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ECONOMIC CHARACTERISTICS OF WATER PROTECTION IN THE WATER AND ENVIRONMENTAL MANAGEMENT

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Summary: *Water protection is a specific area of water management which, among other things, requires effective economic and financial management of the assets engaged in operational processes of the ecological status of natural water quality preservation. Water protection includes identifying, defining and development processes in which asset and resources of specific economic characteristics are engaged. Those specifics refer to economic characteristics of the so-called, pure public goods, public goods and private goods. The paper specifically analyzed the economic aspects of solving the problem of water pollution and externalities. Economic base for achieving and preservation of the water target ecological status could be realized in an integral and integrated management system, a combination of a specific legal and economic framework and instruments of the market economy (market economy, exchangeability of goods, etc.).*

Keywords: *water system economics, water protection, ecology, public goods, management processes, externalities.*

1. INTRODUCTION

Permanent dilemma in setting priorities in economic decision-making on water and ecology refers to the establishment of regulatory and/or economic system. In this field there are two basic theoretical approaches: access to normative and positive approach to the economy. Normative economy estimates possible policies that have been, or will be, in different approaches and directions of the way of development, protection of natural and water quality when using the results of a positive economy. Positive economic analyzes and discusses the scope of activities in water protection, ways of functioning of the water management and applied policies in water management for water protection. In terms of economists to the values of normative and positive economics there are different approaches on the issue of whether to introduce fees and taxes for the protection of water as a fiscal (fixed) size of the past or to import tariffs (prices) using the public goods and use value of water [2]. Fiscal amounts depend on the characteristics of pure water as a public good or a public good in general meeting or the required needs and interests. Meeting the needs and demands, depend on the type and volume of water, or at all public and private/commercial service. Differences in approach as a result of differences in the understanding of the economic functions, elements and processes related to economic differences of public goods and values for which the use values of water.

2. WATER PROTECTION AND ENVIRONMENTAL ASPECTS IN THE WATER

Water is a natural resource, not a commercial product, in which the services realized through specify the quality and use value of water. Thanks to services, polluted water becomes a specific economic

good, which compromised the natural resource is transformed into a natural resource and a new economic resource. For water protection is not enough regulation of the state, but also clearly defined functions and elements to establishing the administrative and business processes in the economic and financial structures and systems. The transformation of use values of water, from free good to economic resource, results from process orientation of organizations in the water sector. The orientation is related to defining procedural administrative activities and use of facilities, equipment and plant, based on defined regulatory and technological basis and measures.

Water management is the process of making decisions in the administrative and business processes that are implemented in public and private systems in the water sector. Environmental management in the water sector includes: protection of water bodies and river basin areas, sustainability of water resources; pollution reduction; increase the quality of water for use; environmental protection; informing users and the public; supervises the implementation of basic, supplementary and complementary measures; Risk management in water management, management of the water sector and the management of pollutants by the user.

Public functions in water management and water protection are related to the normative and regulatory function, the administrative function, social function, quasi-judicial functions and complementary functions with technological and economic functions and changes. As part of the public function is expressed intense presence of various technological, economic and legal functions. The relationship between basic and complementary functions is different, but connected. Thus, eg. in the case of water resource management, regulatory function is focused on the public good, the technological good, or other particular ecological or chemical status of water, and the economic function of the fees. For each of the functions is essential to the input elements and values (basis), which depart from the general value of the output elements providing a maximum output value - precisely defined services for water protection.

Business processes represent a range of activities to meet the chosen mode of management [25] of water resources, and a set of activities to deliver the performance of a variety of water services that bring economic benefits to water users and organizations of the water sector. The complexity of the management of water resources is particularly evident and measurable in business processes related to the use or the use of inputs in a series of transformations and events leading to the output and services that meet the diverse interests of water users. The complexity and risks of the process of governing and solve depending on the type of certain services, choice of resources, ways of solving problems in changes of water and facilities, using different activities in the field of water management.

