Cost Recovery of Water and Wastewater Utilities in Serbia

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Abstract

This paper provides an overview of the current state and existing documentation related to the estimate of investment and operation and maintenance costs for the water supply and sewerage sector in the Republic of Serbia needed to achieve the EU Directives requirements related to urban wastewater and drinking water. The total cost analysis for Serbia's water sector is performed by using the results of various studies. Consideration is given to the fact that the cost recovery of the existing infrastructure has not yet been achieved. The analyses of the operational and financial aspects of selected public utility companies (PUC) for water supply and sewerage in Serbia are given.

Keywords: water supply, sewerage, utilities, costs recovery, water price

The Present State of Water Supply and Sewerage in the Republic of Serbia

Serbia is using both surface water and groundwater for its water supply. Data obtained by the Statistical Office of the Republic of Serbia for year 2009 show that the total water abstracted for municipal water supply and for industries which use high-quality water in Serbia is in the range of 700 million m^3/year, where approximately 71% comes from groundwater sources. The average water demand in Serbia is approximately 320 litres per capita per day (l/c/d), where 400 l/c/d is the demand of the urban population and 250 l/c/d is for rural areas. The total length of the public water supply network in Serbia is 37,228 663 km; some of which is very old in some areas. In 2008, it was estimated that 85% of country's population was connected to the public water supply systems. Although the overall state in the water supply sector may be assessed as satisfactory, there is a need for operational improvement of the existing systems; examples include improvements to operational reliability, water quality delivered to consumers in some parts of Serbia, reduction of water losses, etc.

Wastewater produced in Serbia in 2009 came from the following sources (data from Statistical Office of the Republic of Serbia): households (67%), industry (19%) and other sources (14%). The precise data on infiltration water volumes are not available. The total length of the public sewer network is 14,948 km. Just over half (51%) of all households are connected to the public sewer systems, while the remaining households dispose wastewater into septic tanks or directly into groundwater/watercourses.

EU legislation requires agglomerations of 2,000 inhabitants (or population equivalent - PE) and over to be connected to an appropriate wastewater treatment plant. There are 434 settlements in the Republic of Serbia above 2,000 PE, with total sewage pollution emission of approx 6.5 million PE.

At present, only 21 municipalities have operational municipal waste water treatment plants (WWTP) in the Republic of Serbia, among which some WWTP suffer from various operational problems and ailments. These problems are related to the fact that some of the WWTP have incomplete treatment systems and poor maintenance that does not allow for continual operation and lack of financial resources for operation. The percentage of treated wastewater in 2009, according to Statistical Office of the Republic of Serbia is presented in Figure 1.

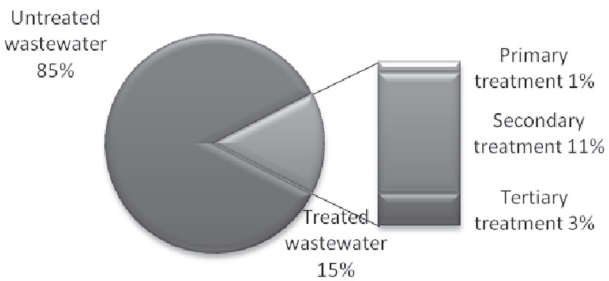

Figure 1: Waste water treatment in Serbia in 2009

It is clear that wastewater treatment is by far the most underdeveloped sub-sector of water infrastructure in Serbia. Several municipal WWTPs are currently under construction and technical designs are being finalised for a number of municipal WWTPs.

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Existing Data and Studies on the Development of Water Supply and Sewerage in the Republic of Serbia

The estimate of required financial resources for the development of water supply and sewerage in Serbia up to the standards required by the existing EU Directives related to water supply and wastewater management, proved to be a very demanding and difficult task. There are several reasons for this and the most important ones are insufficient and incomplete data related to the public utility companies assets and the current state of infrastructure within the public utility companies (PUCs) themselves. Several studies were prepared in the region in order to provide best estimate of the required financial resources, and they will be briefly presented and conclusions related to the calculation and practical application for the Serbian situation will be drawn.

