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MASTER'S THESIS

AN ANALYSIS OF WATER SECTOR IN FEDERATION OF BOSNIA AND HERZEGOVINA: AN EXISTING PRICING MODEL AND SCARCITY RENT

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INTRODUCTION

This is a master´s thesis on restricted natural resources, in particular of water, its value and use, analysis of water sector and assessment of water prices. It is very broad field to be explored and discussed. Definitely, water management cannot be seen as a problem or concern of only one country, not even the continent, but as a concern of the whole mankind.

Estimated world population exceeds 7,279 billion (Worldometers - Current World Population, 2014). Based on statistics that were provided by World Health Organization (hereinafter: WHO) and United Nations International Children's Emergency Fund (hereinafter: UNICEF) in 2010 around 884 million people in the world did not have access to an improved water source. We can assume that the number of population deprived of clean water is much higher today. This fact is frightening. It should make us think and act faster in a direction of changing our ways of water consumption and treatment of the precious and scarce resources.

Bearing in mind nowadays situation regarding consumption of natural resources and the lack of the same, we could say that water consumption in total is low because of small quantity of resources and we won´t be wrong. Organization for Economic Cooperation and Development (hereinafter: OECD, 2001, p. 98) predicts that global water consumption will be increased by 31% in period from 1995 to 2020. The question is if we could control this and is it going to lead us into deeper gap. It is possible that, on one side, we can have a huge increase of consumption. On the other side, the rest of the market can suffer from bigger decrease of consumption at the same time. Same research (OECD, 2001, p. 98) shows that a significant lack of water will exist at local levels and it is to be expected by 2020. 25 developing countries will experience significant difficulties with their water supply. Further on, there are strong indicators for increase of water consumption and no potential to meet all market needs.

However, today we face completely different situation in Bosnia and Herzegovina (hereinafter: BiH). Number of natural resources is at high level and it raises very logical question “What could go wrong with water supply and demand if we have enough resources to fulfill all market needs?” As it is mentioned in Midterm development strategy for BiH-PRSP 2004-2007 (Council of ministers of BiH, Government of FBiH, Government of RS & Office of the BiH coordinator for PRSP, 2004, p. 192), BiH has considerable water resources which could become a foundation for its general economic development.

In order to organize and control water consumption economists try to emphasize a value of water and its associated ecosystem services. This can be observed from different perspectives. For instance, precise water price could:

- pay for the cost of water infrastructure;
- help implementation of the 'polluter-pays' principle;
- support an efficient allocation among competing human water uses;
- encourage change in behavior among water users in order to ensure good water quality and status, and
- support decision making in the implementation of the Water Framework Directive.

Logical question rises up: How do we put a value on water? There is one sentence from legendary book called Economics written by Samuelson and Nordhaus (2000) and it goes like this ”Water as crucial life resource is cheaper than diamonds.” Thing that economists wanted to do is to find the right excuse for this phenomenon trough decades. The question is, even though people find water crucial for their life, do they value it as they should and is there a proper way to ensure rational usage of water. Because of these and similar questions, both written and unwritten, the environmental economy has become important and popular nowadays.

The research subject is to discuss the key factors and challenges for stakeholders in water sector in order to ensure sustainable water supply and water charging which provides equal satisfaction of basic human needs for everyone.

The purpose of this thesis is to present the current situation in BiH water sector, better understanding of payment issues related to water supply development in Federation of Bosnia and Herzegovina (hereinafter: FBiH) required by the EU Directives, as well as importance of establishment of reliable pricing system.

The research objectives are to ensure better understanding of water sector in FBiH, a water pricing model which will be acceptable for all stakeholders: consumers, water suppliers and even for future generations. To be able to understand this simple and rational model, we will have to be able to use gained information in appropriate way. The following list contains objectives defined:

- understanding organization of FBiH Water Sector, both its advantages and disadvantages,
- describing water as economic category and efficient tool of public sector management,
- explaining what kind of water tariffs exist,
- finding new approach for assessment of water tariffs, which is supposed to be more efficient and which should ensure rational usage of water in FBiH.

Final goal of this work is to present an adequate pricing model, which could be more useful in practice compared with the existing one.

All these objectives may look fundamental and crucial for each water sector but those are important issues for small countries in transition such as BiH that are streaming to be resolved in future time. As soon as we analyze and absorb facts from our turbulent history and governmental organization in BiH, we will be able to realize that there are a lot of questions that wait to be answered and many changes to be done here. At least, our intention is to stress out all the critical points and to encourage necessary improvements for benefit of present and future generations. It is about time for economists to find solutions for upcoming problems and to find rational models that will explain potentially radical changes.

The research methodology will be based on combination of analysis, assessment and comparison. Qualitative analysis, descriptive and comparative methods will be used to create this master's thesis, as well as, a model approach in part that copes with water pricing. Primarily, it would be the secondary data that will be collected from secondary sources, annual reports or different types of development and strategic plans in FBiH. Literature reviews will be made to access information and gather knowledge and contribution on the subject by a search form the websites of academic institutions, internet search for e-books, official journals and publications.

The introductory part of this work highlights the research problem, the purpose and objectives of the research. The first chapter gives basic information about BiH, about FBiH and its general characteristics. Further on, FBiH Water Sector together with its organization, infrastructure and economical aspect are presented.

The second chapter analyses water as economic category, its use and water value. Then we analyze water market with its supply and demand, demand management and demand elasticity.

The third chapter explains tariff structures and gives more information about types of tariff structures. We have to be aware of different forms of economic instruments that can be used to set a price on water use. Not all instruments are created in and for the same conditions. In many cases, the best results can be obtained by mixture of economic instruments and policy legislation. When it comes to pricing water use it has to be observed as both powerful and complex tool that requires strong governance structures for monitoring, reporting, verification, and enforcement. To see how well used is this tool in our country, we will analyze existing pricing model in FBiH.

The fourth chapter presents a scarcity rent as a new approach or pricing model and its main characteristics. Anything scarce and in demand commands a price; this is one of the basic principles of economics. If we think of water as a scarce resource, then water pricing could be seen as an acceptable instrument of public policy. Benefits and costs of perceiving this model, experience in foreign countries, comparison of previous pricing model in FBiH and scarcity rent are presented in final phase of this paper.

1 BASIC INFORMATION ABOUT FBIH AND ITS WATER SECTOR

The Constitution of BiH is an integral part of the Dayton Peace agreement and has created a very specific governance structure comprised of two Entities, the FBiH and the Republic of Srpska (hereinafter: RS). Under this constitutional construction BiH is a sovereign state with a decentralized political and administrative structure. BiH is the state with central authority with limited and specific powers. Besides two above mentioned Entities, in BiH exists the Brcko District (bos. *Brčko*) as a single administrative unit of local self-government. FBiH, RS and Brcko District are politically, administratively and legally largely fiscally autonomous.

The administrative division of the country and its political organization, as outlined below, reflect a federalist approach to the governance of BiH. Geographically, there are 6,129 communities in BiH, which form the building blocks of the 142 municipalities. FBiH comprises 79 municipalities, which are grouped into 10 cantons. It is to be mentioned that Entities have their own respective constitutions and hold all responsibility not expressly assigned to the State by the Constitution of BiH.

The basic unit for water management in FBiH is the river basin district (Zakon o vodama FBiH, Official Gazette of FBiH, no. 70/06). The territorial basis for water management in FBiH is defined under the two river basin districts of the Sava River and Adriatic Sea. River basin of River Sava is part of international river basin district of the Danube River (part of the international sub-basin/sub-basin of Sava) in the FBiH. River basin of the Adriatic Sea includes parts of international river basins of Neretva with Trebisnjica, Cetina and Krka in the territory of BiH and FBiH.

1.1 Organization of water sector

Responsibility for water management (i.e., development, protection, use, protection from the harmful effects of water) is the responsibility of the entities and Brcko District. Entity Water Laws designate the institutional framework for water management.

The BiH Constitution gives power to the state to coordinate activities within the exclusive domain of the entities. At the level of BiH, the Ministry of Foreign Trade and Economic Relations (hereinafter: MOFTER) was established by the Law on Ministries and Other Administrative Bodies of BiH (Zakon o ministarstvima i drugim tijelima uprave BiH, Official Gazette of BiH, no. 5/03 and no. 42/03). MOFTER is responsible for carrying out tasks related to defining policies and fundamental principles, coordinating activities and harmonizing plans of Entity authorities and bodies at international level – among others in the fields of agriculture, energy, protection of the environment, development and use of natural resources and tourism. Competencies of MOFTER in the Water Sector are focused on development, use of water resources as part of natural resources and the coordination of the Entity Ministries of Water Management. At state level, MOFTER has the authority to deal with some issues concerning natural resources, including environmental protection.

The FBiH has adopted legislation that impacts the delivery of water and wastewater services, addressing most aspects of technical, administrative and financial matters.

The main authorities responsible for environment and water issues in the FBiH are:

- Federal Ministry of Agriculture, Water and Forestry and
- Federal Ministry of Environment and Tourism.

Institutions competent for environmental issues are responsible for preparation of the environmental policy and strategy-related documents, quality standards of air, water, and soil, environmental monitoring as well as supervision of relevant institutions from the environment sector. The very institutions are also responsible for the water policy and strategy development, maintaining compliance with laws through supervision of approvals, licensing, permits, setting of standards and regulations. The inspection authorities in the RS, FBiH and District Brcko maintain the compliance with laws through inspection.

There are two watersheds in BiH. In FBiH, there are two water agencies operating from January 1st, 2008 in Sarajevo for watershed area of Sava river basin and Mostar for watershed area of Adriatic sea basin.

Responsibilities of the Water Agencies comprise, inter alia, are: data collection and monitoring, preparation of plans, reporting and projects, disaster management and prevention, issuance of licences and permits, reporting, research, development and awareness raising.

The cantons' environmental authorities are the respective ministries of civil engineering, spatial planning and environmental protection and the ministries of agriculture, water management and forestry. Cantons and municipalities have also related inspection services.

Municipalities, in accordance with the law, are responsible for communal activities. They are governed by a Municipal Council. Municipal Councils are elected by voters of a municipality. They also have an executive body headed by a mayor. Municipalities are very important to the Water and Wastewater Sector because they essentially control the water utility companies and have the responsibility for the provision of public services to all people within its borders.

1.2 Institutions responsible for functioning of water sector in FBiH

Federal Ministry of Agriculture, Water and Forestry performs administrative, professional and other tasks stipulated by law concerning the jurisdiction of the FBiH in the area of Agriculture, Water and Forestry. Department of Plant Protection in Agriculture is part of the Federal Ministry of Agriculture.

Federal Ministry of Health among other tasks directly performs administrative, professional and other activities in the context of the safety of water for human use.

Based on the Law on Water of FBiH (Zakon o vodama FBiH, Official Gazette of FBiH, no. 70/06.) the Agencies for water management for the river basin districts were established, with headquarters in Sarajevo and Mostar. In order to ensure efficient execution of tasks within the jurisdiction of water agencies and to promote the principles of convergence, regional offices have been established, which are Water Agency for Sava river district and Water Agency for Adriatic Sea.

According to Article 29 Law on Water of FBiH special duties of water agency in water management are:

- preparation of analysis of the river basin district;
- preparation of overview of the impact of human activities on the condition of surface and groundwater;
- preparation of economic analysis of water use;
- establishing a register of protected areas and areas with special protection by decisions of the Government of the FBiH;
- establishing a register of water bodies that are used or intended to be used for the abstraction of water for human consumption;
- preparation of the ecological, chemical and quantitative status of water;
- preparation of program and organize the monitoring of water;
- preparation of water management plan and program of measures.

In addition to the tasks from Article 29 Law on Water of FBiH, Water agency for river basin district is responsible for issuing water regulations.

Cantons are administrative territorial units within the FBiH. Each canton has a constitution. Cantonal constitutions must be in accordance with the Constitution of the FBiH. Each canton has a legislative body. Cantons regulate the manner and content of the performance of utility services. In the context of water management, the cantons have a significant role in the affairs of securing water for the use of citizens, social and economic entities, and other users. Cantons regulate this area and specify the responsibilities and obligations of municipalities as local self-government.

When it comes to cantonal law relating to water, it is necessary to emphasize that the strategic importance of commitment to the responsibilities in terms of securing water for the population is divided between the FBiH and cantons in a such way that the FBiH shall issue regulations on water quality for human use and regulations related to the effluents, while the development and legal regulation of issues related to the use and maintenance of infrastructure for supplying the population with drinking water and the elimination of waste water lies exclusively within the competence of the cantons or municipalities.

Cantonal Ministry responsible for water is responsible for issuance of water regulations for:

- abstraction of water in quantities up to 10 liters per second,
- discharge of waste water for villages that have up to 2,000 inhabitants,
- extraction of material from surface waters category II,
- construction of hydropower plants to generate electricity when the plant is located in the surface waters category II up to 5 MW,
- formation of the reservoir which is located on the surface waters category II. and is located in canton,
- construction of flood protection for surface waters category II when these activities do not affect the surface water category I, Cantonal regulations determine transfer of cantonal jurisdiction for the issuance of water acts at the level of town and municipality.

Municipalities in FBiH are the units in which local government is implemented. Municipalities have a statute that must be in accordance with the Constitution of the Federation, cantonal constitution and cantonal legislation.

Law on the Principles of Local Self-Government (Zakon o principima lokalne samouprave u FBiH, Official Gazette of FBiH, no. 49/06) specifies the position and role of municipalities in the system of exercising the right of local self-government.

Water and wastewater services are now generally provided either by Water Utility Company (bos. *Vodovod*), a company that usually provides only water and wastewater services, or as part of a compound public utilities company in the municipality. In smaller municipalities water and wastewater are included along with many other municipal services, such as street maintenance, central heating, management of parks and cemeteries, solid waste collection and other services.

1.3 Technology/ infrastructure

Management of water resources and building infrastructure for its use has a centuries-old tradition in BiH. The first aqueduct in Sarajevo was built in 1462. However, it was a time when only 2 or 3 European cities had built a public water system. During the 70´s and 80´s, BiH among the former Yugoslavian counties was a leading one in terms of planning and management of water resources (MOFTER, 2011, p. 2).

Unfortunately, Bosnian war (1992-1995) essentially disrupted planned development of the Water Sector and they left key implications on:

- inter-Entity distribution of responsibility related to the Water Sector without establishing adequate operational coordinating body and / or mechanism at the state level;
- inter-sectorial dispersion of responsibility related to the management of water resources;
- a significant outflow of personnel from the Water Sector without adequate administrative plans and actions to rapidly replace the same;
- destruction and severe damage of infrastructure;
- crucially weakened economic situation of the population and the economy as a result the water in BiH is still treated primarily as a social rather than an economic category.