Existing technology, mode of production and relations of citizens towards the water affect the speed of water pollution, which require protection designed water, the environment and the environment. Water protection is possible in terms of prohibition, restriction or conditionality to engage, or the acceptance of contaminated water into watercourses. Primary water protection is the realization of high-quality water, which is contained in the bids of the water sector. Bids are related to the prevention of technological, economic, regulatory and other solutions for individuals and legal entities that produce pollution sources. The second condition is in the treatment and purification of water before discharge into the watercourse, water management facilities and systems. Third, the direct water supply to a defined quality by using physical, chemical and biological measures in the water body or object and system at the water area and river basin. It remains a specific requirement that the water can only be treated by the watercourse or to be brought into the watercourse a higher level of discharge and runoff.

Water protection can be grouped according to: (a) pressures and the impact of natural factors and human activities on water protection and the environment necessary for the protection of water, protected areas and water use; (b) the nature of the change trends and fluctuations in water quality; (v) the methods and procedures for achieving the goals of water protection; (g) types and methods for the realization of the service process; (d) means and methods of delivery and provision of services to protect water; (f) the needs and demands of the public and users and taxpayers - users and (e) the current regulations for water protection.

Elements of ecology and water protection are related to different physical, chemical and biological characteristics of water, technical and technological systems and economic factors that determine the impacts of the management of the water. Water system can be considered as ecological systems, given that encompasses interrelated effects, of different intensity, pressures and impacts on water and the environment that require ecological balance, which disrupts the interaction due to the relationship

between living beings in their natural environment. The ecological equilibrium must maintain natural diversity, supporting organic farming, the development of methods for the elimination of negative pressures and impacts on water, ensuring the target water quality, fostering economic efficiency of the demand for water services by the water sector.
The basic elements of water policy and water management are related to the following areas: (1) the protection of water and the environment, (2) water (management) services and (3) other activities.

2.1. Water protection and ecology

Water protection relates to all changes and the status of water pipe (management) services and activities of the public. The field includes types and ways of influence and pressures of natural, economic and other factors of human activity on surface and ground water with the categories of income, the sources and amount of funds for services and investments. The area has been targeted at the bureaucratic (administrative) coordination to determine the positioning of water protection and environmental protection in water management. For water quality is applied the theoretical and practical basis and methods in chemistry, physics and biology. The quality of water in water protection and the environment is determined depending on the ecological status of water. For the determination of the ecological status (Annex V of the Framework Directive of the EU water) are important biological, hydro-morphological, chemical - physical, general and specific features elements of pollutants. Annex V of the WFD in detail are determined certain types of elements for ecological and chemical status, which require the establishment of supervisory, operational and scientific monitoring, and can be set up and additional monitoring. From the results of the monitoring, the integral and integrated water management, determine the conditions and to classification of ecological status which may be (1) poor, (2) unsatisfactory, (3) moderately good, (4) good and (5) high. The ecological status is combined with a chemical status, which can be good or bad.

2.2. Water(management) service

Water services in water protection include public and private (business/water management) of each service relating to the acceptance and retention of water use in surface water and groundwater, along with wastewater collection and removal services, water and operation of treatment plants. Public services are related to administrative and regulatory activities in water protection and the environment, and private services are economic activities for the achievement of the target water quality. Public services are activities in the realization of attitudes, conditions, approvals, permits and procedures for the adoption of the program of measures on water area, management plans at river basin management strategies and water protection. Water management services are a series of tasks, work and processes by which by the service provider meet the expressed needs, requirements and demand of the population, industry, agriculture and other economic and non-economic subjects - for water.
In the offer of services sector are determined the instruments for chemical, biological, physical and environmental measures to be taken to bring the water to a predetermined level of quality and in particular the ecological level and potential. [15] The measures and instruments [2] represent the value system of human resources, financial and material resources. The necessary resources and means are expressed toward the condition and status of water service on water treatment and resource costs. Offer water protection through services for preventing pollution and water treatment contain quantitative and value parameters of the existing and the required water quality. Indicators are obtained from the analysis of recorded and measured water quality; applied technology for the measures; applied technology to market opportunities procurement and engaged resources (inputs). The offer includes calculations for certain measures; certain cost centers; to specified cost centers - individual water management services and users and taxpayers of water management and water sector; the balance of quality and ecological potential of water before and after implementation; certain types and levels of value-use value of water; economic and market impacts of water quality to commercial users and taxpayers and impact of services to GDP.
The concept of service is the idea of new services in the protection of water, with the basic functions that arise from individual services, and specific to the Water Framework Directive (WFD). [13]

