Elaboration of Methodology and Action Plan for Economic Evaluation of the Different Water Management Options and Environmental Potentials of Neretva

- FINAL REPORT WG ECONOMY -

INTRODUCTION

Economic analysis and Water Framework Directive (WFD)

The Water framework directive (WFD) is based on principles of integrated river basin management. This means harmonization of the goals for protection of the water environment with socio-economic circumstances in the river basin district. Different water uses generate pressures and possible negative impacts to water status, but, at the same time, they influence significantly to living conditions and level of economic activity and contribute to economic growth and social well-being. By introducing the economics into preparation of river basin management plans (RBMP) is enabled the harmonization of opposite interests of different stakeholders on the principles of sustainable development.

Economic analysis is a central part of the planning process. The purpose is to obtain information necessary for making of management decisions and informing of stakeholders and public. It is about information on water uses, their economic importance and their impact to water status, about costs that are coming from such situation and who pays these costs.

According to Art. 5 and 9 and Annex III, economic analysis is explicitly related to information necessary for selection of economically acceptable combinations of measures to achieve the water environment protection goals and for deciding on implementation of principle of cost recovery. Additionally, economic analysis has a role to give arguments for the need to derogate some environmental goals having in mind the socio-economic reasons and possibilities of certain area. It is related to:

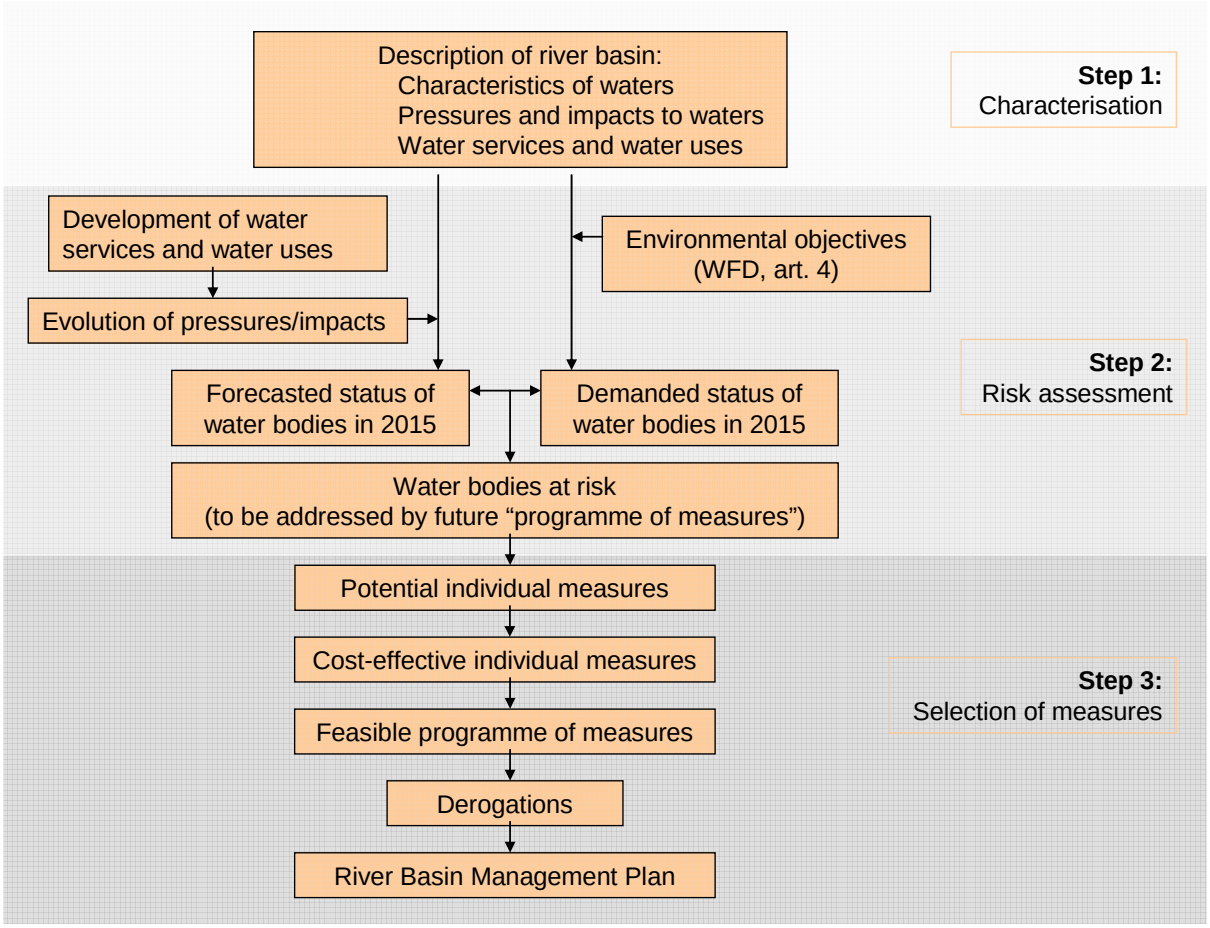
- designation of artificial and heavily modified water bodies (for which are prescribed lower environmental standards), if their re-naturalization cannot be achieved without significant negative socio-economic consequences,
- derogation of goals in water protection for particular water bodies, if costs for achieving of desired status are disproportionally high,
- extension of deadlines for establishment of desired status for particular water bodies, if there are no economic possibilities to achieve it within given deadline,
- allowing of deterioration of status for particular water bodies, if it is coming from new development needs and activities for which there is no cost-acceptable and environmentally more favourable alternative,
- designation of protected areas in which the protection of economically significant aquatic species is the reason to declare additional quality standards.

Economic elements of the WFD represent most controversial and challenging part of the WFD implementation process. In order to achieve sustainability of the water resources Water Framework Directive proclaim and integrate economic principles like:

- "Full cost recovery" based on the "polluter pays principle",
- Usage of the economic methods and tools "cost-effectiveness analysis" as a important part of the decision making process,
- Integration of the economic instruments into water policy and water management

Economic guidance prepared within Common Implementation Strategy (CIS) at the EU level is giving a conceptual frame for introduction of economic analysis in the making of river basin management plans, defining some basic economic terms and giving practical guidelines for approach to particular economic issues. According to the CIS, the implementation of the WFD will be operationalized through the three steps (Picture 1.). Economic tasks in the implementation of the WFD are:

1. step – economic characterization (description) of river basin, which includes economic aspects of water use, trends in water use and cost recovery from water services;
2. step – detailed economic analysis for water bodies or groups of water bodies for which is identified risk that without conducting the appropriate measures they cannot reach the required environmental objectives;
3. step – defining of the most cost-effective programme of measures for achieving of required objectives and assessment of socio-economic implications of these measures with justification of derogations (regarding deadlines and goals) which will be integrated into the RB management plan.



Article 11 (Program of measures) indicates that of program measures should be established with references to the analysis performed based on Article 5 (thus, the economic analysis of water use).

