness (3) Lamages due to the war	Ensure financial mechanisms and sources (1) (2) Preparation of technical documentation (1) (2) Revise conceptual framework for longterm programme of water protection (1) Build new sewerage systems (1) Rehabilitate damaged and outdated sewerage systems (2) Raise environmental awareness and educate general public (3) Enforcement of legal regulations along with the application of legal sanction (3) Building of proper septic tanks (4)
2. Discharge of municipal waste water without previous treatment	Construction for design and construction (1) Conceptual framework for a long term programme of water protection in BIH (1) Trained personnel (1) (2)	P Pollution of soil and water Negative effects on human health Negative impact on flora and fauna	things coming by Sava river downstream	V Increased quantity of floating things	Absence of waste water treatment plants (1) Absence of funds for design and building Lack of planning and technical documentation (1) Damages to existing equipment (Sarajevo) (2) War damages (2) Lack of funds (2)	Ensure mechanisms and sources of funding (1) (2) Build waste water treatment plants for municipal waste water (1) Revise conceptual framework for longtern programme of water protection (1) Design planning and technical documentation (1) (2) Rehabilitate damaged plants
3. Improper disposal of solid waste	 Institution for research, design and building Personnel (1) (2) (3) Public utility companies for solid waste treatment (1) 	Polluted soil (ex: Sarajevo dump site) Pollution of soil and water due to green field dump sites along the water courses through out the basin territory Negative effects on human health		A	 Inexistence of landfills throughout the basin (1) Lack of funds (1) Lack of technical documentation (1) Lack of national strategy for solid and toxic waste disposals (2) Absence of legal regulations (3) Low level of environmental awareness Low level of education of population (4) Insufficiently informed population (4) 	A

Annex 3. Problem Analysis

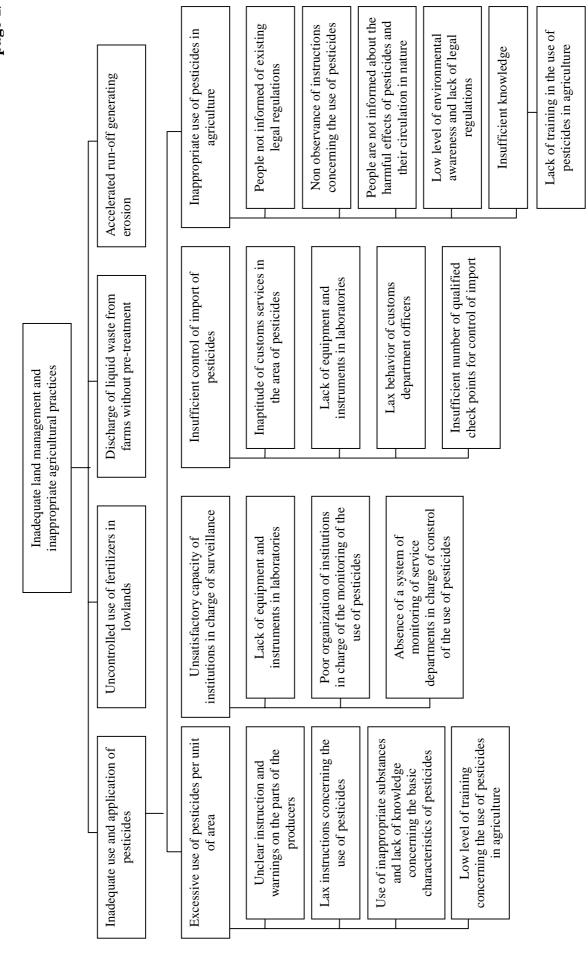
- 3.0. General Problem Hierarchy
- 3.1. Land Management and Agriculture
- 3.2. Industry
- 3.3. Urban Settlements

General Problem Hierarchy



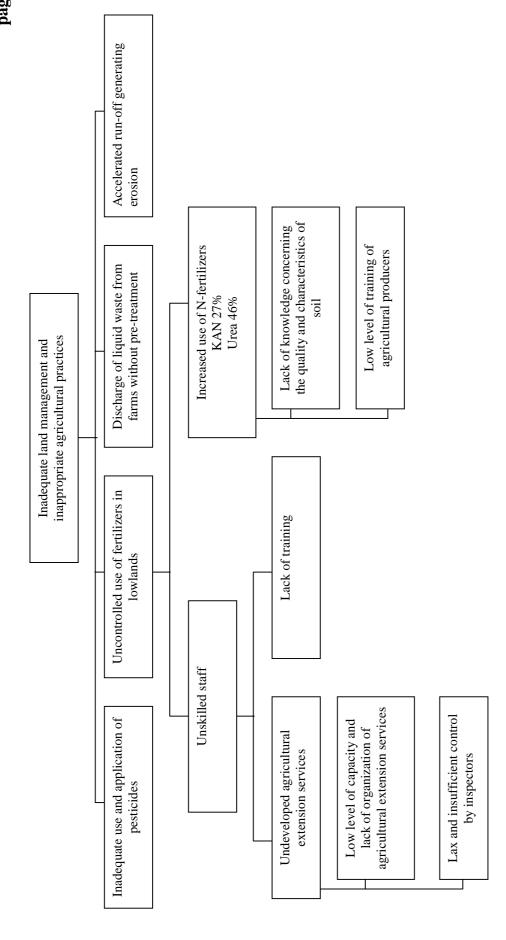
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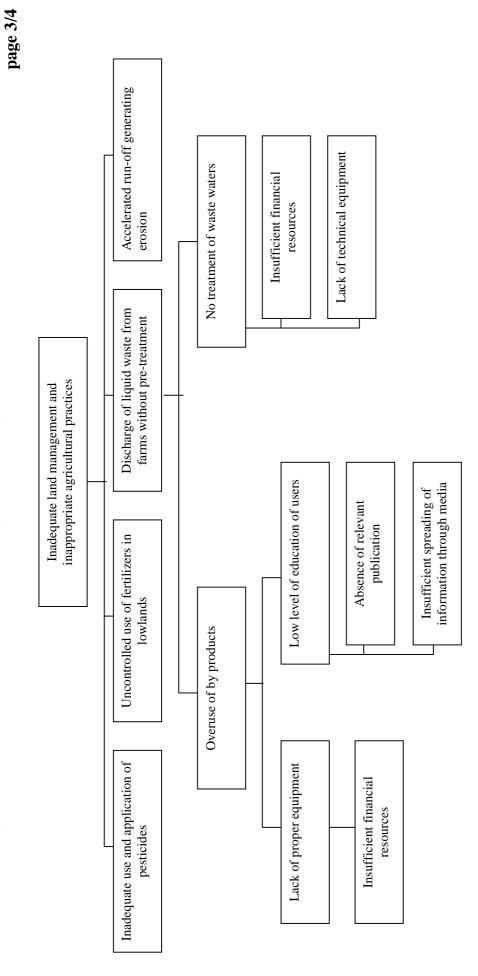
Problem Hierarchy