2.3. Other activities

Other activities are related to the organized actions of the public which, while not affecting both the conditions and status of water, must be accepted in the water policy, water sector and water management activities. These activities may affect the sector through associations which propose measures for more effective protection of waters. Activities of citizens are carried out on a voluntary basis in a specifically organized form of association. Members of the organization or association of citizens determine the rights, duties and tasks related to the management of water protection. Today, the intensity of the influence of associations on policy management in water protection is weak, because the activities are mainly one-way operation without interaction with institutions and state bodies authorized and responsible for water protection.
With regard to the subject of water protection, immutability, significance and characteristics of the water system for action to increase the rationality and efficiency of the water sector, the leading role in this area has the country. The leading role of the state is reflected in the adoption of an adequate legal framework and conditions for implementing the incentive of economic and financial measures to protect the water. The instruments and measures that states have defined and determined by approach the border demarcation of water protection, ecology, water (management) personal services and other activities that are necessary for the harmonization of the elements and characteristics in a single management system. The content, function and interaction parameters for water protection are of particular importance in determining the legal framework, economic characteristics and types of biological, physical and chemical elements in the system of water management in the areas of water and environment.

3. CHARACTERISTICS OF ECONOMIC RELATIONS IN WATER PROTECTION

In economic terms, water protection and ecology are a set of economic policies, instruments and measures with which to provide protection use value of water and achieve the targeted water quality, the environment and the environment and in particular ensuring the conditions for integrated water management. The existence of economic instruments and measures are in terms of satisfying the needs, demands and interests of living beings, population and economy. The needs and requirements contained in the integral states and status of waters and integrated management. Integrated water management is an economic term of market coordination of the water sector, and strength of the relationship value and goods of using value and status of water in water protection and ecology.
The realization of water protection is possible by establishing and implementing regulatory and management functions and processes in planning, organizing, leading and control of the ecological status of water. Water quality management involves legal norms and measures (laws, rules and penalties), economic measures (taxes, fees, prices, state benefits, loans, funds, economic impacts on gross domestic product), institutional measures (state and territorial-political measures and territorial communities), political and social instruments (public relations and trust), spatial planning (integral harmonization of different interests in space), scientific - research approaches (sampling, analysis, and testing of new solutions) and application of technological measures (efficiency of procedures).
The Water Framework Directive (WFD) the EU has proposed that the combination of elements to protect the results of monitoring to be applied the so-called. COMMPS procedure to determine the priorities in the implementation of basic, supplementary and additional measures. The application of the COMMPS procedure depends on the characteristics of the water and the database of hazardous and noxious substances. Every substance in the process must be included in the determination of priorities and measures. In the WFD is recommended to use other methods and to every four year to carry out the analysis and adjustment of the COMMPS procedure.
Specific issues relating to the definition and implementation of the emission limit values according to documents on best available techniques (BREF - Best Available Technology Document) and the best available techniques (BAT - Best Available Technology) [6], which are necessary for the implementation of the Directive on Integrated Prevention and control of Pollution. Best available techniques are using a variety of standard methods for testing water and waste water (ISO, APHA,