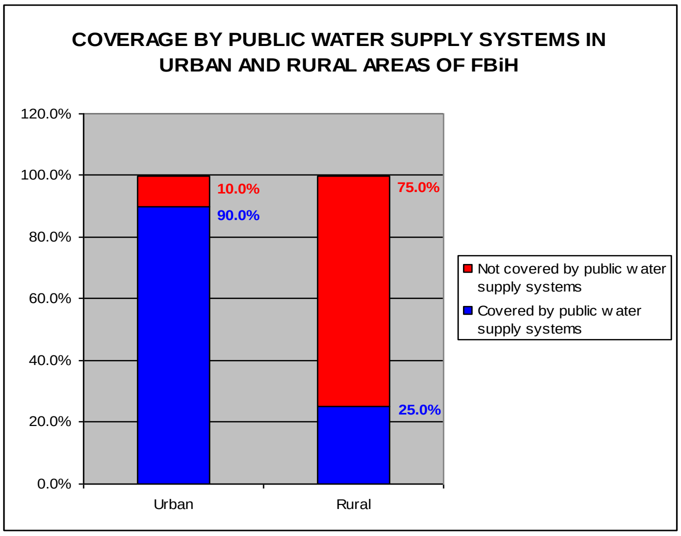
Despite of these difficulties, we have to conclude that in the post-war period, characterized by the radical political, legislative, administrative and financial changes, were achieved significant successes of the competent authorities on the rehabilitation of water infrastructure and the further development of the Water Sector.

Technical background (The European Union IPA Programme 2007, 2010b, p. 61) presents coverage by public water systems for the largest cities in the FBiH as follows:

- Sarajevo 95% - city municipalities;
- Tuzla 95% - municipality center;
- Mostar 90% - municipality center;
- Zenica 80% - municipality center;
- Bihać 95% - municipality center.

Figure 1 shows the coverage by public water systems in urban and rural areas of FBiH analyzed through the EU project entitled Support to BiH water Policy and presented in Technical background (The European Union IPA Programme 2007, 2010b, p. 61). Presented results are emphasizing very low percentage of rural area covered by public water supply system.

Figure 1. Coverage by public water systems in urban and rural areas of FBiH



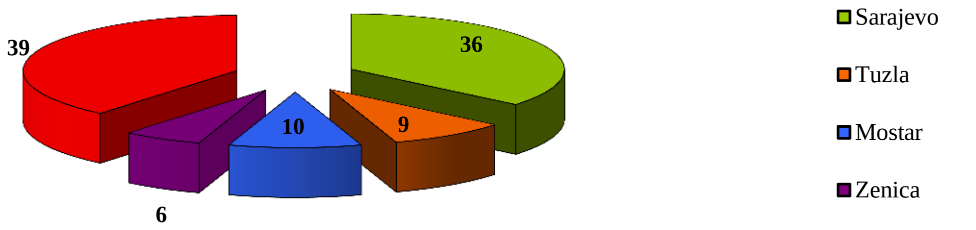
Source: The European Union IPA Programme 2007, *Technical background for development of sub-strategy for the implementation of EU Drinking Water Directive (98/93/EEC) and EU Directive on Urban Wastewater (91/271/EC),* 2010b, p. 61, Figure 12.

Total volume of abstracted water for the water supply in FBiH is around 261,542,143 m3 / annually, which at 1.39 million people covered by public water systems provide a specific gross consumption of 512 l/capita/day (Federal Office of Statistics, 2009, p. 156). Specific consumption structure is, for example, related to households' consumption (consumption in houses or in flats). Further, specific consumption could be analyzed through a consumption in public institutions such as schools, military and health institutions, but also leakages in water supply systems which for our circumstances are very pronounced in the total structure of water consumption. To be able to analyze a specific gross consumption we have to be able to include a industry consumption as well, but industry consumption which is connected to the municipal water supply network and which in their technological processes use drinking water quality. Meeting water requirements for watering of gardens and farmsteads and individual cattle breeding, which primarily relates to rural settlements is also comprised in this item of specific consumption. In some areas, the value of specific consumption of the population is very small, which may be due to poor recording of quantity of water entering the system, or registering by the house, i.e. the consumer water meters, as well as the inconsistent presentation of net and gross consumption.

In Federal Office of Statistics (2009, p. 156) they came to the calculation that the current specific water consumption is about 120 l/capita/day in the areas with regular water supply and this is the average specific consumption of the population in FBiH. This indicates that average specific consumption of the population which is connected to city (municipal) water supply systems (according to available data), is approximately 64 liters/capita/day.

In Water management strategy of the FBiH (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 116) it is stated that according to the processing done with the available data, approximately 60% of the population in the FBiH is covered by public water supplies, while the remaining 40% of the population is supplied from local water supply systems and individual sources (e.g. shallow wells, springs). In urban areas, the coverage by public water systems reaches 94% of the total population, while in rural areas the coverage is significantly lower and it is around 20%.

Figure 2. Distribution of abstracted water quantities per towns in FBiH (in %)



Source: Federal Ministry of Agriculture, Water Management and Forestry, *Strategija upravljanja vodama FBiH 2010. – 2022.*, 2012, p. 123, Figure 3.4.2.

Figure 2 presents specific water abstraction and consumption in urban areas of the FBiH, which have regular water supply which is mostly in the range of usual specific consumptions of the European countries of similar climate, development level, technological development, etc. The largest cities of the FBiH: Sarajevo, Tuzla, Mostar and Zenica have, in terms of water supply, their specificity. Their consumption significantly affects the total water consumption in the FBiH.

1.4 Economic aspect of water sector

Full economic cost of water services includes the financial cost, which in turn includes the capital, operation, maintenance and administrative cost, as well as the environmental and natural resource costs.

For the financial cost (The European Union IPA Programme 2007, 2010a, p. 14), usually these types of information need to be collected:

– Capital costs:

- **Capital costs for new investments**. Usually these are heavy expenditures for construction of new infrastructure. There are, also, associated costs such as those for site preparation need to be identified.
- **Depreciation**. These are expenditures for replacing existing assets in future. Estimating depreciation requires defining the value of existing assets and a depreciation methodology.
- **Opportunity cost of capital**, i.e. an estimate of the rate of return that can be earned on alternative investments. The cost of capital applied to the asset base (new and existing) gives the return that investors expect to earn on their investments.

– **Operating and maintenance costs** are those needed for a facility to be in effect: energy costs, material costs, change of worn out parts, salaries etc.

– **Administrative costs** which are associated with the regulation of water services. Examples of administrative costs related to water resource management include the costs of administering a charging system or monitoring costs.

– **Taxes** which are treated as transfers within society and should therefore be excluded from the estimation of financial costs. However, it is important to distinguish between general taxes and environmental taxes. The latter representative internalized environmental costs and should participate in the cost recovery exercise, and

– **Subsidies** that are very important in the assessment of cost recovery. Examples of subsidies may include grants, direct investments from other government levels, lower interest rates for investments, accelerated depreciation etc. Subsidy payments can be made, for example, to water service providers and/or between different user groups (e.g. households and industrial water consumers). All these subsidies, if any, should be reflected in the cost recovery calculations.

Other direct costs needed for cost recovery assessment in specific sectors mainly consist of the costs of productivity losses due to restrictive measures (for example, loss of agricultural production due to taking land for creating a wetland).

The environmental and resource cost should be assessed when:

– there is an intention to ask for derogation,
– there is a need to justify the designation of heavily modified water bodies,
– the cost recovery principle is to be implemented.

For the first and second case, cost-benefit analysis might be performed.

The requirement of full cost recovery for water services including environmental and resource costs in accordance with the polluter pays principle in Article 9 of the EU-Water

Framework Directive is one of the key concepts of the Directive. The principle of recovery of the costs of water services, including environmental and resource costs associated with damage or negative impact on the aquatic environment should be taken into account in accordance with the polluter-pays principle in particular.

According to the WATECO guidance common implementation strategy for the Water Framework Directive (European Communities, 2003, p. 48) glossary of terms:

- **Environmental costs** are those reflecting damage that water uses impose on the environment and ecosystems and those who use the environment (e.g. a reduction in the ecological quality of aquatic ecosystems or the salinization and degradation of productive soils),
- **Resource costs** represent the costs of foregone opportunities which other uses suffer due to the depletion of the resource beyond its natural rate of recharge or recovery (e.g. linked to the over-abstraction of groundwater).

It should be noted that there exist also other definitions of environmental and resource costs. However, the essence is the same. Very often no distinction is made between environmental and resource costs.

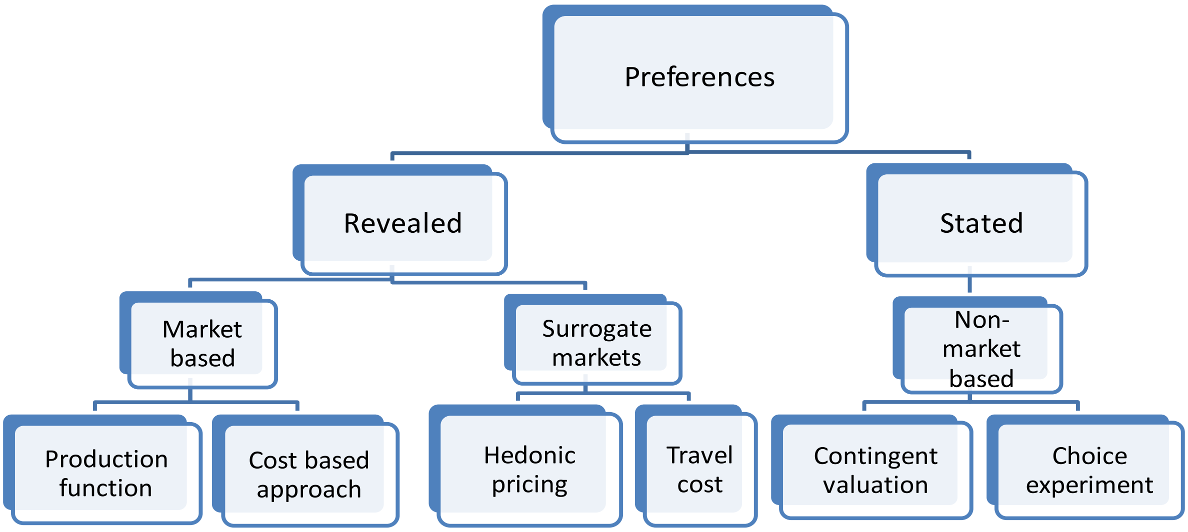
Environmental costs mean external social welfare loss resulting from the degradation of water quality due to anthropogenic pressures to water resources. From an economic perspective, water resources (rivers, lakes, aquifers, wetlands, marine or coastal ecosystems), being in a good status, provide a spectrum of goods and services. Those goods and services directly or indirectly transfer to economic services and values to human beings and thus contribute to the social well-being. Water-related goods and services, in addition to the direct ones such as domestic and industrial water supply, wastewater treatment, recreation, nutrient retention, flood control and protection, and irrigation, also include biodiversity, bequest, existence and altruistic values. However, many of the values associated with functions performed by water resources are non-marketable and hence do not have readily available monetary values attached to them.

Resource costs are, similar to environmental costs, those imposed on society due to resource exploitation resulting in its non-availability for future use. Resource costs are related to the value of the opportunity foregone by exploiting and the use of a water resource in the present period rather than at some time in the future. The WATECO guidance document (European Communities, 2003, p. 122) shows that the resource cost can be calculated as the difference between the price which clears the market (total demand equals total supply) under scarcity and the normal price of water. Resource (water) costs also, as well as environmental costs, can be estimated by the price of technology to acquire resources or to remediate damage done to resources.

In general, public benefits of improved water quality could be:

- better public health and safety,
- more bathing / recreational activities,
- the improved environment for plants and animals,
- landscape amenities,
- better water for future generations,
- safe drinking water, etc.

Figure 3. Environmental cost/benefit valuation techniques



Source: The European Union IPA Programme 2007, *Guidance for BiH water institutions on economic analysis in accordance with WFD*, 2010a, p. 21, Figure 4.

To capture the economic value of environmental resources and accordingly estimate the welfare loss associated with ecosystem degradation, or vice versa, and benefits related to the increase of quality of resources (The European Union IPA Programme 2007, 2010a, p. 18), several valuation techniques have been developed and they are:

- **Production Function Approach** - valuates services of an ecosystem as an input into making various products. For example, in polluted water the stock of valuable fish decreases. It is evaluated how much fish would cost if sold; this is equaled to the damage done to the environment or the benefit which the fish provide. This approach is not suitable for the valuation of the existence value of the environment.
- **Cost Based Approach -** valuates the environment based on the cost needed to maintain benefits which this environment yields. For example, it is evaluated how much it would cost to remediate a polluted area or a water body. If a polluted river needs to be cleaned, the environmental benefit which the river brings or damage to the

environment from the pollution is evaluated by costs needed to clean the river. This approach is not suitable for the valuation of the existence value of the environment.

- **Travel Cost Approach** - valuates costs for a person to get into a concrete place. For example, it is evaluated how much it would cost for travelers to get to a national park. The price which is paid by travelers can be considered the recreational value of the environment. In this case, the real costs are being evaluated. The basic premise behind all versions of the travel cost model is that the travel costs incurred in traveling to a site can be regarded as the price of access to the site. Changes in the travel cost to a site can then be viewed as having the same effect on visits to the site as would a change in an access fee or a price. Under a set of assumptions involving opportunity cost of travel time, purpose of the trip, availability of substitute site, and time spent at the site, it is possible to derive the individuals' demand for visits to a site as a function of the price of admission using the simple or basic travel cost model. This approach is suitable for the valuation of the recreational value of the environment only.
- **Hedonic Price Approach** (hereinafter: HPA) - valuates how much the value of real estate depends on air, water and noise pollution. For example, by comparing prices of properties with other similar characteristics or by examining the price of a property over time as environmental conditions change, information in the housing market can be used to estimate people's willingness to pay for environmental quality. The hedonic technique, like other indirect nonmarket valuation methods, depends on observable data resulting from the actual behavior of individuals. An advantage of the HPA is that market data on property sales and associated characteristics are readily available from county or municipal sources (e.g., assessor's office) as well as from private real estate services. These data can usually be related to other secondary sources of data for the same geographical area (e.g., data on water quality, air quality or a range of physical attributes). These secondary sources of data can be used to construct indices of environmental quality for use in a statistical analysis.

  Despite the advantage of readily available data, several problems limit the use of the HPA in many settings. One problem is that the effect of an environmental attribute or characteristic on price may be small and hard to detect statistically or to disentangle from the effects of all other variables. Yet another problem with the technique is that it is difficult to derive value measures from the estimated hedonic price function (the basic first-stage equation where the sale price of a house is regressed on the set of attributes of that house). Derivation of the value of an attribute requires a second-stage procedure to obtain a demand or willingness to pay function built around market segmentation (to address an estimation problem known as identification). To date, few empirical studies have successfully completed the second stage. Thus most studies report only the results from the hedonic price function, which gives an estimate of the marginal effect of an environmental variable on price (Committee on Valuing Ground Water et al., 1997, p. 82). This approach is suitable for the valuation only for the use value of the environment.