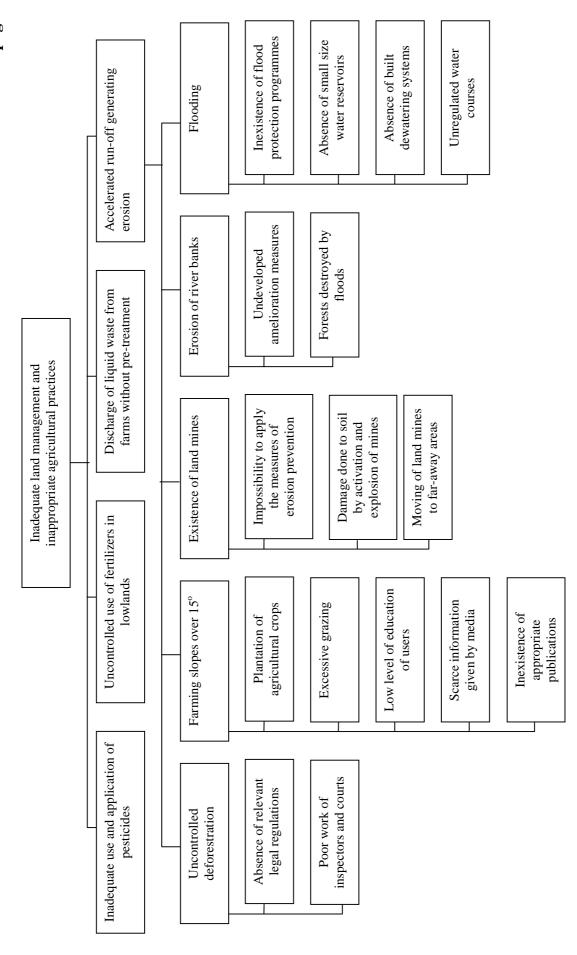


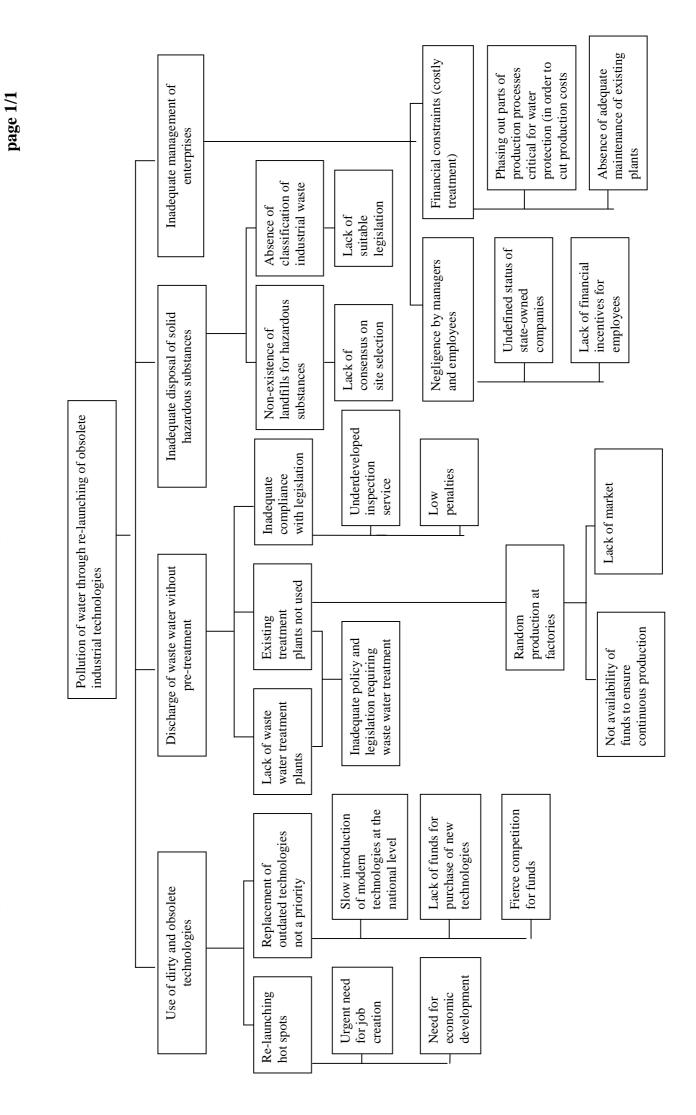
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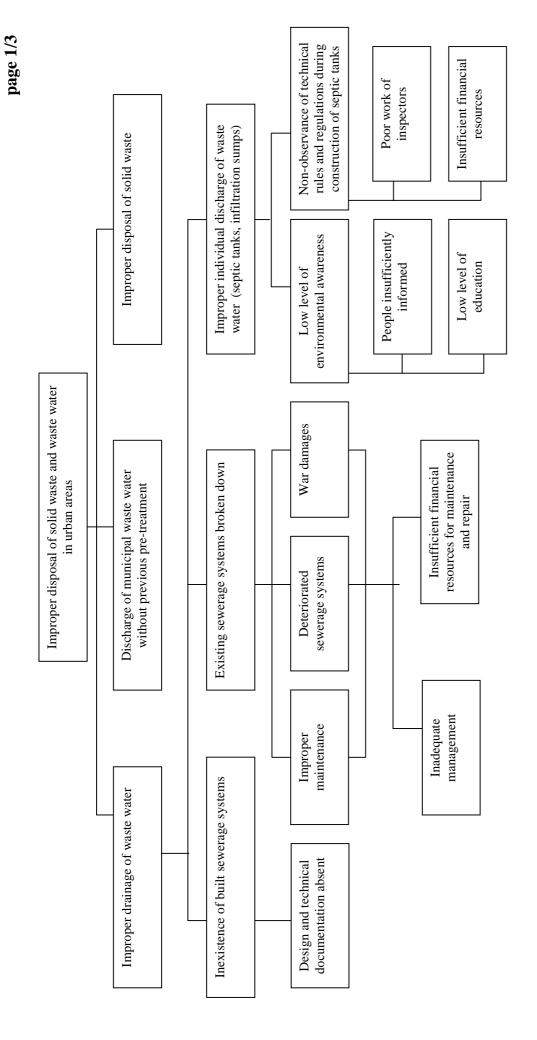
Problem Hierarchy