Annex III indicates that the economic analysis should support the assessment of the most cost-effective combination of measures to be included in the Program of Measures (Article 11). Such cost-effectiveness analysis requires an identification of environmental objectives for each water body, an assessment of possible measures to meet these objectives, an estimate of their costs and of their impact on the status of water bodies. The economic analysis should pave the way for carrying out the cost-effectiveness analysis for the preparation of the program of measures.

It should be noted that the economics is only there to inform decision makers. Whether it is based on cost-effectiveness, cost-benefit assessment or any other economic method, the economic analysis does not take the decision. Similarly to other disciplines and expertise, it helps in taking better decisions by accounting for their economic dimensions and impact. Thus, it is important to ensure the economic analysis and its output is well integrated with other analyses and expertise aimed at supporting policy and management decisions.

Economic characterization of river basin

The content of this report is limited to the first step in the implementation of economic analysis, e.g. to economic characterization. It is related to data collection and defining of indicators on status and trends in water use which will be the basis for deciding in later planning phases. It includes:

1. *Assessment of economic significance of water use* which will help in identification of potential conflicts between economic development and water protection, open the path towards the recognition of key issues in water management and give arguments for possible derogation of environmental objectives of the WFD.
2. *Defining of scenarios* (log-term dynamics of development of RB) which will be starting point for assessing expected pressures and water status in year 2015 and recognition of the water bodies „at risk", where the forecasted status does not match the status which is required by the WFD.
3. *Assessment of the achieved rate of cost recovery for water services* in a way that, together with financial costs takes into account the environmental and resource costs. By inclusion of externalia[1] there is a wish to identify a full economic cost of water services and, by implementation of the principle on cost recovery, to avoid their transferring to future generations.

The purpose of this step / phase is to make use of the existing and available data to provide an initial overview of the use of water resources in Neretva river basin. This includes analysis of the economics of water use, trends in water supply and demand and current levels of recovery of the costs of water services.

The main objective of economic analysis of water uses is to assess how important water is for the economy and socio-economic development of the river basin district. It will provide the river basin's economic profile in terms of general indicators, e.g. economic turnover, gross income, employment or number of beneficiaries for significant water uses.

Also the objectives of this step are to investigate the status of water uses in terms of review of the impact of human activity (domestic, industrial, agricultural uses, water-based recreation, commercial fishing, and aquaculture), water services in terms of water supply, the extent of the recovery of the costs (financial, environmental and resource costs) of these services, the institutional set-up for cost-recovery and the contribution of key water uses to the costs of water services.

[1] External cost (externalities) occurs in case when the activity of one subject is causing the damage (loss) to the other subject and when this loss is not compensated.

1. Assessment of economic significance of water use

The economic characterization starts with the identification of significant water uses and water services on the river basin area. According to WFD, "water use" means water services and any other human activity which, according to the analysis of pressures and impacts, have significant impact to water status. That implies that entering of particular activities in the category of water use or water service depends on the water situation in the basin.

During 1990 official data estimate that only 56% of the BiH population is covered/has access to the sanitary water supply systems, situation was much better in the urban centers where 94% of the population had access to the sanitary water supply comparing to the rural area and smaller settlements where only 35% of the population was connected on the water supply systems.

Situation regarding waste water collection and treatment was even worse, only 35% of the total BiH population has access to the sewerage collection network (72% in the cities and 10% in the smaller settlements). Situation with waste water treatment can be considered as a extremely bad, only 10% of the population living in the settlements over 5000 population had access to the waste water treatment plants, translated into national level we can estimate that only 2,8 % of the total BiH population had access to the waste water treatment plants.

Preliminary analysis of particular economic activities regarding the consumption of water and contribution to pollution or some other form of degradation of water status (morphological, biological) indicated that agriculture and industry can be selected as significant water uses on the river-basin of Neretva. In other economic sections, there are just a few economic units identified as significant sources of pressure. For economic characterization, it has been determined to group economic activities into three basic economic sectors as presented in the Table 1. Later on it will be good to decided on eventual more detailed economic analysis, depending on the results . Detailed analysis should be conducted for particular limited area (water body or groups of water bodies) where is identified the risk of failure in achieving of desired water status.

Table 1. Overview of basic economic sectors for characterization of water use

Economic sector	Economic sections covered by sector
„Agriculture"	Agriculture, hunting and forestry Fishery
„Industry"	Mining and quarrying Manufacturing Electricity, gas and water supply Construction
„Services"	Other (service) activities

To understand the economy of Neretva river basin, and to provide a socio-economic overview of the basin, economic indicators of development are likely to be used. Several general economic impact parameters do appear relatively common throughout the data sources (Annual Statistical Yearbooks), which should be analyzed, such as:

- Gross domestic product,
- Number of legal entities according to activities,
- Overview of investments,
- Employment rates,
- Wages and salaries.

The economic significance of each water use must be judged with respect to both, its importance as a water consumer and also its absolute and relative contribution to the physical and chemical quality of the water in the river basin. Not all the activities in the basin would need to be reported but only those that exert significant pressures (and impacts). A water use can be marked as a water abstraction or a water discharge.

A few analytical indicators are selected which connect socio-economic information (employment, gross value added) and information on pressures at the level of particular sector (Table 2). Data on physical flows on water (abstracted water quantities) and pollution (discharged loads of BOD_5, COD, total N, and total P) are used as indication of pressures. Such analytical indicators will enable comparison and ranging of sectors regarding the efficiency of water use and represent a good basis for deciding on water management.

Table 2. List of selected indicators of efficiency of water use

Indicator of efficiency of water use per sector	Unit of measure	Definition
Employment per unit of abstracted water	No. of employees/ 10^3 m^3	Number of employees in the sector / total amount of water withdrawn for water supply to the sector, including public supply and self-supply
Added value per unit of abstracted water	10^3 KM / m^3	Gross added value in the sector / total amount of water withdrawn for water supply to the sector, including public supply and self-supply
Employment per unit load of pollution	No. of employees/ ton	Number of employees in the sector / total amount of particular substance (BOD_5, COD, total N, total P) added/leached to a water bodies during a year from the sector, including point and diffuse sources of pollution
Added value per unit load of pollution	10^3 KM / ton	Gross added value in the sector / total amount of particular substance (BOD_5, COD, total N, total P) added/leached to a water bodies from the sector, including point and diffuse sources of pollution

By „water services", are understood all activities which to households, public institutions or economy provide services of accumulation, abstraction, storage, conditioning and distribution of surface or groundwater, or collecting, treatment and discharging of waste water. Performers of these activities are not, by itself the water users, but they intermediate between water resource in the nature and real users (households, economic entities, institutions).

Analysis of water services in the river-basin of Neretva probably will be limited on level of municipal water services: public water supply and draining of urban waste water.

Basic data for characterization of water services and water uses have to be collected from different, often redundant and inconsistent sources.

Except basic data, will also be used results of previous analyses contained in study, planning and other available documentation. Difficulties are in non-matching of territorial units for water management (river basin, sub-basin, water body) and administrative units (units of local and regional, service area), according to which the bulk of data are collected and published. Restructuring of data to hydrological scale means using of different extrapolation keys. Top-down or bottom-up approach will be applied, depending for example on the basic scale (Table 3).