- **Contingent Valuation Approach** - valuates how much a person would like to pay for the increase of environmental quality. A population survey is made to find out how much respondents would like to pay for a specific improvement of quality of the environment based on a specific scenario provided. The contingent valuation method is applied when calculating for both use and nonuse values. The flexibility it provides in constructing hypothetical markets accounts for much of the technique's popularity. There are numerous methodological issues associated with application of Contingent Valuation Method (hereinafter: CVM) including how the hypothetical environmental change is to be specified, how valuation questions are formulated, the appropriate welfare measure to be elicited, and various types of response biases. Randall (1991, p. 66) argues that because of the importance of nonuse values, CVM is likely to be the primary tool for measuring the environmental benefits of biodiversity. The CVM is also capable of measuring the disutility associated with some types of environmental degradation that indirect methods are unable to capture. This approach is suitable for the valuation of the existence value of the environment.
- **Choice Experiments** – Choice Experiment Method (hereinafter: CEM) valuates which components are significant determinants of the value people place on the environmental quality change, the implied ranking of the components, the value of changing the individual components either individually or all at once, as well as the total economic value of the quality change. This approach is suitable for the valuation of the existence value of the environment.

According to Koundouri (in The European Union IPA Programme 2007, 2010a, p. 10), the most commonly used methods in researches on environmental valuation are CVM and CEM.

Through CVM application was analyzed sensitivity to changes regarding quantity or quality of non-market environmental resources. For that reason group of consumers evaluate their maximum willingness to pay or minimum willingness to accept compensation for above mentioned changes. The intention of researchers with this method is to reveal consumers' opinions and make estimates on how much want to change something that they found valuable. Eventually, those estimates could be used for improvement of resource management.

The environmental resource in a CEM application is presented through its attributes and levels of these attributes in a condition where sustainable resource management exists and where it doesn't. This method turned out to be more beneficial compared to other methods of evaluation. Observed consumers were lead explicitly to make compromises between the different attributes of the situation. Basic idea of CEMs is value estimation of individual attributes of a good. In the evaluation process of policy changes with multiple components, those individual attributes can be of great importance.

2 WATER AS ECONOMIC CATEGORY

Water is a resource vital to life. The use and utility of water is unquestionable and there is no substitution for it. For example, if one needs carbohydrates, he can choose between different kinds of cereals (corn, wheat, oats, rye).The market mechanism works almost naturally for kind of goods like that, but it is not the case with the water. Water as economic good is fundamentally different from other goods and we cannot choose between water and other products. The only choice we have is whether we are going to be rational with this precious resource or no. We have to analyze all possible ways of water allocation, and find the most efficient way of its use.

Savenije and Van der Zaag (2002, p. 99) argue the neoclassical interpretation of water as an economic good could lead to economic pricing of water, which would damage the interests of the poor and make irrigated agriculture virtually infeasible. In addition, water should be seen also as a social good and that it should be affordable to the poor.

Because of the rising problem of allocation, assessment, development and management of water resources the International Conference on Water and the Environment (hereinafter: ICWE) was held in Dublin in 1992. Five hundred participants, including government-designated experts from a hundred countries and representatives attended this conference (ICWE, 1992) and they all agreed upon these four principles:

- P1: "Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. "
- P2: „Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels. "
- P3: „Women play a central part in the provision, management and safeguarding of water. "
- P4: „Water has an economic value in all its competing uses and should be recognized as an economic good. "

When adopted Dublin principles (ICWE, 1992) should ensure better water management, help to fight against overconsumption of water, water pollution, and rising threats from drought and floods.

Research of Savenije and Van der Zaag (2000, p. 16) shows us how integrated water resources management (hereinafter: IWRM) as concept, together with the first Dublin principle, covers the following aspects:

- consideration of all physical aspects of the water at different temporal and spatial scales (the integrity of the hydrological cycle and the related quality aspects);

- an inter-sectorial approach is needed, as well as recognizing all the interests of different water users (including environmental, social and cultural requirements);
- accent on to the sustainability of water use and the rights of future generations;
- interaction between all stakeholders, at all levels in the management process.

By the research of Savenije and Van der Zaag (2002, p. 99), first aspect of IWRM promotes water as indivisible into different types. It may be groundwater, surface water, rain or soil moisture, but it all remains the same water. These types of water could be used in different ways, but any use of water affects the entire water cycle. The second aspect limits the applicability of neoclassical economic principles. There are water uses that are a highly important to society, but very limited regarding pricing abilities. Decisions on water allocation should be based on economic considerations only. On the other hand, governments generally take decisions on the basis of political considerations with strong considerations for social, cultural, and sometimes environmental interests. Practice shows that economic and financial considerations are rarely used as principal for a decision making. The third aspect makes the application of economic principles (in the classical sense) even more difficult. It calls for long-term sustainability. Speaking in monetary terms the future has no value and the discount rate makes any future benefits (or costs) valueless and irrelevant. It is extremely hard to express societal or personal values in monetary terms. Participation implies decision-making process and the interests of all involved should be taken into consideration. This way economic pricing is disabled or infeasible.

2.1 Water uses and water value

Agriculture, industry and households use water goods and services. Water goods are irrigation and drinking water. On the other side we face usage of water service such as hydroelectricity generation or recreation. There is a strong correlation between these goods and services, and they are determined by available quantity of water and its quality. According to Turner, Georgiou, Clark and Brouwer (2004, p. 2), unique characteristics of water as a resource should be the basis for good water management and appropriate water allocation. Also, Qureshi et al. (2010, p. 100) found that understanding of different water uses and associated trade-offs is crucial in designing and implementing effective water management strategies.

Water use is not easy to control or prevent. This claim can thus be substantiated by the considerations of Turner et al. (2004, p. 2). The withdrawal of water from the hydrological system is mostly involved in water use. This is known as extractive or off-stream use. Water consumption is exclusive in its use and only a small proportion of the water withdrawal is consumed. Young (1996, p. 25) points out that in order to assign an economic value to water, one must express it as a monetary value per unit water volume or quantity used. The quantity variable can be either the amount withdrawn from the river or the amount depleted or consumed. Values will differ, depending upon which measure is chosen.

In his research Young (1996, p. 24) analyzed water resource as a bulky. Author explains that water economic value per unit weight or volume tends to be relatively low. On the other hand, transportation costs of water, which are increasingly important part of the total cost of supply, are high per unit of volume. The costs of abstraction, storage and transportation tend to be high compared to the low economic value that is placed on the use of an additional unit of water. Usually it is not economically viable over long distances unless a high marginal value can be obtained. Since water is a bulky resource with high transportation costs therefore its value may vary with location.

Demand for water can also vary greatly over time, for example there are differences in water demand in agriculture over seasons. Thus, comparisons of value should ideally be in terms of raw water supplies at a specified point. Water supply for households is determined by their preferences which they express in the amount that they are willing to pay for goods and services. In addition, considering the economic value of water in monetary terms, the value of water also needs to be commensurable in terms of place, form and time. Georgiou, Whittington, Pearce and Moran (cited in Turner et al., 2004, pp. 58) find the identification of values, as well as the quantification of the economic value of water resources important to the water resources management because of following reasons:

- The importance of water in national development strategies,
- Modification of national accounts,
- The setting of national and sectorial priorities,
- Project, programme and policy evaluation,
- Economic valuation and sustainable development.

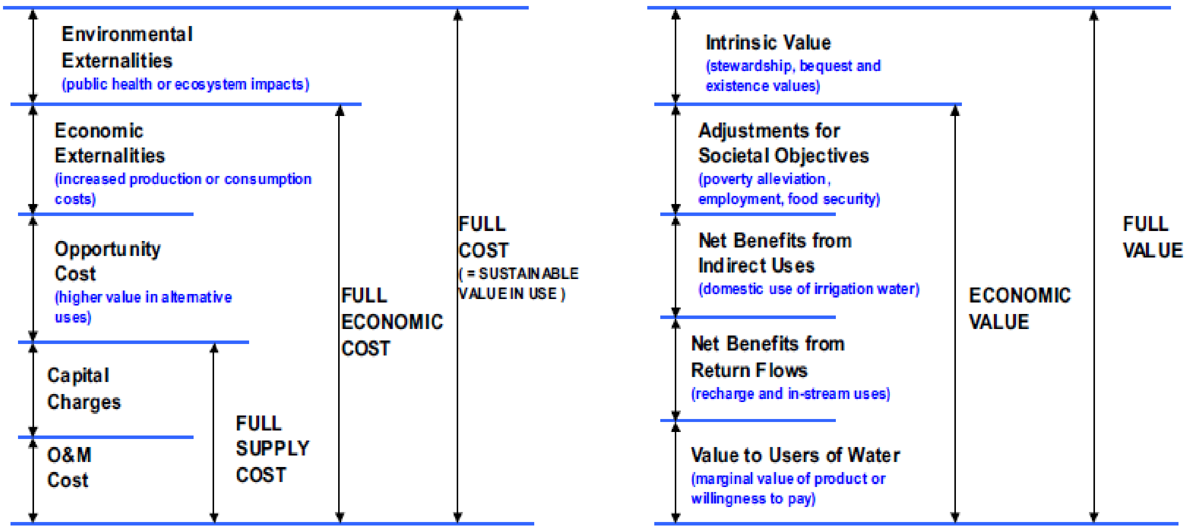
Because of these reasons and in order to create a good basis for effective and efficient water resource management, different types of values are defined. Those values are associated with the water goods and services. First step towards valuation of water resources is definition of their functionality. In other words the way in which society or users evaluate the water goods and services. If we can measure value of those good and services, we could easily evaluate water resource. The concept of derived demand can be applied too.

Several different authors give their categorization of water values as follows:

- Economic and intrinsic value – Due to research of Rogers, Bhatia and Huber (1998, p. 10) the value of water depends on the user and to the use. Value of water is the sum of the economic and intrinsic values. The components of economic value are: value to users, net benefits from return flows, net benefits from indirect use and adjustments for societal objectives,

- Water-related economic values are divided into several classes: commodity benefits, public and private aesthetic and recreational values, waste assimilation advantages and disadvantages or damages. Young (1996, p. 3) explains his findings in a way that each of those categories clearly involves economic considerations. He characterizes these categories by increasing scarcity and the associated problems of resources allocation among competing uses to maximize economic value.
- Socioeconomic values – De Groot (1994, p. 153) analyzes multiplicity of way and means for assessing environmental value and comes to the conclusion that benefits provided by environmental functions are so diverse that methods for measurement of the socioeconomic values may not be the same, i.e. according to the use the method for measurement of the value should be determined.

Figure 4. General principles for cost and value of water



Source: P. Rogers, R. Bhatia & A. Huber, *Water as a social and economic good: How to put the principle into practice*, 1998, p. 7, p. 13.

Turner et al. (2004, pp. 60-65) summarizes classification of water values in three main categories: use values, non-use values and this special values that are not classified like use or non-use values. These categories of values are briefly explained below.

Use values are defined as:

- Direct use – value that occurs during direct interaction with water resource. It may be consumable (e.g. irrigation or fishing), or non-consumable (e.g. recreational swimming or the value of enjoying a view). There is also a value called distant-use value that can be realized through the media but a lot of unclarified issues related to this value.

- Indirect use – water resources supply some services that are in correlation with this kind of values. There is no need for them to interact directly (e.g. use derived from flood protection provided by wetlands or the removal of pollutants by aquifer recharge).

Non-use values are experienced with usage that contains ethical issues and altruistic preferences and they are not connected with use of the resource or its material gains. Non-use values are divided into three types:

- Satisfaction of cognition that a water resource continues to exist in a feature, without taking into account the type of benefits, is called **existence value.**
- The cognition, that generations which will come after us will have the opportunity to enjoy a water resource, creates a **bequest value**.
- Satisfaction derived from insurance that resources are available in present is perceived as a **philanthropic value.**

As it is already mentioned there are special values that are not classified like use or non-use values and they are:

- **Option value** – satisfaction based on the insurance that in future water resource is available despite the fact of uncertainty that future brings.
- **Quasi-option value** – derived from a desire to utilize an improved information in the future and work on correction of preferences. In other words it is a desire to maintain flexibility, and avoid irreversible damage of potential undesirable information in future.

Turner et al. (2004, pp. 60-65) analyzes some specific issues regarding economic valuation process. Therefore, it should be mentioned and given specific attention while evaluating:

- **Evaluation scale -** evaluation process can be restricted by the number of observed variables for an exact external impact.
- **Aggregation and double counting** - This approach advocates the adoption of a functional assessment of water resources, with particular emphasis on the water goods and services that are related with environmental structures and processes.
- **Allocation over time -** Discounting is a very powerful tool for assessing certain values in different time periods. This allows the presentation of costs and benefits in order to facilitate comparisons, as well as help in planning and forecasting.
- **Risk and uncertainty –** assignment of significant likelihood to the possible outcomes or if it is about uncertainty where likelihood is entirely unknown. The extent of possible impacts have to be identified and quantified as far as possible, in order to be able to make right managerial or political decisions. Uncertainty is conditioned by

physical and economic characteristics that will prevail in observed future period and it should be the subject of detailed analysis.

- **Irreversible change -** The emphasis is on reduction of loss as much as possible. The standard procedures for economic evaluation do not take into account the impact of irreversibility. No one responds or does not pay the price for extinction of rare species or exploitation of minerals.
- **Data limitations -** The fact is that not all information and necessary data will be available for the economic assessment. Limitations in data collection are often and analysts have to be aware of this because it will affect their results and recommendations. There have to be clearly defined measures that have to be taken in response to such limitation.

2.2 Water market

Markets include mechanisms or means for price determination of the trade item, communicating the price information, facilitating deals and transactions and effecting distribution. In particular we learned that market for certain item (good or service) is created out of existing and potential customers who have their needs, ability and willingness to pay.

The water market is a place where water is bought or sold, a market with its demand and supply with all their features. It is made up of several water markets, differentiated by water system or administrative boundaries. Water trading ensures increasingly scarce water resources allocation according to the highest valued use.

Water market is specific and it is very different from other markets (Heymann et al., 2010, p. 2). Water supply has one specificity. For instance, the water passes through a cycle in which it only changes its physical condition but the amount of water in the world always remains the same.