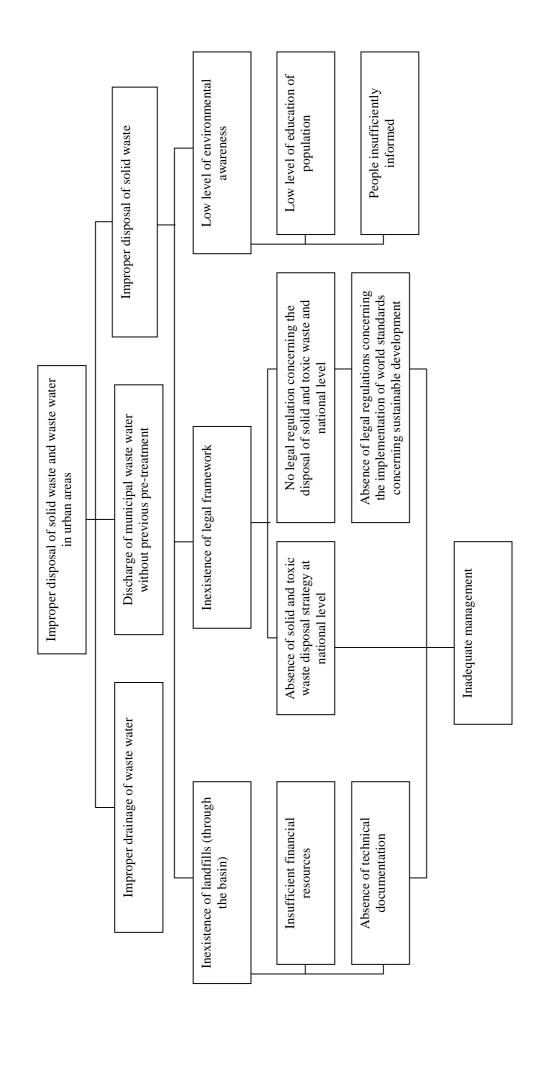








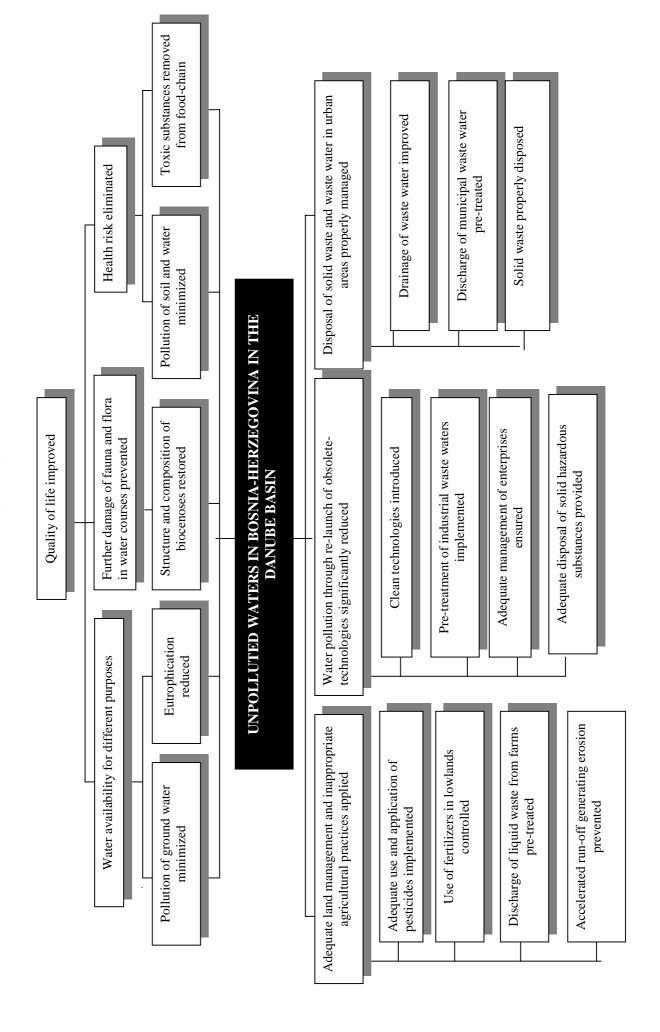


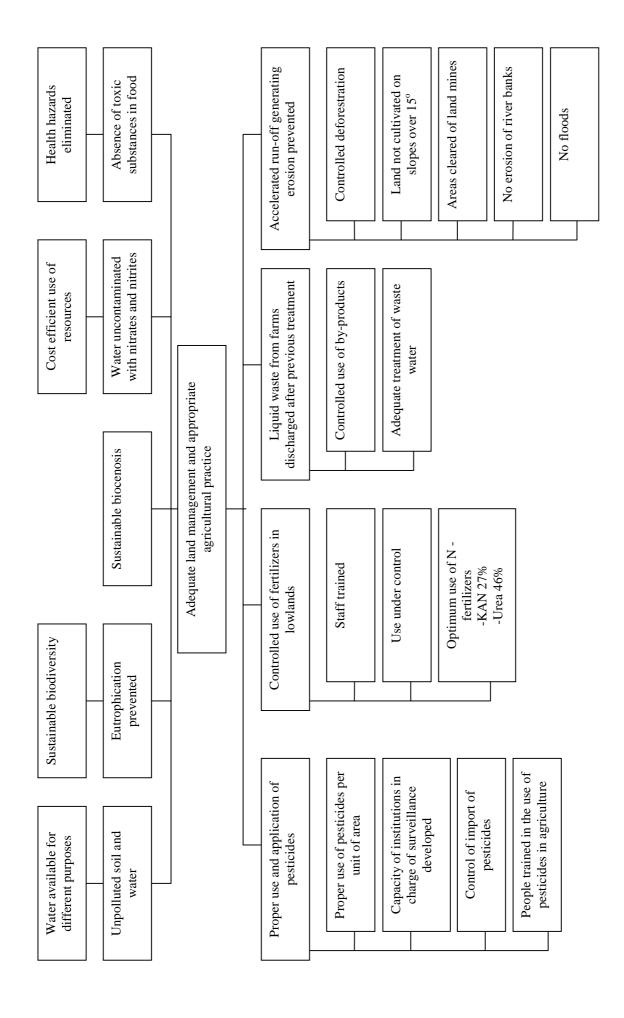


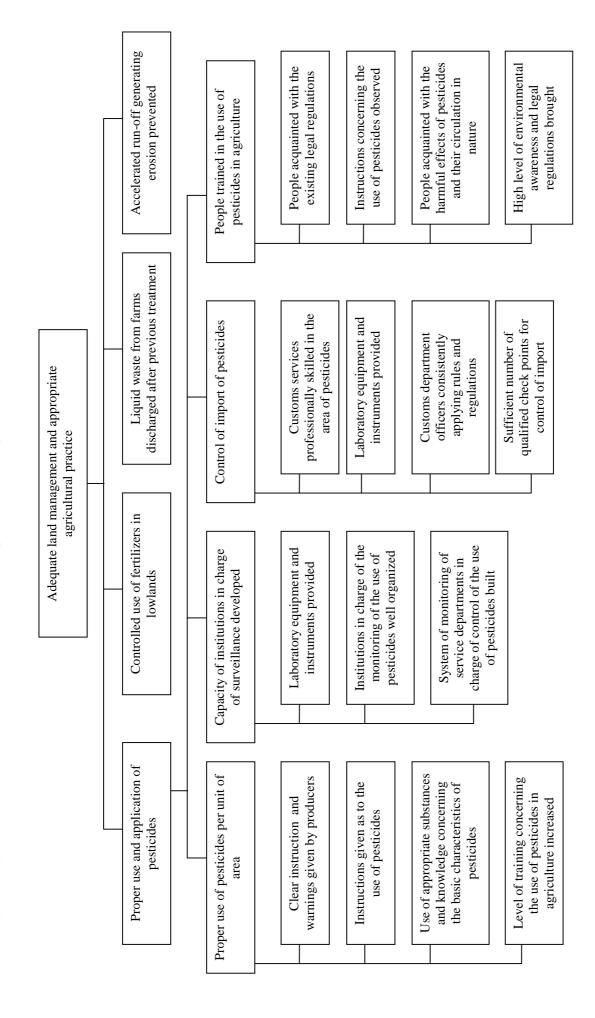
Annex 4. Objective Analysis

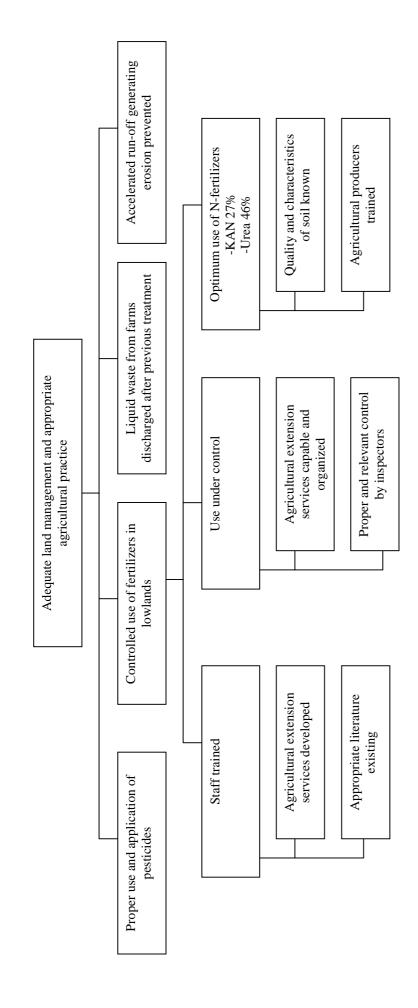
- 4.0. General Objective Hierarchy
- 4.1. Land Management and Agriculture
- 4.2. Industry
- 4.3. Urban Settlements