Strategy for Sustainable Development of Water Supply and Sewerage Services – "Romania 2025"

This strategy was prepared in 2003 by the Romanian Water Association with the aim of determining a strategy for the medium term (2004-2007) and the long term (until 2025) for the development of sustainable water supply and sewerage services. The analyses took into account several social and political aspects that were important in the process of Romania's accession to the European Union and therefore it may serve as a guideline for Serbia as well. The strategy was based on the following fundamental objectives:

- The decentralization of the public services and the increase of local authorities' responsibility regarding the quality of services provided to the population,
- The extension of the centralized systems for basic services and an increase in the population's access to these services,
- Reorganizing the social protection mechanisms for the disadvantaged segments of the population and reconsidering the price/quality ratio,
- Promoting market economy principles and reducing monopoly,
- Attracting private capital in financing local infrastructure investments,
- Institutionalizing local credit and increasing its financial contributions to husbandry services,
- Promoting measures for sustainable development and
- Promoting social partnership and continuous training of human resources.

Chapter 5 of the study (Estimation of the costs related to the implementation of a medium and long-term strategy) is based on the following assumptions:

1. The time horizon for compliance with the European Union directives is 15 years,
2. The forecast of population growth already indicates a negative trend resulting in the decrease in the total number of inhabitants by more than 7%.

On the basis of these assumptions the total costs of the investments were evaluated using specific indicators, calculated as a ratio between the value of investments needed for modernization of the systems (achieving desired level of service) and the number of inhabitants. The sources of data were feasibility studies, ongoing projects, methodologies and guidelines for the assessment of costs to comply with EU norms. The Strategy "Romania 2025" assumed that all utilities had already achieved cost recovery.

In order to apply the same methodology for the calculation of required investments in Serbia, it was required to make an inflation adjustment for the Eurozone. According to the European Statistical Office, the cumulative Eurozone inflation rate for the 2003 – 2011 period was 22%, which lead to the correction of the estimated costs per capita, as shown in the following table.

Table 1: Investment in water and wastewater services according to the Strategy for Sustainable Development of Water Supply and Sewerage Services – "Romania 2025" and values adjusted for inflation in the period 2003-2011

	Investments Per Capita (€/capita)			
	Strategy "Romania 2025"		Strategy "Romania 2025" adjusted for inflation in period 2003-2011	
	Water Supply	Wastewater Management	Water Supply	Wastewater Management
Urban areas	250	380	305	465
Rural areas	250	525	305	645

The estimate of the total funds required to achieve the desired level of service (compliance to the EU directives) is given in the following table, where data on urban and rural population were provided from the Republic Statistical Office.

Table 2: Total estimated investment in water and wastewater services

	Total investments (€)			Total (€)
	Population number	Water Supply	Wastewater Management	
Urban population	4,283,985	1,306,615,425	1,992,053,025	3,298,668,450
Rural population	3,007,451	917,272,555	1,939,805,895	2,857,078,450
Total (€)		2,223,887,980	3,931,858,920	6,155,746,900

The Study of Sustainable Development of the Water Management Sector in the Republic of Serbia (Institute for the Development of Water Resources "Jaroslav Cerni", Belgrade, 2003)

Although this study was prepared almost ten years ago some of the issues mentioned are still valid and still present a source of concerns in the water sector in the Republic of Serbia. This study elaborated on activities necessary to achieve the following:

- The provision of good quality potable water for consumers (ensuring a higher social standard in this sector),
- The improvement of the social and commercial infrastructure in the water sector,
- A significant step towards the standards of the European Union and,
- The initiation of an investment cycle in the water sector.

The study identified the basic reason for the current situation in the water sector as a big gap between the financial needs and the current investments in this area. The following table presents estimates of funds required only for the amortization and operation and maintenance (O&M) costs.

Table 3: Required funds for O&M and investments

Sector	Nominal value of the infrastructure assets	Amortization	Operation and Maintenance	Total yearly investments
	(10^6 €)	(10^6 €/year)	(10^6 €/year)	(10^6 €/year)
Water Supply	5210	156.3	160	316.3
Wastewater management	3350	100.5	75	175.5
Total required investments per year				491.8
Total required investments				7377

This calculation was prepared on the basis of the nominal value of the infrastructure and funds required for operation and maintenance just to maintain the existing infrastructure. The next table indicates the financial funds required for further development of the water sector, which is estimated as the funds needed to implement solutions from the Water Resources Master Plan of the Republic of Serbia – WRMP (adopted 2002).