We have to stress the fact that over 70% of the earth’s surface is covered by water. Surface water from lakes and rivers covers only 1% of total surface water. Nevertheless, it is the main source of water supply. In freshwater goes almost 1.4 billion km^3 of water on Earth and it is around 2.5%. It turns out that almost 70% of water is unusable or not available for use (e.g. it is in the form of ice, especially at the poles and glaciers). The most important source of water supply is groundwater and it makes up about 30% of global freshwater resources. There is one important fact and it lies in Earth´s shape and structure. Not all water resources are disposable for use nor they are equally arranged on the Earth's surface. This is why in some countries a significant part of the water supply is based mainly on the desalination of sea water. For example, this is the cases with oil-rich countries. On the other side, there are territories (parts of the Earth) where through decades water has been seen as an inexhaustible resource and it was available to everyone with or without charges. For example in BiH even though they are charged, water prices are still very low.

During a long period of time, countries developed their water markets. These days we face formal or informal water markets all across the Earth. Companies or individuals can trade water at particular market equilibrium price that will likely change throughout the season. To operate effectively, water markets require a well-defined structure of water rights, a clear and comprehensive set of rules for trading, an entity to manage water delivery, and a judicial body to oversee trading activities and resolve disputes.

Tsur and Dinar (1997, p. 251) point out that water markets also require a well-developed conveyance system for transporting water to all participants. Market equilibrium prices will effectively adjust supply and demand, if these requirements are satisfied (Easter and Liu, 2005, p. 13).

Emerging markets in terms of water rights and water supply systems seek the way to improve utilization of water. It allows potential buyers and sellers to conserve the water, and strive to achieve a fair and efficient distribution of water resources. In practice, sales of resources and debt collection encourage investment in this sector.

Distinguished economic critics argue that the poor will be affected by the establishment of the water market, but in reality markets that are created by the private investment enable the poor greater access to water. Development of water markets around the world, despite their rapid growth is still at an early stage. This will change as more countries are facing the problem of water shortage and trying to find a better ways of resource allocation. Surely, with all these developments and shortages in the same time, we are much closer to face the prediction that the lack of water will lead us to a new world crisis and to new conflicts in countries with scarce amount of water. Water in the world just like oil, is increasingly referred to as blue gold (Džinović, 2010, p. 1).

Maintaining community by ensuring the water availability for consumption, sanitation and food production was one social criteria on which basis water resources were allocated over time. Although huge capital was invested in infrastructure, in order to maintain this allocation, social changes and misunderstandings have created new concerns about allocation of water resources. (Williams, 2010, p. 8).

2.3 Water supply

Water supply is the provision of water by public utilities, commercial organizations, community endeavors or by individuals, usually via a system of pumps and pipes. Water supply service quality could be measured through many dimensions: continuity, water quality (speaking in chemical terms), pressure (the speed with which the water comes up to the user), coverage and the degree of responsiveness of service providers to customer complaints.

According to Turner et al. (2004, p. 2), it is difficult to define a water supply. Supply is determined by a few processes, among which are: the flow of water, evaporation from the surface and plunge of water into the ground. For example, in the case of surface water, supply depends on the climatic conditions to a large extent and quantity of water supply but it is a variable that is not reliable. This can have huge impact on particular water uses (e.g. the development of the industry which is based on the use of water resources) and the water value in some uses (e.g. irrigation). On the other side, quality of water can affect water uses (e.g. drinking water).

Water supply systems, as it is already mentioned, could be designed such way to collect water from a different sources. So, system usually includes groundwater (aquifers), surface water (lakes and rivers), conservation and/or sea water through desalination. After collection, in most cases, water is purified, disinfected through chlorination and sometimes fluoridated. Water supply system further goes through the phase of water transport. Treated water either flows by gravity or is pumped to reservoirs, which can be elevated such as water towers or on the ground. Once water is used, wastewater is typically discharged in a sewer system and treated in a sewage treatment plant before being discharged into a river, lake or the sea or reused for landscaping, irrigation or industrial use.

Water supply and its preservation should be considered as a issue of a high importance. Countries should have emergency plans for sanitation, for example after major catastrophes (earthquakes, floods, war, etc.) destruction of infrastructure for water supply. Damages on water supply can cause epidemics of waterborne diseases and some of them can be life-threatening. So, state of public health is conditioned with clean water supply and it is considered to be its very important determinant.

Consumers rather don't think about this and its importance. Consumer/public awareness is very important in order to conduct the maintenance and development of the water sector and protection of this scarce resource. In some developing countries water is provided for a few hours per day or only a few days per week. This is a serious problem not only for those countries but for all neighboring countries as well. Based on some rough estimates water is supplied on an interrupted basis approximately to a half of the population in developing countries.

2.4 Water demand and elasticity of demand

WHO and UNICEF (2010, p. 7) conducted a research where it was concluded that about 6.74 billion people of the global population (85%) had access to piped water supply through house connections or to an improved water source through other means than house, including standpipes, "water kiosks", protected springs and protected wells. Frightening fact is that 884 million people in the world (that is about 14% of the global population) had to use unsecured wells or springs, or even canals, lakes or wild rivers for their needs. Unfortunately, such a large part of the population don´t have access to a controlled and tested source of water. Half a billion people live in water-stressed or water-scarce countries, and by 2025 that number will grow to three billion due to an increase in population. As per Molden (in Hanjra & Qureshi, 2010, p. 366) irrigation, as the largest user of water is the first sector to lose out as water scarcity increases.

Some researches point out the problem of increased water demand. For instance, Gleick (2003, p. 5) stresses the global demand for water has tripled since the 1950s. In the same time the supply of fresh water has been declining. In order to be able to predict future consumption, decision makers need to manage and monitor this rapid grow of demand. Fruhermore, Hrovatin and Bailey (2002, p. 16) in their research analyze quantities of water consumed per capita in 14 countries compared with EU parameters. Countries with the biggest consumption of water per capita are Spain, Italy and Portugal, while the lowest consumption per capita is recorded in Belgium.

To be able to control or predict consumption of scarce resources, it is very important to understand the concept of demand management. Demand management is defined as the development and implementation of strategies aimed at influencing demand, in order to achieve efficient and sustainable use of a scarce resource like water. Also, it should promote equity and environmental integrity. Water demand management should not be seen as merely aiming at reducing demands or achieving higher water use efficiencies.

Demand management is another approach to water resources management that contrasts with the traditional supply management, aimed at increasing the supply whatever the demand. It differs from supply management in that it targets the water user rather than the supply of water to achieve more desirable allocations and sustainable use of water. Demand management strategy consists of structural and non-structural measures. Some of structural measures are: low-flush cisterns for toilets with special design that will allow less water usage, distribution networks with systems of leak detection and control, and use efficient irrigation system in agriculture, so called drip irrigation. A higher percentage of the measures used in the strategies of demand management are not structural measures, such as: economic and legal measures meant to change the users' behavior and the creation of an institutional and political environment as good foundation for achievement of desired changes.

As it is mentioned before, the purpose of good demand management should be achievement of demands and uses that are desirable. In fact, this indicates that demand management may implement measures intended for demand stimulation. Those measures are applicable in sectors where use by society is considered to be undesirable low. The point is in making the right choices about use of water and establish control of consumption. If well interpreted, the treatment of water as an economic good is corresponding to the concept of water demand management.

Savenije and Van der Zaag (2002, p. 100) found that demand management has many instruments and some of them are:

- **Quota** – an upper limit of water quantity that is supposed to be used for a certain purpose.
- **Use license** – permit for withdrawals or discharges, limitation in usage and period.
- **Tradable water rights -** buying and selling rights to water use in a well-defined legal framework.
- **User charges –** create different prices for water services depending on the service type and use. In order to stimulate desired behavior user charges may include demand management charges or subsidies, as well as the cost recovery element.
- **Subsidies, soft loans, grants, product charges, tax allowances, tax differentiation, and other economic incentives** – intended for stimulation of appropriate water allocation or to influence the behavior of the user.
- **Penalties** – punishment for non-compliance with market rules, whether they are economic or legal nature.

Raising awareness is a very important segment of demand management together with education and training. There are many examples of alternative approaches which support the efficient use of water. They have resulted in a significant reduction in water use and even in reduction of pollution. For instance, pricing is not shown to be an effective instrument in Egypt's water demand management (Mohamed, 2001, p. 80; He, Tyner, Doukkali and Siam, 2005, p. 1). Therefore, particular attention should be directed to all of these instruments of demand management. Mohamed (2001, p. 67) finds implementation of quota very effective and thinks that water pricing could be a real trap from perspective of demand management.

On the other side, He et al. (2005, p. 6) research strategic policy options to improve irrigation and water allocation efficiency in Morocco and Egypt. Although there is a significant differences in the profiles of analyzed countries, experts were looking for factors that have influence on the behavior of water demand meant for irrigation together with agricultural production choices. Water pricing, taxation and low profit crops were considered when analyzing water demand in these countries.

He et al. (2005, p. 22) came to the conclusion that extra revenue for water agency and government could be generated with adequate water prices and taxes (energy and output). Moroccan revenue was increased by 50% with the help of water pricing when set at the level of cost recovery. By the words of He et al. (2005, p. 22), this can be achieved by a taxes on output at the level of 10%. Since, the policy on taxes in energy was the subject of their analysis along with water pricing, it was found that the energy taxes are not effective for revenue generation compared to water pricing and taxes on outputs.

Price, among all instruments of demand management, is an instrument that has the most influence on consumers' behavior. Since demand is changing or it varies over time, it is important to analyze what happens with the price. Price elasticity of demand is units-free measure of the responsiveness of the quantity demanded of good or service to a change in its price, when all other influences on buyers' plans remain the same (Parkin, Powell & Matthews, 2002, p. 82). More precisely, it gives the percentage change in quantity demanded in response to a one percent change in price (ceteris paribus, i.e. holding constant all the other determinants of demand, such as income). Price elasticity is almost always negative, although analysts tend to ignore the sign even though this can lead to ambiguity. In general, the demand for a good is said to be inelastic (or relatively inelastic) when the price elasticity of demand is less than one (in absolute value, $-1 < Ed < 0$). This means that changes in price have a relatively small effect on the quantity of the good demanded and when the price is raised, the total revenue increases (Arnold, 2008, p. 385).The demand for a good is said to be elastic (or relatively elastic) when its price elasticity of demand is greater than one (in absolute value, $-\infty < Ed < -1$). This means that that changes in price have a relatively large effect on the quantity of a good demanded and when the price is raised, the total revenue falls.

Table 1. Price elasticity for households water demand

	2003-2000 (Normal/Normal)			2002-2000 (Normal/Dray)		
	I panel			II panel		
Percentile	**Overall**	**Winter**	**Summer**	**Overall**	**Winter**	**Summer**
10	-1.068	-0.528	-0.959	-0.296	-0.758	-0.362
	(-27.78)	(-3.9)	(-15.22)	(-7.37)	(-7.92)	(-4.54)
25	-0.899	-0.215	-0.823	-0.143	-0.627	-0.335
	(-37.19)	(-2.17)	(-20.25)	(-5.54)	(-10.03)	(-6.28)
50	-0.743	-0.061	-0.652	-0.99	-0.524	-0.307
	(-40.13)	(-0.71)	(-22.25)	(-5.16)	(-11.05)	-7.87
75	-0.625	-0.075	-0.537	-0.003	-0.438	-0.195
	(-35.21)	(-0.91)	(-19.42)	(-0.15)	(-9.67)	(-4.71)
90	-0.528	*	-0.437	*	-0.428	-0.138
	(-27.38)		(-14.94)		(-6.27)	(-2.99)

Note. * The numbers in parentheses are asymptotic Z statistics, treating the price difference, price and quantity at their sample means as constants for estimating the variance of the estimated price elasticity
Note. * Positive and statistically insignificant

Source: Klaiber et al., *Estimating the Price Elasticity of Demand for Water with Quasi Experimental Methods*, 2010, p. 22.

Table 1 presents results of analysis conducted by Klaiber, Smith, Kaminsky and Strong (2010, p. 22) in Colorado, USA. There are presented demand elasticity estimates comparing two normal years on one side (I panel), and a normal and a dry year (II panel), on other side. The purpose is identification of the price effect. Comparing the first and second panel we can directly see how reduced price responsiveness is, especially for the summer when is dry. It is estimated that all classes of users respond to prices in the dry winter. In summers of normal years, among all users there is greater responsiveness to price. It can be concluded that large users don´t response to prices over the seasons. On the other side, households appear to economize and respond to price in winters compared to summers when much more water is used.

Decision makers have to have estimates on price elasticity like this one presented above because they are very important for predictions of the change in water demand. This would result with changes in existing policies on water pricing, amendments on price structure and level along with extending metering (Commission of the European communities, 2000, p. 14).

All decision makers, in the end, are interested in revenue and how demand management and price elasticity can affect it. The total revenue is the earnings generated from selling a product and it depends on the quantity sold and the price per unit. If the demand for a product is price inelastic then an increase in price will lead to an increase in revenue, and if demand is price elastic then an increase in price will lead to a fall in revenue (Gillespie, 2002, p. 51).

The estimation of the price elasticity of demand is therefore very important for process of determining a pricing strategy. In order to increase revenue Gillespie (2002, p. 52) suggests decision makers to:

- lower price if demand is price elastic or
- increase price if demand is price inelastic.

Increase in a relative price of a good, based on its relatively low supply, is a consequence of the economic factor called scarcity value. This will be discussed in chapter 4 of this paper, but we observe it now from price elasticity side. In markets where demand and supply are partially balanced, an increase in demand raises the production quantity better than a price. In such conditions a supply curve is very elastic or horizontal and costs determine the price. On the other hand, the scarcity of the inputs, affects the price. So, usually it is not about scarcity for product but about scarcity of inputs used in production. In most cases, the price (not the quantity supplied) of the product with scarcity value increases with an increase in the demand. Such products have inelastic or even vertical supply curves. When demand is high, the seller sets a price higher than the costs of production. Eventually he receives a significant scarcity rent and producer surplus. It is to be mentioned that costs of production can be close to zero, in that case the entire price becomes a scarcity rent.

3 TARIFF STRUCTURE

3.1 Water price

Water should be seen as an economic good and it should have economic price. We came to this conclusion by looking at water as a social good, and having on mind that it should be affordable to everyone. If so, water should be affordable to the future generations same as it is to us. That is the main reason why water should be treated as economic good. Only when we are forced to pay for it, we will have more appreciation for it.

Water tariff is a price assigned to water supplied by a public utility to its customers. The term is also often applied to wastewater tariffs. Water and wastewater tariffs are not charged for water itself, but to recover the costs of water treatment, water storage, and transportation, collection and treatment of wastewater. Also, there are included administrative costs (e.g. billing and collection costs). Water prices are called water abstraction charges or fees and as a part of water tariffs they are charged in some countries. Structure of water tariffs vary widely between countries, cities and even between user categories (households, commercial, industrial or public users).
In order to determine water price, different varieties of economic instruments can be applied. However, all instruments do not have effect in all/same conditions. Practice has shown that mix of economic instruments and policy legislation gives the best results. For the pricing water use is required a strong governance, that includes activities like introduction of new regulations, enforcement, monitoring and reporting. These can be structures run be state or entities. Also, there are structures governed at different levels for example at national, regional and local, or even at river basin level. These structures should involve local stakeholders, no matter what level they exist on (EEA, 2012, p. 35).