Table 3. Availability of data and information for economic analysis

Basic scale	Available data/information	Approach to extrapolation to sub-basin scale	Reliability/ Quality of extrapolation
Settlement	Census on population	Aggregation of data for settlements belonging to the river-basin Neretva, extrapolation equivalent fixed at the level of city quarters	
(town/ municipality)	Agricultural census Data on employment Connectivity to water services	Aggregation of data for municipality belonging to the river-basin Neretva, extrapolation equivalent for partly enclosed municipality fixed at the level of settlements (e.g. share of population)	
Entity	Data on GDP Data on water uses	Aggregation of data for entity Republic of Srpska and Federation of BiH	
BiH	Trends and projections	Disaggregating of data to lower administrative scale according to appropriate equivalent, and bottom-up aggregation of such estimates	
Service area	Data on drinking water abstraction and distribution Data on water price Financial data on water service provider	Aggregation of data for service providers operating on the river-basin, extrapolation equivalent for partly enclosed service area fixed at the level settlements (e.g. share of population, share of service consumers)	

2. Defining of baseline scenario

A baseline scenario (BLS) represents the expected projection of selected group of indicators on water use, according to valid policies e.g. independent from requirements of the WFD. It is about forecast of future needs for water and investments into water services and water use by 2015, planned year for achievement of the environmental objectives of the WFD. Projections can be based on the analysis of past trends, but in general it is not enough, since the simple extension of past trends often leads to unreal results.

The main activities of this "building block" are

- assessment of the existing economic trends
- forecasting of the future economic trends
- implications and plans for a future investments in the water sector

However, regarding significance of the different water uses in the Neretva RB analysis regarding future trends in water supply demands could be analyzed separately as a priority action. Later on a similar studies can be performed for other significant water uses, e.g. agriculture and similar.

3. Assessment of the rate of cost recovery for water services

Assessment of the rate of cost recovery for water services is to estimate:

- on which level is current rate of cost recovery
- how and what impact have a current policy of water price on efficient use of water.

For calculation a rate of cost recovery we can use a simple formula :

Cost recovery rate (%) = (total revenue – subsidies) / total costs x 100

In total amount, it's very important to include a total econ. expenditures (financial cost, environmental costs and costs of water resources), us they defined in CIS guidance document on economics ;

Financial costs comprise:

- O & M costs – running costs (personnel costs, material costs, energy costs and other costs related to providing the service on daily bases) and maintenance costs to keep assets in good functioning order till the end of their useful life,
- Administrative costs – costs of regulating the water service activity (e.g. concession charge, costs of water resources management),
- Capital costs – expenditure associated with investment into infrastructure (costs of the principal and interest payments related to new investments, depreciation).

Environmental and resource costs (E & R costs) relate to the damage to the water environment and other water users due to deterioration of water quality or depletion or inefficient use of water resources. In BiH we don't have a experience in calculation a cost recovery with this costs, so we will use a experience from country EU.

As mentioned before, analysis of cost recovery will be limited on level municipal water services: public water supply and draining of urban waste water (because we have all data and information for analysis of cost recovery on that level), and further on we need to include a other socio-economics sector what depends of availability of data from this sectors .Methodology that will be implemented depends on institutional set-up of municipal water services in BiH.

Municipal water services are in competence of local (or in regional level), which have an obligation to, independently or in cooperation with the others, ensure their performance in their area. For performing of these activities they can establish municipal company, public institution or own facility, or they can entrust them to the other legal of physical person based on the contract on concession or contract on entrusting of water utility activities.

The service provider is in charge for management and running of water infrastructure. Revenue for performing of the activities is provided from the price of services that is paid by users.

Water utility infrastructure is mostly owned by municipality, which is in charge for adoption and implementation of the program of investment into water works and equipment. Since such infrastructure is of interest for the Republic of BiH (entity level), a large part of the financial resources for co-financing of the construction is secured at the state level. Currently, the legal frame that is on force also enables private (concessional) investment into the water utility infrastructure.

Also on this phase for this report we need to know a components of water price. Components of water price are : *price of municipal water supply service, price of municipal draining service, price of municipal purification service, charge for financing (and maintenance) of infrastructure, charge for protection of springs, charge for water protection, charge for water use, VAT to prices of municipal services and probably in future concession charge for water abstraction*.

Present structure of water price comprises few instruments for recovery of these costs:

- Charge for financing of infrastructure - revenue of local budget assigned for construction of water works, optionally prescribed by local self-governance,
- Water charges (charge for water protection, charge for water use) – obligatory charges prescribed at national level, intended for covering of costs of management with quality and quantity of water resource and re-investment into water-utility infrastructure of interest for the BiH.(Agency for water on entity level).

Economic analysis of water use

For river basin Neretva this analysis of water use will be implemented through this four steps :

1. Assessment of economic significance of water uses
2. Trend analysis
3. Cost recovery analysis
4. Information to support analysis of cost-effectiveness of measures

Assessment of economic significance of water uses

The economic significance of each water use must be judged with respect to both, its importance as a water consumer and also its absolute and relative contribution to the physical and chemical quality of the water in the river basin. Not all the activities in the basin would need to be reported but only those that exert significant pressures (and impacts). A water use can be marked as a water abstraction or a water discharge.

Abstractions from water bodies are undertaken for a number of purposes, including providing drinking water for households and use of water in production processes. Abstractions by water companies supply water for both household and non-household consumption, which include some industrial and commercial uses, as well as consumption by schools, hospitals, etc. Some industries may have their own sources of water and these abstractions must also be investigated. Agriculture, if significantly developed, uses a lot of water. It demands abstraction of water for its many purposes: growing of crops, market gardening, horticulture, farming of animals, etc. Furthermore, power generation by hydro-power plants uses big quantities of water. However, this water is returned to watercourses after the usage, and this use is considered to be non-consumptive use. Fish-farming is also such use. Therefore, the main uses of water are likely to be the following:

- water abstractions by water companies (water supply to households, industries, etc),
- self-supply by households,
- self-supply by industries,
- water abstractions for irrigation systems,
- water use by hydro-power plans,
- water use for fish-farming,
- water use for tourism and recreation,
- etc.

The first step of the economic analysis of water use in Neretva river basin would be to clearly identify these water uses, to locate them, and to specify them in terms of the significance of their pressure on the water bodies. After the uses and users have been identified, experts will work on data collection, in order to provide a description and information on each of the uses. Any surveys or existing databases should be examined as well. Analysis of data is likely to provide answers to the following questions:

- Which are the activities that have more significant impact on water resources then others?
- How much does each user use?
- Number of water supply companies?
- Percentage of population connected to public water system?
- Number of population with self-supply?
- How much water is abstracted by water utilities?
- How much is water consumption per capita?
- Is there leakage and what is the leakage rate?
- How much water is abstracted by industries if they are self-supplied?
- What is water used for in a production process?
- Percentage of arable and crop land?
- Percentage of land is covered by the irrigation systems?
- What kind of crops are usually found in Neretva river basin?
- Number of fish-farms?
- What kind of fish is mostly cultivated?
- Annual production of fish?
- What is the impact of tourism on water consumption?
- Number of tourist night per year?
- Etc.

