DRAFT

National Action Plan (NAP)
for Mediterranean region in B&H
for prevention of pollution from land based activities

CONTENT

I. PREFACE

Elaboration of National Action Plans (NAP) of Mediterranean countries, including B&H, is carried out within Mediterranean Action Plan (MAP) located in Athens, Greece.
According to "Protocol for the protection of the Mediterranean Sea against pollution from land-based sources and Activities" (LBS protocol) of Barcelona convention, on XI meeting of Contractual parties of Barcelona convention, held in Tunis, in 1997, Strategic action plan (SAP) has been adopted, which gave guidelines to signatory countries for undertaking independent actions in accordance with national politics, priorities and resources, towards prevention, reduction, control and/or elimination of coastal environment degradation, as ell as for activities of rehabilitation of consequences from land based activities.

Formulation of National action plans represents a national instrument for implementation of SAP. Signatory countries of Barcelona convention are expected to elaborate and adopt National Action Plans by the end of 2005.
Elaboration of NAP of Mediterranean countries is ensured by financial support of Global Environment Facility (GEF), Mediterranean Fund METAP, French Environmental Fund, and ICS-UNIDO, through a GEF/SAP MED project which lasts since 1st January 2001 until 30th September 2005.
B&H National Action Plan deals with a south part of Bosnia and Herzegovina, i.e. Adriatic sea catchment area (river basins Neretva, Trebišnjica and Cetina) and a narrow coastal area of Neum.

Elaboration of NAP in Bosnia and Herzegovina is implemented through MAP Office in B&H. Consultants for elaboration of NAP in B&H, engaged by the Coordinating Unit of MAP, Athens / GEF Project Manager, are floowing:

- Prof. Tarik Kupusović, Ph. D. Sc. E. – project supervision and coordination
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- Dubravka Grgurinović, Bh. Sc. Chemistry – NDA, BB

In elaboration of B&H National Action Plan were included representatives of: Federal Ministry of Physical Planning and Environment, Federal Ministry of Agriculture, Water-Management and Forestry, The Ministry of Urbanism, Civil engineering and Ecology RS, Ministry of Agriculture, Water Management and Forestry RS, cantonal Ministries of health, cantonal Ministries of Agriculture, Forestry and Water-Management from Mediterranean region of B&H (Herzegovina-Neretva canton, Herceg-Bosna canton and West Herzegovina canton), Public enterprise for watershed of Adriatic Sea catchment area in Mostar, Civil engineering faculty of University Mostar, representatives of all municipalities form three cantons of Mediterranean region, as well as representatives of municipalities from Mediterranean region RS, Hydro Engineering Institute of Civil engineering faculty Sarajevo, Public enterprise of Trebišnjica Hydro Power Plant, and representatives of Communal enterprises and industries from Mediterranean region in B&H.

Document gives an insight of problem complexity of B&H coastal protection, provides information, basis and guidelines for preparation and realization of necessary projects in B&H Mediterranean region.

National Action Plan elaboration started October 2002 and it will last until August 2005, and it included the following phases:

- Elaboration of National Diagnostic Analysis (NDA);
- Evaluation of pollution Baseline Budget (BB);
- Elaboration of National Action Plan (NAP);
- Elaboration of NAP final document.

II. ACRONYMS

MAP	Mediterranean Action Plan
NAP	National Action Plan
UNEP	United Nation Environmental Program
NEAP	National Environmental Action Plan
SAP	Strategic Action Plan
LBS	Land Based Sources
GEF	Global Environmental Facility
B&H	Bosnia and Herzegovina
FB&H	Federation of Bosnia and Herzegovina
RS	Republika Srpska
NDA	National Diagnostic Analysis
BB	Baseline Budget
PRSP	Poverty Reduction Strategy Paper
WWTP	Wastewater Treatment Plant
HPP	Hydro Power Plant
PE	Population equivalent
CARDS	Community Assistance for Reconstruction, Development and Stabilization
BOD	Biological oxygen demand
MOED	Minimization Opportunities Environmental Diagnosis
SFOR	Stabilization forces
TPP	Thermo Power Plant
FAO	Food and Agriculture Organization
PAP/RAC	Priority Action Program/Regional Activity Centre
IP	Investment portfolio
CP	Cleaner production

III. EXECUTIVE SUMMARY

"National Action Plan for Mediterranean region in Bosnia and Herzegovina for prevention of pollution from land based activities" (NAP) is elaborated through GEF/SAP MED project, which lasts from 1st January 2001 until 30th September 2005, with coordination of Mediterranean Action Plan (MAP) Athens, Greece, and with financial support of Global Environment Facility (GEF), Mediterranean Fund METAP, French Environmental Fund, and ICS-UNIDO.

According to "Protocol for the protection of the Mediterranean Sea against pollution from land-based sources and Activities" (LBS protocol) of Barcelona convention, on XI meeting of Contractual parties of Barcelona convention, held in Tunis, in 1997, Strategic action plan (SAP) has been adopted, which gave guidelines to signatory countries for elaboration of National Action Plans.

B&H National Action Plan deals with a south part of Bosnia and Herzegovina, i.e. Adriatic sea catchment area (river basins Neretva, Trebišnjica and Cetina) and a narrow coastal area of Neum.

Document's objective is to give guidelines for achieving sustainable development of Mediterranean region, by defining proposal of actions for pollution prevention, control and reduction, caused by land based activities.

A following methodology was applied during document elaboration:

- Diagnostic Analysis (NDA) defines problems and analyzes their causes, consequences and significance;
- Baseline Budget of specific pollutants (BB) of water and air expressed in kg/year for all three river basins and narrow coastal area of Neum, defines a referent level of pollution which allows further following of reduction rate;
- Based on NDA results and evaluated BB, Issue/Impact matrix for river basins and Neum coastal area have been created, which helped in choosing priority problems for NAP preparation;
- Based on ranked problems a Plan has been suggested with a list of priority problems and necessary activities for reduction of specific pollutants emission.
- Sector plans with proposed measures for pollution reduction and estimated degree of pollution reduction have been elaborated in accordance with existing state diagnosed through NDA and BB, relevant provisions of the law, existing relevant studies and projects, and objectives and activities of SAP;
- NAP had been elaborated based on NDA and BB and sector plans. Draft of NAP gave an overview of existing and proposal of new economic instruments, with purpose to ensure sustainability of proposed activities and projects;
- Ranking of proposed projects / activities has been conducted, according to investment-oriented criteria, with a purpose of defining a final list of priorities for 2010.

Following above described procedure, and having in mind that NDA and BB are separate wholes which are not part of this document, draft of NAP is structured to have 6 following main chapters: 1. Introduction; 2. Objective and Methodology of NAP; 3. Legislation and Institutions; 4. Sector Plans; 5. Economic Instruments; 6. List of priority activities for 2010.

1) Introduction deals with Mediterranean Action Plan (MAP), Barcelona convention and their Protocols, place and obligations of Bosnia and Herzegovina in Mediterranean Action Plan. Strategic Action Plan (MAP/SAP) has been elaborated according to Barcelona convention Protocol about sources of land based pollution, which is a basis and guideline to signatory countries of Barcelona convention for elaboration of National Action Plans (MAP/NAP).

Signatory countries need to prepare National Action Plans until 2005, and to undertake actions for their implementation. Bosnia and Herzegovina, as MAP member and a signatory of Barcelona convention, has full responsibility for conducting its policy with a purpose of environment improvement and sustainable development of Mediterranean. In this context, B&H is responsible, through participation in MAP, for implementation of Barcelona convention and its Protocols.

2) Second chapter specifies objectives of NAP elaboration and represents methodology of draft NAP elaboration.

3) Third chapter deals with legislation, administrative and institutional framework in B&H, which is relevant for B&H Mediterranean region development, and application of measures defined by NAP.

4) Fourth chapter specifies main environmental problems in river basins (Neretva, Trebišnjica and Cetina) and narrow coastal area Neum, which are identified based upon NDA and BB results, and upon ranking of environmental problems. According to this are presented Sector plans for those sectors which represent significant pollution sources:
- Urban wastewaters
- Communal solid waste
- Industrial waste and wastewaters
- Hazardous waste (metal industry and medical waste)
- Pesticides

For each sector is given an overview of existing condition, relevant legal provisions, existing relevant studies and projects, and according to that and SAP provisions, are proposed measures for pollution reduction, and a level of pollution reduction is estimated which is ensured by proposed measures, and shown in table at the end of chapter (Table 1).

5) Fifth chapter deals with economic instruments whose purpose is development of administrative and financial mechanisms for sustainable financing of NAP implementation. An overview of existing condition is given here, regarding implementation of economic instruments in B&H, and a proposal for introduction of new economic instruments in sectors of utilization of water, solid waste, air, industries, product charges – pesticides, with stated objectives and time frames for their introduction.

6) Sixth chapter represents an Investment Portfolio. Based on defined problems and actions, a list of priority actions has been proposed – investments for 2010. For each priority action is given: an overview of problems/causes of pollution, activities to be carried out, included institutions, economic instruments to be applied and estimated time frame of its implementation.

1 INTRODUCTION

1.1 Mediterranean Action Plan (MAP)

MAP operates within United Nations environment program (UNEP), established in 1972. MAP was adopted in 1975 in Barcelona, on inter-governmental meeting for Mediterranean sea protection, by 16 Mediterranean countries and European Commission (EC).
MAP's legal instrument is "Convention of Mediterranean sea pollution protection" (Barcelona convention) and their Protocols:

- Protocol for the prevention and elimination of pollution in the Mediterranean sea by dumping from ships and aircraft (signed in 1976);
- Protocol concerning cooperation in combating pollution of the Mediterranean sea by oil and other harmful substances in cases of emergency (signed in 1976);
- Protocol for the protection of the Mediterranean sea against pollution from land-based sources and activities – LBS Protocol (adopted in 1980, revised in 1996);
- Protocol concerning specially protected areas in the sea (adopted in 1982);
- Protocol concerning combating pollution from exploration and exploitation of oil under sea (adopted in 1994);
- Protocol for pollution protection from trans-boundary transport and storage of hazardous waste (adopted in 1996. god.).

Barcelona convention is adopted in Barcelona in 1976m on a conference of representatives of Mediterranean country governments, and entered into force two years later, i.e. 1978. with this convention the signatory countries are obliged to "undertake all necessary actions in order to prevent, reduce and eliminate pollution and protect marine environment".
Period since 1975 to 1995 (MAP phase I) represents a gradual transition from initial program of marine environment protection, towards a complex program oriented for environment protection of coastal areas and rational resource management in context of integral planning and management of coast.
In 1995, MAP phase II is adopted, which becomes an action program of sustainable development and substantial supplement to Barcelona convention and their protocols, with global and integral approach to development of all Mediterranean regions (natural resources; water, land, air and forests; tourism, urban and rural development, inhabitants, etc.).

1.2 Strategic Action Program (SAP)

According to "Protocol for the protection of the Mediterranean Sea against pollution from land-based sources and Activities" (LBS protocol) of Barcelona convention, on XI meeting of Contractual parties of Barcelona convention, held in Tunis, in 1997, Strategic action plan (SAP) has been adopted, which gave guidelines to signatory countries for elaboration of National Action Plans.

Global objective of SAP, in accordance with LBS protocol, is pollution reduction from land based sources and activities, especially elimination of toxic and non-degradable substances, and those which accumulate in living organisms.
Particular SAP objectives are:

- Formulating principles, approaches, measures, time deadlines and priorities for undertaking actions;
- Preparation of priority lists for undertaking actions and for investments (Investment portfolio);
- Analysis of expected basic and additional actions necessary for solving some trans-boundary priority problems;

- Elements and guidelines for preparation of National Action Plans for protection of land based pollution;
- Identifying potential Non-governmental organizations' role (NGO) in SAP implementation.

1.3 Bosnia and Herzegovina in Mediterranean Action Plan

Bosnia and Herzegovina became a member of MAP and joined Barcelona convention in 1993, on Eight meeting of Barcelona convention signatory countries, held in Antalya, Turkey. B&H took over signed Barcelona convention from ex-Yugoslavia (Official Gazette B&H, no. 26/98) and its four protocols:

1. Protocol for pollution prevention and elimination ships and aircraft;
2. Protocol concerning cooperation in combating pollution of the Mediterranean sea by oil and other harmful substances in cases of emergency;
3. Protocol for the protection of the Mediterranean sea against pollution from land-based sources and activities;
4. Protocol concerning specially protected areas in the sea.

However, to date B&H didn't ratify Barcelona convention, nor signed new, revised protocols (LBS and Protocol concerning specially protected areas in the sea).

Ministry of foreign affairs B&H and Ministry of spatial planning and environment FB&H gave their support to idea of active participation of B&H in MAP and they appointed National coordinator of MAP for B&H in June 1997, when MAP office for B&H started its work.

As a participating country of MAP, B&H has full responsibility for conducting its policy with a purpose of environment improvement and sustainable development of Mediterranean. In this context, B&H is responsible, through participation in MAP, for implementation of Barcelona convention and its Protocols.

Picture 1. Bigger towns in Mediterranean region

Picture 2. B&H exit to sea (town Neum)

2 OBJECTIVE AND METHODOLOGY OF NAP

2.1 Objective of NAP

Objectives and activities identified by SAP are implemented through National Action Plans and as such should be basis for defining projects whose implementation can be financed.

NAP should be focused on sustainable, pragmatic and integral approach of environmental management.

NAP's objective is to provide guidelines for achieving sustainable development of Mediterranean region, by defining proposal of actions for pollution prevention, control and reduction from land based activities.

2.2 Methodology of NAP elaboration

National Action Plan is elaborated according to guidelines and methodology defined by UNEP/MAP and it was carried out in a few phases:

Phase 1. National Diagnostic Analysis (NDA) and Baseline Budget (BB)
During this phase, National Diagnostic Analysis has been elaborated which includes all sectors defined by SAP for three catchment areas (Neretva, Trebišnjica and Cetina), and narrow coastal area Neum. NDA represents a basis for NAP elaboration with a main purpose to identify and estimate state and conditions, including problems, polluters, pollution sources, spatial changes and habitat degradation, impact significance of pollutions, and areas which need to be considered in context of land based pollutions. NDA is elaborated based upon available data and information from institutions and public enterprises which are relevant for state of environment, water and health in Mediterranean region in B&H, and data from previous studies, programs and plans.
For defining a Baseline Budget (BB) for three river basins and Neum coastal area, a list of polluters from households and industries have been prepared (concentrated pollution sources). Data and information are collected through relevant institutions, public enterprises and industries in Mediterranean region. Methodology of BB calculation, i.e. emission's calculation of specific polluters of water and air expressed in kg/year for all three river basins and narrow coastal area Neum, was based upon data about production processes, raw material quantities and produced quantities for industrial plants, and upon data on number of habitants connected to waster supply system. Based on this is elaborated a report on total pollution emissions by river basins (baseline budget by river basins), and a report on total pollution emissions in Mediterranean region in B&H (baseline budget in Mediterranean region in B&H). Objective of Baseline Budget was stimulation of countries to collect data on industrial activities and define a referent level of pollution for following reduction rate.

2. «Issue/Impact matrix» for river basins and Mediterranean region in B&H
Based upon NDA results and estimated BB, "Issue/Impact matrix" have been elaborated for river basins and narrow coastal area Neum. Purpose of "matrixes" was to reach preliminary significance value of different polluters to coastal area and marine environment. This information helped in selection of priority problems, on river basin level and in the whole Mediterranean region in B&H, for preparation of NAP. Ranking was conducted according to methodology and criteria defined by UNEP/MAP (see supplement 8.1.).

3. Defining plans for river basins
As a result of elaborated “matrixes”, problems are preliminary ranked, and based on that a Plan is proposed with a list of priority problems and necessary activities on emission reduction of specific pollutants.

4. Elaboration of sector plans
Sector plans are elaborated for sectors which, based on NDA and BB results and environmental problems ranking, are identified as significant sources of pollution. Those plans represent a framework of NAP and they include:
- Urban wastewaters
- Communal solid waste
- Industrial waste and wastewaters
- Hazardous waste (metal industry and medical waste)
- Pesticides

Sector plans present existing condition, relevant legal provisions, existing relevant programs and projects, according to which and according to SAP provisions are proposed measures for pollution reduction and a degree of pollution reduction has been estimated, which is ensured by proposed measures.

5. NAP elaboration
NAP is elaborated as a result of NDA, BB and sector plans. In NAP elaboration phase, objectives and activities defined by SAP are taken into consideration, existing law are used, available programs and plans such as set of environmental laws in FB&H and RS, Solid waste management strategy, NEAP and other. NAP gives an overview of existing and a proposal of new economic instruments with purpose to provide sustainability of proposed activities and projects.

6. Elaboration of List of priority activities for 2010
After NDA, BB, Issue/Impact matrix and sector plans have been elaborated, investment-oriented criteria was considered for selection of priority projects for investment, all with a purpose of defining a priority list for 2010. For that reason are elaborated “Investment matrixes” which gave preliminary ranking of project with aim of focusing on those projects which can solve environmental problems the most efficiently in a situation of limited financial resources. Ranking of proposed activities / projects is done according to methodology proposed by UNEP / MAP, based on which is selected a final list of priorities for 2010 (see supplement 8.2.)

3 LEGISLATION AND INSTITUTIONS

3.1 Legal framework

3.1.1 Country background

The Constitution of Bosnia and Herzegovina (B&H) is an integral part of the Dayton Peace agreement and has created specific State comprising of two Entities, the Federation of Bosnia and Herzegovina (FB&H) and the Republika Srpska (RS). Under this constitutional construction, B&H is a sovereign state with a decentralized political and administrative structure. The area of Brčko, which remained contested after the Dayton agreement, was settled through international arbitration. Brčko District (BD) was established in March 2000, with powers largely similar to these of the Entities. The State of B&H is the central authority but has only limited and specific powers whereas the two Entities and the Brčko District are politically, administratively and legally autonomous.

The two Entities are asymmetrical in their institutional organization. The FB&H is composed of 10 cantons subdivided into 84 municipalities, whereas RS comprises from 63 municipalities, without cantons.

3.1.2 The Water Law in FB&H

The Water Law of FB&H, which was adopted in 1998, represents a fundamental legislation for regulation of method and terms of water management, water management facilities and public water resources for the purpose of water usage, water protection against pollution, development of river beds and flood protection, responsibility and duties of the competent authorities.
Provisions of this Law concern the following:

1. surface and ground water;
2. mineral and thermal water;
3. coastal water of the Adriatic sea within the borders of Federation Bosnia and Herzegovina in a view of protection against land and sea pollution and usage of coastal sub-merged springs in the coastal water sea areas.

The main objectives of water management, according to this Law, are:

- providing required water quantity of acceptable quality for various purposes,
- water protection against pollution,
- flood protection, and
- channeling or dredging of the riverbeds.

Part of this Law relates to water pollution prevention, including protection of the sea coast, with the following objectives:

- to insure the beneficial use of water,
- protection of people's health,
- protection of the flora, fauna, and environment.

The Water Law also defines that everybody who uses water or discharges waste water and the other materials into water, public water resources, construction site, agricultural or forest land or the atmosphere or who exploit materials from the water streams is obliged to install devices and/or instruments for measuring and control of that water quality and quantity, to

carry out measuring and testing provided by the law, to keep proper records and submit them to the Public company in charge for that watershed area within the defined conditions.

Activities and assignments which are financed according to this law are:

1. flood protection;
2. water pollution protection;
3. water utilization;
4. professional works.

Funds for financing of these works and assignments are provided from:

1. water fees,
2. compensation for use of concessions defined by this law,
3. compensation for utilization of land reclamation systems (hereinafter called land reclamation compensation);
4. income realized from services rendered to direct beneficiaries of structures for water use and water pollution protection;
5. budget of the Federation and cantons;
6. funds from special-purpose loans;
7. public loans;
8. funds provided by particular law;
9. donations and the other resources.

3.1.3 The Water Law in RS

The Water Law of RS, adopted in 1998, regulates water protection, flood protection, water usage and water management, method and terms of water management, provisions of funds for financing of related activities and supervision of enforcement of this Law.
Water management, in accordance with this Law, is activity of special public interest, which contents the following:

1. water resources arrangement
2. water usage
3. water protection
4. water supply
5. land reclamation systems
6. flood protection
7. protection of ground against erosion and torrents
8. management, maintenance, planning, investigation and monitoring in water management area.

This Law also contains provisions about:

- organization of water management, (water management administration, Institute for water management and water management companies),
- financing of water management, funds for financing of water management works are provided from:
    1. general water fees
    2. specially water fees
    3. compensation for use of concession
    4. compensation for utilization of land reclamation systems
    5. budget of the RS and municipalities,-cities
    6. funds for special purpose loans
    7. public loans
    8. paid penalties for offences
    9. funds provided by particular law
    10. donations and the other resources

- and who the rate-payers are.
- and provisions on concession.

3.1.4 Set of environmental laws

In 2003 Bosnia and Herzegovina adopted the following set of environmental laws:
- *Law on Environmental Protection*, including provisions on integrated framework for environmental licensing, including reference to supporting procedures such as environmental impact assessment, based upon the concept of integrated pollution prevention and control (IPPC).
- *Law on Nature Protection;*
- *Law on Air Protection;*
- *Law on Waste Management;*
- *Law on Water Protection.*
- *Law on Environmental Fund*.

Adoption of set of environmental laws has compiled legal aspect of environmental protection in Bosnia and Herzegovina. In previous period, regulations related to environment have been spread out in different acts, laws, rules, decrees and decisions.
Laws prescribed obligation for adoption a number of sub laws and defined responsibilities of different bodies in this respect.
This set of laws exists separately in Federation of B&H and in Republika Srpska, but they are harmonized.

3.1.4.1 Federation B&H

Law on Environment Protection emphasizes that the right to a healthy and ecologically sound environment for everyone is recognized as a basic constitutional right.
This Act shall regulate:
- preservation, protection, restoration and improvement of the ecological quality and capacity of environment and of the quality of life;
- measures and conditions for managing, preserving and for rational use of natural resources;
- the framework for legal measures and institutions for the preservation, protection and improvement of environmental protection;
- financing environmental activities and for voluntary measures;
- responsibilities and tasks and duties of public administration at different state levels.

Within this Law are promoted fundamental principles of environment protection, such as the Principle of Sustainable Development, the Principle of Precaution and Prevention, the Principle of Substitution, the Principle of Integration, the Principle of Co-operation and Shared Responsibility, Public Participation and Access to Information and the Polluter Pays Principle.
This Law covers in brief description the regulations on protection of environment components, such as Land conservation, Water Protection, Protection of the air, Conservation of the biosphere, Conservation of the built environment, Hazardous substances and technologies, Wastes, Noise and Vibration, and Radiation. The comprehensive rules of special fields on the protection and conservation of the environmental components and the protection against impacts posing a hazard to the environment is established by separate Acts.

Protection of nature is regulated by **Law on Nature Protection**. This Law regulates ways and conditions of the restoration, protection, conservation and sustainable development of

landscape, natural areas, plants, animals and their habitats, minerals and fossils and of other components of the nature, competent bodies which will cover nature protection, planning of nature protection, the general and special measures for nature protection, information system, supervision, funding of nature protection and sanctions for legal and natural persons.

The **Law on Air Protection** lays down technical conditions to prevent, or where that is not practicable, to reduce the emissions into the ambient air from anthropogenic activities, which have to be respected in production process, planning of air quality protection, special emission sources, emission inventory, ambient air quality, monitoring and sanctions for legal and private entities and natural persons.
These measures shall be taken by applying the following principles:

- an integrated approach for the protection of the environment, including air, water and soil, as well as the obligation to minimize emissions as far as possible by using the Best Available Techniques (BAT);
- "polluter pays principle" which ensures that the costs of air pollution abatement are borne by the operators of pollution sources;
- adequate protection of safety and health of workers at work;
- improvement of the air quality in Bosnia and Herzegovina, and beyond.

Every emission source must meet the following requirements:

- emissions of pollutants into the ambient air as well as emissions of unpleasant odours shall be minimized as far as possible by using the Best Available Techniques in the planning, designing, establishing and operating phases;
- emission limit values may not be exceeded.

Limit values, target values and alert thresholds for pollutants and the date of their entry into force are defined in the By-laws to this Law. The competent authority shall not approve any activity which may cause exceeding the limit values in such areas where the level of pollution is below the ambient air quality limit values.

The scope of the **Law on Waste Management** covers:

- All waste categories, with the exception of radioactive waste, gaseous effluents emitted into the atmosphere and waste water;
- All kinds of waste management activities, operations and installations.

The scope of the present act covers:

- waste resulting from prospecting, extraction, treatment and storage of mineral resources and the working of quarries;
- liquid waste;
- animal wastes (e.g.: carcass and manure) and other non hazardous materials of a natural origin, which may be utilized for agricultural purposes;
- defused explosives, only in case, if there is no specific legal regulation for such wastes.

The objective of the present act is to encourage and provide the basic conditions for the prevention of waste production, recycling and processing of waste for re-use; the extraction of secondary raw materials and possibly of energy thereof; and safe disposal.
In order to accomplish the objective and whilst taking into account the prevention of pollution and the minimization of the consequences for human health and the environment, the following measures shall be taken:

- it shall be ensured that the generation of wastes and especially the hazardous characteristics of such waste is reduced to a minimum;
- the reduction in the quantities of wastes shall be properly managed, taking into consideration special waste streams;
- wastes shall be treated in a way to ensure recovery;
- those wastes which are not subject to recovery shall be incinerated or disposed of in landfills - in an environmentally sound way.

All the necessary measures shall be taken to ensure that waste is treated and disposed of without endangering human health and without harming or causing substantial risk to the environment, and in particular:

- Without risk to water, air, soil and plants and animals,
- Without causing a nuisance through noise or odours,
- Without adversely affecting the countryside or places of special interest.

The **Law on Water Protection** governs the protection of waters, watersides and water lands: water protection planning and programming, organization, supervision, financing and penalties for each legal and natural person.
Protection of waters, watersides and water lands shall comprise the preservation and adjustment of water quantities, the maintenance of waters, watersides and water lands, and the adoption of decisions on the use and loading of waters.
The objective of the Water Protection Act is to ensure the sustainable use of waters in order to preserve and improve their quality, to ensure the preservation of natural processes and the natural balance of waters, aquatic and semi-aquatic ecosystems and the landscape properties of waters, and – in cooperation with the bodies responsible for water management – to preserve and adjust water quantities for various types of use in order to realize their economic, social and ecological functions.
Subject to the observation of the fundamental principles of environmental and water protection, the protection of waters, watersides and water lands shall be based on:

- Integrity of river basins, taking into account the dynamics of waters and natural processes, and the coherence and interdependency of aquatic and semi-aquatic ecosystems in accordance with the river basin approach;
- Sustainable use of waters based on ensuring the functionality of natural processes and maintaining the natural balance of aquatic and semi-aquatic ecosystems, and on the long-term protection and rational use of available water resources;
- Prevention of the excessive load on waters and promotion of sustainable use or utilization of waters and waterside and water land;
- Economic evaluation of waters and exercise of the principle of compensation of costs for water use and water pollution;
- Public participation;
- Observation of the best available techniques and new scientific findings on ecology,
- Precautionary principle, i.e. where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason to postpone measures aimed at preventing environmental degradation.