AWWA, WPCF, WEF, ASTM, AOAC), and in solving problems, especially sludge directly applicable directives on water protection [15].
Water status for surface waters includes ecological and chemical status, and for groundwater chemical and quantitative status, which can be excellent, good, average, poor and very poor. For protected areas are applied special arrangements measures, plans and programs, labeling, security, monitoring, inventory of natural values (flora, fauna and birds) and others.
Because of the natural features and usability of water, primarily due to services, water is an economic resource required for life and all types of business in the country. Direct, indirect and non-use value of water and the value of services are realized according to certain physical sizes, value measured in the offer, prices and demand, or the costs and revenues. Possibilities of using water use value are determined by the influence of various factors and facts on the economic relations of the water sector and the environment. The factors and the facts that determine the relations are contained: in the spatial and temporal dimension; the existence of the object exchange (services); certain providers, acting and users (polluters) services; a certain relation between the state, taxpayers and users, and fees, taxes, and price; the existence of institutions that affect the economic relations (departments, agencies, funds, JVP, VP, organized users, companies and individuals); established economic regulation of water protection, which provides a framework for economic processes; its model determining the level and types of water protection, especially for the type and extent of ecological status and the status of water; State and social obligations for water protection that meet the given and actual offers of services on solving pollution problems and a certain economy of water and ecology in the macroeconomic framework.
Economic characteristics of water protection are contained in the demand, supply and prices of services and "prices" for the protection of water, and in particular the fees and taxes. In a mixed economy that is dominant, government regulation, and not the market, when they are isolated, are not effective the mechanisms for economic coordination to protect water.
Economy water based solely on market principles is not possible (because of market failures), and it is unnecessary, due to negative market effects (fundamentalism). Therefore, the marketability of water protection (for services) must be complementary to the planning. The inability to establish market relations in this area is conditioned by the fact that: there is no simple market relations for the protection of water; because of the feedback loops that are not two-way connection between the measures for the protection of water and the influence of environmental factors and use of the proposed status of water; because there are externalities; pollution events and services do not occur in one, but in a different time and space; there are active elements that affect the quality of water, which is difficult to determine; There are reverse impact elements in the systems of growth and development of economic events in the regions and countries; interests of individual pollutants may not be in accordance with the collective and common interests, and a system of risk is underdeveloped. Plans for water protection are not instruments for the abolition of economic relations, but a means to identify and guide elements in the relationship of water and pollutants. On the other hand, the economy is using the plans to determine the means of achieving instruments and measures with well-identified and typed of existing and new pollutants.
Direct offer water sector represent a variety of water management services for water quality, containing individual and ancillary startup services and operation of facilities and equipment for the purification of water by taking the chemical, physical, biological, and environmental measures. The main purpose of the service is to be changed the key characteristics of water "discharged" by the user so that they can go back into the natural environment, and not to inflict damage to the environment, population and economy.
Bids for a given or specific water quality start from the database of the management process of water protection and the environment in which they are contained services for different types of pollution. The value expression of causes and effects of water pollution and the environment is derived from mutual relations of the economic operation of pollution and water supply sector. To perform relations are using the concepts of environmental management system - EMS (Environmental Management Systems) and management accounting environment - EMA (Environmental Management Accounting) [14]. Both concepts are particularly applicable in holder of economy and population and economy of the risks that must contain an offer of the water sector. In determining the offer are used the elements, data and information from users [14]: (1) research and development, (2) production, (3) finance, (4)