Discharges is also a water use since watercourses are used as recipients for wastewaters. Water users such as households, industries, agriculture, etc. are an abstractors, as well as polluters of water. Various discharges into water bodies have important impacts on water status. The main threats to the quality of water are discharges of municipal or industrial wastewater directly into the nearest rivers or springs, and run-off from agricultural areas where pesticides and fertilizers are used. Different types of industries bring different type of pollution into the river, depending if it is food industry, metal industry, textile or some other industry. The agriculture sector has the potential to impact on water quality in a number of ways, as a source or diffuse pollution (mainly nitrates, phosphates and pesticides).

Economic analysis of water uses in Neretva river basin should provide information on how the current ecological status is impacted by water uses, specifically by discharges. Each subject that impacts the water status must be clearly identified, located and described. Issues that need to be investigated are:

- Which sector bring pollution to rivers by the significance of their impact?
- Volumes of wastewater collected and discharged by water companies?
- Volumes of wastewater discharges coming from households, economic sector (industries) and non-economic activities?
- Percentage of population connected to sewage?
- Percentage of population connected to WWTP?
- Percentage of wastewater treated?
- Industries with wastewater treatment?
- Impact of the pollution on aquatic life?
- Type of pollution (nutrients, heavy metals, emerging pollutants, etc.)?
- Etc.

There are a lot of information that requires investigation and data collection, in order to form a complete and comprehensive evaluation on water uses in Neretva river basin. The integrated database could contain two kinds of information. From one side it may contain descriptive or empirical information, and some analytical information connecting technical, environmental and economic data in order to assess the economic significance of water uses. Contribution of each water use to the economic development should be described in a way to explain the participation of the water use in, for example: turnover, employment, income, number of beneficiaries of the use, etc.

Analysis of water uses can result with a variety of identified and defined uses in many different sectors of economy. Usually, household uses, industrial and agricultural uses are the most commonly and easily identified, and are considered to be the most obvious uses as well. But they are not the only ones. There can be other uses such as: water-related tourism, recreational and sport uses, and aesthetic values. Of course, the significance of these water uses depends on their development in the river basin.

Households as a water use are unquestionable, since this is the most basic and inevitable kind of water use. Households are usually supplied by water, one way or the other, and they discharge the wastewater. Therefore, they can be consumers of water and they can be polluters of water. The water supplier for the households in Neretva river basin normally is the municipal water utility, but that is not always the case. Sometime, households have their own sources of water, when their water consumption is nowhere officially recorded. In each case, households are well known as very significant water consumers. Furthermore, wastewater collection should be normally covered by municipal water utilities, but often that is not the case, and households in Neretva RB turn to other alternatives, such as septic tanks or direct discharge into

watercourses. Even in case when household wastewater is collected by water utilities, the wastewater is usually discharged into the watercourses without any treatment. So, households in B&H, and in Neretva RB as well, are not just big consumers, but also a very big polluters of water. Therefore, economic analysis of Neretva river basin has to investigate and analyze all relevant and available data and facts related to household impact on water status.

Industry and agriculture can be more or less developed in the river basin. The significance of their impact on the water status, in terms of water consumption and water pollution, can vary from one river basin to another. Hence, one step of the identification of water uses in Neretva RB needs to be investigation of development of industry and agriculture in the river basin.

Some basins may have very little developed *industrial production*, whereas water bodies in other basins may be heavily polluted. Industrial uses, for example, can be investigated more closely by splitting them into types of industries: food processing, manufacturing of textile and leather, paper industry, metal industry, etc. Purposes of using water in industries can be many, such as processing, cleaning, transportation, dilution, and cooling in manufacturing facilities Industries often reuse the same water over and over for more than one purpose.

In the case of *agricultural development*, some areas may be exploited for large-scale agriculture, whereas other might be unsuitable for agricultural development. All this information influences the significance that will be given to this sector of economy during the economic analysis of water uses. Agricultural uses can be divided into irrigation (of farms, orchard, pasture, horticultural crops, parks, etc.), livestock breeding, fish-farming, and forestry.

Furthermore, **power generation** by hydro-power plants uses big quantities of water. However, this water is returned to watercourses after the usage, and this use is considered to be non-consumptive use. Economic value of these uses with regard to their ecological consequences also needs investigating.

Sand extraction from the river bed is a water use as well, and in fact it is a characteristic activity of Neretva river basin. The sand is the one that is used, and not the water, but the extraction of sand changes the ecological and aesthetic value of the river. For example, natural river beaches might be modified by the impossibility for the new send to settle. Habitats of wildlife also might be endangered by this activity.

Water-related tourism is also an economic sector which can be identified as a water use. If a tourism offer of the certain area is based on water-related activities, which makes tourism a water use. It means that potential tourists are trying to be

attracted to the area by natural beauties of water and by possibilities to use the water surface for recreation. Tourist can normally be consumers of water, but they are also polluters of water. However, they can also just be users of the water, without consummation and without pollution. They use water bodies for swimming, for sailing, for recreational fishing, etc.

There are other **recreational uses** of water, such as camping along the river, rafting, kayaking, etc. Their economic and ecological value and their impact to water status need to be investigated and determined as well. Recreational activities can impact water resources both directly and indirectly. Direct impacts result when recreational activities, such as swimming or boating, occur directly on the water. Indirect impacts result when land-based recreation activities, such as camping or hiking, occur close to shore.