Table 4: Estimate of required investments

Sector	Funds required by WRMP	Priority works in the next 10-15 years	Investments per year for priority works
	(10^6 €)	(10^6 €)	(10^6 €/year)
Water Supply	2,550	700	60
Wastewater management	3,000	1,300	110
Total	5,550	2,000	170

The required annual funds for amortization and operation and maintenance are in the range of 490 million Euros (excl. VAT) which can be roughly estimated as:

- 0.67 Euro/m^3 of extracted water
- 66 Euro/inhabitant/year (industry included)

However, if this calculation is compared with the one carried out in the previous chapter and once again taking into consideration inflation in the Eurozone, the investments required will be in the range of 6.8 billion Euros.

Instruments for Water Sector Development in the Republic of Serbia - Phase One (Institute for the Development of Water Resources "Jaroslav Cerni", Belgrade, 2006)

In the introduction of the study, the authors estimated that irregular and inadequate maintenance resulted in various degrees of damage to the water infrastructure, and a consequent decline in the quality of services provided by some facilities and systems, as well as the reduced safety and level of protection against the adverse effects of poor water quality. It is estimated that less than 30% of the total funds needed for maintenance were actually spent during the past fifteen years. The study consists of eleven chapters. Chapter 3 defines a water sector development strategy. Based on that strategy, the level of capital investment required to achieve satisfactory status is identified for each water sector segment. It was assessed that a status close to that required by the EU standards could be achieved within approximately twenty years, assuming a total capital investment of 6-7 billion Euros, and that a satisfactory, or acceptable, situation in the water sector could be achieved within the next fifteen years, assuming an investment in the development of approximately 4.8 billion Euros. The sources and methods of water sector funding are the subject of Chapter 6. It was estimated that a water tariff of 0.86 €/m^3 (excluding VAT) would cover operating costs of the existing water supply and sewerage systems. A summary of the needed investments estimate is given in the Table 5.

Table 5: Required funds for O&M and investments

Sector	Nominal value of the infrastructure assets	Amortization	Operation and maintenance	Total yearly investments
	(10^6 €)	(10^6 €/year)	(10^6 €/year)	(10^6 €/year)
Water Supply	5,070	145	138	283
Wastewater management	2,270	65	59	124
Regional water supply systems	860	17	7	24
Total required investments per year				431

The required funds for amortization, operation and maintenance are in the range of 431 million Euros (excl. VAT), which can roughly be estimated as:

- 0.61 Euro/m^3 of extracted water
- 58 Euro/inhabitant/year (industry included)

Instruments for Water Sector Development in the Republic Of Serbia - Phase Two (Institute for the Development of Water Resources "Jaroslav Cerni", Belgrade, 2011)

This Study is the continuation of the work started in the Study from 2006 on elaboration on the instruments of water sector development. The Study pays special attention to regulatory functions, including setting the standards of the service level and pricing system and the measurement and control of the performance of the water PUCs.

This Study elaborated on the economic policy of the water sector. The important conclusion is that countries which successfully joined the EU all applied water tariffs that provide full cost recovery. Chapter five of the Study updates the analyses of required funds for investments and O&M, and a summary is given in Table 6.

Table 6: Required funds for O&M and investments

Sector	Amortization	Operation and maintenance	Total yearly investments
	(10^6 €/year)	(10^6 €/year)	(10^6 €/year)
Water Supply, incl. regional systems	188.85	173.15	362
Wastewater Management	82.95	110.85	193.8
Total required investments per year			555.8

Required investments for amortization and operation and maintenance are in the range of 555.8 million Euros (excl. VAT) which can roughly be estimated as:

- 0.79 Euro/m^3 of abstracted water.
- 75 Euro/inhabitant/year (industry included).

Environmental Approximation Strategy - EAS

Supported by the EU, Serbia adopted the National Environmental Approximation Strategy for the Republic of Serbia in 2012. The Strategy focused on three areas:

1. Transposition of the EU relevant legislation into national legislation,
2. Providing administrative capacity to implement, monitor and enforce legislation, and
3. Establishment of infrastructure required in order to comply with previously mentioned points.