The **Law on Environmental Fund** stipulates foundation of Fund for protection of BH environment, determines constitution, organization and management of Fund, property and operation of Fund, sources, purpose and way of utilization of Fund's resources, and stipulates other issues related to procurement and management of Fund's resources.
Work of the Fund is collecting and distribution of financial resources for environment protection, and they will be especially used for the following purposes:

- support in accomplishing tasks derived from obligations and responsibilities towards the International community in the field of environment protection;
- reduction of damage to the environment in cases when principle of liability for causing the damage to a certain entity (polluter pays) can not be applied;
- Costs of preventing and removing of damage to the environment which requests immediate intervention;
- Support to the measures of environment protection, especially in the field of development and financing of information system, education and dissemination of knowledge;
- Improvement of economic structure development which is beneficial for the environment;
- Preservation of protected natural areas;

- Improvement of ecologic awareness of the public and exploring of environment;
- Financing of the preparation, implementation and development of program documents and similar activities in fields of preservation, sustainable utilization, protection and improvement of the state of environment and utilization of renewable energy sources.

In conducting its work, Fund promotes objectives and principles of environment protection for accomplishing systematic quality preservation of all environment components, preservation of natural communities and rational utilization of natural resources and energy, as basic conditions for sustainable development, and all in purpose of accomplishing fundamental rights of citizens to a healthy environment.

3.1.4.2 Republika Srpska

Law on Environment Protection stipulates:
- Preservation, protection, reconstruction and improvement of environmental quality and capacity, as well as quality of life;
- Measures and conditions for management, preservation, and rational utilization of natural resources;
- Legal framework of measures and institutions for preservation, protection and improvement of environment;
- Financing of activities related to environment;
- Work and tasks of administration bodies specified by law and sub-laws, and commitments of public administration bodies.

This Law promotes:
- Reduced utilization, prevention of nature pollution, violation prevention, and improvement and rehabilitation of degraded environment;
- Protection of human health and improvement of environment conditions for quality of life;
- Preservation and protection of natural resources, rational utilization of resources, economy which ensures resource rehabilitation;
- Harmonization of other Republic's interests with requests for environment protection;
- International cooperation in environment protection;
- Initiatives by the public, public participation in activities with aim to protect the environment;
- Coordination of economy and integration of social and economic development in accordance with demands of environment protection;
- Establishment and development of institutions for environment protection.

Provisions of this Law are applied on all aspects of activities with the purpose of utilization and load of natural resources, and influence the environment in a way that they represent danger to environment pollution, or they pollute the environment, or they have certain influence on the environment (such as noise, vibrations, radiations – besides nuclear radiation, waste, etc.).

Law on Nature Protection stipulates rehabilitation, protection, preservation and sustainable development of landscape, natural areas, plants, animals and their habitats, land, minerals and fossils, and other components of nature which are part of the environment.
Measures regulated by this Law will provide basic conditions for nature protection and sustainable development of nature and environment, especially:
- rehabilitation, protection, preservation and sustainable utilization of ecological balance in nature;
- rehabilitation, protection, preservation and sustainable utilization of natural resources;

- rehabilitation, protection, preservation and sustainable utilization of nature and revitalization of degraded areas and parts of nature;
- establishment of system for planning, management, providing information and financing of nature protection;
- establishment of inter-entity and international cooperation regarding nature protection;
- public participation in the field of nature protection;
- realization of objectives regulated in nature protection policy;
- necessary harmonization of economic and social development plans and projects with conservation of all existing renewable natural resources;
- reduction of species utilization, load and pollution (animals, plants) and their habitats.

Law on Air Protection regulates protection of air from pollution in order to safeguard the people's health, the climate and the environment from the harmful effects of the air pollution. According to this law, the air protection shall ensure:

- protection of air quality in order to avoid, prevent or reduce the harmful effects of air pollution on human health, climate and the environment as a whole;
- control of pollution arising from anthropogenic activities and limitation of the pollution intensity at the pollution sources;
- maintenance of ambient air quality where it is good;
- improvement of air quality in the areas of polluted air;
- process of air protection as a part of the environmental protection system, with defined rights and obligations of legal and private persons;
- informing the public on air quality and measures for maintaining and improving thereof;
- public participation in the process of air protection.

To meet the objectives of this Law, Republic air protection strategy shall be adopted in the Republic together with the air quality management action plan as well as with other plans and programs that shall be adopted and implemented in accordance with this law.

The objective of the **Law on the Waste Management** is to encourage and provide the basic conditions for:

- the prevention of production,
- for recycling and processing of waste for re-use;
- the extraction of secondary raw materials from the waste and possibly of energy thereof;
- safe disposal.

In order to accomplish the objective from the Article 1 of this Law, the following measures shall be taken:

- minimization of waste generation and especially of the hazardous characteristics of such waste;
- reduction in the quantities of wastes
- waste treatment which ensures recovery
- environmentally sound incineration or disposal of those wastes which are not subject to recovery.

The scope of the present act covers: waste resulting from prospecting, extraction, treatment and storage of mineral resources and the working of quarries; liquid waste; animal wastes (e.g.: carcass and manure) and other non hazardous materials of a natural origin, which may be utilized for agricultural purposes; defused explosives only if there is no specific legal regulation for such wastes.

Law on Water Protection governs the protection of waters from pollution and unreasonable use. Protection of waters shall comprise the preservation and adjustment of needed water quantities of at least good status, the maintenance of waters, watersides and water lands, and the adoption of decisions on the sustainable use.

Same fundamental principles of environmental and water protection which are applied in FB&H are also applied in RS.

3.1.5 Draft Law on inland and maritime sailing

Bosnia and Herzegovina is in the process of drafting the Law on inland and maritime sailing. This draft law regulates conditions of navigation safety on inland and maritime navigations routes belonging to B&H territory, where international and interstate navigation regime are applied, basic legal issues related to ship and boats, navigation accidents, captaincy and inspection supervision, regulation of ports, the protection of sea pollution from boats.

This Law sets conditions of navigation routes in inland waters as well as routes on coastal sea, regulates transportation of passengers and things, rescuing persons, ships and things from those ships, actions in cases of shipwreck, liability of ship owner and ship operator, liability for death of persons, damaging things and environment pollution from the ships, as well as liability in cases of oil outpouring which is transported as cargo.

3.1.6 Poverty Reduction Strategy Paper (Mid-term Development Strategy)

The preparation of the B&H Medium-Term Development Strategy (PRSP) started in April 2002 and lasted approximately eighteen months. Definition of proposals of priorities and of the strategy itself was the task of 20 working groups, composed of the representatives of the Council of Ministers and of the entity governments, as well as of the lower levels of government (Brčko District, cantons, municipalities). The working groups covered the following sectors: macroeconomic and fiscal framework, business environment, privatization, financial sector, labor market, the combat against corruption, foreign trade regime, public administration reform, statistics, education, social protection, health care, agriculture, forestry, water management, environment, infrastructure, energy, information technologies, mine action and industry.

Through implementation of the macroeconomic reform scenario of the Medium-Term Development Strategy, B&H should, by end-2007, restore a partial creditworthiness on the international capital markets, establish functioning market economy and strengthen the capacity of domestic companies to compete in external markets, particularly in the EU market. In view of existing variations in the level of economic development between different parts of the country, creation of preconditions for balanced development of all parts of B&H is also crucial.

One in five inhabitants of B&H may be considered poor. The implementation of the B&H Medium-Term Development Strategy (PRSP) requires acceleration of structural reforms, which in the short term may cause job losses, and consequently an increase in poverty. Therefore, over the coming medium-term period, all levels of government will implement such economic policy measures that will prevent the increase in poverty and will lower the poverty rate by 20% from the present level.

Integration of B&H into the EU is a generally accepted goal of all governments and all segments of B&H society. However, to attain this landmark goal, the B&H society must demonstrate that it shares the EU values. In the course of preparation of the B&H Medium-Term Development Strategy (PRSP), in cooperation with the B&H institutions, and particularly with the B&H Directorate for European Integrations, the issues of relevance for achievement of this goal have been integrated into this document. Therefore, the implementation of the Strategy will contribute to accelerated integration of the country into

the EU, and the focus was placed on signing and implementation of the Stabilization and Association Agreement (SAA).

Basic goals of the macroeconomic framework of the Mid-term Development Strategy B&H (PRSP) are the achievement 70% of the pre-war GDP and realization of country's limited creditworthiness at the international capital market by the end of 2007. In this context, a Reform scenario is defined and it stipulates that GDP is to grow in the coming four years on the basis of the real growth rate of 5 to 5,5 %. Other significant pre-requisites for the realization of Reform scenario are:

- To maintain inflation at the level from 1 to 2 %. The orientation towards preservation of the Currency Board in the future will present the basic ground for the accomplishment of such pre-requisite;
- To reduce the overall public expenditures from 46% of GDP, to 43% by 2007;
- To lower the public debt to around 49 percent of GDP by 2007;
- To bring the current account deficit to the sustainable level of 11% of GDP, by 2007; The realization of this pre-requisite will largely depend on having the export growth in coming years in compliance with the projected rates from 13 to 15%;
- To ensure larger scale of foreign investments inflow – up to around $2 billions, by the end of 2007;
- To increase the level of private savings by 2007 for 7 times;
- To ensure new cycles of donor's assistance in the amount of $1,5 billions.

According to PRSP ***Water management*** will be organized on the level of river basins. A regulatory mechanism will be established for monitoring the work of municipal councils on setting tariffs and for ensuring the preservation of the quality of water and protection of the environment. The autonomy and management capacity of water utilities will be reinforced, and the degree of cost-recovery of utility services will increase to reflect real costs, with the tendency to prepare these segments for privatization. Investment in expansion of water supply and sewage systems will increase, as well as in regulation of watercourses and protection from harmful effects of waters. More efficient utilization of water for irrigation and power generation, exploitation of mineral and thermal waters, as well as restarting of navigation on the Sava River will respectively receive increased attention.

In the area of ***environment***, the B&H Medium Term Development Strategy (PRSP) relies on the priorities of the B&H National Environmental Action Plan (NEAP), which stress the importance of strengthening of the legal and institutional environment and of the inter-sectoral approach to environmental protection issues. Steps to reduce pollution of air and water are envisaged, as well as enhancement of the systems of land management and soil protection, building of regional solid waste depository sites and rehabilitation of sites of existing illegal garbage dumps. It will be necessary to establish a system of integral land management, particularly for rural areas, in line with the EU standards and accepted international obligations. Over the coming medium term, the systems for preservation of the biological and geological diversity, natural and cultural heritage will be improved.

3.1.7 National Environmental Action Plan (NEAP)

In July 2000, the Governments of the Federation of Bosnia and Herzegovina and Republika Srpska received an International Development Fund (IDF) grant from the World Bank for environment capacity building. With the assistance of this grant, the National Environmental Action Plan (NEAP) for Bosnia and Herzegovina was completed in 2003. The goal of the NEAP is identification of short and long-term priority actions and measures providing the basis for preparation of a long-term environmental protection strategy in accordance with the economic, social and political situation in Bosnia and Herzegovina.

A key element of the NEAP is the comprehensive analysis of the state of the environment. Ten thematic areas were identified as covering the key environmental issues (air, water, land, forests, waste, space, economy, biodiversity, health and demography, legal and institutional framework). NEAP preparation is based upon the principles of sustainable development and defines the criteria and priorities for the thematic documents within the aim of resolving environmental protection issues.

Following criteria were defined for establishing priorities in addressing the key environmental issues:

- Impact of environmental pollution on human health;
- Impact of environmental pollution on eco-system;
- Socio-economic and economic significance;
- Commitments and obligations from accepted international agreements.

Eight priority areas of NEAP were established through a joint multidisciplinary approach:

- Water resources/wastewater;
- Sustainable development of rural areas;
- Environmental management;
- Protection of biodiversity and landscape diversity;
- Waste/waste management;
- Economy;
- Public health;
- Demining.

The plan also presents the state of the environment in eight key sectors and proposes measures to address the crucial environmental problems, and defines institutional and technical requirements for implementation, updating and supervision of the NEAP.

Based on the analysis of the current situation in all fields of environmental protection it was determined that the area of water resources and wastewater represents the first priority of the NEAP. Pollution prevention and prevention of irrational and uncontrolled use of water represents a necessary measure for protection of water which is one of the most important resources of B&H. In addressing these problems NEAP proposes: establishment of the catchment areas management, realization of long-term water supply projects, construction and reconstruction of the wastewater treatment plants and sewerage systems, rehabilitation of flood protection systems to the required safety level, and use of water for irrigation and production of electricity.

Major contribution to the currently unfavorable environmental situation in B&H is made by inadequate environmental policies, neglect and lack of a proper environmental management strategy. The key improvements suggested in this field are: introduction of information systems, introduction of comprehensive environmental monitoring, preparation of programs for integral spatial planning, preparation of documentation for planning and environmental management, preparation of programs for environmental education and dissemination of environmental information.

For protection of Biological and Landscape Diversity, NEAP determines a set of goals and proposed measures like: preparation of a strategy and a National Action Program (NAP) for balanced management of bio, geo and landscape diversity, preparation of strategic and national programs for protection of cultural heritage, based on principles of ecological co-existence, and preparation of a program for adequate protection of 15 – 20 % of B&H territory.

All issues related to environmental protection and the measures for their resolution are by far in excess of both the financial and institutional capabilities and resources on hand. Therefore priority areas of the NEAP were defined with the intent of handling these specific areas in the shortest possible time. The focus was on two specific areas: legal and institutional strengthening, and preparation of strategies for planning and environmental management. These are preconditions for implementing activities proposed.

3.2 Administrative framework

3.2.1 Current state of affairs in the environmental sector

There is currently no Ministry or Agency dealing with environment at the State level. Issues (such as Conventions) are dealt with either by the Ministry of Transport (Sava River) or the Ministry of Foreign Affairs (signing of Conventions). There are three Departments within the Ministry of Foreign Trade and Economic Relations dealing with “natural resources”, “energy” and “environment”, without further definition of their role and competence, and of the “boundaries” of the mandate. These units are under-staffed, and with lack of leadership. There is also a State level coordination body (UKOOR), which is currently under process of reorganization.

The Federal Ministry of Physical Planning and Environment is the line Ministry for environment for Federation and Ministry of Physical Planning, Civil Engineering and Ecology for Republika Srpska.

In both Federation of Bosnia and Herzegovina and Republic of Srpska the principal role for the water sector is within the Ministry of Agriculture, Water Management and Forestry (MoAWF of FBiH and MoAWF of RS) which is responsible for water strategy and policy, the issue of agreements and permits, setting of standards and regulations, and the maintaining of compliance with laws and regulations through licensing and inspections.

3.2.2 State level

Ministry of Foreign Affairs
Its main functions and tasks relating environment are:

- signing of international multilateral and bilateral agreements and contracts, and carrying out procedures for their ratifications.

Ministry of Foreign Trade and Economic Relations is, among other things, competent for conducting of work and tasks in B&H jurisdiction related to defining policy, basic principles, coordinating activities and harmonizing plans of entity authorities and institutions on international plan, in the following sectors:

- agriculture;
- energetic;
- environment protection, development and utilization of natural resources;
- tourism.

3.2.3 Inter-entity bodies

Environmental Steering Committee of B&H
It is inter-entity body that coordinates the work related to the environment between the two entities. It was founded in 1998, by signing the Memorandum on Understanding (MOU) between Federation B&H and Republic Srpska. MOU represents the official intention of both Entities to cooperate on all questions related to the environment, and is the basis for the activities undertaken by the Steering Committee.
Environmental Steering Committee has eight members. Four of them are appointed by the Government of Federation B&H, and four by the Government of Republic of Srpska.

ESC is involved in the following tasks:

- International contracts and programs related to the environmental issue;
- Cooperation with Republic of Croatia and Federal Republic of Yugoslavia in the field of environment;
- Harmonization (between two Entities) of existing and future environmental legislative, regulations, environmental action programs, monitoring, standards and information systems;
- Harmonization (between two Entities) of plans for urgent situations;
- Coordination (between two Entities) of all environmental activities to provide that B&H join European Union, as a member country.

Commission for coordination of water management issues
Commission for coordination of water management issues between two entities was established in 1998 by signing Memorandum on Understanding by competent Ministers of both entities' Governments. This commission has eight members. Four of them are appointed by the Government of Federation B&H, and four by the Government of Republic of Srpska.

The Commission deals with the following issues:

- International contracts in the field of water management;
- International water paths;
- International water management projects;
- Cooperation with Republic of Croatia and Federal Republic of Yugoslavia on the water related issues;
- Harmonization of present and future regulations from the water management field;
- Harmonization (between two Entities) and monitoring of water quality standards;
- Harmonization (between two Entities) of solid waste disposal programs – protection of water resources;
- Harmonization (between two Entities) and control of work of laboratories for monitoring of water quality and water streams categorization;
- Construction and reconstruction of water management facilities on the, and nearby the entity line;
- Facilities divided by the entity line;
- Gathering and exchange of data (inter-entity and international)

Harmonization (between two Entities) of plans for flood protection and other urgent situations.

3.2.4 Entity level

3.2.4.1 Federation B&H

The Federal Constitution determines the organizational structure of the Federation. Ten regional cantons are established. The Constitution prescribes that federal and cantonal authorities are jointly responsible for the "policy of environment protection".

Federal Ministry of Physical Planning and Environment
Federal Ministry of Physical Planning and Environment performs administrative, expert, and other works falling under competence of the Federation of Bosnia and Herzegovina and relating to: physical planning and development enforcing the policy for usage of land at the Federal level; preparation, implementation and enforcing the Physical Plan of the Federation; monitoring compliance of physical plans of the cantons with the Physical Plan of the Federation; streamlining long-term development in area of natural resources utilization; geological exploration, designing basic geophysical, seismological, geothermal, mineral-genetic, geochemical, geo-morphological and other maps; preparation of geological backgrounds for physical planning and environmental protection of air, water and soil; preparation of environmental strategies and policies; standards for air, water, and soil quality; ecological monitoring and control of air, water and soil pollution, and supervision of relevant institutions of the sector, and other activities as set out by the governing laws.

Within this Ministry, the ***Environmental Sector*** especially deals with environmental issues within the scope of its activities which are:

- coordinates in preparation of short-term and long-term plans of protection and improvement of existing state of environment: long-term strategic documents on environment protection; National action plan of environment protection, plans and protection measures for protected natural areas, as well documents which prevent activities which are damaging for nature;
- drafting of legal and other acts in sector of environment protection;
- elaborates and undertakes measures in am of preserving the landscape, natural communities, rational utilization of natural sources and energy according to the principles of balanced development without significant degradation of ecologic balance;
- cares on continuous preservation of biodiversity authenticity and preservation of ecological balance (stability), quality of wild life;
- follows international instruments conventions, protocols, agreements, etc.), especially those regulated and verified by B&H.

Federal Ministry of Agriculture, Water-Management and Forestry
Federal Ministry of Agriculture, Water-Management and Forestry executes the administrative, professional and other tasks et out by the laws related to the competence of the Federation of Bosnia and Herzegovina in the field of agriculture, water-management, forestry and veterinary.
Sector of Water Management within the scope of its work conducts the following:

- operations of administrative resolution, normative-legal, study-analytical, professional operative and other work in water management sector,
- operations related to preparation of legislative, strategy and policy of water management, water management objects and public water good (in the field of water utilization, water quality protection and protection from damaging water effect), and undertaking care on water condition;
- preparation and proposal of development documents of water management (water management basis, long-term and short-term plans and programs of water

management development, flood protection plan, water pollution protection plan and other documents according to current legislative);
- participation in preparation and proposal of laws and sub-laws in field of water management, and their implementation and monitoring;
- management of B&H water resources based on current law and sub-law legislative;
- permanent monitoring of condition in water management sector and preparation of information from sector of mater management, water management objects and public water good;
- drafting of first-degree water management acts upon requests on administrative procedure and resolving complaints in second-degree procedure water management conditions, approvals, permits and order);
- steering long-term development in purpose of promotion of water regime and management of waters;
- undertaking procedure of concession approval for waters and public good under jurisdiction of the Ministry;
- operation related to international contracts, agreements, conventions and protocols in the water sector (participation drafting, modifications, and monitoring of obligations and their implementation until setting up of Public cooperation for capacity work in the field of water management).

Water management inspectorate conducts operations of inspection supervision in the field of water management, and according to the law, sub-laws and other regulations. If needed it takes over administrative and other measures within authorizations given by the law. They solve administrative matters; participate in preparation and drafting of laws and by-laws. For criminal acts, economic offence and violations, they submit denunciation, or requests for activation of offence procedure. They work on drafting of solution in second-degree procedure.

Federal Ministry of Transport and Communications

Federal Ministry of Transport and Communications executes the administrative, professional and other tasks as set out by the laws falling under competence of the Federation in areas of transport and communications, as follows: road transport and public roads, rail, air, maritime, river, lake transport; pipeline transport; safety of roads, railway, air, maritime, river and lake transport; flight control; telecommunications and posts, except for establishment and functioning of the joint and international communication devices; inspection supervision in the field of public roads and road, rail, air, maritime, river and lake transport and other tasks as set out by the laws.

Within this Ministry, the ***Sector of transport*** is of special interest when issues of environment are concerned. This Sector conducts administrative, professional and other tasks from its scope of work, and especially:

- Monitoring of the state of development of inner and international road, rail, navigational and postal traffic, as well as pipeline transport and service activities within certain forms of traffic, in aim of optimal satisfaction of needs of economy and population and development incentive for modern transport technology;
- Monitoring of the state of security of road, rail, navigational and postal traffic, and pipeline transport and undertaking measures for increasing the safety level;
- initiates and cooperates on making of development plan and program for maintenance in certain forms of transport and monitoring their implementation;
- coordinates in issuing licenses, permits and other acts in road transport;
- initiates accomplishment of international contracts, conventions and other documents, and monitoring of their implementation;
- supervises over implementation of public authorizations or over legality of regulations and general acts of cantonal and municipal bodies;
- resolves administrative issues;

- issues approvals for investment-technical documentation for production, reconstruction and modernization of road infrastructure, objects and facilities, and their technical acceptance;
- issues licenses and other documents in international traffic;
- establishes of cooperation with inspectors in the transport sector;
- participates in drafting of law and sub-law regulations concerning transport sector as well as proposing modifications and amendments of law and sub-law acts in transport sector.

Captaincy of maritime traffic is one of the organizational units of this Sector which conducts operations that relate to monitoring and analyzing state of maritime traffic, safety of maritime traffic, and conducts other work within competence of maritime traffic.

Federal Ministry of Health

Federal Ministry of Health is competent for quality preservation of drinking water. Main functions and tasks of this Ministry related to water are:

- preservation of drinking water quality in accordance with the corresponding laws, regulations and standards,
- organization of monitoring of water quality.

Public Enterprises for "Watershed Area of Adriatic Sea Basin" (located in Mostar), and Public Enterprise for "Watershed Area of the Sava river basins" (located in Sarajevo)

Under the Law on Water of 1998 in FB&H MoAWF delegates the main competence for preparation of strategic decisions and planning (long-term plans, all regulations, decrees and by-laws necessary for the application of the Water Law) to two Public Companies of Watershed Areas (PCWAs) which are responsible for their administrative zones (River Sava and Adriatic Sea).

Their main responsibilities are following:

- preparation of all strategic decisions and planning (watershed and basin long term plans, all regulations, decrees and by-laws necessary for the application of the Water Law);
- administration of principal (owned by the Federation) water facilities;
- management and monitoring of all water resources;
- investment, exploitation and maintenance of various (non-specified) water facilities;
- research, expertise and consulting;
- management of concession matters, e.g., procurement and bid evaluation;
- ownership of public property;
- flood control.

Public Companies for Watershed Area are established in accordance with federal Water Law 1998 (Official Gazette of F B&H, No 18/98).

Cantonal authorities

The Federation consists of ten cantons. According to the Federation Constitution, the cantons have all competencies not expressly granted to the Federation Government. The cantons exercise their self-government through their own legislatures, executives and judiciaries. The main functions and tasks related to water assigned to the cantons include licensing and allocation of water resources under their competence (drainage, irrigation, water supply, waterways for navigation, hydropower, water protection).

3.2.4.2 Republika Srpska

Considerable difference observed from the aspect of organizational structure and legal system, between two entities lies in the fact that the Republic Srpska (RS) is organized as a unique entity (no cantons), and the Federation presents a classical heterogeneous community. In RS, only the entity has the legal power in accordance with the Bosnia and Herzegovina Constitution and Republic of Srpska Constitution

Ministry of town planning, housing-communal (municipal) services, civil engineering and ecology RS
The Ministry of Urbanism, Housing-communal service, Civil engineering and Ecology conducts administrative and other professional work related to: organizing and land –area planning, work out, implementation and enforcement of RS physical plan, reviewing and consulting on municipal physical and urban plans including special areas, revision of spatial-planning documentation, developing programs and investment-technical documentation specially important for RS, urban planning and construction, construction site planning, civil engineering and production of construction materials, development and services related to the construction, residential construction, financing residential construction and residential clustering, housing –residential relations and property claim in the residential buildings and fore state-owned apartments, maintenance and building administration, planning, management and protection measures, protection of general public interest, protection and improvement of natural inheritance, rehabilitation of the most endangered areas and embracing and managing means set for that specific purpose, inspection/monitoring of spatial organization, as well as many other work under the Ministry authority.

Ministry of Agriculture, Water Management and Forestry RS
The Ministry conduct administrative and other professional work related to: protection and usage of agricultural land, protection of agricultural plants and products from diseases, pests and weeds: seed protection and trading, trading of nursery plants, production and improvement of cattle breeding: animal health protection, control of food products regularity, especially of animal origin food, control of animal food and water, improvement of forestry production, nursing, protecting, arranging and improving forests, state of forest fund, exploitation of forests, seedling degraded forests, carst and bare terrain, communication in forests, hunting and hunting nature, spring, stagnant, running, ground atmospheric, thermal and mineral water, plans and bases, water balance, water protection plan, protection against negative water impact, ensuring water supply for population and industry, hydro-melioration, inspection/monitoring done in the agriculture and veterinary medicine domain, forestry, hunting and water management domain, as well as other work under the Ministry authority.