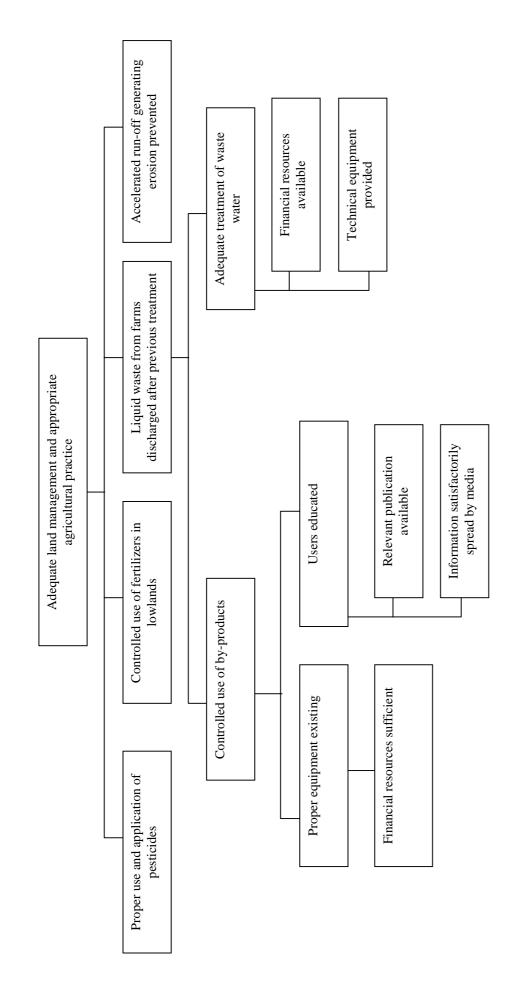
Global Hierarchy of Objectives

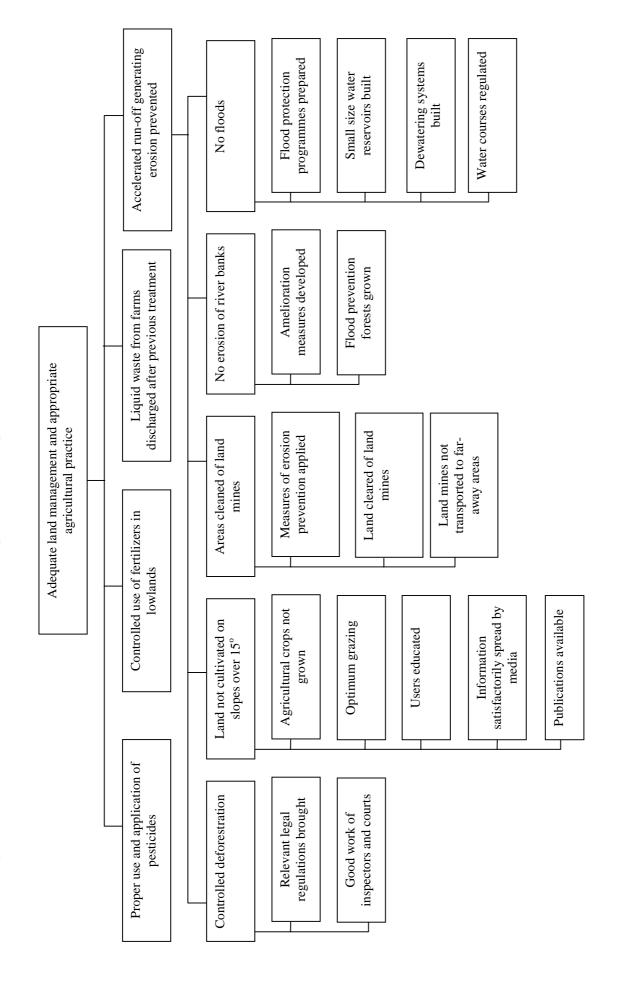


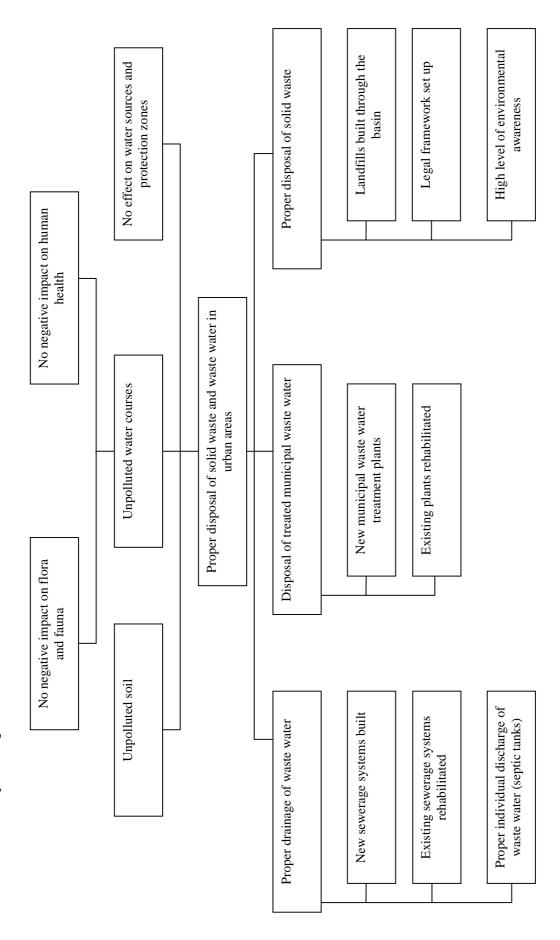


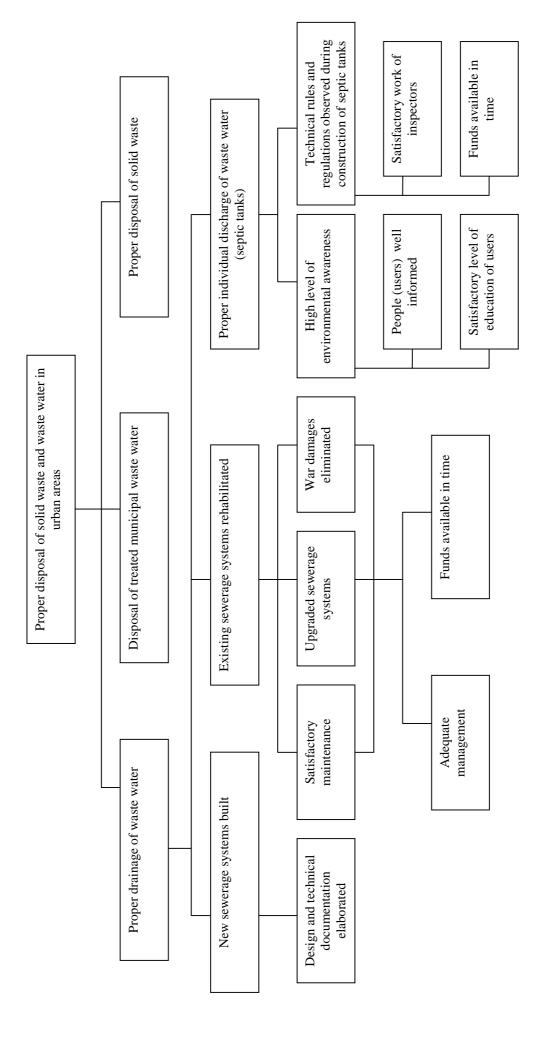


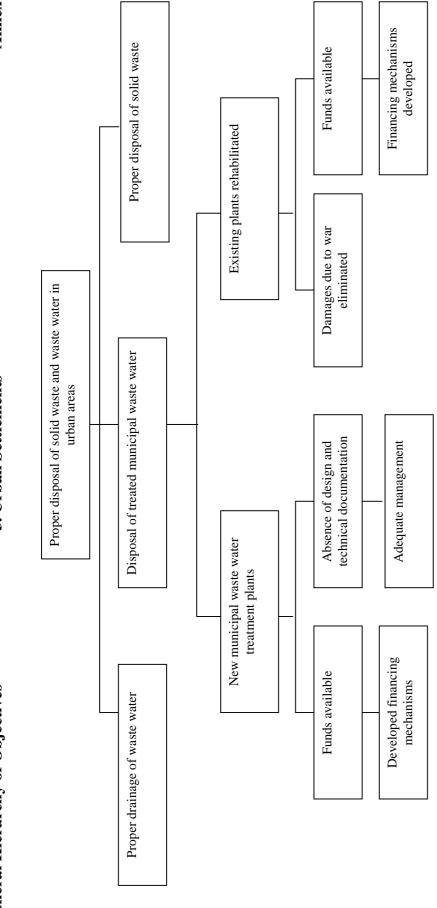


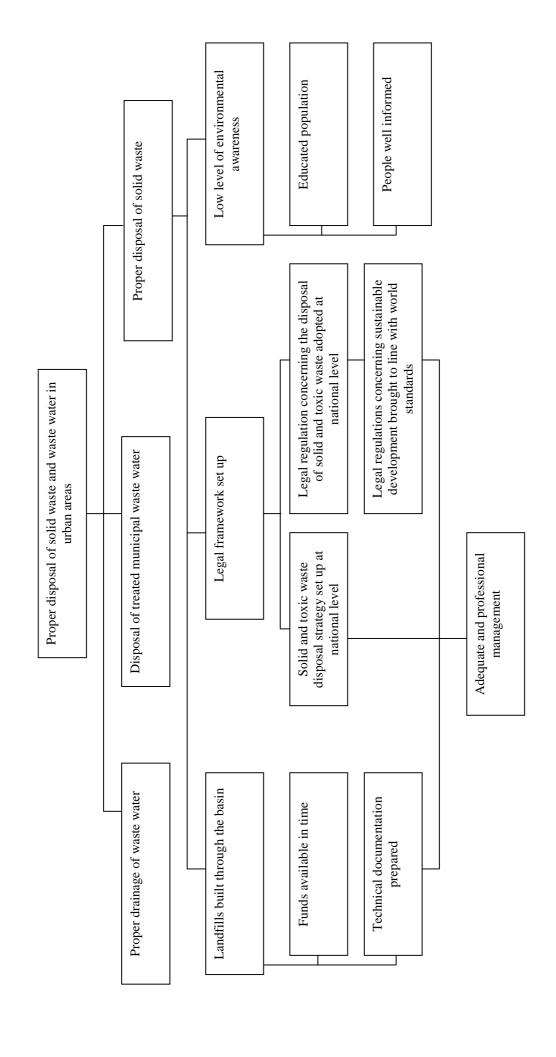












Annex 5. Sector Planning Matrix

- 5.1. Land Management and Agriculture
- 5.2. Industry
- 5.3. Urban Settlements

Summary of Objectives and Activities		Impact Indicators	Important Assumptions
Program Objective: Unpolluted waters in Bosnia-Herzegovina part of the Danube River Basin	oe River	(PO)	Strengthen cooperation between the federation of Bi H and the Republica Srpska
> Sector Objective: Appropriate land management and suitable agricultural practices applied	A	Increase of the percentage of users applying adequate agricultural prectices while at the same time meeting production plan, which covers 50% of the country's need for food (15% - 2000; 20% - 2010; 30% - 2015) (SO-LMA)	Impementation of adequate agricultural practices remains a government priority(SO-LMA) Rational land management remains a government priority
1.1 Adequate use of pesticides adopted 1.2 Adequate use of fertilizers in the lowland areas adopted 1.2 Liquid waste from farms properly treated 1.4 Accelerated run-off generating erosion prevented	A A	1.1 The level of maximum allowed concentration in soil and water maintained without degrading water quality against the year 1998 through controlled use of pesticides at the locations of Unsko-Sanska valley, Lijevce Polje, Posavina, Semberija, Sprecanska Dolina, Podrinje, Bosna and Vrbas valley in the period from October 1999 to 2005 1.2 Acceptable concentrations of nitrogen in soil and water maintained (not exceeding those of 1998) through optimum use of mineral fertilizers at the locations of Unsko-Sanska valley, Lijevce Polje, Posavina, Semberija, Sprecanska Dolina, Podrinje, Bosna and Vrbas valley in the period from October 1999 to 2005	Effective cooperation with international financing institutions (1.1-1.4) Successful transition of ownership (1.1 – 1.3) Clear strategy for development of agriculture in place (1.1-1.3) Successful elimination of war damage (1.1 – 1.4) Transition from state directed to market economy (1.1-1.3) Stabilization of the political situation of the country (1.1-1.4)
Activities: 1.1. Ensure proper use of pesticides 1.1.2 Set up monitoring of the application of pesticides 1.1.3 Control the import of pesticides 1.1.4 Undertake training, promotion and organizational activities for ensuring proper use of pesticides 1.2.1 Ensure training of users 1.2.2 Reinforce the capacities of agricultural extension services and inspection services 1.2.3 Undertake activities and measures for optimum use of fertilizers 1.3.1 Implement rational use of by-products from farms 1.3.2 Ensure proper pre-treatment of waste water from farms 1.4.1 Control cutting of forests 1.4.2 Stop farming on slopes over 15° 1.4.4 Prevent erosion of river banks 1.4.5 Prevent flooding	A A	1.3 Pollution of water reduced without degrading water and soil pollution quality against 1998 by increasing by 30% the use of pretreated liquid waste from farms in the period from 1999 to 2005 at the locations of Unsko-Sanska valley, Ljevce Polje, Posavina, Semberija, Sprecanska valley, Podrinje, Bosna and Vrbas valey 1.4 Level of erosion and flooding reduced by 30% against 1998 by implementing erosion and flood control measures in the period from 1999 to 2005 at the location of Unsko-Sanska valley, Vrbas valley, Bosna andSpreca valey, Drina and Sava valey	A sufficient amount of acceptable fertilizers and pesticides in keeping with standards available (1.1.1.2.3) A sufficient number of available high-quality machines and equipment (1.3.2) Funding and staff for mine-clearing available (1.4.3) Favorable weather conditions (1.1.1, 1.2.3)
PO - Program Objective SOA- Sector Objective of Land Management and Agriculture	t and Agricul	ure	

Annex 5.2. 2. Industry Sector Planning Matrix