planning and development, (5) marketing and (6) management and distribution. Accounting provides data of environment on the impact of changes in water protection in the gross domestic product, finance, income and expenses. Management of accounting environment includes [13]: energy and material accounting, financial management associated with the environment, the evaluation of the product life cycle, cost estimation, environmental assessment and cost accounting for externalities.
Offers of water sector determine the types of instruments for chemical, biological, physical and environmental measures to be taken to bring the water to a predetermined water quality and especially the ecological level and the potential [15].
The most effective market solution to tackle the pollution issue and meet the demand is the application of fee, or tax for water (as well as some of the premium and prices for relations between the regions and states), and fee for service pollutants, in proportion to the amount and types of pollution.
Demand in Water Protection [2] is a requirement for solving problems of water pollution based on two measures: the market rate and the direct application of the law. Demand arising from the needs and demands for solutions that will be operating (basic) and incentive measures and impacts raise economic efficiency with contaminants in the water sector. That is, that when pollutants are recognized and known the applicable rates and fees, that arise from the special relationship of pricing comparable to the real cost to society. The application price for the elimination of pollution leads to a situation where contaminants to the expressed demand to establish new procedures or treatment to stop the pollution of water. Another way is for the state to prescribe the required standards of water pollution and quality standards for the acceptance of used, waste and polluted waters.
The simplest solution for solving the problem of pollution is the application of fee or tax for pollution of water (depending on the discharge into the natural watercourse or in an artificial body of water), or the price for the service charge of pollutants in proportion to the amount and types of pollution. In the graph (Figure 1), the distance AD represents tax, or fee for the pollution, and the marginal cost of pollution, and the surface ABCD is a total paid fee or tax for the pollution. Manufacturers in terms of non-payment of pollution have a higher production, because the burden of social costs can increase their own production. Border private and social costs can be compensated when the producers of the collection of an amount are equaled to marginal costs and prices of water services.
If there are no taxes, or fees for pollution, the manufacturers determine the price equal to marginal private costs, when you reach a higher production Qm. The efficiency is achieved by the introduction of fees or taxes which production is reduced to the amount Qt for a point D on the curve of marginal social costs.

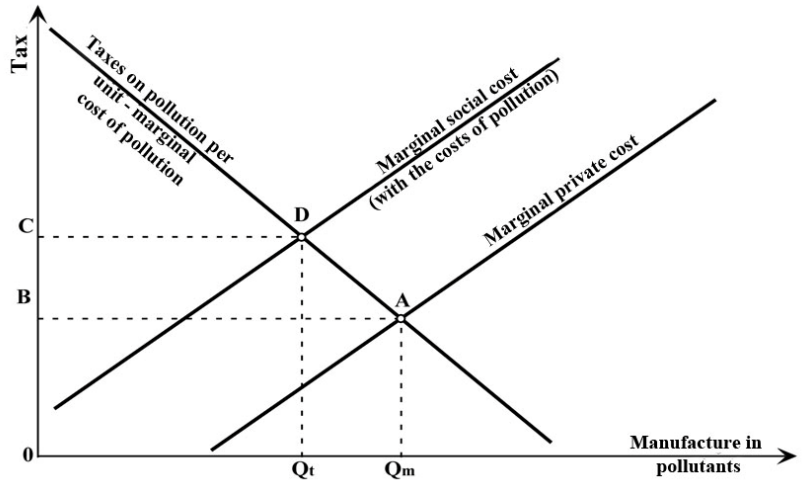

Figure 1: The ratio of taxes and the marginal cost of pollution

The amount of pollution is proportional to the volume of production of pollutants, where the marginal cost of pollution produced by each unit are fixed, due to is introduced taxes or fees per unit of output, which are equal to marginal costs of pollution. Costs can become incentive for polluters, when a socially acceptable level of contamination can be achieved thanks to the water management services that solve the problems of pollution.

Water sector or country can propose and conclude contracts for the use of transferable permits (licensing under the conditions laid down by rules or tariffs) in which the legal entities and individuals (customers) determine the maximum possible water pollution (demand), which can or must be accepted into natural watercourses or water management facilities and systems. Conclusion of the contract for the license is a legal relationship for the provision of water management rights to users that they can indulge a certain volume of water and the level of pollution in streams and water works facilities and systems. In addition to the requirements on the amount of pollution, the contract must regulate relations water system and contaminants on the site, place and time of water pollution; types of matter pollution; the rights and liabilities of pollutants and water sector; Applied criteria of offers for awarding licenses and conditions for the termination of the license. Contractual relationships can, as a special market conditions, provide for the transfer of pollution rights from one person to another person, and conditions for trade licenses when practically may arise scarcity of licenses and the special demand for permits.