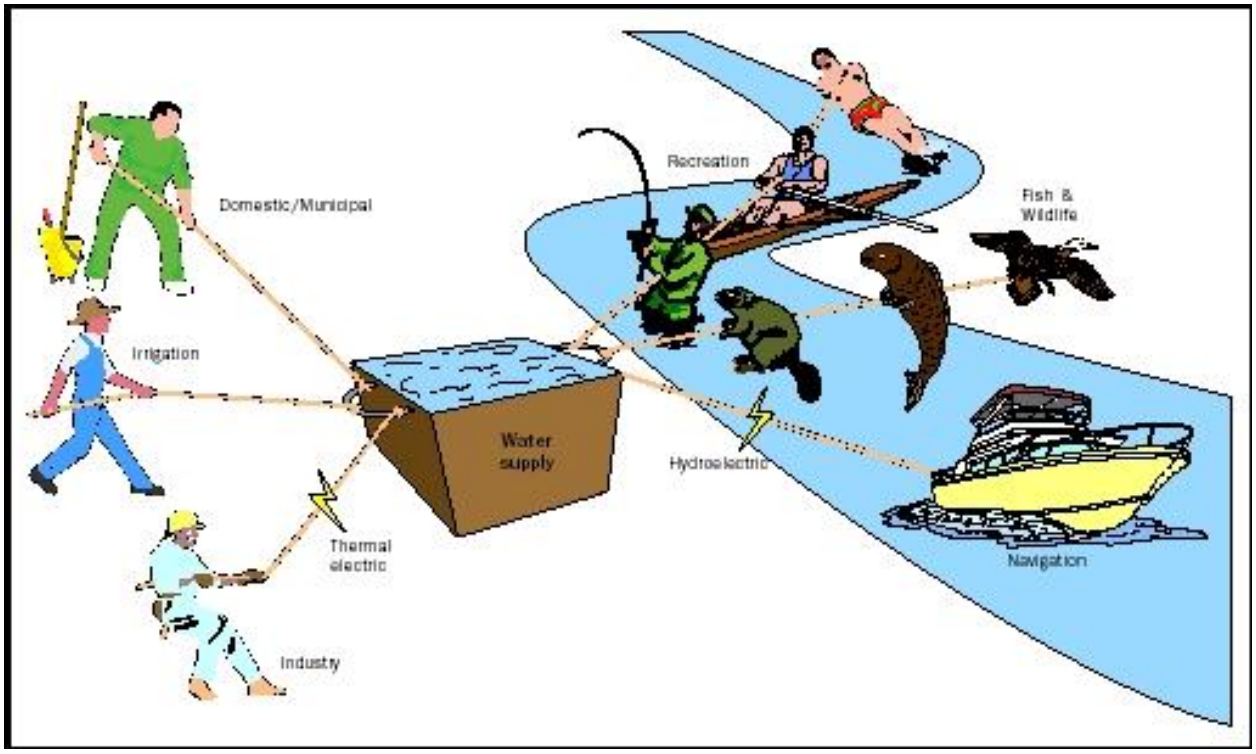


Figure 1. Off stream uses (depicted on the left) are those in which water is removed from its source, either by pumping or diversion. In stream uses (depicted on the right) are those in which water remains in place, and typically refers to stream (rather than groundwater). Where water supply is limited, conflicts may result between and among the various uses.

Trend analysis

This step of the economic analysis of water uses should provide a rough forecast of who will be using water over the next 10 years. Annex III of WFD specifies that economic analysis should "take account of the long term forecasts of supply and demand of water in the RBD and where necessary: estimates of the volume, prices and costs associated with water services and estimates of relevant investment including forecasts of such investments". The construction of long-term forecasts is referred to as business-as-usual scenarios.

The focus of the trend analysis would be the assessment of pressures and of key socio-economic drivers that are likely to influence those pressures (demography, climate, sector policies, e.g. common agricultural policy, technological development) and thus water status.

Increase of water demand by households depends on the trends of annual population increase, and thereby might be forecasted. Any plans that are made in the region regarding industrial, agricultural or tourism development are likely to have significant influence on water demand. Some projections of these trends need to be made. Existing water legislation dealing with issues such as water conservation also may result with some impact of water demand.

Three sources of information which are likely to be used for the approach to trend analysis are:

- Population projections,
- Municipality Development Plans,
- Industrial/Commercial Business Plans.

We need to know that the 90's represent the big political, social and economic turning point for Republic BiH (independence of the country, war, change of the political system, transformation and privatization of the economy, inclusion into integration and globalization processes), which confirms the flow of characteristic socio-economic indicators during that period. Data on GDP, as synthetic indicator of production of certain economy, are showing the large decrease of economic activities in the first war years, the period of instability which followed after that and economic recovery after the year 2000. Due to that fact, the most often is not possible to identify valid historical trends which could be the basis for forecasting of the future status.

But for future demands for water and pressures to water will be assessed based on the expected flows of particular macroeconomic and sector variables from the existing plans and strategies. There are plenty of such documents where are analyzed the development goals and needs of particular sectors and systematized programs and measures for the achievement of such goals, most often at the national or county level.

Based on such documents it is possible to construct the expected scenario of water use in the future, or to assess the level of pressures and impacts to water coming from it.

The projections of basic demographic and macroeconomic indicators are given in the valid spatial-planning documents and Strategy of development of macroeconomics. So they can used for this chapter.

Macroeconomic strategy for the period 2000 - 2015 is planning the stabilization of economic circumstances with available change of technological basis and improvement of structural characteristics of BiH economy (we think this document exist only on entity level , Republic of Srpska and Federation BiH).

It is important for us to know whole documents which we can use in further analysis in river basin Neretva.

Cost recovery analysis

First of all we need to see what was a current level of cost recovery.

Analysis of the cost recovery from water services is based on the financial data publicly available at the Financial agency (on local and entity level). Annual financial reports are collected for all utility companies that provide services of water supply and draining of urban wastewaters to users in the area of Neretva river-basin. For river basin Neretva there is need to have a that financial data.

In the calculation of the cost recovery rate we need to included companies with principal activity related to water services.

Assessed cost recovery rate from water services is related to the costs of running, maintenance and management of water-utility system.

In river basin Neretva there is a need to follow a basic parameters, which means: number of employees, total revenues, subsidies (donations and similar), total expenses. On that principle we can saw a recovery rate.

There is need to collected data on water prices for most of water companies on river basin Neretva (Table 4.).

Table 4. Water price compnent

PRICE COMPONENT	Households (KM/m^3)	Economy (KM/m^3)
Basic price of water (price of water supply service)		
Price of sewerage service and waste water treatment		
Charge for financing of water supply infrastructure		
Charge for financing of waste water infrastructure		
Charge for water use (revenue of entity Agency for water)		
Charge for water protection (revenue of entity Agency for water)		
Tax (VAT)		
TOTAL		
Source:		

Contribution to cost recovery from the key water uses (to what extent a polluter pays principle is applied).

So after defining the services and the costs, analysis should provide answers to the following questions:

- What are the amounts of water and wastewater charges in water utilities in Neretva river basin and their comparison, providing reasons for the price differentiation?
- Do existing prices cover the costs of services?
- What is the percentage of the coverage of costs?
- Do these prices provide an incentive for rational water usage?
- What is the collection rate of the water bills?
- What are the institutional and legal instruments for regulating pricing and cost recovery?
- In the case of the existence of WWTP, what is the extent of coverage of these services?
- Is the "polluter pays" principle applied?
- What is the amount of external subsidies to the sector?
- Where do these external subsidies come from and how are they financed?