As it is important the way it is managed it is very important how economic instruments and policy structures are accepted by water users. Transparency regarding water pricing and investment in water sector especially in infrastructure is required. Reporting in water sector is specific. It is never enough stressing importance of reporting, particularly regarding water costs. These kind of reporting allows only rough estimates of the total costs for implementation of policies that are relevant for water. According to Lago et al. (in EEA, 2012, p. 35), decision makers should have on mind that economic policy instruments in the form of EU regulations meant for water management are not provided as a substitute for existing policy on water.

According to European Environment Agency research (2012, p. 33) in order to ensure compliance with standards regarding water quality and quantity government should introduce regulatory measures and economic policy instruments. Those measures and policies are essential tool that could be seen as refinements and aids to regulatory previous measures.

Every improvement should be made in few similar steps. Firstly, regulation or legislation as a basis should be established, then appropriate instruments introduced in order to support new legislation and to achieve set goals. Here are some examples of economic instruments in water sector that can be used: invest in restoration of areas that have experienced environmental damages, invest in order to encourage and incentivize best practice or make decision on competing water demands. To sum up, if there is a problem in water sector, then legislation has to be the subject of analysis or change. When legislation is set properly, the discussion on economic instruments in water policy can follow.

The adequate recovery of the costs associated with water services is required by the Article 9 of the Water Framework Directive (European Communities, 2003, p. 10.). Practically, this refers on introduction of the polluter pays principle to all water uses. Also, it means placing a price for all phases of water treatment till it is ready for usage (water abstraction, impoundment, storage and distribution). Adequate recovery implies recovery of the environmental and resource costs, together with a visible financial costs. Theoretically, adequate cost recovery can be achieved with a mix of economic instruments. The problem here could occur with the environmental and resource costs, because the way of their calculation is unclear. Based on the European Environment Agency research (2012, p. 35), this has led to different interpretations of the requirements across the EU, but as per the Water Framework Directive (European Communities, 2003, p. 1) all those requirements can be successfully implemented only if Member States tend to satisfy the same standards.

Water utilities are network industries and natural monopolies, regardless of the fact that are publicly owned or privately owned/managed utilities. However, the number of the second group is negligible. Theoretically, we could predict that unregulated private utilities will set the price of water goods and services at a level that allows extracting a monopoly profit, but in practice prices set by utilities are regulated in a way that monopoly effect is reduced.

Prices can be set below costs. Also, they can be set at the level of cost recovery without a return on capital or with predetermined rate of return on capital. If prices are not set at the level of cost recovery, then it can leave serious consequences on maintenance process and create need for substantial subsidies for investment, as well as operation.

When we consider three actors in water market: consumers, utilities and the environment, and if we try to set the price for water from their point of view, water price would be:

– for consumers as low as possible, because water is essential and it should be free,

– for utilities it should cover full economic costs,
– for the environment water should be as expensive as possible so it is not wasted.

Fortunately, none of these three categories sets the price for water by itself. Water price should be based on combination of these points of view, and, in same time, should satisfy all of them. Yet, practice shows that in many developing countries prices are set close to or at the level of cost recovery. Eventually, this implies that satisfaction of all three points of view is impossible, but decision makers have to try to satisfy these needs.

3.2 Tariff structure in general

As noted above water tariffs are based on a number of formal and informal criteria (OECD, 1987, p. 27). Formal criteria are usually defined by law and informal criteria imposed by society or political influences. So, when we discuss about criteria that influence on tariff structure, typically we are talking about:

– financial (cost recovery),
– economic (efficiency pricing based on marginal cost),
– environmental (incentives for water conservation) and/or
– social and political criteria.

Financial, economic and environmental criteria were discussed before, but in a process of tariffs setting social and political criteria also have to be considered. In some cases decision makers want to relieve poor users and in a process of designing tariff structures and levels they are driven by that desire. This creates a social problem and one method to deal with it is to conduct some political measures, but based on OECD (2009, p. 56) research political considerations regarding water pricing often lead to a delay in the approval of tariff increases, especially when elections are to be implemented. This is most common case in BiH. When designing water tariff special attention should be given to publicity and public presentation of new structure, because consumers have to be able to easy understand tariffs they have been charged. It is very important criteria, but it is also very difficult to comply especially in the case of complex types of tariffs. Such kind of tariffs are increasing-block tariffs or tariffs that differ between different user categories, and consumers have to be adequately informed on the way they are calculated.

All these criteria are roughly analyzed thought this research but the accent was on tariffs, water price and determination of water´s market value. The total value of water (TEEB, 2010, p. 2) includes externalities and market value of water (the financial costs of water provision and treatment). Externalities are non-monetary costs and benefits that are far more difficult to determine. Water bodies provide regulatory functions that help flood prevention or pollution absorption. This is one example of non-monetary benefits from water.

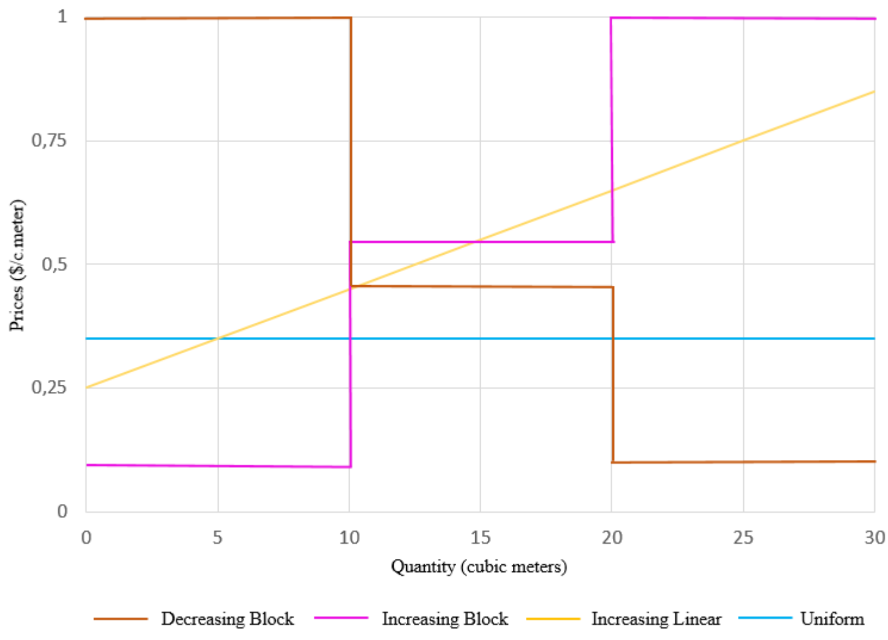
3.3 Types of tariff structures

Water tariffs can be designed in numerous forms or structures. Their diffusion varies from country to country and application of water metering.

As per Whittington (2002, p. 4) basic types of water tariff structures are:

- single-part tariffs: fixed charge or water use charge (uniform volumetric tariff; increasing and decreasing block tariff) and
- two-part tariffs.

Figure 5. Price of water versus the quantity of water used for selected tariff structures



Source: D. Whittington, *Pricing Water and Sanitation Services*, 2006, p. 59, Figure 1.

The Figure 5 presented above shows an example of four types of tariff structures and correlation of price and quantity of water consumed.

A set of procedural rules for determination of service conditions and the monthly bills for water users is called a tariff structure. It can be constructed in various categories or classes. As shown above there are two commonly used types of tariff structures in the water sector. Those are a single-part and tariffs composed of two parts. The consumer´s water bill in tariff system composed of two parts is based on the sum of two calculations. When using a single-part tariff, unlike the two-part tariff, water utilities charge a water bill which is based on one type of calculation. That one type of calculation can be: a fixed charge or volumetric (water use) charge.

Fixed charges are the only possible tariff structure in the absence of metering. In that case, regardless of the volume used, the consumer´s water bill remains the same every month. The fixed charge brings problems. From an economic efficiency perspective, consumers are not motivated to save water or to reduce its use because each additional cubic meter of water consumed is free of charge. From a cost recovery perspective, problem could cause when households do not have individual connections.

Uniform volumetric charges are based on quantity used and the household´s water bill is simply the quantity used times the price per unit of water.

Increasing block tariff (hereinafter: IBT) is based on a low volumetric charge (price) per unit up to a defined quantity for first block. If quantity of water consumed overcomes the permitted amount of water for first block which is calculated at one price, then additional quantity is charged by the price of water in second block. This logic is followed all the way to the highest block where each unit of consumption is calculated at the highest price. More about IBT is presented in chapter 4.

In the increasing linear tariff structure price that a consumer pays increases continuously as the quantity of water used increases. It sends to consumer a powerful signal that increased water use is costly. This tariff structure shows the multiple ways that the quantity of water used can be related to the monthly water bill.

Tariffs with structure composed of two parts (two-part tariffs) are specific because of a fixed charge and a charge related to the amount of water used. There exist many varieties on how these two components can be summed in one calculation

3.4 Analysis of existing pricing model in FBiH

We already emphasized that the basis for the collection of water charges is contained in the **polluter pays** and **user pays** principle, which implies that water polluter should pay the costs of treatment of the discharged polluted water, or water user should pay rent for the usage of water as a common good. These principles are set out in the Water Framework Directive (hereinafter: WFD) of the EU governing water management in the European Union member states.

Calculation and payment of water charges in the FBiH regulates the Water Law and the Regulation on the method of calculation, the procedure and time limits for the calculation and payment and controlling the settlement of obligations arising from the general water charges and special water charges (Official Gazette of FBiH, no. 92/07).

In the new Water Law of FBiH are integrated solutions that are prescribed by the WFD. Implementation of the Water Law of FBiH requires, in addition to professional resources, substantial resources to achieve the desired objectives of the water status in a given period. Water Law of FBiH has, basically, kept the current system of the Water Sector financing.

According to estimates of the Ministry of Agriculture, Water and Forestry, based on the information obtained by the questionnaire related to the harmonization of BiH legislation with the EU directives, according to the current situation and the pace at which funds are raised for the financing of projects in the water sector, BiH will only 2030th reach the required standards in this area. In FBiH, this area is regulated by law, and the Water Law of FBiH lists the following sources of funds intended for the performance of duties and tasks set out in this Law:

- general water fees,
- special water charges,
- income from the lease of public water resources,
- federal budget, the budgets of cantons, towns and municipalities,
- credit assets,
- funds provided by special law,
- grants and other means in accordance with the law.

Funds for financing can be secured through loans - commercial, local or international, including the international financial institutions or through equity investment. Of course, the loans have to be repaid and the equity investors will demand dividends and/or the expected increase in the value of their shares. If three of the ultimate sources of funding cannot provide loan repayment and a reasonable rate of return on equity, investment funds will not be available (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 111).

Part of the funds which belongs to the agencies (40%) in accordance with the Water Law, should be used for:

- the duties and responsibilities of agencies in accordance with the Water law,
- maintenance of protective facilities owned by the FBiH,
- other tasks and activities that are conferred to the water agency by Water Law, and
- financing of water agencies.

Part of the revenue realized that belongs to the cantons (45%) is used to co-finance the construction and maintenance of water supply facilities, as well as other activities related to water management (making technical documentation needed for the issuance of concessions, etc.). Revenues from the Environmental Protection Fund of FBiH (15%) are used exclusively to carry out the tasks which are in the federal jurisdiction of the ministry responsible for the environment and for the co-financing of infrastructure for water protection of importance to the FBiH. BiH could face the problem because of the rate collection and the revenue realization. According to Report on the state of the environment in BiH (MOFTER, 2012, p. 128) the percentage of unpaid water ranges from 25% to 75%.

Data on quantities of water needed for water supply in FBiH, delivered by public utility companies, are often based on estimates. Environmental Protection Strategy of the FBiH 2008-2018 (2008, p. 23) estimated that from total quantity delivered 70% is delivered to households and larger industrial objects are supplied from its own sources. Households are likely to be the biggest users of public utility services in BiH based on these data. This is the reason why we analyzed prices of 1 m3 of water for households and other users in five cities in FBiH and table 2 shows results.

Table 2. Price of water KM/m^3 for July 2013 based on monthly water bills for households

Municipality	**Index Bihać=100**	**Households**	**Industry**	**Others: (Schools, medical facilities, ect.)**
Zenica	42	0.40	n.a.	n.a.
Sarajevo	74	0.70	1.82	n.a.
Mostar	110	1.04	1.80	1.16
Tuzla	131	1.24	n.a.	n.a.
Bihać	100	0.94	n.a.	n.a.

There is an evident difference between analyzed water prices. An average water price for analyzed pattern is 0.86 KM/m^3 for household's users. This average price is acceptable comparing to prices in other countries (e.g. Diyarbakir, Turkish city with a lowest water price of 0.90KM/m3 and given the lowest price, the average water price would be much higher), however not everyone is paying equally for water used. It is evident that water prices of industrial users are poor or not available. But, when compared figures given for two cities Sarajevo and Mostar, we can see that there is difference in price of 1m^3 for households. Households in Mostar pay 0.34KM more than households in Sarajevo for 1m^3. However, with prices given below we can see that in two cities prices set for industry are almost equal, in other words difference in price for industry is smaller. In Sarajevo industrial users pay 0.02KM higher price. In FBiH, based on this pattern, water for industry is valued almost the same. On the other hand, value of water for households suffers obviously wide variations.

One thing is clear in this case, municipalities have common point of view on industry or commercial users and they agreed that this group of users should pay more than households, but the difference in prices for households is incomprehensible. If the difference in prices for households is conditioned by costs of water supply, which, apparently are high in some cities, then those costs should also reflect on the price for industrial users.

Cost recovery, for example, may be associated with a number of problems, the main of which are the following:

- cost recovery is affected by many factors,
- obtaining good cost data on water supply and sewerage collection and treatment is not easy,
- conducting of willingness to pay studies and use of their results to set equitable tariffs are not widespread,
- tariffs usually do not cover all costs,
- poor regulation and enforcement,
- political interference.

All mentioned aspects are to a different extent valid in BiH as well. These aspects should be dealt with while developing the river basin management plan.

For assessing the cost recovery level, the following steps need to be conducted:

- Defining water services.
- Defining water suppliers, users and polluters.
- Assessment of the financial rate of cost recovery.
- Identification of environmental and resource costs.
- Clarification of the mechanism of cost recovery.
- Assessment of the rate of cost recovery.
- Identification cost distribution for users and polluters.