This EAS is the highest planning level document. It covers six identified sub-sectors, and in this paper particular attention will be given to the water sector strategy.

Part of the strategy deals with the economic challenge of environmental approximation. Based on the state of the environmental infrastructure in Serbia, the total costs of approximation, discounted at 5%, are estimated to be over 10.6 billion Euros in the specified planning period (from 2011 till 2030), where capital expenditures (CAPEX) are 5.49 billion Euros, operational expenditures (OPEX) are 5.56 billion Euros and administrative costs are 0.54 billion Euros. The water sector with costs for full implementation of the Urban Wastewater Directive 91/271/EEC and the Drinking Water Directive 98/88/EC accounts for more than 53% of the total costs.

An important part of the costs structure are operational costs. They cannot be covered from any other source other than public budgets, private sources or charges.

Several other important factors are linked to the time required by Serbia to achieve full compliance with the EU Directives and, among other, it also depends on affordability at the consumer level (the amount of cost that can be recovered from end users) as well as on affordability at the national level (the percentage of Gross Domestic Product that Serbia can allocate to water projects).

All of the mentioned assumptions used in the financial model are presented in the following table.

Table 7: Key assumptions and levels of compliance targeted for the water sector, according to EAS

		Projected Approximation to Full Compliance				
GENERAL	**Units**	**2010**	**2015**	**2020**	**2025**	**2030**
Population	Million	7.5	Diminishing at 0.35% p.a.			
GDP/Capita	€	4,528	GDP Growth 1.5% in 2011, 3% in 2012, 5% to 2020, 4% to 2030			
Inflation	Dinars/€	6%	€ Inflation projected throughout at 2%			
Household Income	€/HH	5,208	Growth projected at € inflation + 40% of GDP growth			
Household Expenditure on Utilities	%	16.10%	16.71%	17.83%	18.32%	18.55%
Expenditure on Environment	% of GDP	0.40%	2.16%	2.48%	1.67%	1.36%
SERVICE LEVELS TARGETED		**2010**	**2015**	**2020**	**2025**	**2030**
Drinking Water Supply	% of PS*	77%	77%	81%	90%	92%
Purified Drinking Water Supply	% of PS*	68%	69%	81%	98%	100%
Urban Wastewater Collected	% of PS*	62%	64%	71%	83%	90%
Urban Wastewater Treated	% of WW** Collected	10%	14%	44%	78%	99%

* PS = Population Served
** WW = Wastewater

Wastewater collection and treatment are used to explain the model tool:

1. The first step is to establish agglomerations: Agglomeration means an area where the population and/or economic activities are sufficiently concentrated for urban wastewater to be collected and conveyed to an urban wastewater treatment plant or to a final discharge point.
2. The first step will be followed by:
   - The usage of GIS software to map the country,
   - Preparation of draw outlines of the urban areas,
   - Application of the land class database,
   - Addition of industrial load estimates based on the surface covered by commercial units.
3. Calculation of the investment in networks
4. Calculation of the investment in treatment in the three categories:
   - Large urban areas: > 100,000 PE.
   - Medium urban areas: > 10,000 PE.
   - Small urban areas: > 2,000 PE.

5. Calculation of operation & maintenance costs under the following assumptions:
   - OPEX is a function of new investments only,
   - OPEX depends on network and plant design; in general OPEX is:
     - 3.37% of the Investment Value for Networks,
     - 4.05% of the Investment Value for Treatment Plants.

The assumption made under point 5 indicates that OPEX for the existing facilities are not included.

Estimation of Total Cost for Water Sector Including Costs of the Existing Infrastructure

As follows from previous text, the issue of full cost recovery is a very complex one and primarily based on the assessment of the book value of PUCs assets. The detailed assessment of OPEX of the existing water infrastructure is beyond the scope of this paper. However, an attempt to roughly estimate the total costs for the water sector in Serbia, considering that cost recovery of the existing infrastructure has not yet been achieved, is performed and presented below.

In order to include all costs that are currently incurred by the PUCs, the EAS calculation as Base Case scenario was used while missing costs will be estimated using other available Studies.

