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INDICATORS OF ECONOMIC ANALYSIS OF PROJECTS DEALING WITH URBAN WATER SUPPLY AND SANITATION PROBLEMS

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Abstract: *This paper displays modern trends in projects in the area of environment protection. It presents several examples from around the world, which deal with water sanitation treatment. The investment process is characterised with single or multiple long-term investments, which provide effects in the future. To be able to review and execute a feasibility study, it is necessary to determine and analyze expected overall effects, which an investment should provide. Investors are interested only in direct economic effects, which can be measured exactly, and quantified properly. Meanwhile, for indirect non-economic effects, which are very hard to be measured, investors are not interested enough. But, during project feasibility evaluation, all effects which a project brings to society should be examined. Overall identified benefits, of implementing only water sanitation projects in urban areas, go up to 556 billion euros. In this paper, several examples were given, as well as the current state in Serbia, regarding urban water supply and sanitation projects. Aim of this paper is to explore indicators of economic analysis, to be able to identify new business opportunities (for profit) and opportunities for environmental preservation, all together respecting regulation and legal principles of the European Union.*

Keywords: *Cost-benefit, project, water supply, environment*

1. INTRODUCTION

Basic concept of cost-benefit analysis is to take into consideration and calculate all social benefits and costs of an investment project, and then to evaluate its profitability. Only projects whose total benefits outnumber total costs can be evaluated positively, which signifies that these projects can be executed. Therefore, without questioning the project descrip-

tion, cost-benefit analysis (CBA) requires to determine how the community can benefit from an investment project [1].

Theoretical part of this paper aims to present important indicators of CBA, which are involved during project evaluation periods, and which deal with environmental issues. Environmental protection projects are especially interesting when it comes to evaluating the benefits of its implementation.

2. INDICATORS OF URBAN SUSTAINABLE GROWTH

Different indicators represent sustainable concepts of urban development. In that manner, authors in [2] outline indicators of urban sustainable growth, which satisfy conditions of environment protection, in urban areas. These indicators are presented with:

Basic needs – water access, health institutions access, access to education institutions, residential objects,

Resources efficiency – efficient energy usage, waste recycling

Cleanliness of nature – clean air and water, garbage treatment and disposal,

Built infrastructure – public transport orientation, eco-friendly efficient design and

Commitment to future sustainability – investments in ecology businesses and environmental protection.

Based on World Health Organization (WHO) records, water supply and sanitation projects benefit the most these several regions of the planet:

regions of the East Mediterranean (Cost-to-Benefit Ratio equals 34,95) and

Africa (CBR equals 11,33).

Meanwhile, average CBR of the whole world, regarding the matter of projects dealing with water treatment facilities, as well as improvement of overall sanitary conditions, equals 13,96 [4]. Overall identified benefits, with the implementation of projects dealing with connection to sewerage systems, equal 556 billion euros, (out of which in Africa these projects equal 108,5 billion- the highest valued projects on the scale, and 5,3 billion euros in Europe – the lowest valued projects on the scale).

A study by DKM consultants [3], outlines several indicators of economic analysis of projects in the area of environment protection. In this study, the most important indicators are listed, which can help monitor the implementation success rate of these projects:

Contamination Status – varies from class „A" (which represents perfect state of an observed part of the environment), to class „D" (severe contamination actively damaging the environment),

Location Biodiversity – varies from high (good water quality and satisfactory survival conditions), to very low (bad water quality and unsatisfactory survival conditions),

Usability – varies from „suitable for all" (which represents high level of amenity of the observed part of the environment) to „extremely limited" (which represents zero level of amenity of the observed part of the environment).

Off-course, there are certain specific indicators, which are relevant during the evaluation period of an investment project, which deals with water treatment. Same authors list the possibility of recreational fishing, increase in the price of renting land on the riverside. Kirkpatrick and Weiss in [5], outline the consideration of IRR (Internal Return Rate) in cost-benefit analysis, thereby confirming the importance of this indicator for economic analysis.