Ministry of industry and technology
Within this ministry exists a technology department, which main activities are assistance in realization environment protection programs and education of personnel. This department also leads activities connected to all technologies improvements in industrial sphere, that are related to the environment protection, and in the sphere of introduction systems based on ISO 14000 standards.

The Ministry of Health and Social Protection
The Ministry deals with the state administrative activities related to: preservation and improvement of public health, monitoring of public health and needs, health protection system under any condition, capacity building and specialization of health workers, health inspection, etc.
The priority issue that must be solved successfully in the close future relates to the potable water quality, quality of air, safety and regularity of food, residential/housing hygiene, noise, radiation, waste materials, poison chemicals, etc. Therefore, the responsibility of this Ministry

is unlimited when it comes to the protection of human health and protection and improvement of environment, in general.

The Directorate for Water RS
The Ministry of Agriculture, Forestry and Water management has established directorate for Water and this Ministry is in charge of implementation of long-term, medium-term and annual water management development plans. The Directorate for Water is also in charge of water resource destruction, especially distribution of resources having wider and general importance. The work of the Directorate is controlled by the resource Ministry and Government, in terms of realization of Directorate's public function, as well as in terms of financial means spending, as these financial means are budgetary means and ensured from the water management reimbursement and other taxes.

Water management companies
The Decision on Water form 1996 is still in force after passing the Law on Water determines the category of companies that could work in the water management sector and that could have interest for the Republic of Srpska. The Decision is based on the Law on State Companies. This Law defines several companies called the General State Water Management Enterprises, located in Gradiška (river Sava), Srpsko Sarajevo (river Gornja Bosna), Bijeljina (Semberija), Zvornik (river Drina), Trebinje (river Trebišnjica), Šamac (river Bosna mouth) and Lončari (area of middle flow of the river Save). Later on, two more companies located in Srpski Brod and Vukosavlje have been established.
These nine public enterprises, hereby-called water management companies have the following obligations:

- flood protection,
- maintenance, rehabilitation and substitution, reconstruction, construction and work of water power installations having the general interest for water balance in the zones of water catchment and constructed by these enterprises or entrusted to them for maintenance and exploitation,
- work and maintenance of extremely important regional independent water supply systems to the point of linking on the municipality net, entrusted to the enterprises by the consumers and investor,
- preparation of the draft and technical study for routine and special way of maintenance and reconstruction,
- participation in the organization and execution of the study and tasks covering the water management area,
- organization, monitoring and if necessary control of usage and used water, control of waste water and control of gravel exploitation,
- collection of data having special importance for water management,
- exploitation of material from the river stream, and

other tasks entrusted to them according to the law or other legal obligations.

3.2.5 Local institutional structure

3.2.5.1 Federation BiH

Environmental responsibilities in the FBiH at municipality level are:

- Communal Services Department
- Municipal companies

Communal Services Department
The Law on Basic Principles of Local Self-Governance (Official Gazette of the FBH, No. 6/95), which was brought on the basis of the Decree Law on Ratification of European Charter on Local Self-Governance, brought by the Republic of Bosnia and Herzegovina (Official Gazette of the R BH, No. 31/94), by its Article 8 point 5 prescribes that, within the self-governance activities, primarily the "municipal and other services shall be performed, and local infrastructure taken care of, in the municipality". Articles 18 and 19 above mentioned Law prescribes that all cantons are authorities to enact its Laws on Local-Self Governance.
All ten cantons adopted Laws on Local Self- Governance by which determined competencies and responsible bodies of the municipalities.
Legislative body of Municipalities passed a Statute and on the base of a statute adopted Decision on organization of administrative bodies on its territory. By this Decision municipalities defined relevant departments and their scope of work.

Municipal companies are established in accordance with Law on communal services and municipal decisions.
The Law on Public Utility Services from 1990. (Official Gazette of the SR BH, No. 20/90) defines the public utility services are of special interest for society. The same law establishes which activities are to be considered public utility services, such as production and distribution of water, wastewater treatment and drainage, production and distribution of heating power, and other.
The law further establishes the municipalities shall provide organized delivery of public utility services, either trough companies founded for this purpose by the municipality, or by confiding the performance of public utility services to other companies, which perform other economic activities as well. Municipalities may assign the task of performing public utility services and activities under certain conditions.

In the municipalities the issues of public utility have been regulated by the **Decision on public utility services.** The decision precisely defines the way of organizing the delivery of public utility services by establishing which companies shall perform particular public utility services.

3.2.5.2 Republika Srpska

Environmental responsibilities in the RS on municipality level are:
- Communal Services Department
- Municipal companies

Communal Services Department
The Law on Local Self-Governance (Official Gazette of the RS, No. 35/99; 20/01) prescribes that, within the self-governance activities, primarily the "municipal and other services shall be performed, and local infrastructure taken care of, in the municipality and city".

Legislative body of Municipalities passed a Statute and on the base of a statute adopted Decision on organization of administrative bodies on its territory. By this Decision municipalities defined relevant departments and their scope of work.

Municipal companies are established in accordance with Law on communal services and municipal decisions.
The Law on Public Utility Services (Official Gazette of the RS, No. 11/95) defines the public utility services are of special interest for society. The same law establishes which activities are to be considered public utility services, such as production and distribution of

water, wastewater treatment and drainage, production and distribution of heating power, and other.
The law further establishes the municipalities shall provide organized delivery of public utility services, either trough companies founded for this purpose by the municipality, or by confiding the performance of public utility services to other companies, which perform other economic activities as well. Municipalities may assign the task of performing public utility services and activities under certain conditions.

In the municipalities the issues of public utility have been regulated by the **Decision on public utility services.** The decision precisely defines the way of organizing the delivery of public utility services by establishing which companies shall perform particular public utility services.

4 SECTOR PLANS

4.1 Identification of priority sectors

According to the results and analysis of NDA and Baseline Scenario, the main environmental issues per river basin are following:

a) Neretva river basin

1. Communal wastewater in Mostar (direct discharge into the river)
2. Municipal solid wastes in Mostar (unsanitary landfill)
3. Communal wastewater in Čitluk and Međugorje (septic tanks - pollution at source)
4. Municipal solid wastes in Čapljina (unsanitary landfill)
5. Communal wastewater in Čapljina (direct discharge into the river)
6. Municipal solid wastes in Konjic (unsanitary landfill)
7. Municipal solid wastes in Čitluk and Međugorje (unsanitary landfill)
8. Municipal solid wastes in Stolac (unsanitary landfill)
9. Municipal solid wastes in Ljubuški (unsanitary landfill)
10. Industrial wastewaters in Mostar
11. Communal wastewater in Konjic (direct discharge into the river)
12. Communal wastewater in Stolac (direct discharge into the river)
13. Communal wastewater in Posušje (septic tanks - pollution at source)
14. Communal wastewater in Široki Brijeg (septic tanks, discharge into the river)
15. Municipal solid wastes in Posušje (unsanitary landfill)
16. Municipal solid wastes in Jablanica (unsanitary landfill)
17. Municipal solid wastes in Široki Brijeg (unsanitary landfill)
18. Municipal solid wastes in Grude (unsanitary landfill)
19. Municipal solid wastes in Rama-Prozor (unsanitary landfill)
20. Industrial wastewaters in Čitluk and Međugorje
21. Communal wastewater in Grude (insufficient capacity of treatment plant)
22. Communal wastewater in Rama-Prozor (septic tanks, discharge into the river)
23. Industrial wastewaters in Široki Brijeg
24. Communal wastewater in Jablanica (direct discharge into the river)
25. Communal wastewater in Ljubuški (septic tanks)
26. Industrial wastewaters in Konjic
27. Industrial wastewaters in Čapljina
28. Industrial wastewaters in Ljubuški
29. Industrial wastewaters in Posušje
30. Industrial wastewaters in Grude
31. Industrial wastewaters in Rama-Prozor

b) Trebišnjica river basin

1. Municipal solid wastes in Trebinje (unsanitary landfill located near settlement)
2. Communal wastewater in Bileća (partially constructed sewage system, septic tanks, discharge near water intake)
3. Communal wastewater in Nevesinje (partially constructed sewage system, septic tanks, partial discharge into accumulation used for water supply)
4. Municipal solid wastes in Nevesinje (unsanitary landfill located near settlement)
5. Municipal solid wastes in Bileća (unsanitary landfill located near settlement)
6. Municipal solid wastes in Gacko (unsanitary landfill located near settlement)
7. Municipal solid wastes in Berkovići (unsanitary landfill located near water source)
8. Municipal solid wastes in Ljubinje (unsanitary landfill located near settlement)

9. Municipal solid wastes in Kalinovik (unsanitary landfill located near settlement)
10. Communal wastewater in Gacko (partially constructed sewage system, septic tanks, discharge mostly into water stream)
11. Industrial wastewaters in Bileća
12. Communal wastewater in Berkovići (septic tanks)
13. Communal wastewater in Trebinje (partially constructed sewage system, septic tanks)
14. Industrial wastewaters in Gacko
15. Industrial wastewaters in Ljubinje
16. Communal wastewater in Ljubinje (partially constructed sewage system, septic tanks)
17. Communal wastewater in Kalinovik (partially constructed sewage system, septic tanks, discharge mostly into water stream)
18. Industrial wastewaters in Nevesinje
19. Industrial wastewaters in Trebinje

c) Cetina river basin

1. Communal wastewater in Livno (direct discharge into the river, partially septic tanks)
2. Municipal solid wastes in Livno (unsanitary landfill)
3. Municipal solid wastes in Tomislavgrad (unsanitary landfill)
4. Communal wastewater in Tomislavgrad (septic tanks)
5. Municipal solid wastes in Glamoč (unsanitary landfill)
6. Municipal solid wastes in Kupres (unsanitary landfill)
7. Municipal solid wastes in Bosansko Grahovo (unsanitary landfill)
8. Communal wastewater in Glamoč (existing sewage system damaged)
9. Industrial wastewater in Livno
10. Communal wastewater in Kupres (existing sewage system damaged)
11. Communal wastewater in Bosansko Grahovo (existing sewage system and treatment plant damaged)
12. Industrial wastewater in Glamoč

d) Neum coastal area

1. Municipal solid wastes in Neum (unsanitary landfill)
2. Communal wastewater in Neum (partially constructed sewage system)

4.2 Sector plans

4.2.1 Communal wastewaters

The wastewaters are the significant problem on the whole territory of Bosnia and Herzegovina. The Mediterranean part of Bosnia and Herzegovina has a significant influence on the sea and the seacoast pollution caused by the mainland activities. It is necessary to point out that the war, which took place in these territories, has considerably contributed to the already existing poor situation in the wastewater supervision sector. The communal wastewaters are, together with the industrial waste waters and “wild” landfill waste waters very important source of surface and ground-water pollution. Besides the fact that the whole Mediterranean part of Bosnia and Herzegovina greatly contributes to the pollution, due to unimproved sewerage system and the lack of waste water filters, the current sewerage system is in most cases unsatisfactory and the general assessment is that significant funds are necessary for their rehabilitation in order to avoid catastrophic consequences arising from leaking and mixing with the sewerage system. For the whole territory of the

Mediterranean part of Bosnia and Herzegovina the general assessment is that the existing sewerage system is obsolete and damaged in the war, that the percentage of the improvement is small, that only a few municipalities (Trebinje, Grude and Ljubuški) have the waste water filters the capacities of which need to be increased, that the investment-technical documentation needs to be updated, that the monitoring of all the river-basins needs to be established and that the principle “the pollutant pays” needs to be implemented.

In accordance with the information gathered during the pollution diagnostic analysis in the Mediterranean region, as well as the estimate basic budget for the organic waste pollution it has been concluded that the wastewater sector is one of the priorities for which the pollution reduction measures need to be undertaken.

In the Federation of Bosnia and Herzegovina and Republic of Srpska there is a Law on waters in force (Official Gazette FB&H 18/98, Official Gazette RS no. 10/98). The Law on water protection has gone through parliamentary procedures (Official Gazette FB&H, no. 33/03), however, the law is not implemented until the draft of new Law on waters, which should correct certain flaws from the Law on waters from the 1998, is adopted. In Republic of Srpska the new Law on water protection has been adopted.

Water resources and waste water sector is in NEAP defined as the first priority where it is essential that the waste water filtering and sewerage system be built and reconstructed, which has been confirmed by the drafts mentioned (NDA and BB).

Given the overall situation with the communal wastewaters and classification of influential river basins for the Mediterranean part of Bosnia and Herzegovina according to environmental criteria, the priorities for the reduction of the wastewater pollution have been determined.

In accordance with the determined priorities and SAP goals the following measures for particular locations in the Mediterranean area have been proposed:

A. Construction / reconstruction of the sewerage system and the secondary wastewater filters by 2010.

1. Municipality of Neum is in the south and the only municipality on the Adriatic coast. During the tourist season there is a large increase of household wastewaters. Since in the territory of Neum there are two small bays, which can easily be polluted, Bosnia and Herzegovina and Croatia started construction of the Regional Sewerage system Neum-Mljet channel, the construction of which created the preconditions for constructing the rest of the sewerage system in this area.
Existing documentation: Main Sewerage Project (elaborated before the war).
Activities:

a) Neum municipality needs to continue the started construction of the sewerage system Neum-Mljet channel, in order to preserve the water in Neum bay-continuation of collector construction;
b) Elaborate project documentation and begin construction of the I phase of the secondary sewerage system which would avoid use of illegally constructed septic tanks which have large leaks and significantly contribute to the problem*

2. In Mostar municipality the urban part of the city has a constructed sewerage system, while in the rest of the municipality households use septic tanks. There is no city device for filtering wastewaters.
Existing documentation:

- Proposed solution for Mostar basin sewerage (Hydro Engineering Institute of Civil faculty in Sarajevo 1993),

- Proposed project for Mostar basin sewerage (Hydro Engineering Institute of Civil faculty Sarajevo 1996 - financed by EUAM),
- Since 2000 project elaboration of “Mostar basin sewerage study” is under way (“Harza” from Chicago and “Integra” Mostar – financed by the World Bank.

Activities:

a) Urgently need to begin elaborating project documentation, as well as constructing the main collectors (left-bank and right-bank sewerage system collectors) for the Mostar basin and construction of the I phase of WWTP (150000 ES);
b) Project elaboration of project documentation and construction of the II phase of the Mostar basin sewerage system.

3. Čitluk and Međugorje municipalities as a tourist centre, where in relatively small area large masses of people gather, represents a great source of pollution especially if we consider that unfiltered waste waters seep into chasms and quickly penetrate through bedrock to the Trebižat river, ruining its ecosystem. Only the inner part of the city of Čitluk has a constructed mixed sewerage system 4 km long.

Existing documentation:

-Elaborated project documentation for the collector and the filter, at the level of the main project, which needs to be implemented as soon as possible.

Activities:

a) There is a plan to construct the I phase of two separate WWTP for Čitluk (6000 ES) and 2300m collector and Međugorje (6000 ES) and a 2220m collector,
b) Project elaboration and construction of sewerage network

4. Konjic municipality is located in Neretva’s upper river flow. Only the inner central part of the city has a constructed sewerage system of the separate type approximately 20 km long, while the rest of the city does not have collectors, transport and filtering of waste waters, resulting in direct pollution of the Neretva river.

Existing documentation: Konjic municipality project elaboration of the investment and technical documentation for the sewerage system and waste waters filtering device.

Activities:

a) Project elaboration and construction of primary channels with parts of the secondary network and construction of the I phase (10000 ES) of the WWTP in order to decrease the current pollution of the Neretva River.
b) Project elaboration and construction of the sewerage system network and the II phase of WWTP.

5. Nevesinje municipality wastewaters flow unfiltered into chasms directly connected with Buna and Bunica springs into the Neretva watershed.

Activities:

a) Project elaboration and construction of collectors and I phase of WWTP;
b) Project elaboration and construction of sewerage and the II phase of WWTP.

6. In Bileća municipality the situation is also poor because the existing waste waters flow into the reservoir used for drinking water, thus causing frequent epidemics.

Activities:

a) Sanitation of existing sewerage system, project elaboration and construction of collectors and the I phase of WWTP;
b) Project elaboration and construction of the II phase of WWTP and the sewerage network.

7. In Čapljina municipality only the inner part of the city has a constructed sewerage system (6 km of mixed type and 8.5 km of separate type).

There is no city device for filtering wastewaters.

Existing documentation: project proposal for Čapljina sewerage system (Projektant Mostar 1983)
Activities:

a) Project elaboration of project documentation for construction of the main collectors and I phase of WWTP for 20000 ES located in Gabela and their construction, because the current indirect flowing into the Neretva river directly endangers the Neretva and Hutovo blato delta ecosystem, as well as drinking water sources for both Čapljina municipality and Neum municipality the water pumping station of which is located in Gabela field.
b) project elaboration and construction of the II phase of WWTP (final phase 80000 ES) and the secondary network.

8. In Livno municipality only 40% of the city area is connected to the existing sewerage system (ca. 20 km). The rest of the households have septic tanks. Unfiltered wastewaters flow into the Bistrica and Žabljak watershed. There is no public device for filtering wastewaters.
Existing documentation: " Livno pre-feasibility study-b-waste water system" (GWCC, Vienna, September, 1998).
Activities:

a) Construction of primary channel and parts of the secondary sewerage network, rehabilitation and reconstruction of the existing sewerage system, and project elaboration and construction of collectors and the I phase of WWTP (20000 ES);
b) Project elaboration and construction of the II phase of WWTP (total utilisation 50000 ES) and the secondary network.

B. Construction / reconstruction of the sewerage system and secondary waste water filter until 2015-2025

1. Glamoč municipality and the city itself were severely destroyed in the war. The existing sewerage system also suffered great damage. A greater part of the municipality uses septic tanks. The sewerage system exists only in the inner part of town. There is no waste water treatment device. Due to pollution of surface and round waters there is often pollution, stomach aches, yellow fever, etc.
Project documentation:

- The main sewerage system project Glamoč-Projekt, Banja Luka 1977;
- Status of other documentation unknown.

Activities:

a) Sanitation of existing sewerage system, project elaboration and collector and I phase WWTP construction (4500 ES);
b) Project elaboration and sewerage system and II phase WWTP construction.

2. Before the war Široki Brijeg municipality had completed 90% of its waste water treatment plant which was destroyed in the war. For a longer period of time the location served as a wild landfill. Now that area has been cleaned and there is an opportunity for its utilization. After the war the World Bank funded the project documentation for the WWTP sanitation of the mechanical and biological type. The rest of the municipality uses septic tanks, which presents a great danger for downstream areas located in bedrock.
Existing documentation:

- Project proposal for collector and waste water treatment plant – Projektant, Mostar X/1981;
- Proposal and Main sewerage project of Široki Brijeg – Water Management Institute Mostar;
- Main project sanitation for waste water treatment devices of Široki Brijeg – Loveco Rijeka IX/1996;

- Tender documentation for sanitation of the I phase (5000 ES) of waste water treatment devices of Široki Brijeg – Loveco Rijeka IV/1997, funded by the World Bank.

Activities:

a) Sanitation of I phase WWTP (5000 ES) and construction of collectors;
b) Project elaboration and construction of the sewerage network and II phase WWTP.

3. Only the inner part of the city of Tomislavgrad has a partially built sewerage system (around 2 km of the main collector is built, in the inner city core a part of the precipitation sewerage system is built and the partially regulated Tabašnica channel). The rest of the city and Tomislavgrad municipality releases its waste waters into illegally built septic tanks. No filter device has been built.

Existing documentation:

- The main sewerage system project of the city of Duvno/1982/- Institute for planning of city of Sarajevo
- Proposal for waste water treatment plant and for industry of Duvno- Water Management Institute Sarajevo VII/1989
- Revision of existing and proposed main sewerage network and proposed waste water treatment plant for Tomislavgrad. Blažuj and Kolo (RUST VA-PROJEKT AB Stocholm II/1997).

Activities:

a) Construction of main collector and the parts of the sewerage network in the city, and project elaboration and construction of the I phase of WWTP (6000 ES);
b) Project elaboration and construction of the sewerage network and the II phase of WWTP (total capacity 12000 ES).

4. In Jablanica municipality only the inner part of the city has the sewerage system of the separate type 14.35 km, and unfiltered wastewaters leak into the Neretva river. According to HE Jablanica's waterway operating license, JP "Elektroprivreda Bosnia and Herzegovina" is responsible for constructing the city device to filter wastewaters.

Project documentation: not elaborated.

Activities:

a) Project elaboration and construction of collectors in the I phase of WWTP (10000 ES);
b) Project elaboration and construction of the sewerage network and the II phase of WWTP.

5. In the Stolac municipality only the inner part of town is covered with a sewerage system of the separate type 10 km long, which was devastated during the war along with the whole town. The rest of the city and municipality used septic tanks. No wastewater treatment device has been built and directly pollutes the groundwater and surface water of Bregava River, as well as the waters of Hutovo Blato.

Activities:

a) Project elaboration and construction of the sewerage system and the I phase of WWTP (5000 ES);
b) Project elaboration and construction of the sewerage system and the II phase of WWTP.

6. In the Grude municipality the central part of town is covered with a sewerage system of he separate type and a water treatment device of the I phase 2500 ES, of mechanical and biological type. Besides being overloaded by communal waters, the device is additionally burdened by the brewery UNILINE Grude, which "suffocates" the existing device, because it has difficulty with its anaerobic pre-treatment, which does not function efficiently enough due to large amounts of hydrogen-sulphide formations which is toxic for aerobic and anaerobic

culture of micro organisms. In that way brewery effluents are burdened by 5000-8000 ES, but with proper pre-treatment activity it should be burdened by 1000 ES. Solving the pre-treatment problem would relieve the city device. The rest of the town and municipality uses septic tanks and pollute downstream areas.
Activities:

a) Project elaboration and continuation of the sewerage system construction
b) Construction of the II phase of WWTP (+2500 ES) and project elaboration and continuation of the sewerage network construction

7. Rama-Prozor releases its wastewater into Prozorčica and for the most part into septic tanks, there is no sewerage system and no treatment device.
Project documentation: none.
Activities:

a) Project elaboration and construction of the sewerage system of Rama-Prozor and the I phase of WWTP (5000 ES);
b) Continue project elaboration and construction of the sewerage system and the II phase of WWTP.

8. Posušje municipality does not even have a constructed sewerage system or waste water treatment plant and releases its effluents into leaking septic tanks, which quickly drains through the bedrock and pollutes spring waters. The routing made the ground water flow quicker to Grude spring which serves as a water station for Grude Municipality.
Project documentation:

- Proposal for sewerage system of Posušje Hidrokonzalt Split V/1998
- Main project of the Main sewerage system collector of Posušje-Hidrokonzalt VII/1998.

Activities:

a) Project elaboration and construction of the sewerage system, collectors and I phase of WWTP (10000 ES);
b) Project elaboration and construction of the II phase WWTP and sewerage system.

9. Gacko municipality and TE Gacko release their untreated waste water into Mušnica.
Activities:

a) Project elaboration and construction of the collector and the I phase WWTP;
b) Project elaboration and construction of the II phase WWTP and the sewerage system.

10. Ljubuški municipality built a I phase waste water treatment device in 1990 (5000 ES) of the mechanical and biological type which operated throughout he war. The central part of the town is covered with a sewerage system of the mixed type ca 8 km long. The rest of the municipality uses septic tanks thereby threatening endangering downstream areas.
Activities:

a) Sanitation of the I phase of WWTP (5000 ES) and project elaboration and construction of the sewerage system;
b) Project elaboration and construction of the I phase of WWTP (plus 5000 ES) and the sewerage network.

11. Berkovići municipality does not have a built sewerage system, but rather uses illegal septic tanks.
Activities:

a) Project elaboration and construction of sewerage system and waste water treatment plant.

12. Bosansko Grahovo municipality was severely devastated during the war. The sewerage system of the separate type around 2 km long, along with the treatment device, the construction of which was in the final phase immediately before the war, suffered extensive

damage during the war. The pre-war documentation was destroyed and World Bank funds were used to elaborate them following the war.
Project documentation:

- The Main project of the waste water treatment device sanitation of Bosansko Grahovo-Hidrokonzalt Split VI/1997.

Activities:

a) Sanitation of the I phase (1650 ES) WWTP, project elaboration and construction of the sewerage system;
b) Project elaboration and construction of the II phase WWTP.

13. Kupres has a sewerage system that was significantly damaged during the war, which urgently needs the necessary sanitation – 2.5 km of the mixed type and 2 km of the separate type. The greater part of the municipality uses septic tanks. There is no treatment device.
Activities:

a) Sanitation of the existing sewerage system, project elaboration, and construction of the sewerage system and the I phase WWTP (3000 ES);
b) Project elaboration and construction of the sewerage system and the II phase WWTP.

14. Trebinje possesses a treatment device built at the beginning of the 80s of the last century, which needs to be revitalized, and capacity increased.
Activities:

a) Revitalization and capacity increase of the I phase of WWTP, project elaboration and construction of the sewerage system;
b) Project elaboration and continuation of the sewerage system construction and the II phase of WWTP.

15. Ljubinje releases its waste waters into chasms connected with Popovo field thereby further degrading the area.
Activities:

a) Project elaboration and construction of WWTP and sewerage system;
b) Continuation of project elaboration and construction of the sewerage system.

16. Kalinovnik has a partially built sewerage, which is released, into the Neretva river without treatment.
Activities:

a) Project elaboration and construction of WWTP and sewerage system;
b) Continuation of project elaboration and construction of the sewerage system.

The proposed measures and construction of secondary treatment filters predict a pollution reduction by 90%.

***Note:** Activities under a) are a priority and based upon them appraisements were given for the IP. Activities under b) need to be continued.

4.2.2 Solid waste

Waste represents one of the most important problem of environmental protection in B&H. Waste management problems derive, amongst others, from present social relations towards the waste and from the manner of management of it, then, inadequate both vertical and horizontal managing and professional harmonization and organization, recent inadequate legal regulations and economic measures. This should be supplemented with problems derived from population migration as the consequences of the recent war.

Usually the only offered possibility of the waste (municipal, medical, industrial and other) management are local (municipal) landfills, which are mostly just plane waste disposals set on inadequate locations and without basic technical protection measures. Most of those landfills cannot be included in sanitary landfills. Exception is the landfill Uborak nearby Mostar town. Beside so called municipal landfills there are number of "wild" waste disposals and local trash dumps often set by the river course, deserted quarries, various low-laying areas etc.
Collection of the municipal waste derived from households is not organized. Also, processing of the collected waste is not solved in appropriate way and the waste is not being separated into municipal, hazardous or inert one.