In Figure 2 is a graph showing how the water sector is determined by demand and market relations in the degree and amount of pollution, for which the offer and issue permits. Offer of licenses is carried out based on the conditions that arise from pre-determined and assumed procedures for accepting contaminated (used or waste) water, and, in particular, depending upon the application of biological, chemical and physical measurements of waste water (contained in water management services). Supply curve, which is the basic condition for the award of licenses, is vertical because occurs from the predefined conditions on the level and volume of pollutants that can be accepted into the watercourse. The demand curve for permits is determined by the size depending on the degree and amount of pollution of water users and the cost of services for the removal of pollution. From the conditions of water pollution, the price is determined in exactly the right point on the demand curve (point A to price C0), which determines the scope of satisfying the direct (potential) demand. When the water sector does not undertake the cleaning of the application of physical, chemical, biological and environmental measures, and maintaining a predetermined level of water quality, the amount of possible water pollution from users is reduced to the higher price (because it requires a greater scope of measures - point C1), and the new and higher offer (the volume of Q1). If the physical, chemical, biological and ecological measures intensify, there will be conditions that represent a lower bid because the possibilities of pollution amount to a greater extent (volume Q2) and lower cost (Section C2). The lower offer and price arise because is previously achieved high prices for higher pollution. From the changes in prices and volume of pollution generated cyclicality changes in demand, when the price increases, the extent of pollution falls; and conversely, when the price falls, demand is growing, or the amount of pollution. Changes in demand are constant, and the volumes of pollution and the amount of the price depends on the offer, or of the results of the measurement and analysis of the quantity and quality of water in the watercourse (system) and the necessary measures.

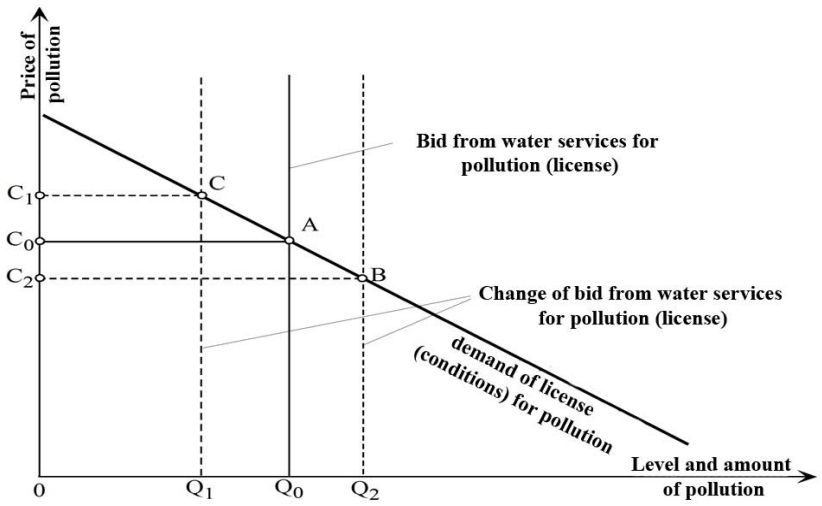

Figure 2: Demand and market relations in the protection of water from pollution

Willingness to tackle pollution is reflected in changes in demand, which must be lower than the equilibrium (previous) offer (the line above the demand curve in Figure 2). In addition to market relations, the decision on the amount and degree of pollution of the water sector affects the economic decisions of public choice (indirect and induced demand) that determined opportunity levels of pollution. Economic decisions for certain differences of costs and benefits, affect the competitiveness of users that can be directed to other sources of funds and the income of the water sector.

4. EXTERNALITIES AND ECONOMIC CONSTRAINTS IN WATER PROTECTION

Sufficient and quality water under the influence of human activity is changing and produces external effects which can be both positive and negative, ie. useful or damage. External effects are not included in the price of services, and they are expressed unidirectional (when only one party produces effects) and the reciprocal (when external effects have effect on both causal hand). In externalities emphasis is placed on natural and legal persons, which produce negative effects of water pollution due to the discharge of waste water, which cause harm to users, the water sector in general and the environment. Water pollution causes the used and waste water from sewage, industry, mines, water from agricultural, forest land, from landfills, as well as from other forms of human activity.