huologies implementing of clean technologies and by the same time decrease of water pollution reaching second class of bonity in the entire catchment area of the Sava River Basin Area (SOI) 2.1 Decreasing pollution at 25% of industrial plants by using clean technologies and at the same time decreasing pollution in water courses up to 90% thus reaching quality of river water in compliance with European Union standards by 2010 in the Sava River Basin 2.2 Decreasing organic and anorganic substances up to 90% by implementing pretreament plants in compliance with regulations for discharged water quality by 2005 in the catchment area of the Sava River Basin 2.3 Compliance with established norms and regulations related to the implementation of celan technologies, per-earnment of waste water, proper disposal of hayardous wastes according to EU standards by 2005 in the catchment area of the Sava River Basin 2.4 Decrease soil pollution by 70% by disposing hazardous industrial waste a landfills in compliance with sailary pollution and increasing water fit for supply by the year applies.	Summary of Objectives and Activities	Indicators	Important Assumptions
Reduction of pollution by 70 % of industries implementation of clean industrial technologies and with the same time decrease of votary pollution reaching second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is second class of honty in the entire catching is sent to have a second class of honty in the entire catching is sent to have a set of the same time decreasing pollution in water compared to the implementation of the same time decreasing pollution in water and an entire catching is sent to sent the entire catching in the sent to sent the entire catching in the sent that is sent the entire catching in the sent that is sent to sent the entire catching in the sent that is sent the catching in the sent characters of the sent that the same that is sent that the sent that is sent that the sent	Program Objective:	(PO)	A
introduced same timplemented aste water implemented plants by using clean technologies and at the same time decreasing pollution in water courses up to 90% thus reaching quality of river water in compliance with European Union standards by 2010 in the Sava River Basin ces properly disposed in landfills 2.2 Decreasing organic and anorganic substances up to 90% by implementing pretrament plants in compliance with regulations for discharged water quality by 2005 in the catchnologies by the new ones regulations related to the implementation of regulations related to the implementation of celan technologies, pre-treatment of waster water treatment plants 2.3 Compliance with established norms and regulations related to the implementation of celan technologies, pre-treatment of waster water treatment plants 2.4 Decreasing pollution by 70% by disposing pazardous industrial waster at landfills in compliance with sanitary pollution and increasing water fit for supply by the year 2005 in the Sava river basin 2.4 Decreasing pollution and increasing pollution and increasing water fit for supply by the year 2005 in the Sava river basin 2.5 Decreasing pollution and increasing pollution and increasing water fit for supply by the year 2005 in the Sava river basin			 ▶ Implementation of clean technologies remains a priority for the government (SOI) ▶ Sustainable behavior of the managers (SOI)
the old technologies by the new ones the waste water treatment plants the waste water treatment plants the waste water treatment plants the legal regulations and increasing water fit for supply by the year configuration by the year configuration and harmful substances and fills for hazardous and harmful substances	2.1 Clean technologies introduced 2.2 Pre-treatment of waste water implemented 2.3 Adequate management of enterprises ensured 2.4 Hazardous substances properly disposed in landfills		
	2.1.1 Eliminate hot spots 2.1.2 Replace the old technologies by the new ones 2.1.2 Replace the old technologies by the new ones 2.2.1 Install the waste water treatment plants 2.2.2 Put the existing treatment plants in operation 2.2.3 Enforce the legal regulations 2.3.1 Adapt the status of enterprises to market economy principles 2.3.2 Upgrade the performance of industrial enterprises 2.3.3 Make available financial resources 2.4.1 Ensure landfills for hazardous and harmful substances		
2.4.2 Classify the industrial waste 2.4.3 Enforce regulations	dustrial v tions		