Smaller industrial installations most frequently dispose their waste to the landfills together with municipal waste, what is not case with significant industrial installations, that is, with basic and heavy industry (Tool industry-Trebinje, Aluminum combine-Mostar). The mine and steam power plant "Gacko" have their own landfill, inadequately organized.
Since it is about big amount of waste so the biggest is the area of the land covered by the landfill.
In B&H there is non-modern incinerator for the municipal and hazardous waste incineration. Incineration of the certain waste (waste oil, old tires etc.) although there are conditions for that (e.g. power plant "Gacko") they are not used.
In short lines, status of the waste management can be defined by following:

- Because of nonexistence of the organized waste stock market so it is not collected for the recycling purposes and reuse of useful waste components, what also represents serious economic loss for the community.
- Not separating the waste and also not sorting it for recycling significantly increases total waste quantity for time being disposed to the landfills,
- Significant power value contained in the waste is not used what, beside all mentioned, is additional loss for the community.

Present and especially important legal regulation related to the waste and its management is consisted of:

- Law on environmental protection of Federation B&H, 2003 and Law on Environmental protection of Republika Srpska, 2003
- Law on waste management of Federation B&H, June 2002 and Law on waste management of Republika Srpska, August 2002

It is important to point out that in all essential elements mentioned entities' laws are harmonized.
Law on environmental protection, as integral document that defines comprehensive approach to the preservation and rational use of natural resources, appropriately deals also with the waste as its important segment.
Law on waste management organizes all waste categories, all types of activities, planning the waste management, responsibilities in waste management, ways of trans-boundary waste transport, and supervision of its management. Task of the law is "to encourage and provide most important prerequisites for: preventing the waste generation, processing the waste for reuse and recycling, separating the raw materials and its use for power production and safe waste disposal".

Especially important progress toward improving the waste management is expected after implementation of following documents:

1. Strategy of the solid waste management in B&H, august 2002
2. National Action Plan for environmental protection of B&H, march 2003
3. CARDS project "Support to waste management improvement in B&H, 2002
4. Feasibility study for landfill Uborak nearby Mostar, 2001.

Strategy of solid waste management in B&H gives basic directions and goals in the field of waste and hierarchy of possible management ways. Strategy foresees two options of transitional solution for forming regional landfills with 16 (entity option) and 14 (inter-entity option) locations that would result in long-term solutions with five common regional landfills in B&H. In that way solving the problem of the solid waste is exclusively planned by construction of regional landfills. In that connection, entity Law on solid waste management, as essential point, promotes "principle of regionalism, meaning that construction of plants and waste treatment facilities and waste disposal should be provided in a way that it covers needs and enables sustainability of constructed facilities".
Strategic document on solid waste management of adjacent municipality of the Mediterranean watershed area are grouped in three regional landfills with micro-locations in Mostar, Trebinje and Livno. According to the entity concept there are following regional landfills planned:

- **Region of Mostar**: Čapljina, Neum, Jablanica, Mostar, Ravno, Čitluk, Prozor, Stolac, Konjic
- **Region of Livno**: Široki Brijeg, Grude, Glamoč, Bosansko Grahovo, Drvar, Ljubuški, Kupres, Livno, Posušje, Tomislavgrad
- **Region of Trebinje**: Kalinovik, Berkovići, Trebinje, Gacko, Ljubinje, Bileća, Nevesinje

Inter-Entity concept plans also three regional landfills:

- **Region of Mostar**: Čapljina, Neum, Jablanica, Mostar, Ravno, Čitluk, Ljubuški, Stolac, Konjic, Nevesinje, Široki Brijeg, Berkovići
- **Region of Livn**o: Grude, Glamoč, Bosansko Grahovo, Kupres, Livno, Posušje, Tomislavgrad
- **Region of Trebinje**: Trebinje, Gacko, Ljubinje, Bileća

According to National action plan for environmental protection of B&H there are eight priority areas defined "which necessary need attention in recent period". Amongst priority areas there is waste management also. The Plan states that for achieving the EU standards for waste management it is necessary to engage significant financial funds, what B&H can not provide in recent time. Changes step-by-step are possibly efficient way for introducing the long-term improvement of the status and sustainable use. In that regard, it is necessary to provide prerequisites for implementation of strategic goals. Action plan defines priority actions as well as appropriate activities within. In that sense, there are two priority areas determined with accompany measures:

a. Establishing the waste management system
   - Adopting the waste management strategy together with action program for its implementation,
   - Establishing the data base,
   - Preparation of the program of selected collection, material and power evaluation of the waste,
   - Establishing the waste stock market,
   - Introducing the economic price for dealing with all kinds of waste in ecologically acceptable manner,
   - Introducing the economic price for producers of hazardous waste for pressuring the environment and
   - Introducing the fees for dealing with wrapping materials.
b. Removing the "wild" landfills and rehabilitation of degraded areas
   - Identification and inventory of status and causes of land damage for the purpose of its revitalization

Under the CARDS program for year 2002, EC is financing preparation of the Project "Support to improving the waste management in B&H" with the aim of establishing the waste management system harmonized with Solid waste management strategy in B&H and the

Law on solid waste management of Entities. This project has prepared plans for construction of two regional landfills in Livno and Trebinje. Region of Livno covers seven municipalities: Livno, Glamoč, Tomislavgrad, Kupres, Bosansko Grahovo, Posušje and Grude, while region of the Trebinje municipality covers: Trebinje, Bileća, Ljubinje and Gacko. This is in accordance with, so called, entity option of Solid waste management strategy in B&H. Concept of such waste management systems is referred to the waste transport as well as to waste station and locations where the waste is going to be disposed out from "wild"/uncontrolled disposals.
Under the Project "Support to the improvement of solid waste management in Bosnia and Herzegovina it is foreseen that municipalities members of regional landfills in Livno and Trebinje sign the Contract for establishing the regional board for waste management. Trebinje and Livno should define micro-locations for future landfills for which feasibility studies are going to be prepared, financed by Government of Italy. And finally, under the CARDS program there should be appropriate campaign introduced and donors conference organized for the purpose of providing at least one part of donors funds, that is, favorable loans for construction of landfills.
Obviously, realization of regional landfills depends exclusively upon funds to be provided since all other prerequisites are fulfilled.

Mostar with c/a 110.000 inhabitants makes quarter of the total population and according to the Strategic Action plan it should have had established solid waste management system by the year 2010. In that connection World Bank has financed Feasibility study for the landfill Uborak nearby Mostar which was finalized in 2001 and which, since being regional landfill, covered municipalities of the Herzegovina-Neretva Canton and municipalities Ljubinje, Ljubuški and Široki Brijeg. First step should have been establishing the solid waste management system for Mostar, and municipalities of Mostar have sighed a Contract on establishing the board for waste management. World bank should have finance construction of the landfill as well as rehabilitation of existing ones, for which funds were obtained. Realization of the loan as well as the start of the work did not happen.

In accordance with information collected during diagnostic analyses of pollution in Mediterranean region, as well as calculation of the BB (basic budget) it was found out that sector "Solid waste" (according to SAP) was one of the priority ones for which pollution reduction measures should be implemented immediately. For the purpose of establishing the priority in solving the problems related to certain municipalities, there was a rank order made according to its health, social-economic and environmental criteria. Defining the priority municipalities has significantly impacted to the choice of the sequence of construction of regional landfills (table 2.b.)

For regional landfills there was ranking made through average ranking of adjacent municipality in each of them.

In that way defined region have following ranking order:

1. Region of Mostar (average ranging 4)
2. Region of Trebinje (average ranking 5)
3. Region of Livno (average ranking 6)

Considering the geographic position of certain municipal centers and in case of Mostar and its size, this outcome is expected and logical.
Regional landfill Mostar has priority also according following parameters:

- Number of adjacent municipalities (12)
- Population number (approx. 290.000) making 63.6% of the watershed population and
- Five out of twelve municipalities belonging to this regional landfill are in the group of municipalities with most unfavorable impact.

According to the defined priorities and goals of the SAP, following measures for reducing the solid waste pollution within the Mediterranean area are proposed:

1. **Establishing the solid waste management system**

By proposed measures it is foreseen to construct regional sanitary landfills by the year 2012.

4.2.3 Industrial wastewaters (BOD_5)

In Mediterranean region in B&H are present industries whose wastewaters are significantly loaded with organic compounds, suspended particles and nutrients. According to estimated BOD_5 values, the biggest polluters in Neretva river basin are textile industry, industry of milk and milk products, industry of non-alcohol beverages, breweries, wine industry and slaughter houses; in Cetina river basin textile industry, and in Trebisnjica river basin textile industry and wine industry. According to the estimated wastewater load with organic compounds of certain locations (cities and places – table 2.c.) in Mediterranean region, and their influence on human health and marine environment, priorities for BOD_5 reduction from industries are defined as follows:

- Mostar (meat industry / slaughterhouse VELMOS ltd., textile industry – Đuro Salaj ltd., wine production – Hepok ltd., production of wine and non-alcohol beverages Hercegovina vino ltd., milk industry - Movita)
- Čitluk and Međugorje (textile industry – Frotea ltd., meat industry / slaughterhouse G.I.P.I. ltd., production of wine - Holding Hepok inc. and Bobita Co. ltd., milk product industry – Ledo, industry of candies – Barpeh),
- Livno (textile industry - Livtex ltd.),
- Široki Brijeg (meat industry / slaughterhouse – Lijanovići ltd.),
- Bileća (textile industry – Factory of carpets and fabrics) and
- Glamoč (Factory of knitwear Međugorje) (*table 2.c.*).

According to information collected during Diagnostic Analysis of pollution in Mediterranean region and Baseline Budget of organic waste pollution, it is identified that sector "BOD_5 from industries" is one of the priorities where measures for pollution reduction need to be undertaken.
The most often case is that these industries don't own pre-treatment nor treatment of wastewaters, with the exception of "Uniline" brewery Grude, which uses city plant for treatment of its wastewaters, and also from meat industry Lijanovići who uses its own plant for treatment. With regard of this condition, measures which can be proposed for BOD_5 reduction from these plants are replacement of outdated technologies and introduction of wastewater treatment. However, considering financial condition of these industries, it is unreal to expect significant investments in above mentioned measures any time soon.
First and necessary step that needs to be taken is introduction of cleaner production, i.e. application of BEP (best environmental practices) in these facilities. On one hand, these measures can contribute to significant BOD_5 reduction, and on the other hand, bring economic profit, i.e. savings of raw material, water and energy-generating products in these industries. At present situation, when degree of pollution reduction measures is relatively low, measurements of cleaner production can certainly contribute to significant degree of pollution reduction.

Cleaner production in B&H industries is introduced into national policy and strategy as a tool for accomplishing environmentally sustainable industrial development. Its application in industrial facilities in B&H is based, by adoption of set of environmental laws in B&H (FB&H and RS, in 2003), on EU directive for integral pollution prevention and control (IPPC).

Directive is stipulated through provisions related to issuing environmental permit. Namely, all industrial facilities which are planed to be built, can be built and operational with condition of obtaining environmental permit, in accordance with provisions of this law and Law on administrative procedure, where existing industrial facilities must obtain environmental until 2008, latest.

According to this law, environmental permit contains:
- emission limit values for polluting substances;
- conditions for protection of air, soil, water and wildlife;
- measures for waste management produced by facility or plant;
- measures for minimization of trans-boundary pollution;
- self-monitoring system with determining methodology and frequency of measurement; and
- measures related to work conditions in extraordinary situations.

Emission limit values and equivalent parameters and technical measures are based upon best available technologies, taking into consideration technical characteristics of facility and plant, their geographic position and other conditions. If quality standards foresee some more strict conditions than those achieved by best available technologies, additional measurements will be considered, necessary for issuing environmental permit (e.g. working hours limit, less polluting fuels, etc.).

Application of cleaner production is not a usual practice in B&H industries. First activities in this field were made during 2002, through implementation of project "Capacity building of cleaner production in B&H" – EC LIFE Third Countries Program. Project was implemented by non-governmental organization "Center for Environmentally Sustainable Development" with technical assistance of MAP regional Center for cleaner production from Barcelona, Spain and Croatian Center for cleaner production from Zagreb.
Experiences from project implementation and application of cleaner production measures in 9 industrial facilities in B&H (Table 5), show that in B&H it is possible to reduce 20% or more of waste and emissions with negligible investments. Further 10 – 20% of emission reduction is possible with small investments, whose amortization period is less then 12 months. Therefore, it was noted that most of industrial facilities in B&H should be able to reduce pollution by 30-40% with introduction of cleaner production measures without using loans. At the same time, cleaner production contributes to higher company profitability.

Proposal of measures for organic load reduction (BOD_5) from industrial facilities in Mediterranean region in B&H and estimation of pollution reduction:
Taking into consideration the existing legislative and present situation in industries of Mediterranean region, following activities are proposed whose implementation would achieve reduction of wastewaters pollution with organic components for period 2006-2010.

1) Rehabilitation or construction of pre-treatment plants, which would result with organic load reduction up to 30% in food industry (wine, brewery, milk, meat industry and industry of non-alcohol beverages) and textile industry.

2) Introduction of program for capacity building for application of cleaner production which includes:

a) Dissemination of information and raising awareness about objectives, ways, procedures and benefits of cleaner production introduction.

b) Training programs for industries in Mediterranean region in B&H about:
- Measures of "good management";
- Benefits that industries have with this approach compared to "end of pipe" treatment;
- Environmental impact of production processes;

- production process organization which allows monitoring of emissions and wastewaters;
- establishment of accounting system which allows calculation of environmental costs and their internalization into product unit price, and
- etc.

c) Elaboration of national BEPs for industries in Mediterranean region

d) Demonstration of cleaner production introduction in industries in Mediterranean region in B&H, which would provide:
- environmental diagnosis of processes in specific industrial facilities;
- selection of solutions for pollution reduction (using MOED tools – methodologies of MAP / Regional Center for cleaner production, Barcelona, Spain); and
- preparation of requests for issuing environmental permit.

e) Implementation of cleaner production measures in industries in Mediterranean region in B&H.

World practice experiences show that introduction of cleaner production measures, without significant financial investments (see supplement 8.3.), may accomplish following reduction percentages of BOD_5 in wastewaters:
- **textile industry – 10 – 20 %**
- **wine industry - 20 – 60 %**
- **brewery- 10 – 20 %**
- **meat industry (slaughterhouses) - BOD_5 10 – 20 %.**

4.2.4 Hazardous waste

4.2.4.1 Medical waste

An overview of the current situation of hazardous waste for the Mediterranean part of Bosnia and Herzegovina was given in the National Diagnostic Analysis. Besides the residual pharmaceutical waste encapsulated in barrels and hospital waste, a great danger is also posed by dissipated polychloride byphenills (PCB), asbestos from damaged roofs and waste from factories that undergo galvanisation processes.
Mostar University's College of Civil Engineering gathered in 2001 statistics on the quantity of destroyed or damaged transformer substations (PCB) in Bosnia and Herzegovina during the war. The statistics for the Mediterranean part of Bosnia and Herzegovina indicate the following:
- Livno municipality suffered damage to transformer substations in the Zgona warehouse, in the Žabljak 110/35/10 KV plant, in STS Grboreza III, in TS Čelebić, in TS D. Rujani, and the transformers from Čelebići and Rujani to Bogdaši and Sajkovići (some destroyed, some stolen);
- Tomislavgrad municipality suffered damage to transformer substation in TS Baljci;
- Glamoč municipality suffered damage to STS Malkočevci, STS Airport, STS Biličić, STS Weekend settlement;
- Bosansko Grahovo municipality suffered damage to 4 transformer substations in TS 35/10/0.4 KV B: Grahovo, and in the rest of the locations (around 35) the transformers were stolen, and there is no data on possible damage;
- Kupres municipality suffered during the war damage transformer substations or condensation batteries on 47 STS.

No data was submitted for the rest of the municipalities or there was no damage. From the above-mentioned it can be concluded that there was considerable PCB leakage and contamination, but the quantity and volume are unknown because there is no comprehensive data or research on the amount of contamination from the destroyed transformer substations.

Further issues regarding hazardous waste include the following:

- There are no legal regulations, which regulate hazardous waste (secondary laws on waste types and hazardous waste management methods). The only valid document in Bosnia and Herzegovina regarding hazardous wastes in the Basel Convention the application of which is at the beginning.
- A complete hazardous waste generator register in Bosnia and Herzegovina does not exist. SFOR conducted the study "Health Hazard Inventory" where they partially researched hazardous and waste generators, but the study is incomplete and as such cannot serve as the basis for hazardous waste register.
- There are no environmental and health services which deal with hazardous waste.
- In the Mediterranean part of Bosnia and Herzegovina as in the whole area of Bosnia and Herzegovina there are no hazardous waste landfills, nor are there processing capacities and ecologically acceptable treatment for certain types of hazardous wastes.
- There is no separation of hazardous and non-hazardous waste at their source and therefore there is no tracking, monitoring and management of hazardous wastes.
- Medical waste from health institutions is not separated at its source into hazardous and non-hazardous waste. In bigger hospital centers, part of the infective waste is incinerated in ordinary fireplaces for burning waste, while the remaining waste is dumped un-separated into inadequate landfills together with the rest of the waste.
- The above-mentioned shows that too little attention was given to this issue and that funds need to be secured and concrete activities and measures need to be undertaken for proper hazardous waste management, all this in favor of people's health and environmental protection.

Proposed measures for reduction of hazardous wastes in the Mediterranean region of Bosnia and Herzegovina

1. Establishment of adequate legislation which will induce hazardous waste producers to implement cleaner technologies in order to reduce hazardous waste, and on the other hand, to introduce mandatory funds from hazardous waste producers for organized supervision and disposal – so-called economic cost of waste disposal. It is necessary, therefore, to build and establish an effective system of hazardous waste management at the state level, which would be in accordance with EU directives.

2. Elaborate a national strategy and national plans for hazardous waste management, propose and adopt an environmentally acceptable way of disposing hazardous waste, and ratify a protocol on hazardous waste. The above-mentioned activities include above all:

- Elaboration of hazardous waste register and cadastre of generated hazardous waste (types of hazardous waste, physical and chemical properties, aggregate state, amount of hazardous wastes, etc.)
- Establishment of integral information system for hazardous waste management
- Determining locations and project elaboration for at least two (or more) hazardous waste landfills in Bosnia and Herzegovina
- Separation of hazardous an non-hazardous waste at their source of generation
- Planning the possibility for constructing a modern incinerator for hazardous waste management

- Procurement and use of hazardous waste transfer stations and adequate transport to landfills or incinerators
- Establishment of trans-boundary hazardous waste transport controls (Basel Convention)
- Establishment of environmental and health services for hazardous waste at the municipal level

3. Disposal of the remaining pharmaceutical waste from the war.

The above-mentioned activities, if implemented as soon as possible, should provide a reduction in hazardous industrial waste production by 2010 for about 20% with introduction of cleaner technologies.
Landfill construction and separation of hazardous waste and the use of transfer stations should result in a 50% improvement in adequate hazardous waste disposal by the end 2020.
Implementing all the mentioned activities should result in environmentally acceptable disposal of hazardous waste by the end of 2025.

4.2.4.2 Metal industry

Metal industry represents significant polluter when it comes to the industrial wastewater. Biggest polluters of all in Mediterranean area of B&H are as follows:

- Tool industry Trebinje,
- UNIS GAL Konjic,
- SOKO Mostar
- FEAL Široki Brijeg

Biggest part of the pollution, according to NDA (National diagnostic analyses and BB (table 2.d) comes from the "Tool industry" Trebinje. This company will in future be possibly key polluter in the field of the metal industry in Trebišnjica river basin since biggest part of the remaining company presented in NDA are going to probably need to make thorough restructuring and some of them will cease the work (case of the factory Metalac that does not operate as metal industry, what makes calculated value of pollution already reduced by Metalac's part in the total amount of pollution acquired trough BB).

Question of the air and water protection, that is, of the way of the effluent release and gas emission, as well as their control, is being regulated by the following legal documents:

- Law on environmental protection of the Republika Srpska and Bosnia and Herzegovina, 2003
- Water Law of Republika Srpska and Federation of Bosnia and Herzegovina, 1998
- Law on air protection of Republika Srpska and Federation of Bosnia and Herzegovina 2002

Although laws dealing with air and water quality are very restrictive, there are still very expressive problems present. There are two basic reasons for that:

- Ineffective inspection service, that is, inappropriate control and application of legal measures in force, and
- Nonexistence of the monitoring system, what is specially referred to the control of the heavy metals.

In order to define real pollution reduction measures it is necessary to make detail insight into technological process used in each of existing factories as well as have knowledge about characteristics of the basic raw material.
Most of the existing metal industries use steel as the basic raw material whose processing is performed by two technological processes:

- Thermal steel processing by tempering and stirring, using the appropriate salts, and
- Drilling of material using the mineral oil as cooling means in that process.

Essential problem here are mineral oils (defined by BB) and salts used in mentioned processes, that is, its inappropriate treatment and storage.
Beside this, there is pollution - product of the galvanization process, what is distinctive for the companies UNIS GAL, Feal and similar.
Above mentioned waste, as well as the waste of the scolding process and metal shavings is being disposed in the factory land, without appropriate storage and protection measures. During high precipitation material from such disposal is being washed out and dispersed so polluting both watercourses and wider area.
Some of the factories, for example "Tool industry" in Trebinje, have installed devices for pre-treatment but those devices are mostly out of function for all problems that especially sector of metal industry in B&H is dealing with, what has resulted in impossibility to neither rehabilitate them of have appropriate maintenance.
Entity Laws on environmental protection have defined that all installations having or could have environmental impact and posses appropriate working licenses issued before this Law entered into the force, are ought to have Environmental permissions according to this Law by the end of 2008.
According the current laws on environmental protection "Environmental permission has high level of environmental protection as its basic goal" and contains following:

- Limit emission values for polluting substances;
- Conditions for air, soil, water, herbal and animal world protection;
- Measures for waste management, the one produced by facility,
- Minimizing measures for trans-boundary pollution;
- System of self-monitoring with defined methodology and measuring frequency, and
- Measures connected with working conditions and extraordinary situations.

Proposal of measures for decreasing the pollution of metal industry waste waters is as follows:

1. **introducing cleaner production**
2. **rehabilitation and/or installation pre-treatment devices**

For defining real measures that will provide cleaner production it is necessary to be well aware of technological process of each installation, that means undertaking special activities as well as special projects. In the same way defining of the pre-treatment requires knowledge about technological process where the one does not exist, that is, estimating the status of the facility for pre-treatment where it is possible to rehabilitate it.

Following percentage of metal industry wastewaters pollution reduction can be achieved by proposed measures:

- **introducing the cleaner production 20-30%, and**
- **pre-treatment measures 20-30%.**

4.2.5 Thermo power plant and mine Gacko

Considering the hydro-geological and hydrological characteristics of carst terrain, area of the mine and power plant Gacko represents one very significant polluter, not just for direct environment, but also for wider area. Negative pollution impact is being reflected as to the Trebišnjica river basin so as to the lower course of Neretva river and wider costal area. All unfavorable impacts generated in the part of Gatačko field (940 m a.s.l.) are directly

transported via underground towards Trebišnjica river springs situated in Bileća accumulation and along costal area.
Annual production of ash and slag varies in volume of 350000-400000 t/year, what makes great problem for its disposal and as such being potentially great polluter if appropriate technical protection measures are not implemented. Impact estimation of power plant Gacko, considering its existing system, can be shown by following:

- system of smoke gas,
- system for ash and slag transport and disposal,
- waste water courses.

System of smoke gas:

Emission of particles is determined on the basis of its exit concentration in smoke gas. Concentration of particles in amount of 0.59 g/m3 has been found out by implemented measures. Quantity and composition of smoke gas is determined according to actual parameters of block and coal characteristics.
On the basis of conducted measures and calculations it was find out that concentration of polluters (sulphate dioxide, nitrogen oxide, ash) are mostly in allowed limits. But, emission of air borne ash is significant problem, especially for its characteristic composition (about 75% of CaO)

System for slag transport and disposal:

Inadequate application of ash and slag disposal technologies make surrounding terrain highly degraded and wider area highly polluted by the ash. This makes great danger for ground water pollution, those which in contact with ash has its pH increased to the value of 12 (it takes two years to make all CaO from ash to $Ca(OH)_2$, so that carbonization process could begin).
Additional problem is evacuation of gas from the landfill during accessory chemical processes. Since the planned ash and slag transport system requires water consumption in amount of 150 m^3/h so protection against outflow of used water has to be realized completely with permanent control. This is more important having in mind the fact that area of Gacko is primary water supplying zone for settlement located downstream (Trebinje, Bileća, Herceg Novi, coast of Dubrovnik)
Negative environmental impact caused by the facility for the coal transport refers to the dusting of the surrounding area in re-loading spots and above-bin area. This, basically local problem, combined with other impacts can additionally impact on environment deterioration in wider area as well, if there are no devices for removing the dust or those are not in function.

Identification and wastewater courses:

According to quality and waste water origin spot they can be classified onto:

- oily water,
- water from regeneration
- water from de-carbonization
- water from slag cooling process
- water from washing the installations
- water from removing the mud out of cooling tower
- sanitary waste water, and
- atmospheric waste water

Oily waters are generated in process of storing and burning of crude oil, as well as in the process of cooling with possibility of cooling water pollution with oils and grease or pollution of atmospheric waters from the surface.

Oil concentration varies to the 100 mg/l and beside the oil water contains also smaller amount of suspended admixtures (sand, soil, coal dust).
For time being the problem of collection of these waters with separate sewage is not solved as well as its primary treatment and transport to the central device, which is constructed, but out of function.
Treatment of the turbine condenser for the boiler water supply is being done in the device consisted of filter and mixed exchanger. Device regeneration is done with sulphuric acid and caustic soda so that waste waters are loaded with salts as well. Water is being drained by separate pipeline into neutralization pool and further into the recipient.
De-carbonization waste waters are just partially treated, with process that remove just mud and afterwards water is conducted into recipient without being previously filtrated.
Two steps are foreseen in the process:

- mud deposition at the reactor bottom and its removal trough the device for automatic mud removal, and
- filtrating in sand filters.