In a world where demand for water threatens to overcome water supplies, many businesses have difficulties in finding water which is necessary for their operations to function

properly. In 2004, i.e.., Pepsi Bottling and Coca-Cola have shut-down their factories in India, because of local farmers and different stakeholders in cities, because of a belief in the local community, that Pepsi and Coke are battling for water in India, leaving the people of India in an unenviable position. During 2007, drought forced the Government of Tennessee in USA, to decrease the level of generated hydro-energy, for a third. About 300 million dollars was lost in that process. Assuming a continued economic and demographic growth, by 2030, water supplies will satisfy only 60% of the global demand, and less than 50% in many developed regions, where water supplying is already a big problem, including China, India and South Africa. The shortcomings of water supplies can be decreased, with the help of desalinization processes, drilling new wells, or by transporting surface water to distant desert dry areas. But, it will be characterized with high expenses and difficulties. What is more believable, governments will have to manage demand levels, by increasing the price of clean water, or by limiting the daily usage amount [10]. These steps will directly influence local and multinational companies. Assets of global companies reside in countries where legal regulative about water usage varies greatly. Chile can be presented as an example, as one of the most important mining centres of the world, and as one of the driest places on the planet. Government allocate clean water rights to companies very strictly, carefully monitoring water usage, and perform additional pressure to consume less water. Several big corporations, such as Ford Motor Company, Nestle and P&G, decrease their water usage levels. First step these companies partake, on that journey, is to analyse which processes consume most water. Often, these companies discover several areas where improvements can be made. A mining company discovered that 30% of costs come from pipelines which bring water to mines. By fixing the pipeline, costs were reduced by 5%. After analysing total costs associated with water usage, a 40% cost stake was discovered, which comes from energy usage necessary for water pumps. Certain companies observe this problem on a long term basis, by considering business risks which will surface in the future, and which are connected to water shortcomings. Companies which bottle water are one of these exceptions, because water obscurity already influences their strategic decision making, i.e., where to locate the manufacturing plants.

3. URBAN WATER SUPPLY AND WATER SANITATION PROJECTS

As opposed to water supply services and sewage treatment, the benefits of waste water treatment are less clear to citizens, and are harder to express in monetary terms. Consensus about the need to increase waste water treatment in cities, as well as safe disposal of waste generated from that treatment, has developed weakly during the years, just because of the obscurity and uncertainty of information. In the US, „Clean Water Act", which has been brought up during 1972, has built a legal foundation for expanding the number of waste water treatment facilities.

In Europe, a directive called „European Union Urban Waste Water Treatment Directive" (Figure 1 explains the waste treatment processes), has been brought up during 1991, and it represents a political response to the growing problem of untreated sewage water, discharged directly into rivers and seas. All waste water treatment benefits are connected to improving water quality, through removal of various substances which pollute the environment. In South-East Asia, „ The Water and Sanitation Program" has been carried out, after which has been appraised that, under bad or non-existent waste water treatment, Cambodia, Indonesia, The Philippines and Vietnam lose 2 billion dollars per year, in financial costs

(0,44% of their overall GDP), and 9 billion dollars per year in social costs (equivalent of 2% of their overall GDP). According to WHO data, indicators of benefits, which can generate the highest value after implementation of waste water treatment projects, are:

Improving the access to clean water,
Reducing the mortality levels caused by bad water quality,
Increase in agricultural soil yield, caused by better irrigation and
Improvement of health care.

Health benefits from improving the quality of recreational waters in South-East Scotland are amounted to 1,3 billion pounds per year. In the Black Sea region (Bulgaria and Romania), degradation of water quality, which happened because of the increase in algae population, influenced fish kill levels, which amounted to 2 billion dollars of economic losses. Quality of water is essential for certain touristic activities, so it can be said that waste water treatment leads to greater touristic attraction of cities which are located near rivers and seas. By closing certain touristic sites, i.e., beaches in Normandy (France), could lead to 14% less visits to this region, as well as losing 350 million euros per year and 2.000 jobs. When these benefits are consolidated on national levels, the difference between the state of the environment and economy without the project (Business as Usual) and with the project, which includes waste water treatment, are enormous. American agency for environment protection estimates that net benefits from regulative and laws, in the past 30 years, have amounted to 11 billion euros per year, or 109 dollars per household [6].