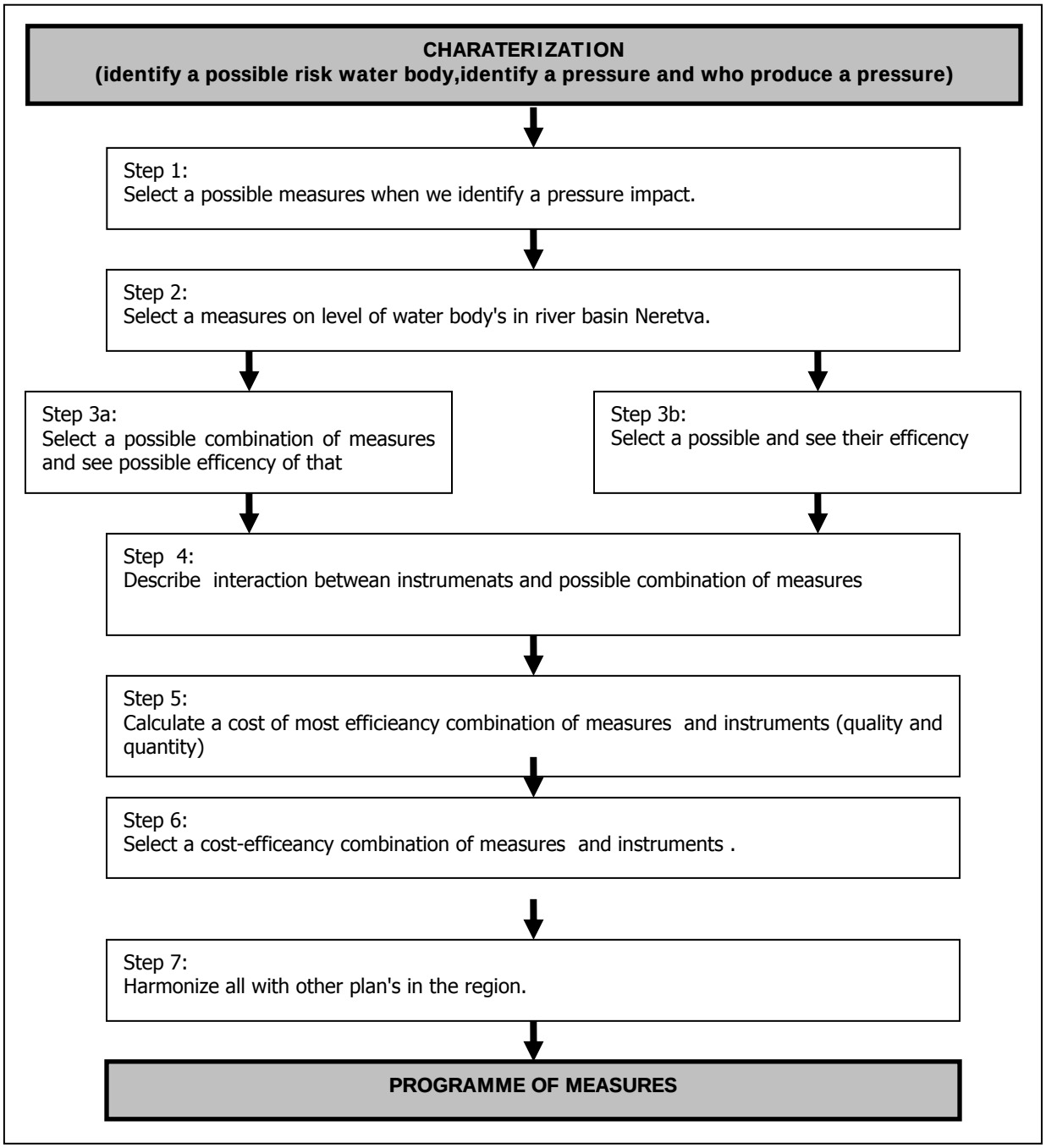
Information to support analysis of cost-effectiveness of measures

The best methodology to chose a cost-effectiveness of measures are show on next table.(Table 5.)So on the first five steps we need to analysis expenditures and benefit of potential measures and instruments, and next step will be a chosen a optimal (or best) combination of potential measures.

The *Programme of Measures (WFD Article 11)* is at the heart of **river basin management planning**, as it sets out the actions to be taken during the planning period to secure the Directive's objectives. It builds on the gap analysis and includes the following considerations.

- *Basic measures* required to implement Community legislation for the protection of waters in the *river basin district* in line with other relevant Directives
- *Supplementary measures,* any pricing measures or other economic instruments intended to provide incentives to encourage more sustainable and efficient water use.
- *Additional measures,* if the above is not sufficient to meet Directive requirements, Member States may need to employ *additional measures as* exceptional cases in order to protect the aquatic environment, e.g. for international river basins.

Table 5.


CHARATERIZATION
(identify a possible risk water body,identify a pressure and who produce a pressure)
Step 1:
Select a possible measures when we identify a pressure impact.
Step 2:
Select a measures on level of water body's in river basin Neretva.
Step 3a:
Select a possible combination of measures and see possible efficency of that
Step 3b:
Select a possible and see their efficency
Step 4:
Describe interaction betwean instrumenats and possible combination of measures
Step 5:
Calculate a cost of most efficieancy combination of measures and instruments (quality and quantity)
Step 6:
Select a cost-efficeancy combination of measures and instruments .
Step 7:
Harmonize all with other plan's in the region.
PROGRAMME OF MEASURES

Implementation of Programme of Measures for the Implementation of the Urban waste Water Treatment Directive (Council Directive 91/271/EEC)

WFD approach on missing information

Lack of data should not be an excuse – demonstrate you tried and have identified data gaps and actions to fill these gaps

The Water Framework Directive requires that "significant pressures" shall be identified, as a central element in the characterization of the River Basin District required under Article 5 and Annex II of the WFD.

Article 10 of the WFD stresses the need to use the combined approach for point and diffuse sources, addressing both

- the environmental **water quality objective** or water quality standard and
- Best Available Techniques (BAT) expressed as **emission limit values.**

While the **WFD addresses the quality of the environment**, the **UWWTD addresses the emissions.**

The **Urban Waste Water Treatment Directive** (UWWTD) is a BAT Directive and outlines the emission limit values shown in the table below:

Parameters	Size of agglomeration	UWWD requirements for waste water handling**	
		Concentration*	Minimum percentage of reduction [1]
BOD[2]	> 2 000 p.e.	25 mg/l O_2	70-90
COD	> 2 000 p.e.	125 mg/l O_2	75
Total SS	> 2 000 p.e.	25 mg/l	90
Total P	10 000 – 100 000 p.e.	2 mg P/l	80
	> 100 000 p.e	1 mg P/l	
Total N[3)]	10 000 – 100 000 p.e.	15 mg/l N	70-80
	> 100 000 p.e	10 mg/l N	

Notes:

* concentration of time or flow proportional 24-hour sample, for parameters total nitrogen and total phosphorus – annual mean values.

** for discharges from urban waste water treatment plants which are situated in the relevant catchment areas of sensitive areas and which contribute to the pollution of these areas

[1)] Reduction in relation to the load of influent

[2)] The parameter can be replaced by another parameter: total organic carbon (TOC) or total oxygen demand (TOD), if a relationship can be established between BOD5 and the substitute parameter

[3)] Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH3), nitrate (NO3)-nitrogen and nitrite (NO2)-nitrogen.

The requirements in the table reflect BAT considerations at the time when the UWWTD was drafted (end of the 80ties) and waste water treatment technology has improved after that, so it is possible to comply with more stringent requirements today from a BAT point of view.

The UWWTD further requires that all agglomerations with a population equivalent (P.E.) of more than 2000 are provided with collecting systems for urban waste water.

Thus, we can considered that each agglomeration with population more than 2000 PE can be considered as a significant pressure and receiving water can be considered as a potentially "water at body at risk".