Slag cooling waste water contain significant amount of rough mechanical admixtures, some of which are easily deposed and some not. They are characterized by increased temperature and pH value. For that reason it is, before all, necessary to provide cooling and clearing for the purpose of its reuse.
Waste water from boiler device washing process are generated only after the repair of boiler, that is, after it is being washed. Depending on the washing means, waste waters can be of acid (pH=5), neutral or alkaline character (pH 10-10.5). Although there are pools for such water treatment they have not been used for some time.
Waste water from mudding the cooling tower out are partially used for damping the ash, and part of it is introduced into collector of atmospheric sewage and further on into recipient. When carbonate hardness reaches limit value then system is being mudded out, part of that water let out and replaced with de-carbonized one.
Sanitary waste water is being directly introduced into Gračanica river although there is treatment plant type "Putox" (poor functioning and out of function for long time). It was planed to perform this waste water treatment together with urban waste water.
Atmospheric waste water are being introduced into the recipient without treatment. Atmospheric sewage collects also water from slag cooling process what makes situation with waste water even more difficult.
According to estimated waste water pressure and its impact on human health and sea environment it was find out that power plant Gacko has significant environmental impact (table 2.e)

Especially important legal regulations dealing with mentioned problems and defining the mode of their environmental impact control and environmental protection measures are:

- Law on Environmental protection of Republika Srpska, 2003
- Water law of Republika Srpska, 1998, and
- Air protection law of Republika Srpska, 2002

Those laws are basically complement in both entities, and by that, basic parameters and criteria are harmonized. Those laws, amongst other things, for each source define " limit emissions that can not be breached", that is, allowed values of physical-chemical parameters of effluents. Law on environmental protection, as roof law, regulates "preservation, protection, rehabilitation and improvement of ecological quality and quantity of environment...legal measures and institution, activities and tasks of administration...." Also, this law defines all exiting economy persons subject to obligation of having the Ecological permission, so they have to obtain it till the beginning of 2008. That means that they have to fulfill all standards proscribed by the law till that period at latest.

Planned and proposed pollution reduction measures for power plant Gacko:
In power plant Gacko there are already some measures undertaken for the purpose of decreasing or eliminating gas emission. Implemented and planned activities should

completely fulfill conditions for obtaining the ecological/environmental permission till 2008. This will significantly reduce pollution for each component below limit values, and in some cases pollution will be totally eliminated (e.g. water outflow from ash and slag deposit, starting the dust removal, etc.)

Beside some already implemented works coordinated with modern criteria there is plan for following technical and technological pollution reduction measures:

1. **System of smoke gas**
   Two new electric-filter fields are installed during 2002. This has reduced emission of solid particles in smoke gas for several times, so this is now in allowed limits, that is below the limit value (100 mg/m3).
   Although concentrations of polluters (sulphur oxide, nitrogen oxide, etc.), according last measuring are in allowed limits, reconstruction of the boiler significantly reduced emissions of CO, NOx, SO2 gas
   Plan of power plant Gacko for 2005 foresees establishment of monitoring of solid particles in smoke gas and emission of CO, NOx, SO2 from smoke gas.

2. **System for transport and disposal of ahs and slag**
   Construction of appropriate disposal, as well as installation of system for hydraulic transport of ash and slag (optimal relation of water-solid substances 1:1) will completely eliminate water from the disposal that represent significant polluter with ph 12.4 for the open course of river Musnica in size of c/a 100 m3/h per hour. Those activities are planned for 2005.

3. **Waste water courses**
   Final technical-technological solution for waste waters is going to be preceded by the preparation of the Study for waste waters which realization is planned during 2005. Chosen solution will be incorporated into design on which basis one will perform the works. Implementation of all works is foreseen till the end of 2007 at most.
   This will significantly reduce level of waste water pollution for some sectors, and in some sectors pollution will be completely eliminated.

4.2.6 Mineral fertilizers and pesticides

The Mediterranean part of Bosnia and Herzegovina has a relatively small cultivation area adequate enough for intensive agricultural production. The most fertile agricultural surfaces in the Neretva valley is the area around Čapljina and Gabela, around Mostar, Ljubuški, Stolac and Trebinje. The upper Herzegovina area is more suitable for cattle-breeding and wheat cultivation. Eastern Herzegovina also awaits increased agricultural production and cattle-breeding development.

As it is already mentioned in NDA, due to undeveloped service for plant protection and preventive and quarantined service, the application of pesticides is not controlled and is implemented mostly without expert supervision and recommendations. Monitoring of the residuals in the ground, water, and plants has not been established, and there is no data on possible water contamination by pesticides. Data on the number, type and amount of pesticides, which are currently used, is also non-existent.

Analysis on permanent organic pollutants is not being continually conducted due to the lack of laboratory techniques and lack of staff education, and the baseline budget cannot be assessed. The public health institute is intensively working on the preparation and education of cadres, and expects to begin research soon. There is no unified information system or pollutant register.

The Agronomy Institute from Mostar has conducted research in the Neretva and Cetina valleys in Herzegovina on approximately 5520 ha, which shows what amounts of mineral fertilizers and pesticides are used in the area of research and on which surfaces, and they illustrate current water usage conditions in the area of research and assess potential pollution problems. There is a need for further research in order to control water pollution from fertilizer and pesticide use and their potential influence on the water condition.

Based upon the agriculture development strategy in the researched area there is a great possibility for activating surface areas for agricultural purposes (23500 ha is planned to be activated) and hill and mountain areas for cattle breeding. It is realistic to rely on production of healthy foods under a brand name following the conditions of standard application of pesticides, minerals and organic fertilizers. However, with the analysis of certain samples conducted over time in the Agronomy Institute's laboratory, that amount is significantly greater. This is especially the case for vegetable farming, where there are cases of fertilizer and pesticide amounts more than 2-3 times greater that written standards. Such a practice arises, on the one hand, from seeking higher crop yields, and, on the other hand, it is the result of producers' insufficient knowledge and poor education of employees in agricultural pharmacies.

Proposed measures for controlling pesticide pollutants in the Mediterranean region of Bosnia and Herzegovina:

- Aiming for activating surface area for agricultural purposes and cattle-breeding development in hill and mountain areas, and educating producers and employees in agricultural pharmacies, all for the purpose of standardizing the application of pesticides, mineral and organic fertilizers, which will greatly contribute to environmentally acceptable cultivation;
- Parallel with agricultural and cattle-breeding development, it is necessary to determine the polygons for monitoring the influence of mineral and organic fertilizer use as well as pesticide use on water quality. That should be a research project lasting at least three years;
- Tracking the conditions of the soil and its pollution, as a media in which certain processes take place, and possible remnants from pesticides;
- Instituting continual monitoring of the quality of surface water, groundwater, and seas;
- Build a unified information system concerning the quality of surface water, groundwater, and seas;
- Elaborate a register of possible pollutants;
- Modernize and strengthen laboratory pollutant control in the soil and water;
- Establish appropriate monitoring of production and pesticide, mineral and organic fertilizer consumption, all in accordance with the LBS protocol and other regional and international regulations on environmental protection and health;
- Take part in FAO programs;
- Implement the conventions on desertification;
- Educate the population on the importance of land for sustainable development and for future generations;
- Establish cooperation of expert and scientific institutions for the purpose of implementing a unified policy for land management and protection.

All the mentioned activities serve for controlled activation of agriculture and cattle breeding in an environmentally acceptable way and standardized application of pesticides and mineral and organic fertilizers without any harmful consequences for the environment.

4.3 Table 1. List of priority problems

COMMUNAL WASTE WATER							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible Economical Instruments**
Coastal area	Neum	Communal waste waters (BOD,N,P)	Continuation of sewage construction for Klek-Neum-part in BiH, elaboration of I. phase construction of the secondary sewage system / Waste water drainage-expected pollution reduction 80%	JP for water areas of the Adriatic Sea, "Marecco"-Neum	2010	Monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Mostar	Communal waste waters (BOD,N,P)	Urgently need to begin elaborating project documentation, as well as constructing the main collectors (left-bank and right-bank sewerage system collectors) for the Mostar basin and construction of the I phase of WWTP (150000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal companies of Mostar	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Čitluk and Međugorje	Communal waste waters (BOD,N,P)	Construction of separate collectors and separate of I.phase of WWTP, i.e. 2 x 6 000 ES. Construction under preparation. / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea,, Communal company "Brotnjo»	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Konjic	Communal waste waters (BOD,N,P)	Project elaboration and construction of primary channels with parts of the secondary network and construction of the I phase WWTP (10000 ES) / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Konjic	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebišnjica river basin	Nevesinje and Bileća	Communal waste waters (BOD,N,P)	Sanitation of existing sewerage system, project elaboration and construction of collectors and the I phase of WWTP; / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal companies of mentioned municipalities.	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation

COMMUNAL WASTE WATER							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible Economical Instruments**
Neretva river basin	Čapljina	Communal waste waters (BOD,N,P)	Project elaboration of project documentation for construction of the main collectors and I phase of WWTP for 20000 ES. / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Čapljina	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Cetina river basin	Livno	Communal waste waters (BOD,N,P)	Construction of primary channel and parts of the secondary sewerage network, rehabilitation and reconstruction of the existing sewerage system, and project elaboration and construction of collectors and the I phase of WWTP (20000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Livno	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Cetina river basin	Glamoč	Communal waste waters (BOD,N,P)	Sanitation of existing sewerage system, project elaboration and collector and I phase of WWTP (4500 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Glamoč	2010-2015	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Široki Brijeg	Communal waste waters (BOD,N,P)	Sanitation of I phase waste water treatment devices (5000 ES) and construction of collectors; / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Široki Brijeg	2010-2015	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Cetina river basin	Tomislavgrad	Communal waste waters (BOD,N,P)	Construction of main collector and the parts of the sewerage network in the city, and project elaboration and construction of the I phase of WWTP (6000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Tomislavgrad	2010-2015	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation

COMMUNAL WASTE WATER							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible Economical Instruments**
Neretva river basin	Jablanica	Communal waste waters (BOD,N,P)	Project elabor. and constr.of collectors in the I ph.of WWTP 10000 ES; / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Jablanica	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Stolac	Communal waste waters (BOD,N,P)	Project elaboration and construction of the sewerage system and the I phase of WWTP (5000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Stolac	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Grude	Communal waste waters (BOD,N,P)	Project elaboration and continuation of the sewerage system construction and the II phase of WWTP(+2500ES) (with solve problem of WWTP of factory UNILINE-Grude) / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Grude	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Rama-Prozor	Communal waste waters (BOD,N,P)	Project elaboration and construction of the sewerage system of Rama-Prozor and the I phase of WWTP (5000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Rama - Prozor	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Posušje	Communal waste waters (BOD,N,P)	Project elaboration and construction of the sewerage system, collectors and I phase of WWTP (10000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Posušje	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebišnjica river basin	Gacko	Communal waste waters (BOD,N,P)	Project elaboration and construction of the collector and the I phase WWTP / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal company of Gacko.	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation

COMMUNAL WASTE WATER							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible Economical Instruments**
Cetina river basin	Kupres	Communal waste waters (BOD,N,P)	Sanitation of the existing sewerage system, project elaboration, and construction of the sewerage system and the I phase WWTP (3000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Kupres	2015-2020	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebišnjica river basin	Berkovići	Communal waste waters (BOD,N,P)	Project elaboration and construction of sewerage system and waste water treatment plant. / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal company of Berkovići	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Cetina river basin	Bosansko Grahovo	Communal waste waters (BOD,N,P)	Sanitation of the I phase (1650 ES) WWTP, project elaboration and construction of the sewerage system; / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Bosansko Grahovo	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Ljubuški	Communal waste waters (BOD,N,P)	Sanitation of the I phase of WWTP (5000 ES) and project elaboration and construction of the sewerage system; / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Ljubuški	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebišnjica river basin	Trebinje	Communal waste waters (BOD,N,P)	Revitalization and capacity increase of the I phase of WWTP, project elaboration and construction of the sewerage system; / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal company of Trebinje	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebišnjica river basin	Ljubinje and Kalinovik	Communal waste waters (BOD,N,P)	Project elaboration and construction of WWTP and sewerage system / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal companies of Ljubinje and Kalinovik	2020-2025	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation

MUNICIPAL SOLID WASTE – REGIONAL LANDFILLS							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible economic instruments**
Neretva river basin	Mostar region	Solid waste	Regional sanitary landfill / Expected reduction 100%	Communal enterprise, municipality	2007- 2012	monitoring	User charges for municipal waste collection and disposal; Subsidies for recycling
Trebišnjica river basin	Trebinje region	Solid waste	Regional sanitary landfill / Expected reduction 100%	Communal enterprise, municipality	2007- 2012	monitoring	User charges for municipal waste collection and disposal; Subsidies for recycling
Cetina river basin	Livno region	Solid waste	Regional sanitary landfill / Expected reduction 100%	Communal enterprise, municipality	2007- 2012	monitoring	User charges for municipal waste collection and disposal; Subsidies for recycling

BOD 5 FROM INDUSTRIES							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible economic instruments**
Neretva river basin	Mostar	Industrial wastewaters (BOD5) (textile, slaughter-houses, wine)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Posušje	Industrial wastewaters (BOD5) (slaughter-house)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Konjic	Industrial wastewaters (BOD5) (slaughter-house)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Čapljina	Industrial wastewaters (BOD5) (slaughter-house, wine)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Čitluk and Međugorje	Industrial wastewaters (BOD5) (textile, slaughter-house, wine, milk products)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Široki Brijeg	Industrial wastewaters (BOD5) (meat indistry)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Grude	Industrial wastewaters (BOD5) (brewery)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

BOD 5 FROM INDUSTRIES							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible economic instruments**
Neretva river basin	Ljubuški	Industrial wastewaters (BOD5) (wine)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Trebišnjica river basin	Trebinje	Industrial wastewaters (BOD5) (wine)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Trebišnjica river basin	Bileća	Industrial wastewaters (BOD5) (textile)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Trebišnjica river basin	Gacko	Industrial wastewaters (BOD5) (cow farm)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Trebišnjica river basin	Ljubinje	Industrial wastewaters (BOD5) (poultry)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Cetina river basin	Livno	Industrial wastewaters (BOD5) (textile)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Cetina river basin	Glamoč	Industrial wastewaters (BOD5) (textile)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

HAZARDOUS WASTE							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
METAL INDUSTRY							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible economic instruments**
Neretva river basin	Mostar SOKO	Industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Trebišnjica river basin	Trebinje "Tool Industry"	Industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts, galvanization)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Široki Brijeg FEAL	Industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts, galvanization)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Konjic UNIS GAL	Industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts, galvanization)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
MEDICAL WASTE							
Neretva river basin	Mostar	Medical waste	Separation, transfer of station, disposal on hazardous waste landfills or incinerators of hazardous waste.	Ministries for health and for environment; Public enterprise for watershed of Adriatic sea catchment area,	2020	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

THERMO POWER PLANT GACKO							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
River basin	**Location**	**Pollutant**	**Activity / Expected reduction %**	**Stakeholders**	**Time period**	**Reduction Monitoring Method**	**Possible economic instruments**
Trebišnjica river basin	Gacko	TPP Gacko (Emission of particles and gases - sulphur dioxide, nitrogen oxide, wastewaters)	a) Smoke gas system - establishment of monitoring of solid particles in smoke gas and emissions of CO, NOx, SO2 from smoke gases b) System for transport and disposal of ashes and cinder - construction of adequate landfill and system of hydraulic transport of ashes and cinder c) Wastewaters - elaboration of a study of wastewaters - elaboration of final project, as well as introduction of necessary works	Owner / Stockholder; Water directorate	a) 2005 b) 2005 c) 2005 c) 2007	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

5 ECONOMIC INSTRUMENTS

5.1 Introduction

While elaborating proposals for economic instruments, project “national Action Plan for Economic Instruments To Address Marine Pollution From Land-Based Activities” implemented by Priority Actions Program Regional Activity Center (PAP/RAC), Split, was partly taken into consideration. The project was expected to assist in the development of administrative, legal and fiscal mechanisms for the sustainable financing of the implementation of SAP at country level. One of these mechanisms is the use of economic instruments.

5.2 Current condition in B&H

In Bosnia and Herzegovina a number of economic instruments have been introduced, although the role of economic instruments in environmental protection has not been fully recognized. Basically, the “polluter pays” and “user pays” principles have been adopted. Economic instruments can have a number of fiscal advantages including cost recovery for public service companies and increased fiscal revenues. Existing economic instruments in B&H do not provide enough incentives for consumers and producers to change their attitude toward environmental protection. The main problem of effectiveness of existing economic instruments is inadequate level of charges and non-compliance fees. Low charges for public services and natural resources have resulted in inefficient use of resources. Wider problems related to the implementation of existing economic instruments include gray and untaxed economy, legislative gaps regarding enforcement of delayed payments, organizational weaknesses in collection of charges, limited powers of inspectorates to impose sanctions in case of non-compliance, and lack of political support for effective enforcement and implementation of economic instruments.

Forms of economic instruments, which are proposed for environmental protection in B&H, are charges, taxes and fees. At present, the following charges and taxes are prescribed and applied: user charges (for use of natural resources and for public utility services), discharge charges (for pollutants discharged into environment) and special product taxes, when their consumption has damaging impact on the environment (oil derivatives, tobacco products etc).

Economic instruments currently used in B&H are listed below:

1) Water management
- water extraction charges
- water user charges
- water protection charges
- charges for exploitation of material from water stream

2) Wastewater management
- sewage user charges
- charges for wastewater discharge into the sewage
- wastewater treatment charges

3) Solid waste management
- user charges for municipal waste collection and disposal
- deposit refund for beverage containers

4) Transport
- registration charges (cars)

- charge for the road
- tax differentiation un-/leaded gasoline

5) Import
- import duty on vehicles

The following titles describe economic instruments which are proposed in short-term period, until 2007. When introducing economic instruments, following criteria has to be taken into consideration:
- environment efficiency
- economic efficiency
- incentive effects on pollution reduction and technical innovations
- administrative acceptance.

These instruments include taxes, charges, subsidies, deposit refunds and non-compliance fees.

5.3 Proposal of economic instruments

A. WATER	Existing in B&H	Short-term 2007
TAXES/CHARGES		
Water service charges:		
Surface and underground waters utilization;	X	
User charges:		
Mineral water user charges	X	
Water user charges	X	
Irrigation service charges;		X
Charges for water pollution protection:		
Water protection charges	X	
NON-COMPLIANCE FEES		
Non-compliance fees for water pollution	X	X
Grants, soft loans, reduced tax rates, rapid depreciation, etc. - Subsidies		
To support potable water quality improvement;		X

B. SEWAGE AND WASTE WATER	Existing in B&H	Short-term 2007
TAXES/CHARGES		
Sewage user charges;	X	
Charges for wastewater discharge into the sewage;	X	
Wastewater treatment charges	X	
Grants, soft loans, reduced tax rates, rapid depreciation, etc. - Subsidies		
To support construction of Waste Water Treatment Plants		X

C. WASTE DISPOSAL AND MANAGEMENT	Existing in B&H	Short-term 2007
TAXES/CHARGES		
User charges for municipal waste collection and disposal;	X	
Hazardous waste charges;		X
Industrial waste charges;		X
NON-COMPLIANCE FEES		
Waste non-compliance fees;		X
Grants, soft loans, reduced tax rates, rapid depreciation, etc. – Subsidies		
To support recycling and reuse;		X
DEPOSIT REFUND SCHEMES		
Beverage containers (glass)	X	
Beverage containers (PET, glass, metals)		X

D. AIR	Existing in B&H	Short-term 2007
TAXES/CHARGES Air pollution charges		X
NON-COMPLIANCE FEES Air pollution non-compliance fees;		X

G. INDUSTRY	Existing in B&H	Short-term 2007
NON-COMPLIANCE FEES Noise non-compliance fees		X
Grants, soft loans, reduced tax rates, rapid depreciation, etc. – Subsidies For investments in pollution prevention and control;		X

G. PRODUCT CHARGES	Existing in B&H	Short-term 2007
TAXES/CHARGES Pesticides charges		X

5.3.1 Irrigation service charges

Since Bosnia and Herzegovina gained its independence in 1992, irrigation service charges have not been in use due to destroyed irrigation system during the war. In the last ten years the water for irrigation has been illegally used by farmers without any charges.

The Water Law (Official Gazette FB&H no. 18/98; Official Gazette RS no. 10/98) stipulates that obligors of computation and payment of special water management fees for utilization of waters are legal persons and citizens who perform some economic or professional activity and households which are water supplied from their own water supply sources and for utilization of water for **irrigation**. This Law also sets the basis for water fees for water utilization which is 1 m^3 of used water.

According to the Article 201 of Water Law, land reclamation fees are to be paid for repayment of loans and of other funds used for reconstruction and construction of land reclamation systems for drainage and irrigation, as well as for maintenance and management of land reclamation systems as follows:

1. fees for land drainage
2. fees for land irrigation and drainage
3. fees for water supply.

There is an ongoing project in B&H financed by the World Bank (Small Scale Commercial Agricultural Development Project) to rehabilitate existing irrigation and drainage infrastructure and to hand over the systems to revitalized Water Users Associations once they are fully functional. The system needs to be equipped with measuring devices so that water for irrigation can be measured and the users of water charged for the cost of providing them with water.
Within this project two pilot zones are selected in both B&H entities (FB&H and RS); in FB&H the region of Ljubuški field, while in RS it is Trebinje field. Both fields are karstic fields which is a common phenomena in the karst of the Dinarides. The irrigation system is not reconstructed and therefore irrigation service charges are not applied.

Nevertheless, irrigation service charges need to be introduced as they are a very important economic instruments in keeping the system sustainable. These charges should be set a rate which provides cost recovery for:

- costs of irrigating services provided to users of the system,
- costs prescribed by the law (water management charges: for water extraction and water pollution),
- costs of salaries and other relevant costs,
- operation and maintenance cost.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Improvement of irrigation services (reconstruction and maintenance)	Total length of system reconstructed (m) and area irrigated (km^2)	Length measurement of reconstructed system and following the increase of area connected to the system
Environmental Objective: Efficient water use	m^3 water saved	Measurement of water use decrease over a given period of time
Financial Objective: Cost recovery, User Pay Principle	Collection rate	Collecting information of service cost and the amount of revenue collected
Equity Objective: Increase of employment	Number of people employed in agriculture	Following the increase of employment in the agriculture sector

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of the local authorities, public service companies, Ministry of Water Management, Agriculture and Forestry of FB&H and RS	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal Establishment of hydro melioration associations, which will manage the irrigation system;	
Design of EI	Funds collected from user charges for irrigation water can be invested in reconstruction of hydro melioration system; key parameter for calculation of charge is m^3 of used water;	-Financial revenues are increasing; -Positive impact on the environment; sustainable and economic use of water
Review		

5.3.2 Grants, soft loans, reduced tax rates - subsidies to support potable water quality improvement

Bosnia and Herzegovina has at its disposal significant water resources, which will be one of the most important factors of general economic development for the majority of areas in the forthcoming period. The fresh water basins are a key natural resource in Bosnia and Herzegovina. The quality of surface water varies from region to region. Water supply in the territory of Bosnia and Herzegovina is mainly based on the use of ground water sources (89% of the overall sources of water supply), while 10.2% of the water comes from the rivers and 0.8% from the natural lakes and artificial reservoirs.

Due to war in Bosnia and Herzegovina, the water infrastructure of the country was severely damaged. Although it is estimated that the water supply sector has been rehabilitated up to 90% of the pre-war level, as a whole it is still far below the international, particularly European, standards. The springs and source fields are not sufficiently protected, and the quality of potable water is questionable, in certain cases utterly unacceptable. The potential pollution is still hanging as a threat to human health, due to aged and damaged pipelines, uncontrolled chlorination and insufficient pressure. For these reasons, the level of water supply is far below the European one; the coverage is about 50%, as compared with 90% and more in Europe. The extracted water is of varying quality, some is drinkable without any kind of treatment but in other cases the quality is totally unacceptable, especially during the

dry season. Water treatment is in many cases insufficient, often just chlorination even when the water needs additional treatment.

Government may try to improve the existing situation of questionable potable water quality by approving subsidy schemes (grants, soft loans, reduced tax rates) as a form of financial assistance to producers of potable water. These subsidies would be used for construction of Potable Water Treatment Plants and expanding the pipeline system to the population not connected to the system, mainly in suburban areas. The maintenance of the existing water pipelines has been neglected for years, and they are now in poor condition. Provided financial assistance in the form of subsidies would give incentive for repair of old and leaking pipelines and also solving the problem of insufficient pressure, which could also pollute water before it reaches the consumers.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Construction of Potable Water Treatment Plants, reconstruction of water supply system	Number of constructed PWTP, % of reconstructed/ expanded water supply system	Determining the number of constructed PWTPs by using these subsidies over a given period of time
Environmental Objective:	Potable water quality improvement	
Financial Objective: Lower investment cost		
Equity Objective: Protect public health and environment	Number of inhabitants connected to the water supply	Following the increase of connections to the water supply over a period of time

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of local authorities, public service companies, Waterworks, Ministry of Water Management, Agriculture and Forestry of FB&H and RS, Ministries of Finances of FB&H and RS	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	Source of financing may come from earmarked revenues, from one specific or several charges;	Impact of the EI is mostly social providing the population with better quality water and sufficient water pressure
Review		

5.3.3 Grants, soft loans, reduced tax rates – subsidies for construction of Waste Water Treatment Plants

The percentage of population in Bosnia & Herzegovina served by wastewater collection and treatment is very low. About 30% of the population is connected to sewerage systems. In urban areas the connection rate for households is 56%, but in villages and rural areas a maximum of 10% of the households are connected. In operation today are six Treatment Plants, and more than 95% of the municipal waste water is discharged directly into water streams without any kind of treatment. The Mediterranean region of B&H is one of the regions with the lowest percentage of population served by sewerage system. In this region there are only two WWTPs operating in the Federation of Bosnia & Herzegovina (Ljubuški and Grude) and one in the Republic of Srpska (Trebinje).

Most of the industrial waste water is, like municipal waste water, discharged into the nearest watercourse. There are only few operational treatment facilities for industrial waste water.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Construction of Waste Water Treatment Plants	Number of constructed WWTP	Determining the number of constructed WWTPs by using these subsidies over a given period of time
Environmental Objective: Improved effluent quality	PE reduced	Effluent quality sample surveys
Financial Objective: Lower investment cost		
Equity Objective: Protect public health and environment	Number of inhabitants connected to the waste water treatment	Following the increase of connections to the waste water treatment over a period of time

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of the local authorities, public service companies, Ministry of Water Management, Agriculture and Forestry of FB&H and RS, Ministries of Finances of FB&H and RS	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	Government finances the construction of WWTPs; sewage user charges and wastewater treatment charges may be earmarked for this specific purpose; priority should be given to the most polluted water streams	Impact of the EI on the environment is positive, improving degraded ecosystem
Review		

5.3.4 Hazardous waste charges

Hazardous waste means any waste which is covered by separate regulations and which has one or more of the properties, which poses a hazard to human health and to the environment due to its origin, composition or concentration, and which is listed in the list of wastes adopted by a separate regulation. Law on Waste Management, Article 19 (Official Gazette FB&H no. 33/03; Official Gazette RS no. 53/02), stipulates that measures need to taken for the prevention of waste production, especially in the case of hazardous waste, as well as separation of waste, in particular of hazardous waste from other wastes. It is also regulated that households are obliged to collect waste generated by them and to hand it over to the public service provider, and in the case of hazardous waste to selective collection points (centers) or to a person having special authorization for operating waste management services. Waste producers other than households shall use the public service for wastes generated by them, that is the same and/or similar to household waste by its nature.