Within the different attitudes about water pollution appear to be of the opinion that pollutants as users of water management systems should not be allowed to engage in water streams. Economically it is not justified because the costs of pollution are not unlimited. To determine the cost of required pollution is necessary the control on the basis of which will be determined by measuring the volume and type of permitted pollution. Based on the measurement and control costs can be lower, and benefits increase, in the same way as it is done for the inputs and outputs in production. The problem is not the level of pollution, but that the contaminants do not take into account the social costs of externalities, which is why the state has to resolve these issues.

In the economy of the externalities, with asymmetric information and monopolies, are considered a consequence of the imperfection of functioning of the market mechanism. To externalities is important that "the interest of society in terms of market outcomes not only the benefit of buyers and sellers who participate in the market, but also the welfare of others, in which there is an indirect influence. As buyers and sellers neglect the external influences of their actions when deciding how much to ask for or offer, market equilibrium in the presence of externalities can be violated. Thus, market equilibrium in such conditions fails to maximize the benefits to society as a whole "[12]. Externalities have a strong impact on the water sector, with respect to pollutants from the water discharged into water bodies, structures and systems.

Externalities [18] are phenomena that occur as effects of use, respectively water pollution affecting people who do not want to pay for the benefit of, or to prevent damage, although they are a result of human activities and natural processes that take place outside the market exchange. The creation of externalities is related to the use (consumption) of water. In the production profile, externalities are the result of which can bring benefit and harm to persons who do not have a direct investment of funds in the water sector. From the use of water, externalities occur when a person using (consumption) of water contributes to the benefits of, or damage to other persons. Externalities are transmitted to the third parties who pay service charges for water, but not necessarily to those who pay provision and use of water.

In the economy of the public sector to solve the problem of externalities [21] is applied the *theory of property rights* and the *theory of welfare economics*. The theory of property rights solves the problem of external effects by establishing ownership rights on a private basis. Water as a natural resource has no owner, but the payment of water use (handling) exercise their rights. The theory is known as the *Coase Theorem*, which starts from the fact that in solving the phenomenon of externalities, the two sides are connect with external effects when negotiating on a grant basis. The theory of the welfare state assumes that the problem of externalities solved by government intervention and "internalization" of externalities is carried out by taxation or subsidies. The introduction of the tax has the basis to prevent damage from water pollution. In economics known as "pigovouian taxes" (according to English economist of Arthur Pigou), which state that in so far as the damage occurs, introduces taxes (budget funds). The Pigovouian tax is equal to the marginal costs for achieving of an efficient level of

production for each unit of emissions, or the quantity level and water quality and are considered a fine or price risk. In addition to the introduction of a proportional damage produced by external product can be introduced and taxes that are added to the cost of materials and raw materials that customers use in the production of which is water-polluting.
Subsidies [1] are the second most commonly used methods for solving the problem of externalities. Subsidizing is used in positive and negative externalities and presents forms of financial assistance that the state gives to the producers of externalities, ie issuers of pollution. The protection of water is a problem of free users when individuals have greater economic power and are willing to pay a price for the use and enjoyment of water. Troubleshooting of free users is an attitude of the state that by means of fiscal or administrative procedures and methods come to the scope, needs and wishes of the population and with the "forced" or "voluntary" to charge usage and water consumption.

5. CONCLUSION

Management and economy in different systems and areas, including the management and economics of water protection, represent a complex area of science and profession. They are contained in many sources of theory and practice, disciplines and sectors, which need in certain conditions in society and the state to be structured in order to achieve optimum results.
Approaches to determine the types and evaluation of water protection may be different, depending on the application of economic regulations on the basis of the theory of classical, neoclassical, neo-liberal economic or other theory. The economy of water and ecology are particular area of water management and the state's economy. Scope requires a broader research of approaching to economic instruments and measures for the optimization of costs and benefits. Research in economics water protection is in direct correlation with many economic fields and disciplines.
From the established economic system in the protection of water is expected to be efficient, effective, affordable and equitable and in particular, not decrease, but rather to influence the growth of gross domestic product. The economic system has to be established through the interaction of two subsystems which are related to regulation and market variability and water service from the water protection.

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