3. Urban Settlements

Summary of Objectives and Activities	Indicators	Important Assumptions
Program Objective: Unpolluted waters in Bosnia-Herzegovina part of the Danube River Basin	A	۷ (PO)
> Sector Objective: Waste water and solid waste from urban areas adequately disposed	BOD5 in the water courses of the Sava River Basin reduce by 20% by the year 2005 against 1998, leading to improved living conditions for river flora and fauna	 Environmental protection policies continues to be priority for the government (SOUS) Sustainable behavior of the population achieved(SOUS) Local sources of funding available (SOUS)
> Results / Outputs: 3.1 Waste water adequately collected 3.2 Municipal water treated before discharge 3.3 Solid waste suitably disposed	3.1 Percentage of hygienically unacceptable potable water samples in urban settlements in the Sava River Basin reduced by 30% by the year 2005 against 1998, leading to a substantial reduction of risk to human health.	➤ Favorable economic conditions (3.1 – 3.3) ➤ Long term water protection programme in place (3.1 – 3.3)
3.1.1 Build new sewage system 3.1.2 Rehabilitate existing sewage system 3.1.3 Ensure proper collection of waste water from individual users 3.2.1 Build new waste water treatment plants 3.2.2 Rehabilitate damaged plants 3.2.3 Ensure efficient operation of plants 3.3.1 Build sanitary landfills 3.3.2 Enforce legal frame 3.3.3 Raise the public awareness	 ▶ 3.2 Number of coliform bacteria in te Sava River Basin water courses reduced by 35 % by the year 2005 against 1998, leading to increase of possibilities for recreation of people ▶ 3.3 The number of green-field sites in the territory of the catchment area of the Sava River is reduced by 35 % in relation to 1998, thereby reducing the ground water pollution and increasing the capacity of their utilization for the needs of the population (water supply and irrigation) by 2005. 	 ▶ Government supports environmental protection policy (3.1.1-3.3.3) ▶ Financial assistance from international community available (3.1.1-3.3.3.3) ▶ Effective cooperation of population (3.1.1-3.3.3) ▶ Legislation related to environmental protection in place. (3.1.1-3.3.3.3)
PO - Program Objective SOM - Sector Objective Municipality		

SOM - Sector Objective Municipality

Annex 6. Activities and Important Elements

- 6.1. Land Management and Agriculture
- **6.2. Industry**
- 6.3. Urban Settlements

Activities and Important Elements	1. Land Management and Agriculture Annex 6.1.
Result 1.1. Adequate use of pesticides adopted	icides adopted page 1/4
Activities	Important Elements
✓ 1.1.1 Ensure proper use of	➤ Bring rules and regulations governing the use of pesticides
pesticides	➤ Enforce consistent application of rules and regulations
	> Establish declaration (specific documents and instruction on pesticides
	➤ Introduce optimum use of proper pesticides
	Conduct measurements of the contents of residual substances in soil and water
	➤ Replace the pesticides with more environmentally means
▶ 1.1.2 Set up monitoring of the	▶ Organize the agricultural extension services
application of pesticides	Conduct professional training of staff specialized in the control of pesticides
	> Set up the system of control – monitoring
	➤ Procurement of equipment for control of pesticides
	Introduce relevant international standards in the area of phytopharmacology
	➤ Establish pest reporting, forecasting and quarantine services
➤ 1.13 Control the import of	> Set up the control of import and trade with the pesticides
pesticides	> Equip and train the services for control of import of pesticides
	> Strengthen the control on the part of inspectors
	Consistent application of rules and regulations
	> Ensure that that the staff working in agricultural pharmacies is adequately trained and qualified
> 1.1.4 Undertake training,	Organize the advice-giving services
promotion and organizational activities for ensuring proper use	Training and education of users
of pesticides	Prepare and disseminate popular publications
	> Spread information through media
	> Promote the environmental awareness
	> Train the users to apply regulations

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Annex 6.1.	1/2 apen
1. Land Management and Agriculture	as adonted
Activities and Important Elements	Result 1.2. Adequate use of fertilizers in the lowland areas adonted

Result 1.2. Adequate use of fertilizers in the lowland areas adopted	zers in the lowland areas adopted page 2/4
Activities	Important Elements
➤ 1.2.1 Ensure training of users	 Organize infrastructure for user training Design suitable literature Educate users
	 Provide training on the implementation of legislation Inform the public through mass media Raise environmental awareness
	Educate farmers
> 1.2.2 Reinforce the capacities of agricultural extension services and inspection services	 Draft and pass legislation on fertilizer control Introduce modern management techniques of agricultural extension services Ensure funding Set up and train extension service Provide equipment for extension services Train and equip inspection service Control the application of fertilizers
➤ 1.2.3 Undertake activities and measures for optimum use of fertilizers	 Design and pass legislation on proper use of fertilizers Ensure proper and optimum use of N-fertilizers Stimulate the use of organic fertilizers Monitor soil and water quality

Activities and Important Elements	1. Land Management and Agriculture	Annex 6.1.
Result 1.3. Liquid waste from farms properly treated		page 3/4
Activities	Important Elements	
➤ 1.3.1 Use of by-products rationally	➤ Design and pass legal regulation	
	Ensure control on the part of inspectors	
	➤ Equip the users	
	➤ Educate users	
➤ 1.3.2 Ensure proper pre-treatment of waste water from farms	➤ 1.3.2 Ensure proper pre-treatment ➤ Bring regulations governing to the waste water treatment of waste water from farms	
	➤ Ensure control on the part of inspectors	
	Provide funds	
	Procure waste water treatment plants	
	Y Treat the waste water from farms	

Annex	
1. Land Management and Agriculture	
Activities and Important Elements	

Activities and Important Elements	1. Land Management and Agriculture
Result 1.4. Accelerated run-off generating erosion prevented	nerating erosion prevented page 4/4
Activities	Important Elements
➤ 1.4.1 Control cutting of forests	 Draft forest management plann Draft and pass legislation Replant forests with trees Reinforce inspection service Enforce control of cutting of forest trees
▼ 1.4.2 stop farming land on slopes over 15°	 Turn plow land and orchards into grassland Enforce adequate agro-technical measures Implement contour farming Ensure optimum use of grassland
✓ 1.4.3 Clear land mines	 Clear land mines from high-risk areas Design popular literature (publications) Educate the population about the risk from land mines Inform the population about risk from land mines (through media)
> 1.4.4 Prevent erosion of river banks	 Regulate and manage river beds Build wire and concrete fences Implement amelioration measures Plant trees on sloping terrain Plant trees on areas subject to erosion
× 1.4.5 Prevent flooding	 Enforce regulations Ensure funding build and maintain basic canal networks and systems Regulate and manage water courses Design suitable technical documentation Build mini dams Build and maintain dikes

Activities and Important Elements	2. Industry	Annex 6.2.
Result 2.1. Clean technologies introduced		page 1/4
Activities	Important Elements	
> 2.1.1 Eliminate hot spots	 Define and adopt legislative regulation Define and adopt regulations to eliminate certain obsolete technologies 	
	 Establish the production according to the existing outdated technologies through new technical improvements Introduce world production norms in all production processes 	
> 2.1.2 Replace the old technologies by the new ones	 Start the transition process Stimulate introduction of new technologie4s by the government Make available financial funds through international mechanisms Promote environmentally friendly technologies 	

nnex 6
A
2. Industry
Activities and Important Elements

Activities and Important Elements	2. Industry Annex 6.2.
Result 2.2. Pre-treatment of waste water implemented	e water implemented page 2/4
Activities	Important Elements
➤ 2.2.1 Install the waste water treatment plants	 Design waste water treatment plants Identify the kind and efficiency of treatment plants Provide incentives to factories to built treatment plants Prepare registry of polluters Make available financial funds through international mechanisms
> 2.2.2 Put the existing treatment plants in operation	 Identify kind and degree of damage in existing treatment plants Make available financial funds through international mechanisms Train the staff
> 2.2.3 Enforce the legal regulations	 Strengthen inspection service Adopt the principle "polluter pays" (to provide financial funds) Establish monitoring system in factories Build the capacity of inspectors