Currently there is no separation and treatment of hazardous and medical waste from other wastes and they are dumped together with municipal waste at unmanaged and non-sanitary landfills. Facilities that generate hazardous waste are not obliged to allocate funds for the monitoring and disposal of their waste. There are some small incinerators for medical waste in Bosnia and Herzegovina, but they do not meet the technical requirements for medical waste incineration. One such incinerator is at the Uborak landfill (Mostar, Neretva river basin). The temperature of incineration is very low (400-600° Celsius), and there is no purification system for its exhaust gases. Toxic substances like dioxins and furans are released into the atmosphere in the vicinity of hospitals. To prevent the adverse effects of such incineration on the population and the environment, separate collection systems for medical waste need to be introduced and modern high-temperature incinerators with exhaust gas treatment built.

There are no special charges on hazardous waste on neither State nor Entity level. Introduction of those charges should be set a priority due to the increasing number of contaminated sites which represent a serious danger to human health. For hazardous waste, it is particularly important that the charges should be based on volume or weight, as well as the type of waste, and set at rates that encourage companies to introduce processes that will decrease the amount of waste generated, including changes in the technological process and recycling. NEAP also emphasizes that the cost of the disposal of hazardous waste should be entirely covered by the industries and businesses generating it.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Financing of activities planned in the Hazardous Waste Management Strategy Exmp.: Register of hazardous waste, Rehabilitation of contaminated sites, as well as abandoned disposal sites, Landfill construction Construction of hazardous waste incinerators, etc…	Percentage of implementation of planed activity	Following the changes in implementation of planed activities over a period of time
Environmental Objective: Improved state of environment	Number of rehabilitated contaminated sites, Number of companies included into the system	Following decrease of contaminated sites in a period after introduction of these charges
Financial Objective: Cost recovery, User Pay Principle	Collection rate	Collecting information of service cost and the amount of revenue collected
Equity Objective: Protect public health and environment	Number of hot-spots	Following decrease of hot-spots located near inhabited areas

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H, Ministry of Foreign Trade and Economic Relations B&H, Ministry of Health and Social Protection RS, Ministries of Heath FB&H and RS	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal Transport of hazardous waste is regulated by Law on Waste Management	Implementation of Hazardous Waste Management Strategy
Design of EI	Charge rates will be determined according to volume of waste generated; revenues are used for collection and safe disposal of hazardous wastes	Impact of the EI is positive considering that industries will reduce the production of waste in sense of changing their technology or production materials; revenues may be used for developing a collection scheme
Review		

5.3.5 Industrial waste charges

Industrial waste is most often dumped at local landfills along with municipal waste. A portion of the basic and heavy industry, such as mines, thermal power plants etc. have their own dumpsites within their industrial complexes.

The responsibility for collection, transport and disposal of industrial waste lies with the Ministry of Energy, Mining and Industry FB&H and Ministry of Economy, Energy and Development RS. Industry itself is responsible for the separation, treatment and disposal of its waste.

Financing the waste management system in the future needs to be based on the "polluter pays" principle. For the moment, the principle of charging for waste management on the basis of space occupied (m^2) should be implemented, especially for industrial and hazardous waste. Gradually, the charges should be based on the volume or quantity of waste generated and one part of the costs could be recovered by recycling a portion of the wastes. Costs for the disposal of industrial wastes should be entirely covered by those organizations generating the waste (industry and businesses).

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Financing of activities planned in the Industry Waste Management Strategy Exmp.: Register of industrial waste, Rehabilitation of contaminated sites, as well as abandoned disposal sites, Landfill construction, Construction of industrial waste incinerators, etc…	Number of constructed industry waste treatment plants	Collecting data on number of industry waste treatment plants construction, after introduction of these charges, over a period of time
Environmental Objective: Improved state of environment	Number of rehabilitated contaminated sites Number of constructed landfills	Following decrease of contaminates sites and increase of constructed landfills
Financial Objective: Cost recovery, User Pay Principle	Collection rate	Collecting information of service cost and the amount of revenue collected
Equity Objective: Protect public health and environment, increase of employment	Number of people employed	Following increase of employment in the construction of these facilities

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal; The Law on Waste Management stipulates that waste management services shall be provided for a fee, the conditions and structure of which is to be established in separate regulations.	Implementation of Solid Waste Management Strategy
Design of EI	Charge rates will be determined according to volume of waste generated; Rates are set high enough to encourage companies to introduce processes that will decrease the amount of waste generated, including changes in the technological process and recycling.	
Review		

5.3.6 Waste non-compliance fee

Non-compliance fees consist of penalty payments that are imposed in cases of violation of standards of waste management and disposal and for violation of provisions stipulated by Law on Waste Management. Payers of this economic instrument could be any legal or natural persons illegally depositing waste or violating waste management legislation.
In 2005, Federation B&H and RS adopted a group of by-laws, special regulations which are in accordance with the Laws on Waste Management (FB&H, RS) and non-compliance of these regulations may be a basis for application of these fees. The group of adopted regulations consist of: Regulation on conditions of transfer of waste management obligations from producer and dealer to operator of waste collection system (Official Gazette FB&H 9/05; Official Gazette RS 39/05), Regulation on license issuing for activities of small scale

economy in waste management (Official Gazette FB&H 9/05; Official Gazette RS 39/05), Regulation waste categories with lists (Official Gazette FB&H 9/05; Official Gazette RS 39/05), Regulation on waste procedure which is on hazardous waste list or whose content is unknown (Official Gazette FB&H 9/05; Official Gazette RS 39/05), Regulation on content of plans for waste management for existing treatment plants and for waste disposal and of activities carried out by the competent authority (Official Gazette FB&H 9/05; Official Gazette RS 39/05).

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective Reduced non-compliance	Number of non-compliance	Following of possible decrease in the number of non-compliance
Environmental Objective: Improved state of environment	Number of contaminated sites	Following reduction of contaminates sites during given period of time
Financial Objective: Collecting revenue	Collection rate	Providing data of amount of revenue collected during given period of time
Equity Objective: Protect public health and environment		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	Establish a functioning monitoring system
Design of EI	Fees will be set in the case of non-compliance with permit conditions and regulations for waste disposal;	The main purpose of the EI is to raise revenue and to make an influence on businesses and industries to comply with the regulations stipulated by the Law on Waste Management
Review		

5.3.7 Subsidies to support recycling and reuse

Laws on Waste Management of RS and FB&H contain provisions for collecting waste separately according to type and provisions for introducing recycling for certain types of waste. Such changes in waste management system are certainly desirable from environmental perspective, but the mechanism for introducing them, and particularly economic aspects, are not clear. Waste separation and recycling will need significant capital investment before part of the waste management costs can be recovered through sale of recycled materials.

Bosnia and Herzegovina does not have a system of recycling or treatment. There is some potential for recycling and reuse, because a big part of waste is actually a source of secondary raw material such as paper, glass, metal and plastic. Organic waste could be composted and used as fertilizer. The main problem with the separation of municipal waste is equipment unavailability for processing separated components (paper, glass, metal, aluminum, organic waste). At present there is also no industrial waste recycling or reuse as secondary raw material. However, such industrial waste as electro filter ash from thermoelectric plants, red mud from aluminum plants, steel slag and mining waste are valuable sources of secondary raw material that could be used in other industries. Mining waste (overburden), for example, could be used to rehabilitate municipal landfills and repair roads, restore contaminated land for building; spent oil and solvents could be processed to produce low-grade solvents and oil.

Ministry of Physical Planning and Environment of FB&H and Ministry of Physical Planning, Civil Engineering and Ecology of RS, in cooperation with municipalities, should raise awareness and organize training of separation, recycling and reuse, and undertake feasibility studies for organizing a separate collection of municipal waste and constructing facilities for its recycling and reuse. The studies should also examine economic aspects including potential market for such recycled or reused goods.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective Expand of recycling network (investment in plants for recycling and net of collection and transport of row material)	Number and capacity of constructed recycling plants	Determining the number of constructed recycling plants by using these subsidies over a period of time
Environmental Objective: Efficient use of resources	Quantity of recycled waste	Collecting data of recycled waste quantity over a given period of time
Financial Objective: Lower cost investment	% of reduction of total investment	Comparing investment cost with and without using these subsidies
Equity Objective:		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	Adopt the framework law on recycling and processing of secondary raw materials
Design of EI	Local authority can invest in the construction of recycling network and plants using funds allocated by some other revenue raising economic instrument;	
Review		

5.3.8 Deposit refund schemes – beverage containers (PET, glass, metals)

Deposit refund systems are not widely introduced in Bosnia and Herzegovina. In the pre-war period it was usual for glass (bottles for mineral water, juices or beer) but now even in that area cans mostly replaced bottles. Only a few local beer factories (like Sarajevo beer factory or Tuzla beer factory) still use the system (for last 30 or more years) but for just part of their production (other, greater parts are covered with cans). Percentage of products returned is around 70 percent. Foreign products rarely use the system, although there are no specific trade barriers. Consumers now mostly prefer cans (easier to handle), so as distributors and retailers, for the same reason. These cans are collected separately (for recycling) only on few spots in some Bosnian cities.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Improved waste management	Rates of return for beverage containers	Collecting data of the amount of returned beverage containers
Environmental Objective: Reduction of environmental degradation caused by disposal of containers into the environment and landfills	Reduced volume of waste	Following of possible reduction of disposed waste quantity
Financial Objective: Reduction of production cost by containers reuse	% of cost savings	Providing data of amount of savings during given period of time
Equity Objective: Protect pubic health and environment		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	Deposit-refund scheme imposes a penalty if the material is not returned for recycling; A higher deposit will provide a higher return rate.	
Review		

5.3.9 Air pollution charge

Air emission charges were in use in the former Socialist Federal Republic of Yugoslavia and exist in principle in Bosnia and Herzegovina. However, in practice it is not implemented, and industries are not paying anything for air emissions even when the content and amount of air pollution from their activities are known. There is also no requirement for self reporting of data on air pollution from these companies. The Federation's Law on Air Protection (Official Gazette F BiH 33/2003) and Republika Srpska's Law on Air Protection (Official Gazette RS 53/2002) state that the "polluter pays" principle should be applied to ensure that the cost of air pollution abatement is borne by the operators of pollution sources. For most activities that may result in air pollution, the Laws specify regulatory, rather than economic instruments, through a system of environmental, urban, construction and user permits. The payment for permits is not mentioned explicitly in the Laws except for a fee for conducting an air study before a permit can be issued. It is not clear whether companies emitting different types or quantities of air pollutants will be charged differently for their permits. The Laws specify that fines are to be paid for operating without a permit, exceeding emission values specified in the permit and other violations.

In 2005, Federation B&H and RS adopted a group of by-laws, special regulations which are in accordance with the Laws on Air Protection (FB&H, RS): Regulation on air emission monitoring (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05), Regulation on air quality limit values (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05), Regulation on emission of vaporizable organic compounds (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05), Regulation on conditions for operating of waste incineration plant (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05), Regulation on air emission limit values from incineration plant (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05), Regulation on air emission limit values (Official Gazette FB&H, 12/05, Official Gazette RS, 39/05).

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Improve monitoring systems for air quality control in urban and rural areas, Car fleet equipped with catalytic converters Capacity of SO_x and NO_x abatement equipment of stationary resources	Number of car fleet equipped with catalytic converters Improved capacity of SO_x and NO_x abatement equipment of stationary resources	Collecting data of usage of catalytic converters Following the capacity improvement level of SO_x and NO_x abatement equipment
Environmental Objective: Improved air environment	Air quality parameters (SO_x, NO_x…)	Air quality surveys
Financial Objective: Increasing revenue of government budget, Polluter Pay Principle	KM[1] of revenue	Providing data of amount of revenue collected during given period of time
Equity Objective: Protect pubic health and environment		

[1] 1 € = 1,95583 KM

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal Adopted by-laws: special regulations for specific emitters, provisions and requirements for monitoring, air quality and air emission limit values	
Design of EI	The charge rate of EI will be in accordance with the volume of pollution	
Review		

5.3.10 Air emission non-compliance fee

Emission non-compliance fees were also in use in the former Socialist Federal Republic of Yugoslavia and exist in principle in Bosnia and Herzegovina, but neither this economic instrument is implemented in practice.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Reduced non-compliance	Number of non-compliance	Following of possible decrease in the number of non-compliance
Environmental Objective: Improved air environment	Air quality parameters (SO_x, NO_x…)	Air quality surveys
Financial Objective: Collecting revenue	KM of revenue	Providing data of amount of revenue collected during given period of time
Equity Objective: Protect pubic health and environment		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal Adopted by-laws: special regulations for specific emitters, provisions and requirements for monitoring, air quality and air emission limit values	
Design of EI	Fees will be set in the case of non-compliance with permit conditions and regulations for air emissions	The purpose of the EI is mostly to raise revenue
Review		

5.3.11 Noise pollution non-compliance fee

Currently, increased noise in urban areas is mainly due to increased road traffic and other noise pollution sources such as industry. Noise levels are not monitored and there are no studies of the effect of increased noise pollution due to road traffic intensification.

According to the Law on Environment Protection “the protection against noise and vibration in the environment shall cover all artificially generated energy emissions, which cause an unpleasant, disturbing, endangering or impairing noise or vibration load.” Sources of noise emission and vibration can be divided into four categories: motor vehicle, airplanes, household appliances and construction equipment.

Law on Environment Protection stipulates the following measures:

- the abatement of the noise emission or vibration generation of sources of noise and vibration;
- the reduction or prevention of an increase in the noise or vibration load;
- the posterior protection of environments loaded above standard levels on a permanent basis.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Reduced non-compliance	Number of non-compliance	Following of possible decrease in the number of non-compliance
Environmental Objective: Improved state of environment	Level of ambient noise	Survey of ambient noise level
Financial Objective: Collecting revenue	KM of revenue	Providing data of amount of revenue collected during given period of time
Equity Objective: Protect pubic health		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	Fees will be set in the case of non-compliance with permit conditions and regulations for noise	The purpose of the EI is mostly to raise revenue
Review		

5.3.12 Subsidies for investments in pollution prevention and control

Cleaner Production (CP), is a continuous application of a systematic, preventive environmental strategy to processes, products and services so as to increase efficiency and reduce risks to humans and environment. By targeting the causes rather than the consequences of polluting activities, cleaner production eliminates pollutants at their sources – where and when they occur in manufacturing and other production processes – and eliminates the need to treat or dispose of those pollutants later. Organizations may use CP to look for new and innovative practices that will lead to waste reduction and at the same time increase profits by reducing costs or stimulating new products.

Majority of industrial plants in B&H date back to the post war era and they do not comply with environmental standards relying on the European policies and practices. However, after adoption of regulations, the industries will be enforced to implement them, i.e. they will have to introduce measures in order to prevent, mitigate and control pollution. The new set of Environmental Laws obliged industries to implement CP measures, i.e. cleaner production in B&H industries is introduced into national policy and strategy as a tool for accomplishing environmentally sustainable industrial development. Its application in industrial facilities in B&H is based, by adoption of set of environmental laws in B&H (FB&H and RS, in 2003), on EU directive for integral pollution prevention and control (IPPC). Directive is stipulated through provisions related to issuing environmental permit. Namely, all industrial facilities which are planed to be built, can be built and operational with condition of obtaining environmental permit, in accordance with provisions of this law and Law on administrative procedure, where existing industrial facilities must obtain environmental until 2008, latest.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Investment in cleaner techniques (BAT and BEP, EMS) to prevent and reduce pollutants emissions	Level of usage of cleaner techniques	Collecting data of usage of cleaner techniques (BAT and BEP, EMS)
Environmental Objective: Improvement of companies environmental performance – reduced emissions	Relevant parameters for water, waste and air emission	Measuring of relevant parameters for water, waste and air emission, and analysis of their trends
Financial Objective: Lower cost investment, Savings in production	% of reduction of total investment Annual savings, or % of reduction of product prize	Comparison of investment cost with and without using these subsidies, following the percentage of annual savings
Equity Objective: Protect public health and environment		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, public service companies, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	The subsidy could be offered for the purchase of pollution abatement equipment or technology; Investment by means of loans at low interest rates	
Review		

5.3.13 Pesticide charges

Existing data show that B&H agriculture didn't have a significant negative impact on the environment as a result of intensive production. However, this situation can be changed with development of this sector and production-oriented agriculture in the next few years. Considering the fact that there is no monitoring of environmental impact of agriculture, situation analysis is based upon assessment. In the main production regions, as well as in river valleys, inadequate and overuse of mineral fertilizers and pesticides represents a threat.

Uncontrolled and overuse of pesticides has been a problem even before the war, when it reached high levels of 1 kg per hectare of arable land. During the war, input of chemicals into soil has been drastically reduced and the soil was able to recover. However, rehabilitation of agricultural development will bring back the risk of pesticides. Therefore, relevant charges need to be introduced, whose level will give incentive in order for pesticides to be used adequately and in a proper moment for crops.

Objectives of the economic instrument

Hierarchy of Objectives	Key Performance Indicators	Monitoring and Evaluation
Development Objective: Improvement in soil quality	Level of pesticides usage	- Control of owning a license for pesticide traffic - Control of legal entities who deal with production, traffic, usage and examination of pesticides - Control of pesticide storage capacity with domestic producers - Control of storage, keeping and supplying of pesticides
Environmental Objective: Improved state of environment	Number of doses applied per hectare on cultivated land	Following changes in number of doses applied over a given period of time
Financial Objective: Increasing of revenue	KM of revenue	Providing data of amount of revenue collected during given period of time
Equity Objective: Protect pesticides users, the general public and environment		

Implementation Plan

Activity	Actions/Inputs	Outputs
Consultations	Meetings with representatives of industry, the local authorities, agriculturists, Ministry of Urban Planning, Civil Engineering and Ecology RS, Ministry of Urban Planning and Environment FB&H	Reports on the results of the consultations
Administrative/ Legal Steps	Reviewing legal base for the proposal	
Design of EI	Charge base for pesticides is the retail price of the pesticides;	
Review		

6 PRIORITY LIST FOR 2010

River basin	Location	Pollutant	Activity / Expected reduction %	Stakeholders	Time period	Reduction Monitoring Method	Possible economic instruments
COMMUNAL WASTEWATERS							
Coastal area	Neum	Communal waste waters (BOD,N,P)	Continuation of sewage construction for Klek-Neum-part in BiH, elaboration of I. phase construction of the secondary sewage system / Waste water drainage-expected pollution reduction 80%	JP for water areas of the Adriatic Sea, "Marecco"-Neum	2010	Monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Mostar	Communal waste waters (BOD,N,P)	Urgently need to begin elaborating project documentation, as well as constructing the main collectors (left-bank and right-bank sewerage system collectors) for the Mostar basin and construction of the I phase of WWTP (150000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal companies of Mostar	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Citluk and Medjugorje	Communal waste waters (BOD,N,P)	Construction of separate collectors and separate of I.phase of WWTP, i.e. 2 x 6 000 ES. Construction under preparation. / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea,, Communal company "Brotnjo»	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Konjic	Communal waste waters (BOD,N,P)	Project elaboration and construction of primary channels with parts of the secondary network and construction of the I phase WWTP (10000 ES) / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Konjic	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Trebisnjica river basin	Nevesinje	Communal waste waters (BOD,N,P)	Project elaboration and construction of collectors and the I phase of WWTP; / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal companies of mentioned municipalities.	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation

River basin	Location	Pollutant	Activity / Expected reduction %	Stakeholders	Time period	Reduction Monitoring Method	Possible economic instruments
Trebisnjica river basin	Bileca	Communal waste waters (BOD,N,P)	Sanitation of existing sewerage system, project elaboration and construction of collectors and the I phase of WWTP; / Secondary treatment –expected pollution reduction - 90%	Management for waters, agriculture and fishery, communal companies of mentioned municipalities.	2010	Monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Neretva river basin	Capljina	Communal waste waters (BOD,N,P)	Project elaboration of project documentation for construction of the main collectors and I phase of WWTP for 20000 ES. / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Čapljina	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
Cetina river basin	Livno	Communal waste waters (BOD,N,P)	Construction of primary channel and parts of the secondary sewerage network, rehabilitation and reconstruction of the existing sewerage system, and project elaboration and construction of collectors and the I phase of WWTP (20000 ES); / Secondary treatment –expected pollution reduction - 90%	JP for water areas of the Adriatic Sea, Communal company of Livno	2010	monitoring	Subsidies for constructing plants (grants, loans, tax relief, taxes); Sewage system use compensation; waste water release compensation; waste water treatment compensation
SOLID WASTE							
Neretva river basin	Mostar region	Solid waste	Regional sanitary landfill / Expected reduction 100%	Communal enterprise, municipality	2007-2012	monitoring	User charges for municipal waste collection and disposal; Subsidies for recycling
INDUSTRIAL WASTEWATERS (BOD5)							
Neretva river basin	Mostar	Industrial wastewaters (BOD5) (textile, slaughter-houses, wine)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

River basin	Location	Pollutant	Activity / Expected reduction %	Stakeholders	Time period	Reduction Monitoring Method	Possible economic instruments
Neretva river basin	Citluk and Međugorje	Industrial wastewaters (BOD5) (textile, slaughter-house, wine, milk products)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Siroki Brijeg	Industrial wastewaters (BOD5) (meat indistry)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Cetina river basin	Livno	Industrial wastewaters (BOD5) (textile)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Cetina river basin	Glamoc	Industrial wastewaters (BOD5) (textile)	Pre-treatment / Expected reduction. 30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2010 2008	monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
METAL INDUSTRY							
Trebisnjica river basin	Trebinje – "Tool industry"	Metal industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts, galvanization)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Stockholders; Water directorate;	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;
Neretva river basin	Konjic UNIS GAL	Metal industrial wastewaters (Mineral oils, Cd, trichlorides, waste salts, galvanization)	Pre-treatment / Expected reduction. 20-30% Cleaner production / Expected reduction 20-30%	Owner / Stockholder; Public enterprise for watershed of Adriatic sea catchment area	2006-2010	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

River basin	Location	Pollutant	Activity / Expected reduction %	Stakeholders	Time period	Reduction Monitoring Method	Possible economic instruments
THERMO POWER PLANT GACKO							
Trebisnjica river basin	Gacko	Thermo Power Plant Gacko (Emission of particles and gases - sulphur dioxide, nitrogen oxide, wastewaters)	a) Smoke gas system - establishment of monitoring of solid particles in smoke gas and emissions of CO, NOx, SO2 from smoke gases b) System for transport and disposal of ashes and cinder - construction of adequate landfill and system of hydraulic transport of ashes and cinder c) Wastewaters - elaboration of a study of wastewaters - elaboration of final project, as well as introduction of necessary works	Owner / Stockholder; Water directorate	a) 2005 b) 2005 c) 2005 c) 2007	Inspection Monitoring	Subsidies for WWTP construction (grants, soft loans, reduced taxes); Charges for wastewater discharge into the sewage;

7 TABLE

7.1 Issue/Impact Matrix

ISSUE/IMPACT MATRIX
-COMMUNAL WASTEWATERS-

Table 1.a. Issue/impact matrix – Communal wastewaters

NERETVA RIVER BASIN – *COMMUNAL WASTEWATERS*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Significance**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
MOSTAR	110 000	**34**	4x4	3x3	2x3	1x3	Direct discharge	Construction of Treatment Plant
POSUŠJE	17 456	**24**	4x3	3x2	2x2	1x2	Septic tanks – pollution of water source	Construction of sewage system and Treatment Plant
KONJIC	31 500	**26**	4x3	3x3	2x3	1x2	Direct discharge	Construction of Treatment Plant
ČAPLJINA	28 800	**30**	4x3	3x3	2x3	1x3	Direct discharge	Construction of Treatment Plant
ČITLUK AND MEĐUGORJE	15 000	**26**	4x3	3x2	2x3	1x2	Septic tanks – pollution of water source	Construction of sewage system and Treatment Plant
STOLAC	12 300	**26**	4x3	3x2	2x3	1x2	Direct discharge	Construction of Treatment Plant
JABLANICA	13 016	**20**	4x2	3x2	2x2	1x2	Direct discharge	Construction of Treatment Plant
ŠIROKI BRIJEG	29 170	**24**	4x3	3x2	2x2	1x2	Discharge into the river, septic tanks	Construction of sewage system and Treatment Plant
GRUDE	15 500	**23**	4x3	3x2	2x2	1x1	Treatment Plant of insufficient capacity	Construction of sewage system and increase of capacity
RAMA - PROZOR	19 700	**22**	4x3	3x1	2x3	1x1	Discharge into the river, septic tanks	Construction of sewage system and Treatment Plant
LJUBUŠKI	27 540	**20**	4x2	3x2	2x2	1x2	Treatment plant exists, but there are also septic tanks	Expansion of the sewage system

Table 2.a. Issue/impact matrix – Communal wastewaters

TREBIŠNJICA RIVER BASIN - *COMMUNAL WASTEWATERS*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
BILEĆA	11 200	**30**	4X4	3X2	2X3	1X2	Partly constructed sewage; septic tanks; no treatment; discharge near water intake; jaundice registered	Construction of sewage treatment plant, rehabilitation of septic tanks
NEVESINJE	15 500	**30**	4x4	3x2	2x3	1x2	Partly constructed sewage; septic tanks; no treatment; sewage is partly discharged in underground waters, smaller part goes into accumulation	Construction of sewage treatment plant, rehabilitation of septic tanks and accumulation coast
GACKO	10 000	**21**	4x3	3x1	2x2	1x2	Partly constructed sewage; septic tanks; no treatment; mostly discharged into water stream	Construction of sewage treatment plant, rehabilitation of septic tanks
LJUBINJE	4 200	**16**	4X2	3X1	2x2	1X1	Partly constructed sewage; septic tanks; no treatment; mostly discharged in underground waters	Construction of sewage treatment plant, rehabilitation of septic tanks
BERKOVIĆI	3 200	**20**	4x3	3x1	2x2	1x1	Mostly septic tanks	Construction of sewage treatment plant, rehabilitation of septic tanks
TREBINJE	25 000	**17**	4x2	3x2	2x1	1x1	Part of the town doesn't have; septic tanks; treatment plant exists	Construction of part of sewage system; reconstruction of treatment plant; rehabilitation of septic tanks
KALINOVIK	3 800	**16**	4x2	3x1	2x2	1x1	Partly constructed sewage; septic tanks; no treatment; mostly discharged into the river	Construction of sewage treatment plant, rehabilitation of septic tanks

Table 2.a. Issue/impact matrix – Communal wastewaters

CETINA RIVER BASIN - *COMMUNAL WASTEWATERS*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
LIVNO	42 000	**30**	4x3	3x3	2x3	1x3	Livno town direct discharge into rivers; rest of the municipality-septic tanks	Continuance and construction of sewage and treatment plant
TOMISLAVGRAD	29 385	**25**	4x3	3x2	2x2	1x3	Septic tanks-underground infiltration	Construction of sewage and treatment plant
GLAMOČ	4 637	**23**	4x3	3x2	2x2	1x1	Existing sewage damaged - jaundice registered	Reconstruction, rehabilitation and construction of sewage and treatment plant
KUPRES	2 650	**20**	4x2	3x2	2x2	1x1	Existing sewage damaged	Reconstruction, rehabilitation and construction of sewage and treatment plant
BOSANSKO GRAHOVO	1 861	**20**	4x2	3x2	2x2	1x1	Existing sewage and treatment plant damaged	Reconstruction and rehabilitation of sewage and treatment plant, and continuance of sewage construction.