It is important to note that the uniform understanding of full cost recovery also requires common accounting standards for the calculation of the financial cost and a common methodology for the estimation of the environmental and resource costs on European level. In many EU countries the requirements of the first step have been partially fulfilled, but the methodology for estimating the environmental and resource costs has not yet been agreed upon.

The four major tasks to make cost recovery assessment are the following:

- How much do current water services cost?
- Who does pay these costs?
- What is the current cost-recovery level?

– Propose cost-recovery mechanisms.

The most common sectors whose cost recovery has been assessed in river basin management plans of the EU member states are: households, industry and agriculture. These sectors represent the main water services in BiH and need to be taken into account while assessing the cost recovery level.

The key economic drivers influencing use of water resources that need to be determined include: general socio-economic indicators such as population growth, income, employment and key sector policies that may significantly influence water use (for example, environmental, energy, agricultural and tourism policies).

Projections of a country's economic indicators have to be based on recent economic development trends and risks as well as assumptions of economic development. The following elements/sectors should not be overlooked while assessing socio-economic trends, which interrelate with the pressures on water resources: population, income level of households, industrial development, agricultural development, tourism and recreation.

4 SCARCITY RENT AS NEW APPROACH OR PRICING MODEL

Population growth has become a major problem regarding a water scarcity in many countries. Water pollution is more widespread than ever before. Traditionally, governments have a leading role in water resources management. Water allocation and management are closely related and have to be efficiently conducted. That is the reason way particular attention should be paid to reduction of inefficient water use, poor cost recovery, infrastructure costs, problems with the quality of services or even problems with agency-managed systems which result in a change of water supply sources.

Scarcity is the condition where wants are greater than the resources available to satisfy those wants (Arnold, 2008, p. 37). Anything scarce and in demand commands a price – this is one of the basic principles of economics. When water scarce in some contexts (drought, degraded quality), then water pricing should be seen as an acceptable instrument of public policy. Water-use charges, pollution charges, tradable permits for water withdrawals or release of specific pollutants, and fines are all market-based approaches that can contribute to make water more accessible, healthier and more sustainable over the long term. For this reason, countries are working toward the goal of incorporation of full marginal costs (including environment costs) into decisions that affect water use and water quality.

The term **scarcity rent** could be the marginal opportunity cost imposed on future generations by extracting one more unit of a resource today. Scarcity rent is one of two extraction costs of a finite resource imposed on society. The other is marginal extraction cost – the opportunity cost of resources employed in the extraction activity. Scarcity rent is the cost of using up a finite resource because benefits of the extracted resource are not available to future generations. Efficiency is achieved when the resource price is equal to the sum of marginal extraction cost and scarcity rent.

Also, Salman et al. (2006, p. 18) highlight the fact that demand, in particular, is not independent of price, even in the case of water. If demand and supply are equal only at an unacceptably high price then water is truly scarce. This means that the scarcity rent is reflecting on the price. As per research of Hanson (1977, p. 351) scarcity rent will rise exponentially if economy is consuming more than supposed, as some weighed average of the market and consumption rates of interest. Later extensions showed that scarcity rent rises less rapidly when extraction costs change as the quality of the resource changes (Livernois, 2006, p. 185).

As per analysis of European Commission DG XI & Instituto da Agua (2001, p. 22) different users are willing to pay for water according to the added value that water provides for each of them. Since the added value will differ between users, the resource cost is equal to what water could earn in its most valuable alternative use, in other words resource cost is equal to opportunity cost. The resource cost depends on the number and types of users competing to use the resource today or in the future, and it arise when water is relatively scarce in quantity and quality for users.

4.1 Main characteristics of new approach

As per words of Hewitt (2000, p. 275) IBT is now the tariff structure of choice in developing countries and that adoption of one pricing model or tariff structure depends of size of utility and even of climate characteristics of the region. It is commonly presumed that IBT structures are the best tool for determination of monthly bills for water usage. This is a finding of some multilateral donors, international financial and engineering consultants, and water sector professionals who have worked in developing countries. A lot of studies about water tariffs for developing countries propose IBT structures, so we will research whether that might be a solution for BiH water pricing system.

First condition toward volumetric tariffs of water service is change in infrastructure or changes that have to be introduced to ensure that users have metered connection. This enables calculation of different amounts for different levels of water consumed. Block tariffs have so called step-wise structure. Each block in this structure has its own quantity limitation and price of m^3 of water. So, as consumption increases and overcomes the quantity of first block, the price for the amount that exceeds the limit of the first block will be higher due to the price for the second block. This trend will be followed till the highest block of consumption. Usually, for the highest block there are no limitations. Consumers are free to use desired quantities of water but they have to pay the highest price for it (see example of La Paz below). IBTs are widespread in developing countries and they are the mostly implemented tariff structures in countries were water is a scarce resource such as countries of Middle East or Spain (Whittington, 2002, p. 6).

We will try to create a comprehensive formula for calculation of IBTs. In this equation Q_n is a maximum water quantity that can be sold in the n block at price P_n. Then we will introduce a quantity used by specific consumers Q^* for whom we calculate price of water consumption and creating the consumer´s water bill (B). Q_1 is a maximum quantity of water that can be sold in the first block at price P_1. Then note that Q_2 is a maximum quantity of water that can be sold in the second block at price P_2. Eventually, Q_3 is a maximum quantity of water that can be sold in the third block at price P_3.

Water bill based on IBT is calculated (1) in the following manner:

$$\text{If } Q_n<Q_{n+1}<Q^*<Q_{n+2}, \text{ then } B= P_nQ_n + P_{n+1}Q_{n+1} + (Q^* - (Q_n + Q_{n+1}) P_{n+2} \qquad (1)$$

$$\text{If } Q^* < Q_1, \text{ then } B = (Q^*) P_1$$

$$\text{If } Q_1 < Q^* <Q_2, \text{ then } B= P_1 Q_1 + (Q^*- Q_1) P_2$$

$$\text{If } Q_1 <Q_2 < Q^* <Q_3, \text{ then } B= P_1 Q_1 + P_2 Q_2 + (Q^*- (Q_1 + Q_2) P_3 \ldots \qquad (2)$$

In order to design the IBT (2), the decision makers have to decide specifics for each category of water use:

1. How many blocks IBT structure will contain (n=1, 2, 3…)?
2. What will be the quantity of water available at each block (Q_n=Q_1)?
3. What will be prices for water use within each block (P_n=P_1…)?

The price for the water consumption in the first block of IBT is usually very low. The purpose of such low rate is to protect poor consumers, with the assumption that poor use less than non-poor consumers. The first block can be sized on the range from 5m^3 to 50m^3 per consumer (household). For example, in some countries in Africa the first block of consumption is 6m^3 per household. Average of monthly consumption of water differs regarding household size and consumption habits. Usually, it is about 4m3 for a single-person household in temperate climate (e.g. in Germany) with no outdoor water use and about 50 m^3 for a four-person household in warm climate (e.g. in the Southern United States) including outdoor water use.

In order to create an ideal IBT, following three blocks are frequently used:

– **Social or lifeline block** – a volume of water that is supposed to be spent by the lowest price corresponds to the essential minimum consumption. As per research of TERI

(2010, p. 63), in most of the IBT structures, the first block price is normally set below cost, in order to promote equity. When creating IBT great attention is paid to the size and price of the first block and this step is of strategic importance;
- **Normal block** – corresponds to the average consumption defined on the basis of the marginal cost;
- **High block –** a price is designed in such way that it should cover the full cost of the service. Cardone and Fonseca (2004, p. 49) found that by charging higher rates for higher levels of consumption (especially for industrial and commercial users), IBTs have effect on reduction of water use.

As it is mentioned before, IBTs can be structured as two-part tariffs. For that matter, all consumers are charged monthly fixed rate together with an increasing tariff for their water consumption.

According to the research of Jones (2003) there is a clear trend in some countries towards volumetric charging. For instance, Hungary, Poland and the Czech Republic, already use pricing systems based solely on volumetric pricing. This means that when more water is used the more should be paid or the higher price should be calculated. Even in countries where fixed charges still exist, the policy of allowing large free allowances is declining. More about this is presented in chapter 4.3.

If the decision makers in the FBiH want to protect water as an important natural resource, to secure its availability for future generations, or to meet current needs for water, than the IBT model combined with the scarcity rent could be optimal solution. The first block of the presented IBT structure will have to have acceptable price for 1m3 and to meet the social component of this model, but for the next block price has to be set at the level of scarcity rent. The purpose of such decision should be a discourage of excessive consumption and ensures sufficient revenues that could be used for the rehabilitation of infrastructure in order to reduce losses.

4.2 Benefits and costs of perceiving this model

While doing this research we found a few reasons why should utility, municipal, canton or even country advocate the introduction of IBTs:

- Promotes water conservation and saving,
- It enables better water quality. One reason for rising of water charge level is that water quality decreases as a result of over-consumption especially in the areas where groundwater is used,
- Makes water affordable to the poor households with acceptable water price for a first block,

- If well designed size and height of the blocks, it ensures sufficient revenues to recover costs, and
- It achieves efficiency from confronting consumers in the highest block with the marginal cost of using water.

In order to make this research objective and to introduce a new approach properly we gathered all disadvantages which could be considered as obstacles. Those disadvantages are:

- Tariff design is very complex process and special attention should be paid on design of first block. Balance should be made between price and the weight for first block.
- Many IBTs fail to reach cost recovery and economics efficiency objectives. Usually, it is a consequence of bad decision on price of water for the higher consumption blocks and/or because the first life-line consumption block is so large that almost none of the households consumes beyond this level.
- Expressed political and other pressures when it come to the limitations, especially regarding size of the first block
- This tariff system is difficult to implement, especially if water connection is not metered and if there are any kind of problem related to connecting, neighboring relations etc.
- Collection of debts is very low. Consumers do not pay according to the costs.
- This system is not favorable to poor families with large households or shared connections.
- There should be put a huge efforts on rising of public awareness and overcoming difficulty of administration and a problem with lack of transparency.

When we look closely into these advantages and disadvantages we can conclude that despite numerous disadvantages, advantages are much stronger to be driven by. Advantages like water conservation, efficiency in water use, better quality of water etc. can offer us a real progress and we can reach defined goals. On the other side disadvantages offer us a similar scenario no matter which water tariff structure we are trying to incorporate in our water management system. For example, if we try to make any kind of changes we could have political, administrative or infrastructural problems. We conclude that, since we are going to have all those obstacles we should make them worth trying and use the tariff structure that will give us more advantages.

Putting aside all those advantages/benefits and disadvantages the subject of concern could be cost of perceiving this model. We already mentioned how to calculate costs in water sector but basically those are operating and maintaining costs. What about reconstruction and reform costs of water sector? We are referring on new infrastructure, administration and new software for introduction of IBTs. These costs could be measured in billions. With current trend of collecting water fees we are not able to cover current cost, not to mention the investment in new infrastructure.

4.3 Experience in foreign countries

On conference named Pricing Water organized by European Commission DG XI and Institute da Agua (2001, p. 37) was stated that industry has been the first to cut consumption as a result of price increases. In the EU, industrial firms have been the first group of users to adopt water saving technologies to cut consumption short. Industrial users are always metered when connected to the public water supply. Although, many industries have direct abstraction permits and pay abstraction charges. Just a few countries industries are charged using a flat rate. Two-part tariff structures are generally used. These have a fixed element (based on meter size or pipe size) and a variable element. The variable element can be a fixed rate or can involve increasing or decreasing block tariffs. Increasing block tariffs have developed as a response to needs for water conservation (in Spain, Portugal and Italy).

The average share of industrial water use (without power production) is 16%. This share varies substantially from one OECD country to another: from a maximum of 66% in Finland down to 3% in Mexico. There is a noticeable trend in Europe towards a decline in industrial water consumption, as industry is relatively more price elastic than other sectors and therefore more responsive to water pricing policies (European Commission DG XI & Instituto da Agua, 2001, p. 315).

Agriculture is a major user of water in Europe, accounting on average for about 56% of total water abstraction in the 15 EU Member States. In countries with significant areas of irrigated land (Greece and Spain) agricultural uses represent nearer 80% of total water consumption. However, water prices in irrigation agriculture are still low and well below the costs incurred to supply the water (Garrido & Calatrava, 2009, p. 136).

In previous sections it was explained how IBT water tariff could be defined with (a two-part tariff) or without fixed charge element. IBT structure, regardless fixed charge element was subject of Global Water Intelligence (hereinafter: GWI) research and it was found that uniform volumetric tariffs are the most common form of water tariffs in countries of the OECD.

In 2007 and 2008 IBTs were used by 90 out of 184 utilities surveyed by GWI. The observed pattern either had introduced or not a fixed charge element. Pricing system based solely on volumetric charging, with no fixed charge element is used in some eastern European countries like Hungary, Poland and the Czech Republic (Jones, 2003). Out of 94 utilities, more than 62% (59 utilities) used uniform volumetric tariff and about one third (31 utilities) used specifically IBTs.

IBTs are very common in the area that lies south of the Sahara Desert in Africa. Considering the number of utilities relevant for this study, only 6 utilities were represented in the GWI sample. It is obvious that GWI sample does not represent equally proportion of all utilities with their different tariff structures and underestimates the prevalence of IBTs in countries which are not OECD. This is corroborated by the fact that 28 utilities from transition economies where uniform volumetric tariffs are common are used in the same sample.

Table 3 presents water tariff structure as share of utilities in some countries. In this sample, analyzed and presented in percentage, it is evident that IBTs beside uniform volumetric tariffs are the most used tariff structures.

Table 3. Share of utilities charging different water tariff structure (in %)

Country	**Fixed Charge**	**Uniform Volumetric Charge**	**Increasing Block Tariff**	**Decreasing Block Tariff**
Australia	-	68	27	5
Canada	56	27	4	13
France	2	98	-	
Hungary	-	95	5	
Japan	-	42	57	1
Netherlands	7	90	3	-
Norway	87		13	-
Spain	-	10	90	-
Sweden	-	100	-	-
Turkey	-		100	-
UK	90	10		
US	2	33	31	34

Source: D. Whittington, *Water Tariffs and Subsidies in South Asia: Understanding the Basics,* 2002, p. 10, Table 1.

Country that we can use as an example from the table 3 is Spain. According to data given above we can see that 90% of observed utility pattern in Spain use IBTs. The River Basin Authorities in Spain (hereinafter: RBA) provide irrigation associations, municipal services and industrial users with water regulation and transportation. The RBAs introduced chances in water pricing system of Spain. Tariffs for households and industrial users are designed as 3 block tariffs, although experts suggest 5 block in major cities. The purpose of such structure is penalization of excessive water usage. Industrial tariffs could be seen as discriminatory for bigger users both in the fixed and variable charges. Empowered by Water Law RBAs are allowed to create water charges and apply all measures needed to promote water savings. It almost become practice that irrigation associations establish charges by volume and to practice penalization for water overconsumption for areas where water is scarce (EMWIS, p. 1).