In other words, Programme of Measures is defined by identified agglomerations and UWWT Directive requirements.

Programme of Measures WFD Implementation Cycle

Significant pressures ➔ Analyzing feasibility of defined measures based on economic, social and environmental criteria ➔ Choose 'best set of measures' ➔ Incorporate them in the RBM plan ➔ Implementation ➔ Repeat in a six year cycle

On this basis we are able to, as a first iteration, calculate future cost for the implementation of PoM for UWWT Directive.

Calculations will be based on the

- The FEASIBLE (Feasible Financing Strategies for Environmentally Related Infrastructure) Model, Version 2 – OECD EAP Task Force/EU Water Initiative (www.oecd.org/env/finance) 2003, ISBN: 92-64-10276-0
- CD4WC, research project supported by the European Commission under the Fifth Framework Programme (www.tu-dresden.de/CD4WC)
- EC CARDS 2004 WQM Project BiH Final Report – Carl Bro&Neri, 2007
- Available technical documentation from BiH
- Consultant experience and judgment

Wastewater Treatment Plants

This component includes the wastewater treatment plant and the outfall pipeline, if applicable. Expenditure functions for wastewater treatment were taken from the FEASIBLE Model.

The influent water quality assumed is illustrated in the table below:

Influent quality in mg/L (yearly average)

BOD	N	NH4 - N	P	SS
250	50	30	8	300

The following combinations of wastewater treatment plants are considered:

M	Mechanical
MC	Mechanical-Chemical
MB	Mechanical-Biological
MBC	Mechanical-Biological-Chemical

Effluent quality by type of treatment (in mg/L - yearly average)

Treatment	Expenditure category	Effluent quality in mg/L						
		BOD	N	NH4 - N		P		SS
M	1	175	45	35		7		25
MC	2	100	40	35		2		25
MB	2	25	35	30		6		25
MBC	3	15	35	30		1		25

Organic pollution is the primary parameter for establishing the expenditure functions for the capital expenditure of new wastewater treatment plants.

The following assumptions have been made:

- The pollution parameter used in the expenditure functions is PE. The number of PE is defined at the total load of BOD (including industry) divided by 60 g/day.
- The function assumes a wastewater flow of 200 l/PE/day.
- BODinlet/Ninlet = 4.5
- Peak flow rain/Peak flow dry weather is equal to 2
- The design temperature of inlet water is 7 oC5
- "Medium quality" design. Very fancy and very cheap solutions have not been assumed.

Investment expenditure functions for wastewater treatment plants

	Load in P.E.	
Technology	2,000-100,000	>100,000
M	=10^(-0.2073*log(PE)+3.6385)/7.44	53.8
MC	=10^(-0.2632*log(PE)+4.0149)/7.44	67.2
MBC	=10^(-0.2808*log(PE)+4.1823)/7.44	80.6

Operational Expenditure

The operational expenditure for wastewater services is estimated using a percentage of the investment expenditure. This covers all operational expenditure except electricity, which will be specified separately.

Electricity consumption:

Category M: 15 kWh/year/PE

Category MB: 25 kWh/year/PE

Other operational expenditure: 3% of the total investment expenditure for wastewater treatment.

Plant Expenditure, Adjustment to Local Conditions

In order to adapt the generic expenditure functions to local conditions, a number of correction factors are recommended.

A number of special physical conditions which will cause higher unit expenditure of construction are listed below along with factors by which the expenditure of the collection system should be multiplied, when relevant. It is recommended to use the factors where no local data allows a more detailed assessment:

1. The site has soft ground with a high groundwater table, which implies that either the ground must be excavated and filled with sand or the constructions must be piloted:
   Factor = 1.3

2. The site has rocky ground, which implies difficult excavation conditions or a need for blasting:
   Factor = 1.3

3. The plant receives storm water from a combined system, with a magnitude of 3-4 times max wastewater flow.
   Factor = 1.2

Final sludge disposal.

The following amounts of sludge will normally be produced:

Assumptions as to sludge production

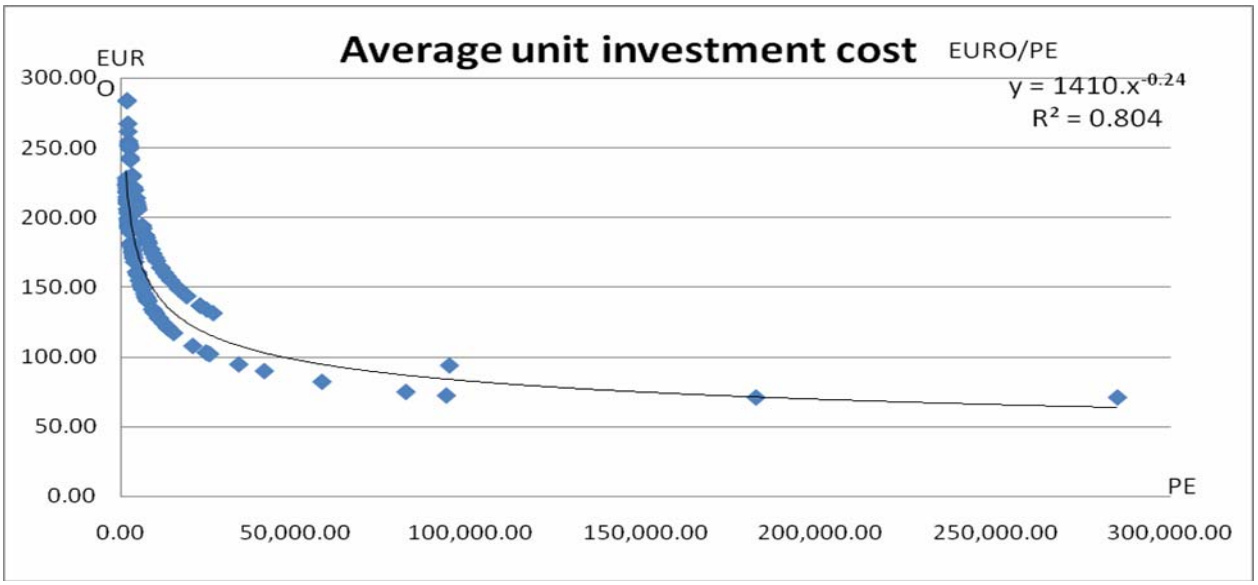
Plant type	Stabilised dry solids	Dewatered 25%
	(kg/PE/year)	(m3/PE/year)
M	13	0.05
MC	23	0.09
MB,	20	0.08
MBC,	30	0.12

Cost shares for investment, renovation, and maintenance costs (%)

Equipment	40.0%
Materials	10.0%
Labour	25.0%
Consulting	10.0%
Contingencies	15.0%
Land	0.0%
Sum	100.0%
Cost shares for other operational cost (%)	
Materials	27.8%
Labour	55.6%
Other	16.7%
Sum	100.0%