Table 2.a. Issue/impact matrix – Communal wastewaters

NEUM COASTAL AREA - *COMMUNAL WASTEWATERS*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Significance**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
NEUM	4 656	**33**	4x3	3x4	2x3	1x3	Sewage not completely constructed	Continuance of sewage construction

ISSUE/IMPACT MATRIX
-MUNICIPAL SOLID WASTE-

Table 2.b. Issue/impact matrix – Municipal solid waste

NERETVA RIVER BASIN – *MUNICIPAL SOLID WASTE*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**(*) Unsanitary /illegal landfill**	**(*) Construction of sanitary landfill**
MOSTAR	130 000	**33**	4x4	3x3	2x3	1x2	*	*
POSUŠJE	17 456	**24**	4x4	3x1	2x2	1x1	*	*
KONJIC	31 500	**30**	4X4	3x2	2X3	1X1	*	*
ČAPLJINA	28 800	**33**	4X4	3x3	2X3	1X2	*	*
ČITLUK I MEĐUGORJE	15 000	**30**	4X4	3X2	2X3	1X2	*	*
STOLAC	12 300	**28**	4X4	3X2	2X2	1X2	*	*
JABLANICA	13 016	**24**	4X4	3X1	2X2	1X1	*	*
ŠIROKI BRIJEG	29 170	**24**	4X4	3X1	2X2	1X1	*	*
GRUDE	15 500	**24**	4X4	3X1	2X2	1X1	*	*
RAMA - PROZOR	19 700	**24**	4X4	3X1	2X2	1X1	*	*
LJUBUŠKI	27 540	**28**	4X4	3x2	2X2	1x2	*	*

Table 2.b. Issue/impact matrix – Municipal solid waste

TREBIŠNJICA RIVER BASIN - *MUNICIPAL SOLID WASTE*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
TREBINJE	25 000	**33**	4x4	3x3	2x3	1x2	No sanitary landfill; existing landfill located near settlement, water source and agriculture area	Sanitary landfill and rehabilitation of the existing one
NEVESINJE	15 500	**28**	4x4	3x2	2x2	1x2	No sanitary landfill; existing landfill located near settlement, water source and agriculture area	Sanitary landfill and rehabilitation of the existing one
BILEĆA	11 200	**27**	4x4	3x1	2x3	1x2	No sanitary landfill; existing landfill located near settlement and accumulation	Sanitary landfill and rehabilitation of the existing one
GACKO	10 000	**25**	4x4	3x1	2x2	1x2	No sanitary landfill; existing landfill located near settlement	Sanitary landfill and rehabilitation of the existing one
BERKOVIĆI	3 200	**24**	4x4	3x1	2x2	1x1	No sanitary landfill; existing landfill located near water source and agriculture area	Sanitary landfill and rehabilitation of the existing one
LJUBINJE	4 200	**24**	4x4	3x1	2x2	1x1	No sanitary landfill; existing landfill located near settlement and agriculture area	Sanitary landfill and rehabilitation of the existing one
KALINOVIK	3 800	**24**	4x4	3x1	2x2	1x1	No sanitary landfill; existing landfill located near settlement	Sanitary landfill and rehabilitation of the existing one

Table 2.b. Issue/impact matrix – Municipal solid waste

CETINA RIVER BASIN - *MUNICIPAL SOLID WASTE*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**(*) Unsanitary /illegal landfill**	**(*) Construction of sanitary landfill**
LIVNO	42 000	**30**	4X4	3x2	2x3	1x2	*	*
TOMISLAVGRAD	29 385	**28**	4X4	3x2	2X2	1x2	*	*
GLAMOČ	4 637	**24**	4X4	3X1	2X2	1X1	*	*
KUPRES	2 650	**24**	4X4	3X1	2X2	1X1	*	*
BOSANSKO GRAHOVO	1 861	**24**	4X4	3X1	2X2	1X1	*	*

Table 2.b. Issue/impact matrix – Municipal solid waste

NEUM COASTAL AREA - *MUNICIPAL SOLID WASTE*								
1	**2**	**3**	**4**				**5**	**6**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
NEUM	4 656	**36**	4X4	3X4	2X3	1X2	Unsanitary landfill	Construction of sanitary landfill

ISSUE/IMPACT MATRIX
-INDUSTRIAL WASTEWATER (BOD)-

Table 2.c. Issue/impact matrix – Industrial wastewaters

NERETVA RIVER BASIN - *BOD5*							
1	**2**	**3**				**4**	**5**
PROBLEM	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
		HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**Approximate values of BOD from industries**	
MOSTAR	**27**	4x3	3x3	2x2	1x2	≈6 110 238,90kg/year	
POSUŠJE	**14**	4x2	3x1	2x1	1x1	≈1534,10 kg/ year	
KONJIC	**20**	4X2	3X2	2X2	1X2	≈1 105 kg/ year	
ČAPLJINA	**20**	4X2	3X2	2X2	1X2	≈3 669,26 kg/ year	
ČITLUK I MEĐUGORJE	**24**	4X3	3X2	2X2	1X2	≈902 270,86 kg/ year	
STOLAC	**10**	4X1	3X1	2X1	1X1	≈210,5 kg/ year	
JABLANICA	**12**	4X1	3X1	2X2	1X1	≈942,2 kg/ year	
ŠIROKI BRIJEG	**22**	4X2	3X2	2X3	1X2	≈272,4 kg/ year	
GRUDE	**14**	4X2	3X1	2X1	1X1	≈1 065,54 kg/ year – treatment effects	
RAMA - PROZOR	**10**	4X1	3X1	2X1	1X1	≈157,86 kg/ year	
LJUBUŠKI	**17**	4X2	3X2	2X1	1X1	≈811,20 kg/ year	

Table 2.c. Issue/impact matrix – Industrial wastewaters

TREBIŠNJICA RIVER BASIN - *BOD5*							
1	**2**	**3**				**4**	**5**
PROBLEM	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
		HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**Approximate values of BOD from industries**	
TREBINJE	**10**	4x1	3x1	2x1	1x1	≈720 kg/ year	
NEVESINJE	**16**	4x2	3x1	2x2	1x1	≈ 500 000 kg/ year	
BILEĆA	**21**	4x3	3x2	2x1	1x1	≈ 198 500 kg/ year	
GACKO	**17**	4x2	3x2	2x1	1x1	≈ 750 000 kg/ year	
BERKOVIĆI	**/**	/	/	/	/	/	
LJUBINJE	**17**	4x2	3x2	2x1	1x1	≈ 850 000 kg/ year	
KALINOVIK	**/**	/	/	/	/	/	

Table 2.c. Issue/impact matrix – Industrial wastewaters

CETINA RIVER BASIN - *BOD5*							
1	**2**	**3**				**4**	**5**
PROBLEM	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
		HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**Approximate values of BOD from industries**	
LIVNO	**23**	4X2	3X3	2X2	1X2	≈ 500 000 kg/ year	
DRVAR	**/**	/	/	/	/	/	
TOMISLAVGRAD	**10**	4x1	3x1	2x1	1x1	≈ 135 kg/ year	
GLAMOČ	**20**	4X2	3X2	2X2	1X2	≈ 323 900 kg/ year	
KUPRES	**/**	/	/	/	/	/	
BOSANSKO GRAHOVO	**/**	/	/	/	/	≈ 8 kg/ year	

Table 2.c. Issue/impact matrix – Industrial wastewaters

NEUM COASTAL AREA - *BOD5*							
1	**2**	**3**				**4**	**5**
PROBLEM	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
		HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**	**Approximate values of BOD from industries**	
NEUM	**23**	4X2	3X3	2X2	1X2	≈12 000 kg/year	

ISSUE/IMPACT MATRIX
-HAZARDOUS WASTE-

Table 2.d. Issue/impact matrix – Hazardous waste

NERETVA RIVER BASIN – HAZARDOUS WASTE								
1		**2**	**3**				**4**	**5**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
UNIS - KONJIC	31 500	**25**	4X3	3X2	2X2	1X3		
SOKO - MOSTAR	130 000	**20**	4X2	3X2	2X2	1X2		
FEAL - ŠIROKI BRIJEG	29 170	**19**	4X2	3X2	2X1	1X3		

Table 2.d. Issue/impact matrix – Hazardous waste

TREBIŠNJICA RIVER BASIN - HAZARDOUS WASTE								
1		**2**	**3**				**4**	**5**
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
			HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
TOOL INDUSTRY - TREBINJE	25 000	**27**	4X3	3X2	2X3	1X3		

ISSUE/IMPACT MATRIX
-THERMO POWER PLANT GACKO-

Table 2.e. Issue/impact matrix – TPP Gacko

TREBIŠNJICA RIVER BASIN - THERMO POWER PLANT GACKO							
1	**3**	**4**				**5**	**6**
PROBLEM	**Signific.**	**IMPACT**				**CAUSE**	**POSSIBLE SOLUTIONS**
		HUMAN HEALTH	**MARINE ENVIRON.**	**SOCIO-ECONOMIC LOSS**	**GENERAL ENVIRON.**		
GACKO	**34**	4X4	3X3	2X3	1X3	Particles and gas emission; wastewaters from production process; municipal wastewaters	Filters; adequate landfill; pre-treatment and treatment plants

7.2 Rank list of environmental priorities

PRIORITY ACCORDING TO
COMMUNAL WASTEWATERS

Table 2.f. Priority according to communal wastewaters

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA			
Ranking according to health, socio-economic and environmental criteria			
Location	**Priority according to communal wastewaters**		**Population number (2001)**
	SIGNIFICANCE	**RANKING**	
Mostar	**34**	**1**	130 000
Neum	**33**	**2**	4 656
Čapljina	**30**	**3-I**	28 800
Nevesinje	**30**	**3-II**	15 500 (from NDA)
Bileća	**30**	**3-III**	11 200 (from NDA)
Livno	**30**	**3-IV**	42 000
Konjic	**26**	**4-I**	31 500
Čitluk i Međugorje	**26**	**4-II**	15 000
Stolac	**26**	**4-III**	12 300
Tomislavgrad	**25**	**5**	29 385
Široki Brijeg	**24**	**6-I**	29 170
Posušje	**24**	**6-II**	17 456
Grude	**23**	**7-I**	15 500
Glamoč	**23**	**7-II**	4 637
Rama-Prozor	**22**	**8**	19 700
Gacko	**21**	**9**	10 000 (from NDA)
Ljubuški	**20**	**10-I**	27 540
Jablanica	**20**	**10-II**	13 016
Berkovići	**20**	**10-III**	3 200 (from NDA)
Bos. Grahovo	**20**	**10-IV**	1 861
Kupres	**20**	**10-V.**	2 650
Trebinje	**17**	**11**	25 000 (from NDA)
Ljubinje	**16**	**12-I**	4 200 (from NDA)
Kalinovik	**16**	**12-II**	3 800 (from NDA)

PRIORITY ACCORDING TO
MUNICIPAL SOLID WASTE

Table 2.g. Priority according to municipal solid waste

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA			
Ranking according to health, socio-economic and environmental criteria			
Location	**Priority according to municipal solid waste**		**Population number (2001)**
	SIGNIFICANCE	**RANKING**	
Neum	**36**	**1**	4 656
Mostar	**33**	**2-I**	130 000
Čapljina	**33**	**2-II**	28 800
Trebinje	**33**	**2-III**	25 000 (from NDA)
Konjic	**30**	**3-I**	31 500
Čitluk i Međugorje	**30**	**3-II**	15 000
Livno	**30**	**3-III**	42 000
Ljubuški	**28**	**4-I**	27 540
Stolac	**28**	**4-II**	12 300
Nevesinje	**28**	**4-III**	15 500 (from NDA)
Tomislavgrad	**28**	**4-IV**	29 385
Bileća	**27**	**5**	11 200 (from NDA)
Gacko	**25**	**6**	10 000 (from NDA)
Široki Brijeg	**24**	**7-I**	29 170
Posušje	**24**	**7-II**	17 456
Jablanica	**24**	**7-III**	13 016
Rama-Prozor	**24**	**7-IV**	19 700
Grude	**24**	**7-V**	15 500
Ljubinje	**24**	**7-VI**	4 200 (from NDA)
Kalinovik	**24**	**7-VII**	3 800 (from NDA)
Berkovići	**24**	**7-VIII**	3 200 (from NDA)
Glamoč	**24**	**7-IX**	4 637
Bos. Grahovo	**24**	**7-X**	1 861
Kupres	**24**	**7-XI**	2 650

PRIORITY ACCORDING TO
INDUSTRIAL WASTEWATERS (BOD)

Table 2.h. Priority according to industrial wastewaters

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA			
Ranking according to health, socio-economic and environmental criteria			
Location	**Priority according to industrial wastewaters (BOD)**		**Population number (2001)**
	SIGNIFICANCE	**RANKING**	
Mostar	**27**	**1**	130 000
Čitluk i Međugorje	**24**	**2**	15 000
Neum	**23**	**3-I**	4 656
Livno	**23**	**3-II**	42 000
Široki Brijeg	**22**	**4**	29 170
Bileća	**21**	**5**	11 200 (from NDA)
Konjic	**20**	**6-I**	31 500
Čapljina	**20**	**6-II**	28 800
Glamoč	**20**	**6-III**	4 637
Ljubuški	**17**	**7-I**	27 540
Gacko	**17**	**7-II**	10 000 (from NDA)
Ljubinje	**17**	**7-III**	4 200 (from NDA)
Nevesinje	**16**	**8**	15 500 (from NDA)
Posušje	**14**	**9-I**	17 456
Grude	**14**	**9-II**	15 500
Jablanica	**12**	**10**	13 016
Stolac	**10**	**11-I**	12 300
Rama-Prozor	**10**	**11-II**	19 700
Trebinje	**10**	**11-III**	25 000 (from NDA)
Tomislavgrad	**10**	**11-IV**	29 385

7.3 IP Matrix

IP MATRIX
-COMMUNAL WASTEWATERS-

Table 3.a. IP matrix – Communal wastewaters

NERETVA RIVER BASIN - *COMMUNAL WASTEWATERS*							
1	**2**	**3**	**4**				
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				
			BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
MOSTAR	110 000	**65**	5X5	4X5	3X3	2X5	1X1
POSUŠJE	17 456	**48**	5X3	4X3	3X3	2X5	1x2
KONJIC	31 500	**67**	5X5	4x5	3X3	2X5	1X3
ČAPLJINA	28 800	**58**	5X5	4X3	3X3	2X5	1x2
ČITLUK I MEĐUGORJE	15 000	**67**	5X5	4x5	3X3	2X5	1X3
STOLAC	12 300	**50**	5X3	4X3	3X3	2X5	1x4
JABLANICA	13 016	**58**	5X3	4X5	3X3	2X5	1x4
ŠIROKI BRIJEG	29 170	**60**	5X5	4x3	3X3	2X5	1x4
GRUDE	15 500	**51**	5X3	4x3	3X3	2X5	1X5
RAMA-PROZOR	19 700	**50**	5X3	4x3	3X3	2X5	1x4
LJUBUŠKI	27 450	**50**	5X3	4x3	3X3	2X5	1x4

Table 3.a. IP matrix – Communal wastewaters

TREBIŠNJICA RIVER BASIN - *COMMUNAL WASTEWATERS*							
1	**2**	**3**	**4**				
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				
			BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
TREBINJE	25 000	**50**	5X3	4x3	3X3	2X5	1x4
NEVESINJE	15 500	**59**	5X5	4x3	3X3	2X5	1x3
BILEĆA	11 200	**59**	5X5	4x3	3X3	2X5	1x3
GACKO	10 000	**50**	5X3	4x3	3X3	2X5	1x4
LJUBINJE	4 200	**50**	5X3	4x3	3X3	2X5	1x4
KALINOVIK	3 800	**50**	5X3	4x3	3X3	2X5	1x4
BERKOVIĆI	3 200	**50**	5X3	4x3	3X3	2X5	1x4

Table 3.a. IP matrix – Communal wastewaters

CETINA RIVER BASIN - *COMMUNAL WASTEWATERS*							
1	**2**	**3**	**4**				
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				
			BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
LIVNO	42 000	**58**	5X5	4X3	3X3	2X5	1x2
TOMISLAVGRAD	29 385	**60**	5X5	4x3	3X3	2X5	1x4
GLAMOČ	4 637	**60**	5X5	4X3	3X3	2X5	1x4
KUPRES	2 650	**50**	5X3	4X3	3X3	2X5	1x4
BOSANSKO GRAHOVO	1 861	**50**	5X3	4X3	3X3	2X5	1x4

Table 3.a. IP matrix – Communal wastewaters

NEUM COASTAL AREA - *COMMUNAL WASTEWATERS*							
1	**2**	**3**	**4**				
PROBLEM	**No. of inhabit.**	**Signific.**	**IMPACT**				
			BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
NEUM	4 656	**69**	5X5	4X5	3X3	2X5	1X5

IP MATRIX
-MUNICIPAL SOLID WASTE-

Table 3.b. IP matrix – Regional landfill

NERETVA RIVER BASIN - *REGIONAL LANDFILL*						
1	**3**	**4**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
MOSTAR	**59**	5X5	4X3	3X5	2X3	1X1

Table 3.b. IP matrix – Regional landfill

TREBIŠNJICA RIVER BASIN - *REGIONAL LANDFILL*						
1	**3**	**4**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
TREBINJE	**45**	5X3	4X3	3X3	2X3	1X3

Table 3.b. IP matrix – Regional landfill

CETINA RIVER BASIN - *REGIONAL LANDFILL*						
1	**3**	**4**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
LIVNO	**44**	5X3	4X3	3X3	2X3	1X2

IP MATRIX
-INDUSTRIAL WASTEWATERS (BOD)-

Table 3.c. IP matrix – Industrial wastewaters

NERETVA RIVER BASIN - *BOD5*						
1	**2**	**3**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
MOSTAR (textile, slaughter houses, wine)	**58**	5X3	4X5	3X3	2X5	1X4
POSUŠJE (slaughter houses)	**41**	5X1	4X3	3X3	2X5	1X5
KONJIC (slaughter house)	**41**	5X1	4X3	3X3	2X5	1X5
ČAPLJINA (wine, slaughter houses)	**41**	5X1	4X3	3X3	2X5	1X5
ČITLUK AND MEĐUGORJE (textile, slaughter houses, wine, milk products)	**58**	5X3	4X5	3X3	2X5	1X4
ŠIROKI BRIJEG (meat industry)	**49**	5X1	4X5	3X3	2X5	1X5
GRUDE (brewery)	**41**	5X1	4X3	3X3	2X5	1X5
LJUBUŠKI (wine)	**41**	5X1	4X3	3X3	2X5	1X5

Table 3.c. IP matrix – Industrial wastewaters

TREBIŠNJICA RIVER BASIN - *BOD5*						
1	**2**	**3**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
TREBINJE (wine)	**41**	5X1	4x3	3x3	2X5	1X5
BILEĆA (textile)	**58**	5X3	4x5	3x3	2X5	1X4
GACKO (cow farm)	**41**	5X1	4x3	3x3	2x5	1X5
LJUBINJE (poultry)	**41**	5X1	4x3	3x3	2X5	1X5

Table 3.c. IP matrix – Industrial wastewaters

CETINA RIVER BASIN - *BOD5*						
1	**2**	**3**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
LIVNO (LIVTEX textile)	**48**	5X1	4X5	3X3	2X5	1X4
GLAMOČ (knitwear)	**48**	5X1	4X5	3X3	2X5	1X4

IP MATRIX
-HAZARDOUS WASTE-

Table 3.d. IP matrix – Hazardous waste

NERETVA RIVER BASIN – *HAZARDOUS WASTE*						
Metal industry						
1	**2**	**3**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
UNIS GAL - KONJIC	**56**	5X5	4X3	3X3	2X3	1X4
SOKO - MOSTAR	**48**	5X5	4X1	3X3	2X3	1X4
FEAL - ŠIROKI BRIJEG	**48**	5X5	4X1	3X3	2X3	1X4
Medical waste						
MOSTAR	**39**	5X5	4X1	3X1	2X3	1X1

Table 3.d. IP matrix – Hazardous waste

TREBIŠNJICA RIVER BASIN – *HAZARDOUS WASTE*						
Metal industry						
1	**2**	**3**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
TOOL INDUSTRY - TREBINJE	**49**	5x5	4x1	3x3	2x3	1x5

IP MATRIX
-THERMO POWER PLANT GACKO-

Table 3.e. IP matrix – TPP Gacko

TREBIŠNJICA RIVER BASIN – THERMO POWER PLANT GACKO						
1	**3**	**4**				
PROBLEM	**Signific.**	**IMPACT**				
		BENEFITS	**ECONOMIC DEVELOPMENT**	**FINANCIAL SUSTAINABILITY**	**FEASIBILITY**	**COSTS**
TPP GACKO	**58**	5x5	4x3	3x3	2x5	1x2

7.4 Rang list IP

RANKING ACCORDING TO
COMMUNAL WASTEWATERS

Table 3.f. Priority according to communal wastewaters

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA				
Ranking according to economic criteria (INVESTMENT PORTFOLIO)				
No.	Location	Priority according to communal wastewaters		Population number (2001)
		SIGNIFICANCE	RANKING	
1	Neum	69	1	4 656
2	Čitluk i Međugorje	67	2-I	15 000
3	Konjic	67	2-II	31 500
4	Mostar	65	3	110 000
5	Tomislavgrad	60	4-I	29 385
6	Široki Brijeg	60	4-II	29 170
7	Glamoč	60	4-III	4 637
8	Nevesinje	59	5-I	15 500 (from NDA)
9	Bileća	59	5-II	11 200 (from NDA)
10	Jablanica	58	6-I	13 016
11	Livno	58	6-II	42 000
12	Čapljina	58	6-III	28 800
13	Grude	51	7	15 500
14	Rama-Prozor	50	8-I	19 700
15	Ljubuški	50	8-II	27 540
16	Trebinje	50	8-III	25 000 (from NDA)
17	Stolac	50	8-IV	12 300
18	Gacko	50	8-V	10 000 (from NDA)
19	Berkovići	50	8-VI	3 200 (from NDA)
20	Bos. Grahovo	50	8-VII	1 861
21	Kupres	50	8-VIII	2 650
22	Ljubinje	50	8-IX	4 200 (from NDA)
23	Kalinovik	50	8-X	3 800 (from NDA)
24	Posušje	48	9	17 456

RANKING ACCORDING TO
MUNICIPAL SOLID WASTE

Table 3.g. Priority according to municipal solid waste

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA				
Ranking according to economic criteria (INVESTMENT PORTFOLIO)				
No.	Location	Priority according to municipal solid waste		Population number (2001)
		SIGNIFICANCE	RANKING	
1	**Mostar**	**59**	**1**	110 000
2	**Trebinje**	**45**	**2**	25 000 (from NDA)
3	**Livno**	**44**	**3**	42 000

RANKING ACCORDING TO
INDUSTRIAL WASTEWATERS (BOD)

Table 3.h. Priority according to industrial wastewaters

RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA				
Ranking according to economic criteria (INVESTMENT PORTFOLIO)				
No.	Location	Priority according to industrial wastewaters		Population number (2001)
		SIGNIFICANCE	RANKING	
1	**Mostar**	**58**	**1-I**	110 000
2	**Čitluk i Međugorje**	**58**	**1-II**	15 000
3	**Bileća**	**58**	**1-III**	11 200 (from NDA)
4	**Široki Brijeg**	**49**	**2**	29 170
5	**Livno**	**48**	**3-I**	42 000
6	**Glamoč**	**48**	**3-II**	4 637
7	**Ljubuški**	**41**	**4-I**	27 540
8	**Trebinje**	**41**	**4-II**	25 000 (from NDA)
9	**Konjic**	**41**	**4-III**	31 500
10	**Čapljina**	**41**	**4-IV**	28 800
11	**Grude**	**41**	**4-V**	15 500
12	**Gacko**	**41**	**4-VI**	10 000 (from NDA)
13	**Ljubinje**	**41**	**4-VII**	4 200 (from NDA)
14	**Posušje**	**41**	**4-VIII**	17 456

7.5 Combined table of issue/impact and IP matrix

COMBINED TABLE
COMMUNAL WASTEWATERS

Table 4.a. Combined view of environmental and economic aspect of ranking for communal wastewaters

COMMUNAL WASTEWATERS RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**No. of inhabitant**
	Signific.	**Rank**		**Signif.**	**Rank**			
Neum	33	2	1)Neum municipality needs to continue the started construction of the sewerage system Neum-Mljet channel, in order to preserve the water in Neum bay-continuation of collector construction; 2)Elaborate project documentation and begin construction of the I phase of the secondary sewerage system which would avoid use of illegally constructed septic tanks which have large leaks and significantly contribute to the problem*	69	1	102	1	4 656
Mostar	34	1	1)Urgently need to begin elaborating project documentation, as well as constructing the main collectors (left-bank and right-bank sewerage system collectors) for the Mostar basin and construction of the I phase of WWTP (150000 ES); 2)Project elaboration of project documentation and construction of the II phase of the Mostar basin sewerage system.	65	3	99	2	110 000
Livno	30	3	1)Construction of primary channel and parts of the secondary sewerage network, rehabilitation and reconstruction of the existing sewerage system, and project elaboration and construction of collectors and the I phase of WWTP (20000 ES); 2)Project elaboration and construction of the II phase of WWTP (total utilisation 50000 ES) and the secondary network.	58	5	88	5	42 000
Čitluk and Međugorje	26	5	1)There is a plan to construct the I phase of two separate WWTP for Čitluk (6000 ES) and 2300m collector and Međugorje (6000 ES) and a 2220m collector, 2)Project elaboration and construction of sewerage network	67	2	93	3	15 000
Čapljina	30	3	1)Project elaboration of project documentation for construction of the main collectors and I phase of WWTP for 20000 ES . 2)Project elaboration and construction of the II phase of WWTP (final phase 80000 ES) and the secondary network.	58	5	88	5	28 800
Jablanica	20	11	1)Project elaboration and construction of collectors in the I phase of WWTP (10000 ES); 2)Project elaboration and construction of the sewerage network and the II phase of WWTP.	58	5	78	9	13 016