Beside Spain, Turkey is one of the analyzed countries in the table 3 and based on its findings 100% utilities in Turkey use IBTs. Ünver and Gupta (2002, p. 146) analyzing cost recovery in Turkey in 2002 concluded that only a fraction of the total costs was covered and no allowance for depreciation of the unsustainable infrastructure was made. Since, distribution and maintenance costs have to be covered, government funding is required. New structure of water charges was required and in the medium term it should include costs of the main canal operator.

Ünver and Gupta(2002, p. 146) suggested that water distribution should to be charged based on increasing block structure, and only few years later in 2009 we face situation that in most Turkish cities IBTs are implemented. Linear tariffs are used for water pricing for commercial users and public institutions. These tariffs are close to or even higher than the highest block of the tariffs for households and they differ in Turkish cities. In 2009 the highest water and sanitation tariff among 11 metropolitan cities was charged in Istanbul. In order to analyze or compare prices we will convert Turkish Lira (hereinafter: TLY) into currency used in the FBiH and based on an exchange rate of 1 TLY = 0.6848KM (Kursna lista, May 2014). So, in Istanbul water was charged with 2.08 KM/m^3 and the lowest was charged in Diyarbakir with 0.90KM/m^3 each for a consumption of 20m^3/month.

During 1990s it was a period of high inflation in Turkey. In some cities tariffs have been indexed with purpose of prevention an erosion of tariffs. The indexation system allowed tariffs to increase automatically and parallel to the increase of the consumer price index. These days, Turkey as a middle-income country has the level of tariffs and cost recovery relatively high. However, the country's investment needs in the field of wastewater treatment in order to comply with EU directives are high and out of range. It still depends on grants and subsidized loans from external partners.

Volumetric charges would allow a water market to develop directly. Each tertiary would be entitled to a given total volume of water in a season and to a given maximum volume in peak periods. Sales of water within a tertiary would be direct and simple. Sales between territories, or between irrigation management organizations, would be dependent on irrigation systems capacity constraints, but would not be difficult to manage, once volume measurement and systems were in place.

In developing countries user who use small amount of water are usually the poor users. That is the reason why decision makers intent to make those small amounts of water affordable to such group of users. On the other side, industrial and commercial users are often charged higher tariffs than public or residential users. Also, metered users are often charged higher tariffs for higher levels of consumption (IBTs). However, cross-subsidies between residential users do not always reach their objectives. Given the overall low level of water tariffs in developing countries even at higher levels of consumption, most consumption subsidies benefit the wealthier segments of society. High industrial and commercial tariffs can also provide an incentive for these users to supply water from other sources than the utility (own wells, water tankers) and thus actually erode the utility's revenue base.

Boland and Whittington (2000, p. 4) with their research enable us to analyze the good example of IBTs implementation. La Paz, in Bolivia, could be used like role model of IBT practice. IBTs in La Paz were adopted by the local water utility and the Bolivian National Tariff Board. The table below illustrates how IBT structure looks in this municipality.

Table 4. Example of the IBT adopted in La Paz

Volumetric charge[1] (US $per m^3)	**Households consumption (in m^3)**	**Commercial consumption (in m^3)**	**Industrial consumption (in m^3)**
0.22	1 to 30		
0.44	31 to 150		
0.66	151 to 300	1 to 20	
1.18	Above 300	Above 20	All water

Source: J.J. Boland and D. Whittington, *Water Tariff Design in Developing Countries: Disadvantages of Increasing Block Tariffs and Advantages of Uniform Price with Rebate Designs*, 2000, p. 33.

Block tariffs in La Paz are designed on progressive basis and there was created difference between households, commercial and industrial users. IBTs were developed as subsidization of households who usually use small quantities of water. There are different numbers of blocks for specific user groups and, consequently, there are four blocks for households, two for commercial and one block for industrial users. It is obvious that households are charge differently for their consumption and that price difference is so evident between blocks. Nevertheless, charges for commercial and industrial water users are much higher compared with those for household level of consumption.

The design of the first, so called lifeline block is very sensitive issue as it is it is affected by social conditions (Boland & Whittington, 2000, p. 2). The political environment may be the cause for any kind of restriction denial or delay, especially when it comes to the limitation of lifeline block size. The size of the first block is set too large in the case of La Paz. For example, in family that counts 5 members daily needs are assumed to be approximate to 200 l of water. Poor households cannot save on their water bill and they

[1] Based on an exchange rate of US $ 1=1.43KM (*Kursna lista*, May 2014)

have no benefits from this tariff structure if they use less than 30 m^3 water per month. On the other side households which are not poor get benefits from the first block tariff, especially if their consumption habits are high but don't overcome the limitation of the first block. Therewithal, water can be resold by unscrupulous consumers at much higher prices to households with no connection to the water services.

To sum up, the marginal cost of the service provided are required to be reflected on prices by economic criteria of efficiency. In our example of La Paz water provided to household users has price set at marginal cost but only for units above 300 m3. This corresponds to the highest consumption block. However, most households' don´t use more than 150 m3 water per month. Therefore, negligibly small quantity of water is actually sold at marginal cost, so their contribution to investments in the water sector is very low.

Cardone and Fonseca (2004, p. 51) analyze the assumption that poor households with private connection benefit from the subsidized rate. They found that IBTs, depending on the conditions in which they are implemented, could have undesirable effects. For example, in situation when poor households share a single connection, consumption and rates go higher resulting that poor households finally pay more than other users. Moreover, in developing countries, most of poor households have no connections to the water distribution system therefore they cannot benefit from lifeline tariff.

According to Cardone and Fonseca (2004, p. 20) there is an alternative to correct some of the inefficiencies of IBTs. Although their solution could face some problems while implementing, they suggest that for all income groups the same price per unit should be charged and for different income groups added a fixed charge. This would mean a negative fixed charge for the poorest users. This fixed charge has to be deducted from the volumetric charge. However, the assumption that the poor can be easily identified can cause a problem, as well as high administrative costs.

4.4 Future steps towards new pricing model in FBiH

A common consensus on the EU Water Policy is to be beneficial for all state members as it follows: the intensification of sustainable ways water resources use with special emphasis on balancing the needs of all users during water shortages, more efficient management of water resources using the river basin as the main control unit, reduction of pollution and improved wastewater treatment, improving health conditions related to the enhanced protection of water resources used for water supply and swimming; growth of certain economic activities (e.g. tourism), more efficient and more effective use of water resources due to the introduction of the real economic cost of water and raising the awareness of all stakeholders that they are the real owners of water resources.

As it is mentioned in Midterm development strategy for BiH-PRSP 2004-2007 (Council of ministers of BiH, Government of FBiH, Government of RS & Office of the BiH coordinator for PRSP, 2004, p. 199), BiH for now has considerable water resources, so that the water in future, if well managed, can become a foundation for its general economic development in many fields. Damage caused by war, both inadequate maintenance and regulatory framework have led sector and water management into difficult problems. As time passes it is even harder to maintain the supply systems of drinking water, which otherwise have not been able to meet the needs of all users. Existing infrastructure protection of water is obscure. Water resources are increasingly exposed to pollution. Sustainable development can be achieved by application of the principle of integrated water resources management only, which suggests collaborative effort in problem solving in basic water management sectors, particularly in water use, water protection and protection from floods.

To summarize, condition of water supply infrastructure can be viewed through the following:

- coverage of public water systems under control[2];
- water quality;
- state of the facilities of water supply systems (water abstraction, transportation pipelines, reservoirs, pumping stations, plants for the conditioning of drinking water, distribution networks);
- quantity of unaccounted water, which is the difference between water produced and invoiced amounts of water;
- the percentage of physical losses;
- collection rate of invoiced amounts of water, and
- tariffs.

Looking at each of these parameters, we can generally say that the state of water infrastructure in BiH is not satisfactory, primarily in terms of the degree of coverage of public water systems, the amount of losses, the state of water supply facilities, and especially in terms of tariff level and the level of charge which cannot cover regular work and maintenance, and especially the development.

Taxes, tradable permits and liability schemes are commonly used as economic instruments for reduction of pollution and excessive use of water resources. This is good way to generate revenues part of which could be used for financing plans for environment restoration.

[2] Under „public water supply systems under the control“ are water supply systems trusted by decision of local self governance bodies (canton, city, municipality) to the companies for management and usage

Generally, main reasons for the difficulties in water utilities functioning are high physical losses in systems that in some cases they reach even 80%, low collection rate (below 50%) and low tariffs, as well as their organizational fragmentation at the municipal level. Mentioned difficulties are resulting in poor financial indicators (Herceg at al., 2010, p. 8). In publication by Environmental and Social Sustainable Development (hereinafter: ECSSD, 2003, p. 15) which analyses facts about South-East Europe countries and water in this region, priorities for BiH are stressed. The rehabilitation of water supply and wastewater management, flood control, as well as control of water quality and development of firm institutional framework were suggested. More than eleven years later, we face same facts and same suggestions could be made.

In order to ensure better conditions under which FBiH water management operates, economic objectives in Water management strategy of the FBiH (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 208) have been defined as follows:

- Objective 1: Water management sector is integrated in a single economic system and uses more of economic tools;
- Objective 2: Water sector is efficiently, reliable and transparently managed;
- Objective 3: Introduction of changes in water pricing system through assessment of economic water price as one way towards financial sustainability of water management.

Water users and the potential ones compete in usage of scarce water resources and, automatically, there is a need for its adequate allocation. Right allocation has better effects on the economic development and ecosystem as whole. It helps better utilization, creation and distribution of income, as well as maintenance of acceptable living standard. This can also have significant impact on the planning on land utilization and cause the migration of people to urban areas. Economic policies and measures on resource development and allocation should result in secured water quantity which would be sufficient for basic human needs. In addition, the number of natural disasters in the world has lately rapidly increased. Hence, priority to the economic evaluation there should be given. Losses and financial provision for their prevention and mitigation of their consequences should be defined.

Using adapted cost-benefit analysis, market-based instruments in protection of water, pricing policies and policies for setting rates of charges for water use, as well as other economic tools is of crucial importance for efficient and fair allocation of water resources. At the same time social and economic criteria should be taken into consideration, together with a basic human needs. Inadequate economic policies inevitably contribute to the extremely poor business performance of the entities involved in water management, thus reducing their capacity to attract funding from public and private sector, national and international financial institutions.

Second objective refers to financial management and its efficient and transparent components as prerequisite for effective cost recovery in the water management sector, and therefore, it would be necessary to ensure transparency in terms of setting more reasonable and economically justifiable charges, subsidies, cross-subsidies and taxes, and to promote competition wherever possible. It would be important to develop an appropriate program of incentives for water supply companies for the purpose of implementing the measures for more efficient and more rational use of water. This would lead to a progressive transition from the existing supply management practice to demand management practice and a progressive transition to so-called demand-side which is suggested as a strategic commitment of the water supply companies in the FBiH.

The strategic commitment should be the promotion of the idea that active demand-side water management may be more cost-effective than projecting demand on the basis of trends from the previous periods and implementation of the construction projects in order to satisfy the requirements of such projections. Unless they are causing damage to the environment or endangering sustainability of water resources for other existing or future users, the objective of an effective demand-side water management program should allow the users to keep all the advantages by satisfying their needs for water.

Traditionally the water supply companies have been focusing on developing additional supply in order to satisfy the higher demand accompanied by the population growth and economic development. Increasingly, these companies recognize that conservation program, the program that advocates more rational and more prudent water use, can reduce current and future demand for water, and provide benefits to the consumers, businesses and environment.

In the area of water supply, collection and drainage of waste water the fixed costs account for approximately 65% and 80% in the structure of total costs. This means that for FBiH the reduced consumption would require less investment, and thus ensure larger savings. The capital costs are closely connected to the level of consumption: average and, particularly peak consumption. The experiences indicate that demand management has significant advantages. For example, by preventing damages caused by water overflow and by reducing irrational consumption and use, the accountability in terms of management of this scarce resource would be significantly improved. The principle of accountability is the basis of the sustainable water resources management, being the responsibility towards present and future generations.

The third objective stresses the importance of the adequate funding for current operations and investment maintenance, as well as for satisfying the needs in terms of new infrastructure in the area of water management. The role and nature of the traditional stakeholders in water management funding is considerably changing. The public budget funds have been funding a large portion of water infrastructure and facilities development throughout the world. Those funds are gradually withdrawing from the current funding schemes, partly due to the bigger competition in terms of using the budget funds, and partly due to reduced funds availability. Taking into account the growing financial needs, as well as the reduction of public investments in the water sector and the lack of private investments directed to this sector (only 5% of private investments monitored by the World Bank is associated with waters), the need to define new strategies in this area is becoming more and more evident. The infrastructural projects in the water sector undergo the general falling trend in lending international, private, investment and commercial banks. The reason for this rather low level of interest rests with numerous risks specific for this sector. It is, therefore, necessary to actively promote the cooperation between the public and the private sector in order to change the perception of the foreign investors about the numerous risks, and use the collected funds in a proper way.

The strategic challenge is related to the issue of collecting the required funds for compliance with the EU environmental standards. Since the start of the negotiations on stabilization and association EU has been emphasizing, the fact that around 90% of these costs should be covered from national sources, expecting that nearly 5% of gross domestic product must be invested in the projects on environment, over a number of years, in order to cover the costs associated with the environmental issues (Fiedler & Janiak, 2003, p. 49). A part of these funds should be alimented by the Environment Protection Fund of the FBiH.

In the countries in transition international environmental assistance is regarded as a tool that should help to leverage domestic environmental expenditure. International assistance can be focused on financing infrastructure projects as well as providing technical assistance. In both cases it is important to tailor the process of international assistance to the countries' needs. Imposing international priorities that force the countries to adapt their requests to the available assistance may result in weak ownership of implemented projects (Fiedler & Janiak, 2003, p. 83).

The infrastructural projects in the water sector undergo the general falling trend in lending by international, investment, commercial and private banks. Numerous risks specific for this sector are causing extremely low level of interest. Those risks could be summarized as follows:

- high capital intensity,
- low rates of return,
- very long pay-back periods,
- political pressure on prices for water services,
- widely spread conviction that water is a free good,
- inadequate legislative framework,
- unsatisfactory status and limited knowledge of network and user data and

– imbalanced revenues and sources of funding.