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Activities and Important Elements	2. Industry Annex 6.2.
Result 2.3. Adequate management of enterprises ensured	t of enterprises ensured page 3/4
Activities	Important Elements
➤ 2.3.1 Adapt the status of enterprises to marked economy	➤ Redefine status of state enterprises
principles	Establish program and priorities for privatization of enterprises
	➤ Ensure privatization if snakk abd karge enterprises
	4
➤ 2.3.2 Upgrade the performance of industrial enterprises	> Facilitate introducation of modern management instruments
	> Ensure training and education of the employees
	➤ Undertake measures for staff stimulation
	➤ E3nsure technology discipline through penal policy
➤ 2.3.3 Make available financial resources	➤ Introduce appropriate financing mechanisms
	Provide financial means through cost-effective operation
	> Support industrial production through marketing
	Promote environmentally friendly industries

Activities and Important Elements	2. Industry	Annex 6.2.
Result 2.4. Hazardous substances properly disposed on landfills		page 4/4
Activities	Important Elements	
> 2.4.1 Ensure landfills for hazardous and harmful substances	 Achieve consensus on location choice Regulate the area of industrial waste by law Rehabilitate the existing landfills for industrial waste 	
➤ 2.4.2 Classify industrial waste	 Provide funds for construction of proper landfills Evaluate hazardous wastes Identify the landfills of hazardous industrial waste 	
	Inform the industries on the adopted ways of classification and disposal	
> 2.4.3 Enforce regulations	 Prepare legal regulation Strengthen inspection service Monitor activities related to hazardous wastes 	

Activities and Important Elements	3. Urban Settlements Annex 6.3.
Result 3.1. Waste water adequately collected	y collected page 1/3
Activities	Important Elements
➤ 3.1.1 Build new sewage system	➤ Evaluate the existing planning and technical documentation
	► Elaborate long term plan for protection of waters in B-H
	➤ Prepare technical documentation
	➤ Ensure sources and financing mechanizms
	➤ Use upgraded materials and updated standards
> 3.1.2 Rehabilitate existing	➤ Make assessment of damages
sewage system	➤ Elaborate rehabilitation projects
	➤ Ensure financing mechanisms
	➤ Use upgraded materials and standards as much as possible
▶ 3.1.3 Ensure proper collection of ▶ Educate the population	➤ Educate the population
waste water from individual users	Stimulate the building of individual private septic tanks
	Assist the population in building of individual treatment facilities
	\triangleright Enforce the legal regulations applying the sanctions

Activities and Important Elements	3. Urban Settlement	Annex 6.3.
Result 3.2. Waste water adequately collected		page 2/3
Activities	Important Elements	
> 3.2.1 Build new waste water treatment plants	 elaborate planning documentation witz priorities defined Develop financing mechanisms Prepare technical documentation Apply state of the art know-how in the area of waste water treatment technologies 	
> 322 Rehabilitate damaged plants	 Make assessment of the damages Prepare rehabilitation project Implement state of the art know how concerning the ww treatment technologies when rehabilitating the damaged plants Ensure sources and mechanisms of financing 	
→ 3.2.3 Ensure efficient operation of plants	➤ Introduce modern management system ➤ Introduce inflow-outflow control (monitoring) ➤ Train the management and maintenance staff ➤ Make available funds for operation and maintenance	

Activities and Important Elements	3. Urban Settlement Annex 6.3.
Result 3.3. Solid waste suitably disposed	sposed page 3/3
Activities	Important Elements
➤ 3.3.1 Build sanitary landfills	➤ Elaborate the plan for building the landfills
	➤ Upgrade the existing municipal dumps into sanitary landfills
	Prepare the investment and technical documentation
	Provide financial resources on time
	Permanently educate the staff on latest technical developments
> 3.3.2 Enforce legal frame	➤ Build a strategy of solid and toxic waste disposal at national level
	Pass legal regulations at state level related to the solid and toxic waste disposal
	➤ Use international sustainable development standards
	> Revise the existing regulations related to work of utility companies at municipal level
	> Introduce strict penal measures sanctioning the disposal of waste on green field sites
➤ 3.3.3 Raise the pubic awareness	➤ Develop environmental awareness
	> Educate the population
	➤ Inform public about legal frame
	➤ Introduce the ecological policy
	> Introduce new subject "environmental protection and promotion" in prima" in primary and secondary schools

Annex 7. Results and Projects

- 7.1. Land Management and Agriculture
- 7.2. Industry
- 7.3. Urban Settlements

	RESULTS		PROJECTS	
		EXISTING/ON-GOING	PLANNED	PROPOSED
A	1.1 Adequate use of pesticides adopted			Establishement of the sistem of the monitoring of the pesticides Pesticides in nutrition chaine Presence of pesticides in agricultural products Presence of pesticides in agroaquatic eco-systems Level of pesticides conatamination in soil and water Resistence of agrophytocenoses Presence of pesticides in agrophytocenoses Imapcts of pesticides upon human health Environmental and agricultural potentials for production of unpolluted food
A	1.2 Adequate use of fertilizers in the lowland areas adopted	Role of N-compunds from soil and ground water in causing nefritis in Posavina and Semberija		 Nitrogen compounds in water and land Environmental and agricultural potentials for production of unpolluted food
A	1.3 Liquid waste from farms properly treated		waste water from main sewer Treatment of waste water from Brcko farms Treatment of waste water from Brcko farms Treatment of waste water from Spreca farms (structural Kalesija) Treatment of waste water from Butmir Sarajevo (structural) Treatment of waste water from farms (structural Bijeljina)	Treatment of waste water from "mini" farms Presence of poisonous substances in farms Disposal of waste in agriculture
A	1.4 Accelerated run-off generating erosion prevented	➤ Impact of "Visegrad" lake on surrounding land		 Cadaster of eroded areas Rehabilitation of eroded areas Surveillance of erosion in catchment areas Assesment of erosiveness of land

Annex 7. 2. 2. Industrry **Resutls and Projects**

	RESULTS		PROJECTS	
		EXISTING/ONGOING	PLANNED	PROPOSED
A	2.1 Clean technologies introduced	Changes in the technolgy of the disposal of dross on the dump site of thermo power plant Tuzla		Preparation of the list of hot spots Establishment of the monitoring of hot spots Change in technology in tanneries from chromium to vegetable origin tanning agents Change in technology in electrolytic plants Tuzla, Banja Luka, Jajce
Α	2.2 Pre-treatment of waste water implemented	Building of treatment plant in thermo power plant Kakanj in course	Reconstruction of treatment plant in Ironworks Zenica Building of treatment plant in sodium hydroxide Lukavac Building of treatment plant (distillery Teslic) Biulding of pre-treatment plant in fibre board factory "Maglic" Foca Reconstruction of treatment plant in "Natron" Maglaj Reconstruction of existing treatment plant of wood pulp and viscose fibres factory Banja Luka Reconstruction of treatment plant in Chlorine lye factory Tuzla Building of waste water treatment plants in "Celpak" factory Prijedor	building of waste water treatment plants in Banja Luka brewery Reconstruction waste water treatment plant in Bihac brewery Building of waste water treatment plant in "Elktro Bosna" Jajce Building of waste water treatment plant in leather and textile plant "Kozarsko Tekstilni Kombinat" Visoko Building of waste water treatment plant in leather factory Kotor Varos Building of waste water treatment plant in oil factory and abattoire Brcko Reconstruction of waste water treatment plant in leather factory Prnjavor Building of waste water treatment plant in ply-wood factory "Lignosper" Bosanski Novi Building of waste water treatment plant in leather factory Banja Luka
А	2.3 Adequate management of enterprises ensured			 Project of education of employees Preparation of instructions and guidelines for proper operation of enterprises
А	2.4 Hazardous substances properly disposed in landfills			Project of industrial hazardous waste landfills in the territory of BIH Project of clasification of industrial waste