COMMUNAL WASTEWATERS								
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**No. of inhabitant**
	Signific.	**Rank**		**Signif.**	**Rank**			
Konjic	26	5	1)Project elaboration and construction of primary channels with parts of the secondary network and construction of the I phase (10000 ES) of the WWTP. 2)Project elaboration and construction of the sewerage system network and the II phase of WWTP.	67	2	93	3	31 500
Tomislav grad	25	6	1)Construction of main collector and the parts of the sewerage network in the city, and project elaboration and construction of the I phase of WWTP (6000 ES); 2)Project elaboration and construction of the sewerage network and the II phase of WWTP (total capacity 12000 ES).	60	3	85	8	29 385
Široki Brijeg	26	5	1)Sanitation of I phase WWTP (5000 ES) and construction of collectors; 2)Project elaboration and construction of the sewerage network and II phase WWTP.	60	3	86	7	29 170
Rama-Prozor	22	9	1)Project elaboration and construction of the sewerage system of Rama-Prozor and the I phase of WWTP (5000 ES); 2)Continue project elaboration and construction of the sewerage system and the II phase of WWTP.	50	8	72	12	19 700
Nevesinje	30	3	1)Project elaboration and construction of collectors and I phase of WWTP; 2)Project elaboration and construction of sewerage and the II phase of WWTP.	59	4	89	4	15 500
Bileća	30	3	1)Sanitation of existing sewerage system, project elaboration and construction of collectors and the I phase of WWTP; 2)Project elaboration and construction of the II phase of WWTP and the sewerage network.	59	4	89	4	11 200
Ljubuški	20	11	1)Sanitation of the I phase of WWTP (5000 ES) and project elaboration and construction of the sewerage system; 2)Project elaboration and construction of the I phase of WWTP (plus 5000 ES) and the sewerage network.	50	8	70	14	27 540
Stolac	26	5	1)Project elaboration and construction of the sewerage system and the I phase of WWTP (5000 ES); 2)Project elaboration and construction of the sewerage system and the II phase of WWTP.	50	8	76	10	12 300

COMMUNAL WASTEWATERS								
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**No. of inhabitant**
	Signific.	**Rank**		**Signif.**	**Rank**			
Trebinje	17	12	1)Revitalization and capacity increase of the I phase of WWTP, project elaboration and construction of the sewerage system; 2) Project elaboration and continuation of the sewerage system construction and the II phase of WWTP.	50	8	67	15	25 000
Grude	23	8	1)Project elaboration and continuation of the sewerage system construction. Construction of the II phase of WWTP (+2500 ES) and project elaboration and continuation of the sewerage network construction.	51	7	74	11	15 500
Glamoč	27	4	1)Sanitation of existing sewerage system, project elaboration and collector and I phase WWTP construction (4500 ES); 2)Project elaboration and sewerage system and II phase WWTP construction.	60	3	87	6	4 637
Posušje	24	7	1)Project elaboration and construction of the sewerage system, collectors and I phase of WWTP (10000 ES); 2)Project elaboration and construction of the II phase WWTP and sewerage system.	48	9	72	12	17 456
Gacko	21	10	1)Project elaboration and construction of the collector and the I phase WWTP; 2)Project elaboration and construction of the II phase WWTP and the sewerage system.	50	8	71	13	10 000
Berkovići	20	11	1)Project elaboration and construction of sewerage system and waste water treatment plant**.**	50	8	70	14	3 200
Bos. Grahovo	20	11	1)Sanitation of the I phase (1650 ES) WWTP, project elaboration and construction of the sewerage system; 2)Project elaboration and construction of the II phase WWTP.	50	8	70	14	1 861
Kupres	20	11	1)Sanitation of the existing sewerage system, project elaboration, and construction of the sewerage system and the I phase WWTP (3000 ES); 2)Project elaboration and construction of the sewerage system and the II phase WWTP.	50	8	70	14	2 650

COMMUNAL WASTEWATERS								
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**No. of inhabitant**
	Signific.	**Rank**		**Signif.**	**Rank**			
Ljubinje	16	13	1)Project elaboration and construction of WWTP and sewerage system; 2)Continuation of project elaboration and construction of the sewerage system.	50	8	66	16	4 200
Kalinovik	16	13	1)Project elaboration and construction of WWTP and sewerage system; 2)Continuation of project elaboration and construction of the sewerage system.	50	8	66	16	3 800

***Note:** Activities under 1) are a priority and based upon them appraisements were given for the IP. Activities under 2) need to be continued.

COMBINED TABLE
MUNICIPAL SOLID WASTE

Table 4.b. Combined view of environmental and economic aspect of ranking for solid waste

MUNICIPAL SOLID WASTE – REGIONAL LANDFILLS								
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**No. of inhabitant**
	Signif.	**Rank**		**Signif.**	**Rank**			
Mostar	4,0	1	Construction of regional landfill for twelve municipalities	59	1	63	1	110 000
Trebinje	5,0	2	Construction of regional landfill for four municipalities	45	2	50	2-I	25 000
Livno	6,0	3	Construction of regional landfill for seven municipalities	44	3	50	2-II	42 000

COMBINED TABLE
INDUSTRIAL WASTEWATERS (BOD)

Table 4.c. Combined view of environmental and economic aspect of ranking for industrial wastewaters

BOD_5 FROM INDUSTRIES RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA								
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**	**Evaluated value of BOD5**
	Signif.	**Rank**		**Signif.**	**Rank**			
Mostar	27	1	1) Pre-treatment 2) Cleaner production	58	1	85	1	≈6 110 238,90kg/year
Posušje	14	9	1) Pre-treatment 2) Cleaner production	41	4	55	7	≈1534,10 kg/ year
Konjic	20	6	1) Pre-treatment 2) Cleaner production	41	4	61	5	≈1 105 kg/ year
Čapljina	20	6	1) Pre-treatment 2) Cleaner production	41	4	61	5	≈3 669,26 kg/ year
Čitluk and Međugorje	24	2	1) Pre-treatment 2) Cleaner production	58	1	82	2	≈902 270,86 kg/ year
Široki Brijeg	22	4	1) Pre-treatment 2) Cleaner production	49	2	71	3	≈272,4 kg/ year
Grude	14	9	1) Pre-treatment 2) Cleaner production	41	4	55	7	≈1 065,54 kg/ year - pre-treatment effects
Ljubuški	17	7	1) Pre-treatment 2) Cleaner production	41	4	58	6	≈811,20 kg/ year
Trebinje	10	11	1) Pre-treatment 2) Cleaner production	41	4	51	8	≈720 kg/ year
Bileća	21	5	1) Pre-treatment 2) Cleaner production	58	1	79	3	≈ 198 500 kg/ year
Gacko	17	7	1) Pre-treatment 2) Cleaner production	41	4	58	6	≈ 750 000 kg/ year
Ljubinje	17	7	1) Pre-treatment 2) Cleaner production	41	4	58	6	≈ 850 000 kg/ year
Livno	23	3	1) Pre-treatment 2) Cleaner production	48	3	71	3	≈ 500 000 kg/ year
Glamoč	20	6	1) Pre-treatment 2) Cleaner production	48	3	68	4	≈ 323 900 kg/ year

COMBINED TABLE
HAZARDOUS WASTE

Table 4.d. Combined view of environmental and economic aspect of ranking for hazardous waste

HAZARDOUS WASTE							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**
	Signif.	**Rank**		**Signif.**	**Rank**		
METAL INDUSTRY							
Tool industry - Trebinje	27	1	1) Pre-treatment 2) Cleaner production	49	2	**76**	**2**
UNIS GAL- Konjic	25	2	1) Pre-treatment 2) Cleaner production	56	1	**81**	**1**
SOKO Mostar	20	3	1) Pre-treatment 2) Cleaner production	48	3-I	**68**	**4**
FEAL Široki Brijeg	19	4	1) Pre-treatment 2) Cleaner production	48	3-II	**67**	**5**
MEDICAL WASTE							
Mostar	34	1	Separation, transfer of station, disposal on hazardous waste landfills or incinerators of hazardous waste.	39	4	**73**	**3**

COMBINED TABLE
THERMO POWER PLANT GACKO

Table 4.e. Combined view of environmental and economic aspect of ranking for TPP Gacko

TPP GACKO							
RIVER BASINS: NERETVA, TREBIŠNJICA, CETINA							
Location	**ENVIRONMENTAL ASPECT**		**ACTIVITY**	**ECONOMIC ASPECT**		**TOTAL SIGNIF.**	**TOTAL RANK**
	Signif.	**Rank**		**Signif.**	**Rank**		
TE Gacko	34	-	Separation, transfer of station, disposal on hazardous waste landfills or incinerators of hazardous waste.	58	-	**92**	**-**

7.6 Cleaner Production table

Table 5. Results of cleaner production in 9 industries

Industry / Location	Water savings (m3/god)	Energy savings (kW/giod)	Fuel savings	Raw material savings	Recycled waste (t/ god)	Total savings (KM/god)	Investments (KM)	Return period (months)
Živinoprodukt - Srbac poultry,	25.543,1	0				62.911,0	37.165,0	6
Long transmission line factory -Sarajevo, metal final finishing	20.925,0	5.850,0		85%		703.800,0	21.000,0	1
Sinalco -Sarajevo, production of non-alcohol beverages,	0	11.100,0			12	5.907,4	471,0	1
Krajina Klas-Banja Luka, baker industry	0	7.5680,		0	1,8	7.075,0	1.379,0	2,5
Brewery - Sarajevo	64.000,0	119.454,0			470	114.620,0	26.290,0	3
Fana – Srebrenik, fruit and vegetable processing	3.836,0	0			30	11.359,0	53.200,0	52
Žica - Sarajevo, metal final finishing	13.647,0		18649 Sm3 gas	49%	0	51.481,0	1.000,0	0
Meboš -Šamac, metal final finishing	0	400,0	400 l oil	2%		12.000,0	36.000,0	36
Vegafruit - Mala Brijesnica, fruit and vegetable processing	0	0			585	20.000,0	19.487,0	12
Total	**127.951,1**	**144.372,0**			**1098,8**	**989.153,4**	**195.992**	

Water savings and reduction of wastewaters varies between 24 to 81%, with average of 60%. Total annual energy savings are 144372 KW, while waste is reduced for 1098,8 t/year. Production costs are reduced for 989.153,4 KM/year (505.746,1 EURO/year). Most of the implemented measures of cleaner production (78%) have return period of 12 months.

8 SUPPLEMENTS

8.1 Issue/Impact matrix

Criteria for Issue/Impact matrix, defined by UNEP/MAP, are considered in order to select activities which are priorities for environment protection. Four issue/impacts are defined and each of them is given weighted factor:

1) HUMAN HEALTH (**weighted factor 4**)
2) MARINE ENVIRONMENT, (**weighted factor 3**)
3) SOCIO-ECONOMIC LOSS and (**weighted factor 2**)
4) GENERAL ENVIRONMENT- trans-boundary impact (**weighted factor 1**)

Ranking steps:

STEP 1)
Significance of each individual problem / location / industry is evaluated (value from 1 to 4)* related to each of above mentioned four basic *impacts*, according to instructions defined by UNEP/MAP.

* Value 1 - **No problem (unknown problem**)
* Value 2 - **Small problem**
* Value 3 - **Medium problem**
* Value 4 - **Significant problem**

STEP 2) Values are multiplied with relevant weighted factors of *impact*
STEP 3) Sum of these products for each individual problem / location / industry represents a quantified SIGNIFICANCE for individual problem.

Based on this sum (Step 3) is made a ranking list of priorities for river basins: Neretva, Trebišnjica, Cetina - ranking according to health, socio-economic and environmental criteria.

8.2 IP matrix

Investment-oriented criteria defined by UNEP/MAPare considered in order to select priority activities / projects which need to be invested in. Basic objective is to focus and select those activities / projects which solve environmental problem the most efficiently within limited financial resources.
For this purpose are defined five criteria and each of them is given a weighted factor:

1) BENEFITS (**weighted factor 5)**
2) ECONOMIC DEVELOPMENT (**weighted factor 4)**
3) FINANCIAL SUSTAINABILITY **(weighted factor 3)**
4) FEASIBILITY **(weighted factor 2)**
5) COSTS **(weighted factor 1)**

Criteria	Description
Benefits	**Impact or benefit (regarding environmental quality) which is expected from implementation of activity / project** There are two sub-criteria: - Rough estimates of existing or anticipated environmental losses which the project / activity will prevent; this information should be available from the Issue/Impact matrix that identify the environmental priority of the project. - Rough estimates of improved value of environmental resources achieved by the project, such as: additional production, recreational opportunities, or purely environmental services to the community.
Economic	**Contribution of the project / activity to development and life standard** Estimate of activity's/project's contribution to the economy and sectors that comprise it (tourism, recreation, fisheries, etc.). The emphasis should include the population groups gaining most from the project, and roughly estimate direct gains to low income population.
Financial sustainability	Availability of financial resources for implementation and the project's capacity to generate revenues. Estimate about the interaction of the activity/project with the market ,i.e. in order for project implementation to provide marketable services, and to raise revenues contributing to cost recovery or at least to the annual running costs, and if it will invoke private sector participation.
Feasibility	Easiness with which a project / activity can be implemented within the existing legal and administrative structure of the county/ region, or if changes will be needed which may delay implementation.
Costs	Estimation of capital and running costs of the project. Cost information will be approximate (but realistic). Costs can be estimated more precisely at the pre-feasibility stage when more technical details will be available.

Ranking steps:

STEP 1) Evaluation of project / activities
Significance of each individual location. i.e. project / activity is evaluated related to each of above mentioned five criteria, according to instructions defined by UNEP/MAP.

Benefits	Benefits from implementation of activity / project to population health **= 5**
	Other benefits from implementation of activity / project for disadvantage population groups (e.g. population with low income and other groups**) = 3**
	General benefits from implementation of project / activity (unspecified) **= 1**

Economic development	Contribution of project's / activity's implementation to the leading economic sector (e.g. agriculture, tourism, industry...) in the region **= 5**
	Contribution of project's / activity's implementation to less important economic sector in the region **= 3**
	General contributions **= 1**

Financial sustainability	Opportunity/possibility for application of ***economic instruments (high financial sustainability)*** **= 5**
	Potential application of economic instruments (***medium financial sustainability***) = **3**
	Difficult to apply economic instruments (***low financial sustainability***) = 1

Feasibility	Easy implementation = **5**
	With minimum changes = **3**
	With major changes = **1**

Costs	0-1 M EURO = **5**
	1-3 M EURO = **4**
	3-6 M EURO = **3**
	6-9 M EURO = **2**
	OVER 9 M EURO = **1**

STEP 2) Values are multiplied with relevant (given) weighted factors from each of five criteria
STEP 3) Sum of these products for each individual location, i.e. project / activity represents a quantified SIGNIFICANCE.

Based on this sum (Step 3) is made a ranking list of priorities, according to investment-oriented criteria, for river basins: Neretva, Trebišnjica, Cetina and coastal area Neum.

8.3 Basic measures of cleaner production for BOD_5 reduction (world experiences)

- **Beer industry**

In Mediterranean region in B&H, in Neretva river basin, there is a brewery "Uniline" in Grude, whose wastewaters are treated with municipality's plant.
Wastewaters from brewery are highly contaminated with organic matters, which is indicated by high BOD and COD levels. Washing and cleaning operations consumes from 40 - 60 % of total daily water consumption and presents main source of organic pollution. Organic matter in the waste water is mainly related to the surplus yeast and spend-grains, but also to diatomea filter – filling which is used as a filter to retain suspended substances during the last filtration. Efficiency of aerobic and anaerobic treatments depends upon hydraulic load.
Therefore, all cleaner production measurements that leads to the BOD_5 reduction should be directed to the:

- Collection of solid organic matters (ferment, diatomea filter, spend-grains and muddy residue) after sedimentation, during different production operations, which significantly reduces quantity of organic matters in wastewaters;
- Rational usage of water leading to reduction of hydraulic load on the treatment plant, thereby influencing the efficiency of wastewater treatment.

Introduction of cleaner production measures in beer industry can reduce BOD_5 for 10 – 20%.

- **Textile industry**

Textile industry in Mediterranean region in B&H is mostly based on processing of cotton (Mostar, Čitluk, Livno, Glamoč) and wool Bileća.
The textiles industry includes fiber production, (natural and synthetic), raw weaving, dyeing, finishing, printing, and final cutting into garments, carpets, fabrics, etc. Natural fibers include animal wools and cellulose products such as cotton and flax. Synthetic fibers include rayon, nylon, acrylic, polyurethane and others. Many textiles are printed with patterns and colors. The primary environmental aspects of the textiles industry involve water consumption and wastewater discharge, chemical use at dyeing and finishing, and management of scrap and solid waste. The wastewater is normally characterized by high dissolved solids (TDS), biological oxygen demand (BOD), chemical oxygen demand (COD), color and toxicity.
For natural raw materials, dissolved solid are normally small textile fibers, while organic load is due mainly to fiber residue, greases and oils, dirt and chemicals added during the processes.
In a typical mill processing of cotton or cotton-blend woven fabric, the first phase of fiber preparation represents the main emission source in the overall process. The washing water on this occasion may contain up to 70% of the total COD load in the final wastewaters.
Dyeing process is the cause of high emissions of hardly biodegradable and toxic organic compounds.
In order to minimize wastewater organic load prior the eventual wastewater treatment plant, the following options should be considered:

- Process modification

1. Dirt and grease recovery: During washing of raw wool, dirt and greases finish into the wastewater. System that partially recycles washing water after grease and dirt recovery are nowadays well known and used. Improvement of this process can

greatly decrease BOD in wastewaters, and moreover, recovered grease from wool can have a high commercial value

2. Use low-liquor ratio dyeing machine: improved design dyeing machine allows to reduce the amount of dying solution needed, thus decreasing the amount of wastewater discharged.
3. Replace chemical treatment with other treatments: wherever possible give priority to other treatment rather than chemical. Moreover, sometimes, chemicals are added to counterbalance the side effects of other chemicals or treatments. In that case try to solve the problem at the origin by eliminating the disturbing agent instead of adding other substances.

- Good operating practice

1. Process optimization: choosing the best conditions (temperature, time, chemicals concentration) can allow to reduce the total amount and concentration of wastewater produced along the process.
2. Schedule dyeing operation to minimize machine cleaning: in dyeing operation, startups, stop offs and color changes often lead to necessity to heavy clean the dyeing machine. The ideal sequence, requiring the least amount of machine cleaning, is to run the same color repeatedly on a particular machine. The second best way is to group colors within families and then run the dyes within one color family from lighter to darker values.
3. Optimize chemicals usage / install of automated dosing systems: clear instruct the staff on the correct use and concentration of chemicals preventing their overuse. Wherever feasible install automatic dosing and mixing system.

It must be noted that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must be examined case by case.

Although it may seems simplistic, housekeeping and work habits of chemical mixers can account for 10 to 50% of a factory total effluent load in BOD, COD, metals and organic solvents.

- **Meat industry – slaughterhouses**

In Neretva and Trebišnjica river basins (Čituk, Široki Brijeg, Konjic, Posušje, Čapljina, Mostar and Ljubinje) there is a large number of small and medium size slaughterhouses which significantly contribute to water pollution with organic waste.
Meat industry has a potential to produce large quantities of wastewaters with high value of BOD_5. Pollution load of slaughterhouse wastewaters incurs as a result of blood, flesh particles, soluble protein losses and waste materials which, intentionally or not, are lost to the sewage system. The amount and characterization of wastewater produced strongly depend on kind of meat processed, kind of process and technological level achieved.
Typical slaughterhouses and packing houses generally give high values of BOD_5, total suspended solids, floatable material and grease. Solid waste is usually at an elevated temperature and often contains blood, bits of flesh, grease, manure, dirt and viscera (inner organs). Blood recovery, grease recovery, separation of manure from entrails and efficient rendering can lead to waste reduction, but also reduction of some by-products. Chlorides, phosphorus and nitrogen compounds can also be found in wastewaters.
Without treatment and control, BOD_5 in effluent can easily exceed 10 – 15 kg/t of slaughtered animals, while suspended solid substances and nitrogen level can also be very high.

Wastewaters are generated during all working phases, but cleaning and slaughter operation represent the most important pollution sources.

In order to minimize organic pollution prior the eventual Wastewater Treatment Plant, cleaner production measures need to focus on:

- Dry process vs. wet process

Water is used for many purposes in a chain of processes: meat and carcass cleaning, transport of entrails, cleaning of working space and instruments. Reduction of water usage for these activities helps in reduction of environmental impact in two ways: reduction of organic load in effluent and reduction of water quantity to be treated.
In food industry facilities, most of the water is wastewater from produced food and it is primarily of organic nature. The objective is to eliminate organic solid substances without them reaching the sewage.
This category includes dry cleaning (cleaning of working space with a vacuum cleaner). Despite these measures solid substances may reach the sewage. Avoiding this material to mix with wastewaters will significantly reduce organic load. A cheep system to reach this target (removal of solid components from wastewaters) is covering collection channel with grids.
Using dry systems (e.g. compressed air) for transport of entrails instead of water systems.

- Segregation of high polluted waters

Slaughterhouses produce wastewaters during different process phases. These streams of wastewater are generally heavily polluted. Segregation of high polluted waters from low or not polluted waters can greatly increase performance of further treatments.

- Blood collection

Blood is a high liquid polluter, mostly with high organic load. Collected blood from a singe slaughtered cattle corresponds to the pollution generated by about 50 PE (population equivalent). This means that if discharged into wastewaters, it will greatly increase the organic load, thus causing high costs for further treatment. It is identified that retention of the blood is the most successful way of minimizing wastewater pollution in slaughterhouse.

- Grease collection

Most of the fats can be easily separated by using “fat traps” or oil separator in wastewaters collection channels. Rational use of detergents and hot water can reduce the amount of dissolved grease that cannot be recovered.

Experiences from good operating practices in meat industries show that BOD_5 can be reduced by 10-20%, suspended substances by 25-40% and grease by 25-30%.

It is important to emphasize that slaughterhouses which do not practice blood collecting, as it is the case in majority of slaughterhouses in Mediterranean region in B&H, can accomplish reduction of BOD_5 up to 40%.

Wine industry

Wine production exists mostly in Neretva river basin (Čitluk, Čapljina, Mostar, Ljubuški) and Trebišnjica river basin (Trebinje).
Wastewaters in wine industry are generated almost in all process phases: from washing of containers, reactors, filters, etc. The highest concentrated wastewaters are generated during fermentation, fining, and racking due to the washing out of sediment. Instead of water washing, semi-solid fractions – muddy sediment, should be separated for further draying and dumping, due to organic load. If solids from fining or racking are not separated, the effluents are highly contaminated and have very high BOD_5 values, up to 500000 mg/l. Therefore, it is essential to treat wastewaters with filtration, centrifugation, which requires installation of centrifuge, or sedimentation, so that they do not enter the sewage system.

Pollution prevention measures that can be proposed to the wine processing industry should be directed to separation of semi-solid residue and muddy sediment for further treatment, rather than washing them out with water to drain. Residue can be collected from the following processes:

- grape crushing and destemming
- pressing
- clarification
- fermentation
- ageing / racking
- fining / clarification

With efficient implementation of these measures, it is possible to accomplish BOD_5 reduction by 20-60% in wastewaters.

Additional source of organic pollution would be wastewater after washing of cisterns. The wine production industries could use waste water after final washing of cisterns that is relative clean and enriched with necessary detergents, with the purpose of first washing. As waste water after first washing of the cisterns is high polluted, it would be necessary to introduce small mechanical treatment of this waste water. By efficient implementation of this measurements, it is possible to achieve from 10% - 20% BOD reduction in waste water. These measurements are also directed to saving the fresh water.

8.4 Grude – Uniline Brewery

- **Possibility of BOD_5 reduction in brewery Grude**

UNILINE brewery in Grude owns an anaerobic wastewater treatment. This treatment doesn't work efficiently enough. Reason for this is H_2S (hydrogen sulfide) which incurs in large quantities during anaerobic treatment and causes undesirable conditions for survivor and performance of microorganisms which are the basis of anaerobic treatment. True source of H_2S is in fresh water which is enriched with sulfide salts. Sulfate anion in anaerobic conditions is transformed into sulfide anion, thus creating H_2S which is toxic for aerobic as well as for anaerobic culture of microorganisms. Normally, H_2S is present in anaerobic treatments of wastewaters, but it tends to maintain on minimum. Increased H_2S in wastewater treatment plant causes insufficient reduction of organic substance (BOD_5), causing effluent quality to be unsatisfactory regarding presence of organic substance. Effluent of wastewater treatment plant from UNILINE brewery is loaded with 5000 – 8000 PE, while with efficient treatment it should be loaded with maximum of 1000 PE.

In Grude municipality there is an aerobic treatment plant of municipal wastewaters. This plant is designed for wastewater treatment loaded with up to 2500 PE. Due to brewery effluent which is highly loaded with organic substances, influent of municipal wastewater treatment plant is 5000 – 10000 PE. Furthermore, this water is loaded with H_2S which is damaging for aerobic culture of microorganisms. This condition practically leads to non-existence of real wastewater treatment. Municipal wastewater treatment plant is still operational, but with practically a minimum of accomplished treatment. Apart from non-existence of treatment, there is also an unpleasant smell very damaging for health of workers.

Possible measures of overcoming this problem are:

- According to available data, UNILINE brewery owns a filter strainer that is out of function. Function of this filter strainer is among other to detain mud from reaching exit water. Hence, it is necessary to enable filter strainer.
- It is necessary to make a complete inspection of wastewater treatment plant aiming to find a solution of plant's poor efficiency. To find a way of more efficient brewery wastewater treatment plant, with a purpose of effluent discharge which is less loaded with waste substances.
- It is possible to separate sulfides by adding iron salt. This will allow sedimentation of Fe – sulfide, and then landfill disposal.
- Aiming to reduce BOD_5 in wastewaters, a possibility of increasing capacity of municipal wastewater treatment may be considered. Current capacity of about 2500 PE is apparently not sufficient.

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