The total costs of the environmental approximation process, as presented in the National Environmental Approximation Strategy for the Republic of Serbia, are:

- The costs of the increased administrative burden;
- The costs of the investments in capital equipment, construction of facilities, etc. needed to implement and comply with the acquis; and
- The O&M costs associated with the operation of these investments.

Specific costs were estimated with the following assumptions:

- Drinking Water Supply:
  - The cost estimates for water supply systems (drinking water) were based on estimations at the municipal level and were derived from locally adjusted cost functions based on European experience,
  - The existing systems for water supply was assumed to require reconstruction works (25% of supply assets, 30% of treatment assets) to reflect the capital maintenance backlog from past years;
- Wastewater:
  - The cost estimates for wastewater collection and treatment were based on estimations at the agglomeration level and were derived from locally adjusted cost functions derived from European experience,
  - The existing systems for wastewater are assumed to require reconstruction works (25% of collection assets, 50% of treatment assets) to reflect the capital maintenance backlog from past years.

For the adjustment of costs to local conditions, various data sources were used, including the “long list” and “short list” of the Environmental Projects listed in the proposal to the Delegation of the European Union for financing, the reports of the Serbian European Integration Office determining required assistance of the donors in the next short term period, recent projects implemented under the Municipal Infrastructure Support Programme and for the costs of wastewater collection and treatment specifically from the Master Plan for South Morava.

Together with the financial requirements, the affordability (capacity) of the population was evaluated in the model according to three scenarios: maximum, average and minimum affordability. The maximum affordability was calculated based on the projected growth of the Gross Domestic Product (GDP) of the Serbian economy and the maximum internationally accepted burden of 4% for water and wastewater services. Having this calculation in mind and taking into consideration that the EAS Base scenario uses the assumption that cost recovery is achieved in the existing water sector. The data from the following two studies were analysed to assess the current gap between the income and PUCs O&M costs:

- Instruments for Water Sector Development in the Republic of Serbia - Phase One, completed in 2006. The operational costs without depreciation are estimated in the range of 204 million Euros. At the same time, the collection recorded in year 2004 was approximately 130 million Euros, therefore the missing funds were added to the amortization costs of 227 million euro, which lead to 300 million Euro per year of total missing funds,
- Instruments for Water Sector Development in the Republic of Serbia - Phase Two (completed in 2011) where operational costs with depreciation are estimated to be in the range of 555.8 million Euros. The Association of Public Utilities of Serbia estimated that price would have to be increased by 57% in order to achieve cost recovery. The total missing funds in this case are in the range of 200 million Euros per year.

Further analyses will be performed by using the optimistic figure of 200 million Euros of additional funding required for bridging the gap between full recovery costs and funds collected from the customers (water fees). Using this estimate, the additional costs for the calculation of OPEX and total costs using the EAS methodology, for undiscounted costs, were added and the obtained results are shown in the figures below. Total costs over the whole considered period increased by two billion Euros of which the water sector share accounts for over 60%.

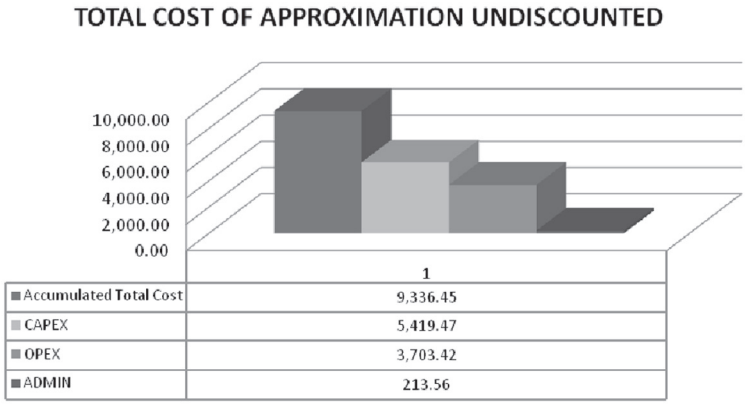

Figure 2: The EAS Base case scenario (undiscounted)