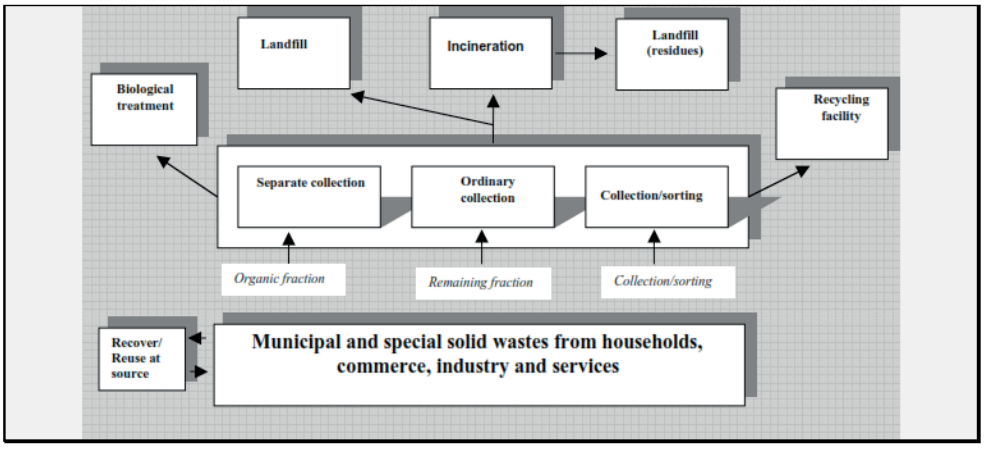

Figure 1. Waste management systems from waste source to final disposal or removal [7]

In [9], it is discussed about the size of the gap between the increase in demand for clear water, and existing productivity of water supply systems (Business as Usual), which will appear in the next 15-20. The identified gap is about 60% wide, or 2 trillion m3 of clear water, which needs to be provided so that water supply systems can adjust to ever increasing demand.

4. ECONOMIC ANALYSIS OF WATER SUPPLY AND SANITATION PROJECTS IN THE REPUBLIC OF SERBIA

Serbia has adjusted its regulative with EU laws and regulative, in terms of ecology and environment protection, but implementation of these new standards will cost about 10 billion euros. What costs the most is waste water treatment facilities, as well as waste disposal management, and prevention of industrial pollution, according to sources from the Ministry of Energetics and Environment. Serbia has adopted over 70 laws which are adjusted to European laws. Official statistic data shows the following: Out of 2,5 million households in Serbia, 1.3 million households are plugged on public sewage systems. Out of 365 million m3 of waste water, discharged during 2009, only 51 million m3 has been treated in a facility (MISP, 2011).

Some kind of secondary treatment is present in about 10% of households and businesses in Serbia, while nutrient removal is carried out on less than 2% of urban waste water. In Serbia, currently only 20 facilities operates, and in the following 10-20 years, it will be necessary to construct over 100 facilities, to accomplish government regulative and EU standards. As far as waste water treatment in Belgrade, currently there are no facilities of that kind. The "Interceptor" is a capital infrastructure project, of Belgrade sewage systems, which will solve waste waters for the next 50 years [8].

Disharmony between increasing number of citizens in Belgrade, and an insufficient development of sewage systems, has brought up the current condition, in which sewer and atmospheric waters are not separated. Aside of that, the non-existence of "Interceptor" has created dozens of waste spills in rivers Sava and Danube, and old collectors have become failing and worn out. "Interceptor" is waiting for implementation for over 30 years, and so far, two stages of the project have been executed. In an area of 28.000 ha, today lives 1.150.000 citizens. The significance of "Interceptor" lies in raising the level of urban standards of living, as well as in improving sanitary conditions of Belgrade citizens. The project includes five stages (out of which two have been constructed), which will stretch from "Usce" sewage collector, to waste water treatment facility in Veliko Selo near Belgrade. Direct and indirect economic effects of this investment are displayed in table 1.

Table 1. Economic effects of the Belgrade water sanitation project (Authors' analysis)

	Direct effects of the project	Type (Quantitative / Qualitative)
1	Total wastewater removal in rivers Sava and Danube	Qualitative
2	Improved water quality of river Sava and river Danube	Qualitative
3	Improved sanitary conditions in the urban urea	Quantitative
4	Increased employing in the city	Quantitative
	Indirect effects of the project	**Type (Quantitative / Qualitative)**
1	Economic coastal development in Belgrade	Quantitative
2	Tourism development in Belgrade	Quantitative
3	Decrease of infectious disease after waste water spilling	Quantitative
4	Material damage avoided because of atmospheric waters spilling on agricultural soil	Quantitative

Apart from enabling Belgrade to "reach out" other capital cities in Europe, by levels of environmental protection, this project, will represent a backbone of future economic growth of Serbia, in terms of hospitality, tourism, fishing, agriculture, public health, as well as further exploitation of Belgrade riverside land for various features, which have not been feasible at an earlier stage.

5. CONCLUSION

Different indicators are shown in this paper, which are specific for projects in the environment protection areas, such as biodiversity of locations, usability and quality of certain parts of the environment. An example of CBA has been displayed, with conclusions from studies regarding the construction of "Interceptor" waste water collector, as well as waste water treatment facility, both to be constructed in Belgrade. There were several indicators and benefits identified, which will surely enlarge social well-being in Belgrade metropolitan area. Initial financial feasibility analysis has shown that the project is unfeasible, but after economic (CBA) analysis, economic feasibility has been discovered and elaborated.

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