Annex 7.3. 3. Urban Settlements Resutls and Projects

	RESULTS			PROJECTS	
		EX	EXISTING/ONGOING	PLANNED	PROPOSED
A	3.1 Waste water adequately collected	A A	Institutional strenghtening of water sector Mater plan for water supply and drainage in Canton Sarajevo	Building of regional sanitation system sistema Sarajevo-Visoko Building of regional sanitation system G.Vakuf-Bugojno-D.Vakuf Building of main sewer along Pliva river and Pliva lake, near Jajee Building of regional sanitation system Tuzla - Lukavac Building of regional sanitation system Travnik - Vitez Building of regional sanitation system treatment plant - Bijeljina	Building of sanitation system Gradiska - Topola - Laktasi Project of giving incentives for building of proper septic tanks through granting soft loans Preparation of programmes for protection of water in BiH
A	3.2 Municipal water treated before discharge	AA	Institutional strenghtening of water sector Mater plan for water supply and drainage in Canton Sarajevo	Rehabilitation of Sarajevo waste water treatment plant Buildin o central treatment plant for system Tuzla - Lukavac Building of central treatment plant for system G.Vakuf - Bugojno - D.Vakuf Building of treatment plant for system near Pliva lake-Jajce Building of treatment plant for system Travnik - Vitez	Building of treatment plant in Zenica Building of treatment plant in Doboj Building of treatment plant in Brcko Building of treatment plant in Bihac Building of treatment plant in Prijedor Building of treatment plant in Banja Luka
А	3.3 Solid waste suitably disposed	А	Urgent works on rehabilitation of Sarajevo landfill	Impact of Sarajevo landfill on pollution of soil	Preparation of planning documentation related to waste disposal strategy. Preparation of rules and regulations for solid waste disposal according to international standars Defining of strategy of solid and toxic waste disposal at state, regional and municpal level Programme of raising of public awareness concerning the proper solid and toxic waste disposal

Annex 8. Workshop Organization

- 8.1. Agenda of the Workshop
- **8.2.** List of Participants
- 8.3. Evaluation of the Workshop

GEF- Danube Pollution Reduction Program National Planning Workshop November 2 – 5 1998, Sarajevo

Monday		
08.30-09.30		Registration
09.30-10.00		Opening Ceremony
10.00-11.00		Presentation of participants Introduction of the topics Objectives of the workshop and methodology of work
11.00-11.30	Break	
11.30-13.30	Plenary	Identification of the River Basin Areas
13.30-15.00	Lunch	
15.00-16.30	Plenary / groups	Situation Analysis - Activities leading to water pollution - Assets / Achievements - Environmental problems of pollution - Transboundary effects - Causes leading to inappropriate activities - Measures to be undertaken
16.30-17.00	break	
17.00-18.30	plenary	Situation Analysis - presentation of results
19.30		Reception
Tuesday 8.30 -10.30	Plenary / groups	Problem Analysis concerning to dissimilar of Activities in the Social and Economy Sector - basic problem in sector - direct causes of basic problem - direct effect of basic problem
10.30-11.00	break	
11.00-12.30	groups plenary	Problem Analysis - continuation - presentation of results
12.30-14.30	lunch	
14.30-16.30	Plenary / groups	Analysis and Identification of Objectives - activities for reduction of water pollution from diffusion sources and water quality enhancement
16.30-17.00	break	
17.00-18.30	groups plenary	Objectives Analysis - continuation - presentation of results

Wednesday		
8.30-10.30	Plenary / groups	Programme Planning Matrix (policy, strategy, activities) - objectives in the sectors - results in the sectors - activities
10.30-11.00	break	
11.00-12.30	plenary	Programme Planning Matrix - continuation - presentation of results
12.30-14.30	lunch	
14.30-16.00	Plenary / groups	Description of important elements of strategy in connection with development of new project concerning water quality enhancement
16.00-16.30	break	
16.30-18.30	plenary	Description of important elements of strategy in connection with development of new project concerning water quality enhancement - continuation - presentation of results
Thursday		
8.30-10.00	groups	Identification of the objectives of national and international water quality Identification of indicators of damage leading to sector and results in accordance with the objectives of national and international quality
10.30-11.00	break	
11.00-13.00	Plenary / groups	Presentation of Sector Planning Matrix, preparation of Programme Planning Matrix (policy, strategies, activities, indicators of damage activities)
13.00-14.00	plenary	Conclusion and finish of workshop
14.00	lunch	

GEF - DANUBE POLLUTION REDUCTION PROGRAM

National Planning Workshop

November 2 – 5, 1998, Bosnia and Herzegovina, Sarajevo List of participants

	Name	Profession	Institution
	Federat	ion of Bosnia a	and Herzegovina
1.	Azra Seratlić-Tutić	B.Sc. Eng.	Ministary for agriculture, forestry and watermanagement of ZENICA-DOBOJ Canton, Zenica
2.	Muhamed Ibrahimpašić	B.Sc. Eng.	Ministry for physical planning and environment of UNA-SANA Canton, Bihać
3.	Dalila Nuhić	B.C. Eng.	Institut za hidrotehniku, Sarajevo
4.	Esad Bukalo	M.Sc.	Zavod za agropedeologiju, Sarajevo
5.	Azra Korać-Mehmedović	B.Sc.Biol.	Federal Ministry of physical planning and environment, Sarajevo
6.	Atifa Zaimović,	B.Sc.Eng.	JKP "Vodovod" Tuzla
7.	Sead Čizmić	B.Sc.Chem.	Ministry for physical planning of ZENICA – DOBOJ Canton, Zenica
8.	Gorjana Radulović	B.Sc.Eng.	Institut za hidrotehniku Sarajevo
9.	Rasema Bajramović	Prof.	Ekološki pokret "Travnik"
10.	Dautović Vildana	B.Sc.Biol.	
11.	Finka Filipović	B.Sc.Eng.	Ekološka udruga "Stari hrast" N.Travnik
12.	Šefket Goletić	M.Sc.	Eko – pokret BiH, Zenica
13.	Arnautalić Zahid	B.Sc.Eng.	Ministarstvo prostornog uređenja i okolišta Tuzlansko-Podrinjskog kantona
14.	Begić Sabit	B.Sc.Eng.,	Univerzitet u Tuzli
15.	Šarac Mirko		Vodoprivreda – Mostar
		Republic of S	Srpska
1.	Mihajlo Stevanović	B.C.Sc.	Ministarstvo za poljoprivredu, šumarstvo i vodoprivredu RS
2.	Duško Komarčević	B.Sc.Eng. Agricult.	Ministarstvo za poljoprivredu, šumarstvo i vodoprivredu RS
3.	Nebojša Kuštrinović	B.Sc.Eng. Agricult.	Hidrometeorološki zavod RS
4.	Veseljko Veselić	B.C.Sc.	Opština Banja Luka
5.	Borislav Jakšić	Prof. dr.	University of Banja Luka
6.	Radivoje Bratić	M. Sc.	University of Banja Luka
7.	Uroš Hrkalović	B. Sc.	
8.	Milenko Stanković	B. Sc.	Ministarstvo za urbanizam, stambeno- komunalne djelatnosti, građevinarstvo i ekologiju
9.	Drago Trkulja	Prof. dr.	"Ekološki inženjering" – Banja Luka
10.	Branislav Nedović	Prof. dr.	"EKOS" Banja Luka
11.	Momčilo Domazet	Prof. dr.	"EKOS" Banja Luka

Prof. dr Mehmed Sarić - CPC – for Bosnia and Herzegovina

Workshop Organization

Evaluation of the workshop

Satisfactory Sood Good Good Good Good Good Good Good	Organization		Method	Content and results achieved	(Personal contribution)
Acceptable with some slight changes New, dense and therefore demanding more time for local people Good Cooperation between entities. Good Cooperation between entities. Good Cooperation with UNDP/GEF, Very good way for cheeper Collecting the brain power Good and interesting Cooperation of participants, Good Cood and interesting Satisfactory Cooperation with Cooperation with UNDP/GEF, Very good Cooperation of participants, Good Cooperation of participants, Cooperation o					
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