Average Investment Unit Cost per PE for Biological Treatment in BiH

ES	Unit investment costs	OM Unit costs
	Euro/PE	Euro/PE
1000	268.67	14.09
2000	227.50	12.53
5000	182.59	10.72
10000	154.60	9.53
20000	130.91	8.47
25000	124.08	8.15
30000	118.77	7.91
50000	105.07	7.25
75000	95.32	6.77
100000	88.96	6.44
150000	80.72	6.01
200000	75.33	5.73
300000	68.35	5.35
500000	60.46	4.90



Final Cost Assessment – PoM for UWWT Directive implementation

			NEW UWWTP COSTS			
Agglomeration	Recipient	PE	Total Investment cost	Total annual O&M cost	Total Investment cost	Total annual O&M cost
			EURO/PE	EURO/PE	mill EURO	mill EURO
NERETVA and TREBIŠNJICA RIVER BASIN					**35.529**	**2.293**
Međugorje		30,000	118.77	7.91	3.563	0.237
Čitluk	Lukoč	15,246	139.72	8.87	2.130	0.135
Grude	Kanal	9,486	156.57	9.62	1.485	0.091
Nevesinje	Zalomka	9,090	158.18	9.69	1.438	0.088
Posušje	Ričina	5,000	182.59	10.72	0.913	0.054
Mostar	Neretva	125,000	84.33	6.20	10.541	0.775
Stolac	Bregava	5,530	178.22	10.54	0.986	0.058
Široki Brijeg	Lištica	8,300	161.67	9.84	1.342	0.082
Prozor-Rama	Prozorčica	3,500	198.90	11.39	0.696	0.040
Kalinovik	Rasovača	2,500	215.63	12.06	0.539	0.030

Čapljina	Neretva	9,174	157.84	9.67	1.448	0.089
Konjic	Neretva	16,500	137.10	8.75	2.262	0.144
Jablanica	Neretva	5,000	182.59	10.72	0.913	0.054
Vrapčići	Neretva	3,464	199.40	11.41	0.691	0.040
Jasenica	Jesenica	2,071	225.60	12.45	0.467	0.026
Potoci	Neretva	2,921	207.73	11.75	0.607	0.034
Gnojnice	Neretva	2,211	222.08	12.32	0.491	0.027
Gacko	Mušnica	9,500	156.52	9.61	1.487	0.091
Ljubinje	Bukov potok	3,400	200.29	11.45	0.596	0.033
Bileća	Bilećko lake	11,250	150.29	9.34	2.935	0.164
TOTAL					**35.529**	**2.293**

Plan of activities

The objective of the "Action Plan" is to identify, prioritized and to proposed particular research activities supportive to the implementation of the WFD operationalized through the three steps. (See picture1, page 4.)

Disaggregating of the WFD economic analysis requirements into smaller "individual" building blocks, should allowed us to prepare flexible, resource les intensive and implementable plan for the implementation of the economic analysis in the Neretva RB.

Following proposed activities are primary field research activities with objective to obtain realistic data and to support competent bodies for WFD implementation. Proposed list of the activities reflect current knowledge of the consultant regarding available data in the BiH and Neretva RB and their estimation of the future data needs.

As a priority action we should proposed following activities :

- Desk top research with objective to collect and assessed current data availability and to pinpoint potential sources of the information's and their relevancy for the future economic analysis.
- Identification and definition of the water users in the Neretva RB
- Implementation of the combined research activities
    - Contingency evaluation method

- Stated preferences research
- Household income research

With objective to obtain data in information on the

- Affordability and willingness to pay for the water and waste water services
- Evaluate and monetarized non market values of the ecologic services, aesthetic values and recreational/tourism values

- Financing and cost recovery analysis of the water utilities in the Neretva RB

Proposed activities are focused on three significant "water users"

- Communal utilities
- Agriculture
- Ecological (including recreational and aesthetic use)

The other two significant users that are not covered by proposed activities are

- Industry production
- Energy production

It is envisaged that results of the proposed activities should strongly support and create solid base for the future preparation of the "Economic Characterization of the Neretva River Basin" analysis.

Defined activities, scope and priority of implementation and estimated costs are based on the experience and expert judgment of the EE working group members.

No.	Proposed activity	Description of activity	Expected results	Support to	Estimated costs (Euro)	Comment
1	Quantitative survey of the household water services in the Neretva RB	Combined "household income and living standard" and "stated preferences" survey	The quantitative research should provide quantitative measures of willingness to pay; affordability, current and future trends of the water consumption, as well as other aspects of interest regarding current and planed future water and waste water services Assessment of the costs of the ecological and aesthetic values	Article 2: Definition of water services – Definition of water use; baseline scenario definition Article 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use Article 9: Recovery of costs for water services Articles 11: Programme of measures	20,000 Cost estimation based on the expert experience and judgment	Step 1 Water service and water uses Step 2 Future water service and water uses Step 3 PoM cost effectiveness PoM feasibility assessment

No.	Proposed activity	Description of activity	Expected results	Support to	Estimated costs (Euro)	Comment
2	Survey of the agriculture activities and related use of the water in Neretva RB	Combined survey including • Desk top research • Field investigation • Field qualitative and quantitative survey • Data analysis and preparation of the synthesis report	Analysis should provide data and information on the current type of the agricultural production (including fish farming), spatial distribution over Neretva RB, current water use • Quantitative (water abstraction for irrigation and other purposes) • Qualitative (assessment of the farming practice, use of the fertilizers, pesticides and other pollutants) • Current levels of the cost recovery • Estimate of future demands	Article 2: Definition of water services – Definition of water use; baseline scenario definition Article 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use Article 9: Recovery of costs for water services Articles 11: Programme of measures	40,000 Cost estimation based on the expert experience and judgment	Step 1 Water service and water uses Step 2 Future water service and water uses Step 3 PoM cost effectiveness PoM feasibility assessment

No.	Proposed activity	Description of activity	Expected results	Support to	Estimated costs (Euro)	Comment
3	Water and waste water utilities performance analysis	Field survey	To assess current performances of the water and waste water service providers, to assess costs of the future investments in to water and waste water infrastructure, to establish baseline scenario and to assess performance indicators, to define and establish reporting structure and obligations	Article 2: Definition of water services – Definition of water use; baseline scenario definition Article 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use Article 9: Recovery of costs for water services Articles 11: Programme of measures	20,000 Cost estimation based on the expert experience and judgment	Step 1 Water service and water uses Step 2 Future water service and water uses Step 3 PoM cost effectiveness PoM feasibility assessment

No.	Proposed activity	Description of activity	Expected results	Support to	Estimated costs (Euro)	Comment
4	Economic value of the ecological, recreational and aesthetic amenities in the Neretva RB	At this moment it is difficult to say what type/methodology of economic analysis will be the best option, thus definition of the methodology should be a part of this activity	Assessment of the economic values of the identified aesthetic, recreational and ecologic amenities and potentials in the Neretva RB	Article 2: Definition of water services – Definition of water use; baseline scenario definition Article 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use Article 9: Recovery of costs for water services Articles 11: Programme of measures	Not Available	

There is need to identify data gaps.