Moncur and Pollock (1988, p. 71) should be commended for outlining a solution to a water utility pricing problem. First, the solution generally reflects the consensus among economists of the desirability of achieving economic efficiency, and thus the solution becomes tenable to most economists. The perspective reflects the dominant value presumption among economists that economic efficiency should be the objective with the top ranking. Second, the solution recognizes the fact that utilities will usually account only for water exploration, development, transmission, treatment, distribution and out-of-pocket costs (Lynne, 1989, p. 420). They argue that utilities ignore scarcity rents and thus set water rates too low. Social opportunity costs are often overlooked by utilities (but, as will be argued, scarcity rents as a part of the opportunity costs may be included in the institution).

Suggestion made by Moncur and Pollock (1988, p. 71) was that economic efficiency can be achieved by calculating the scarcity rents and using the calculated rents to define a water rate. In other terms price setting is the fundamental issue that must be solved adequately considering water as an increasingly scarce good. The underlying idea of setting water prices is to facilitate the cost recovery and to rationalize, i.e. reduce the consumption of this resource by using different market incentives. If the water price is set adequately, all sectors in one economy will be using water more rationally and reduce the qualities they are consuming. Educating and informing the public about the importance of rational use of water proved to be an inadequate approach for reducing consumption sufficiently, however, if combined with appropriate water prices, this approach could give good results.

The differences in price setting methodologies largely came as a result of different opinions about the importance and the necessity to include economic and/or environmental externalities in the water pricing process. Regarding water resources allocation, one of the most important aspects of the operations of a company dealing with use and protection of water is price setting. The reason for this is because the change in pricing sends a signal to the consumers and suppliers about the changes in the consumption costs. Although, the pricing process is not too complex, the practice shows that the water pricing process involves a number of prerequisites that should be considered. The most important and required is determining the water value itself, taking into consideration that this value is only a starting point in the pricing process.

Setting prices in a large number of countries is perceived as more or less a measure for ensuring the required funding. There are a few systems in the world that are fully funded by the current and future customers. Generally, water systems remain being dependent on the budget funds and international assistance. The future business models in the water management sector of the FBiH must progressively adopt the transition to the pricing

system based on full cost, as its strategic commitment. This is something that shall be done if the financial challenges are to be adequately confronted.
Water tariffs in South East Europe countries have been increasing recently. Nevertheless, the increment is insufficient because tariffs are still set below cost recovery levels. A lot of countries face the same problem with the revenues collected by water utilities. Often, collected amounts are not sufficient to cover operating and maintenance costs. The revenues in water sector would not cover utilities annual expenses even if all water bills were paid (Speck, 2006, p. 15). The extreme case, where price structure is of little importance, is where water is free and it does not encourage water saving at all (e.g., Egypt and Albania). At the opposite extreme, Israel has introduced a pricing structure giving high incentive to save water with IBTs. However, it should be emphasized that the absolute level of prices largely determines the effectiveness of the pricing system implemented. The European Water Framework Directive requires in this segment as well, that the scarcity of natural resources and the environmental aspects must be taking into account when determining the structure and the level of water prices.

Current situation in water sector of FBiH is such that special water charge applicable to public water supply is set to the amount of KM 0.01 KM per m³ of abstracted water. It is obvious that the end result is negative given the large losses of water. As a result we have our companies in a better financial position because their total expenditures on this basis have been reduced (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 217). This situation should be changed (i.e. the water abstraction charge should be increased) because water charges should be a motivating factor for rationalization of water use. Taking into consideration the significance of these companies, their presently exercised monopolistic right to use this scarce resource, as well as the volumes of water they are using, it is clear that this arrangement is not in compliance with the main requirement stipulated in the Law on Water of the FBiH, which emphasizes that the water resources management must be organized in accordance with the principles of sustainable water management and preservation of scarce water resources. However, the strategic commitment in this segment should be to increase this amount of water charges. It is evident that the water supply companies are not sufficiently motivated to use their source being entrusted to them in a more rational manner and it should be changed.

Next point to consider is irrigation. Only around 0.65% of agricultural land is irrigated in BiH. The existing irrigation systems are damaged because of the war and negligence. Most of the flat areas in the northern part of the country used as arable land contain high percentage of humidity and should be drained. The decision on special water charges for the abstraction of water intended for irrigation stipulates the charge to the amount of KM 0.01 and previously it was amounted KM 0.05 per m³ (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 218). Hanjra and Qureshi (2010, p. 366) conducted analysis and it shows that, population and income growth will increase the demand for food and water, and irrigation will be the first sector to lose water as water competition by non-agricultural uses increases and water scarcity intensifies. Increasing water scarcity will have implications for food security, hunger, poverty, and ecosystem health and services.

Due to the difficulties in the agricultural production in FBiH, special water charge would be annulled, i.e. it would be equal to zero until further notice. In the future period the options for re-imposing this charge should be certainly taken into consideration. The reason for this is that the water in agricultural sector is used inefficiently and there is no motivation to improve the efficiency of such use (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 218). Some findings suggest that the adoption or modifications of pricing schemas (or water markets) do indeed incentivize farmers to use irrigation water more efficiently, but also that increased efficiency does not always correspond to improved water conservation (Balali et al., 2011, p. 869). Since, in the world, a great attention is paid to the water pricing and its use in agriculture, and therefore, there are well developed and diverse models. FBiH should use more of foreign practice to improve water sector condition.

The charge for abstraction of water for industrial processes, including thermal power plants is next point of concern and it amounts to 0.03 KM per m^3 (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 219). The thermal power plants will, in the future, pay this charge per m^3 of water abstracted and not per kWh of electric power generated, which is the case now. It is considered that this charge should be based on the water consumed that can also be recycled by the thermal power plant in the generation process. The initiative for the change of the charge basis related to water use by thermal power plant was made by the electricity companies. In order to achieve sustainable water use in countries with weak governance Lambooy (2011, p. 860) suggests that corporate responsibility should be of greater significance, since it becomes the moral duty of companies to prevent their acts violating human rights.

The special water charge for the use of water for the purpose of generating power amounts to 0.001 KM per kWh of the electric power generated. So far, this charge has been based on a percentage (2%) of the ex-works price for 1 kWh of the electric power generated. Every year, JP Elektroprivreda BiH and JP Elektroprivreda Herceg Bosna were obliged to deliver the generation prices charged for 1 kWh based on which the water charge was paid. To simplify the payment system, this charge was determined in a flat amount per kWh generated. After recalculating the payments made so far, this charge was increased by up to 50%. This charge should be even higher in the future. Water is the basic input factor for electric power generation and for this reason, this charge was increased. By comparison, this charge in the Republic of Croatia amounts to 7.5% of the generation price for 1 KWh. In Switzerland this charge is collected by the cantons and it is set at the level of 52 EUR per KW of the total installed hydro power plant capacity regardless of its costs structure or

the capabilities of generating total income (Federal Ministry of Agriculture, Water Management and Forestry, 2012, p. 220).
As we have already analyzed the required funds for financing the projects of irrigation and drainage may be potentially collected from the several sources:

- budget funds (the Federation, cantons, municipalities of city);
- EU Pre-Accession Funds;
- government-backed commercial loans;
- local administration (e.g. bond issuing);
- system users.

From a part of the funds generated by collecting the general and special water charges is financed one part of the water protection. That part is being particularly allocated to:

- Collectors, discharges to the recipient and other associated facilities and equipment – cantons;
- Institutions responsible for co-funding the infrastructure used for the protection of waters of relevance for the FBiH – Federal Environment Protection Fund.

The other part of the water protection segment is financed from the funds generated by collecting the special water charges. The basis for collecting the special water charges is contained in the polluter-pays and consumer-pays principles implying that a water polluter should pay the costs of treatment of the discharged polluted waters, and that a water consumer should pay for the use of water being a common good. The experiences of some European countries in terms of the rates for special water charges for water protection imposed on all water polluters – industry, individuals and all other polluters are quite interesting. The effluent charges, being one of the economic tools used in the environmental protection, may be based on the composition (type and concentration) of the pollutant.

The special water charge for water protection applicable to importers and manufacturers of artificial fertilizers in FBiH amounts to 0.005 KM per 1kg. This charge remained the same, which is not justifiable. In other words, the costs caused by using the artificial fertilizers are much higher than the above-mentioned amount.

Water management in FBiH should offer an adequate pricing model, which could be more useful in practice compared with existing situation in water sector, e.g. increasing block tariffs. IBT´s can be applied everywhere where water is provided and/or wastewater is collected and it can be set at the services provider level or even by national or local government. Cardone and Fonseca (2004, p. 16) mentioned that to be able to discover the actual local needs, to determine the acceptable level of costs for providing a quality service, and to make a plan to cost recovery, involvement of local communities is needed. Involvement of all stakeholders in the process of tariff setting is of great importance.

IBT as a model of tariff assessment have its advantages and disadvantages. Advantages are presented through cost recovery if water quantity and price for each block are properly designed. Then even the poor households have connection to the network and they can use the water same as others. In background of all of that we have good promotion of water conservation and water appreciation. In the same time some of this advantage could be disadvantages all depend on way it is assessed and accepted by consumers.

In the example of La Paz we analyzed the problem that occurred with design of tariffs. Since tariff structure design is complex, government or others decision makers have to have correct information and analyze data to be able to make appropriate estimation on blocks of tariffs. Complete system has to be prepared for implementation of such model. Otherwise, problems will occur and accumulate. IBT promotes cost recovery which essentially depends on collection of bills, once again we stress how important is roll of government and decision makers in conduction of water policy on a right way to avoid above mentioned disadvantages.

In FBiH the most used tariff structures are fixed charge and uniform volumetric tariff. Fixed charge is set in a way that one household pays water bill which equals number of members multiplied with a fix charge. In this case it is assumed that members will use certain quantity of water, not more or less. Uniform volumetric tariffs are implemented in households that have installed their own consumption meters then it is charged quantity consumed multiplied with price of water per cubic meter. It is obvious that government and consumers in BiH have to put a lot of efforts, invest and work on water system infrastructure to be able to agree upon tariff structure and charge all consumers based on the same principle and methodology. When we resolve the problem with infrastructure we can argue on price of each tariff block. Actually we could focus on how to implement the polluter pays and user pays principle, and how to follow the instructions given in WFD.

FBiH could face all disadvantages of implementing IBT. Advantages would be inevitable too. We could have problem with infrastructure, assessment and design of tariff blocks, collection rate. However, lack of data is what we find to be crucial. Statistics is point of concern in water sector. Not that the situation is drastically different in other sectors but to be able to design IBT decision maker and all involved need specific data. There are a lot of good examples or at least examples of IBT´s implementation that could be used as guidelines. We have to be careful and use experience of other in order to avoid undesirable consequences and mistakes.

CONCLUSION

Good water management, inter alia, ensures efficient water use, water quality protection, infrastructure development and expansion of water sector. All of this could be provided by adequate water pricing systems with assurance that water services can be provided to all users at an affordable price. At the same time, efficient water use should be ensured in order to reduce the financial burden on the state. One way to do it is to create water pricing system that covers full economic costs of water. In order words, we have to create efficient water pricing policies and be able to use those policies. Based on research of Dinar and Mody (2004, p. 112), pricing may be a useful tool but it is not always easy to implement. In order to create efficient water pricing we have to work on metering of water consumption as a precondition.

Looking at water sector as whole, in BiH only a fraction of the real total costs is covered. The infrastructure of BiH water sector is unsustainable and it still needs government funding. On the other side, government should impose increase in water charges. Also, it is to be expected that water charges gradually increase. So far, everything points to the fact that changes have to be made in order to recover distribution and maintenance costs. Cost recovery is in line with the user pays principle, which stipulates that those who benefit most from a service should bear the brunt of its cost. Cost recovery today is still one of the major obstacles for achieving sustainable water resources in many countries, though it is officially acknowledged on the international scale that water is an economic good. The political choices or measures to be taken toward a cost recovery have to be more rigid. One way toward cost recovery is to satisfy and retain rapidly growing subsidies to irrigation. Not to be forgotten that significant part of costs in the irrigation system that is old and worn out includes maintenance and related cost. Also, there are external costs of inefficient use of water. These are the key segments to be taken into account when deciding about the coming economic and political measures in the water sector in FBiH.

Projections of a country's economic indicators have to be based on recent economic development trends and risks as well as assumptions of economic development. We have to raise awareness about key economic drivers influencing use of water resources that need to be determined (population, income level of households, industrial and agricultural development, tourism and recreation) to be able to make any kind of predictions.

In the environmental domain, perfectly functioning markets are the exception, rather than the rule. Governments can try to correct these market failures and to incorporate right policies. Not all public policies will pass an efficiency test. If undertaken wisely, government interventions can improve welfare, that is, lead to greater efficiency. Having to pay for water encourages water-saving behavior, thus promoting water conservation.

Analyzing parameters related to FBiH water management, we can generally say that the state of water infrastructure in FBiH is not satisfactory, primarily in terms of the degree of coverage of public water systems. Another problem that comes with damaged infrastructure is the amount of losses and generally bad state of water supply facilities. Statistics is point of concern in water sector. Not that the situation is drastically different in other sectors but to be able to make progress, decision makers must have appropriate inputs. And last but not least, problem with tariff level and the level of charge which cannot cover regular work and maintenance, and especially the development. We can conclude that there have to be adequate policy and regulations for water sector recovery. Changes should include reconstruction and/or construction of new infrastructure, setting a new tariff structure and plans for charging rate, as well as some sort of measures to obligate state/entity institutions to do their work.

Among studied single and two-part tariffs we found that the best tariff structure that combines two opposite approaches (water as social and economic good) is IBT. IBT offers the possibility to charge minimum for the minimum usage of water so that water could be affordable to everyone and at this level it should satisfied basic needs for water. It, also, offers greater quantities of water but with the higher price to be paid. In the end water is affordable to everyone (social category) but for the price they can pay (economic category). Water distribution needs to be based on volumetric charging at the tertiary outlet, which requires irrigation groups to be formed, and flow measurement systems to be installed and operated. Having on mind the fact that IBTs are introduced and used in water systems of countries which are lacking in water resources; BiH should use this model to ensure meeting the water needs of present and future generations.

Putting aside all advantages and disadvantages the subject of concern could be cost of perceiving this new model. We already mentioned how to calculate costs in water sector but basically those are operating and maintaining costs. What about reconstruction and reform costs of water sector? We are referring on new infrastructure, administration and new software for introduction of IBTs. These costs could be measured in billions. With current trend of collecting water fees we are not able to cover current costs, not to mention the investment in new infrastructure. Our findings and suggestion to combine IBT structure and scarcity rent could be starting point for some other research that would be based on quantitative assessment, and could be indicative for new analysis on all possible ways to combine those pricing models having on mind the complexity of this country and taking into account the number of factors that influence the price.

It is obvious that government and consumers in FBiH have to put a lot of efforts, invest and work on water system infrastructure to be able to agree upon tariff structure and charge all consumers based on the same principle and methodology. When those conditions are implemented which they can be for sure, only political activity is needed to start this process of reform, and then the water market will regulate all the rest.

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