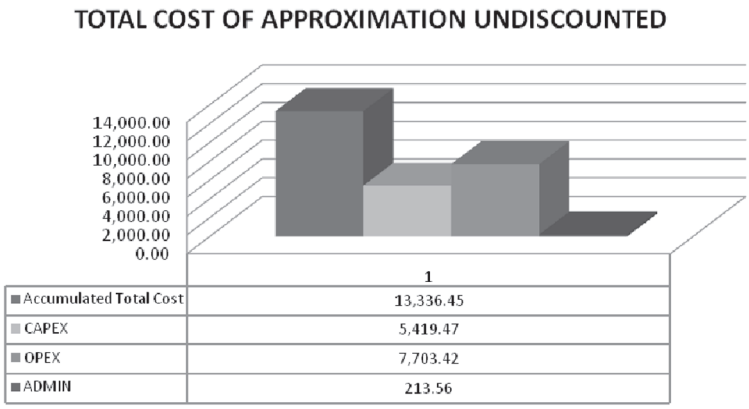

Figure 3: The EAS OPEX of existing infrastructure included (undiscounted)

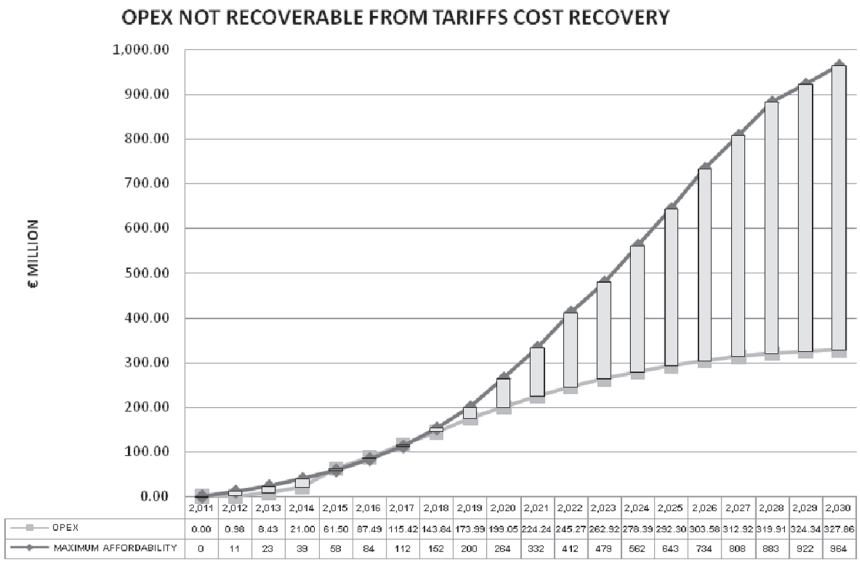

Figure 4: The EAS Base case scenario – total OPEX with achieved cost recovery

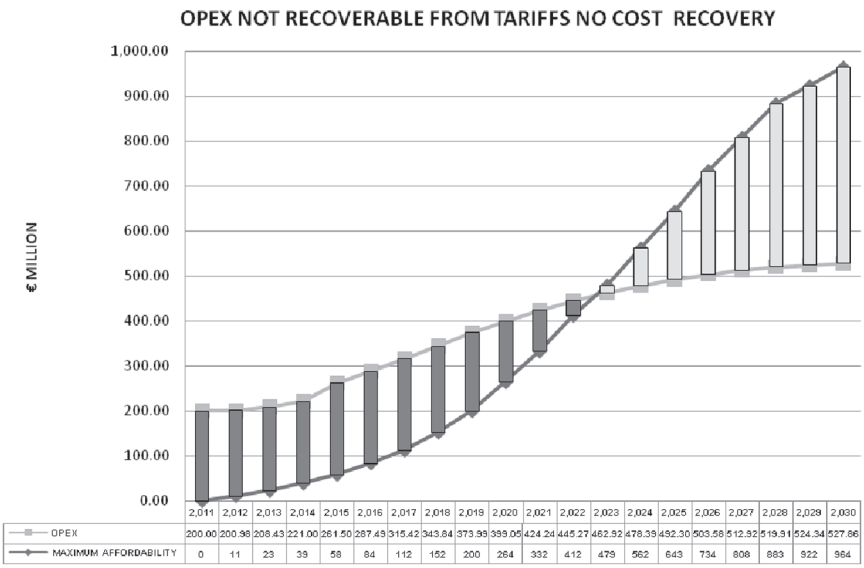

Figure 5: The EAS case scenario – total OPEX with existing tariffs

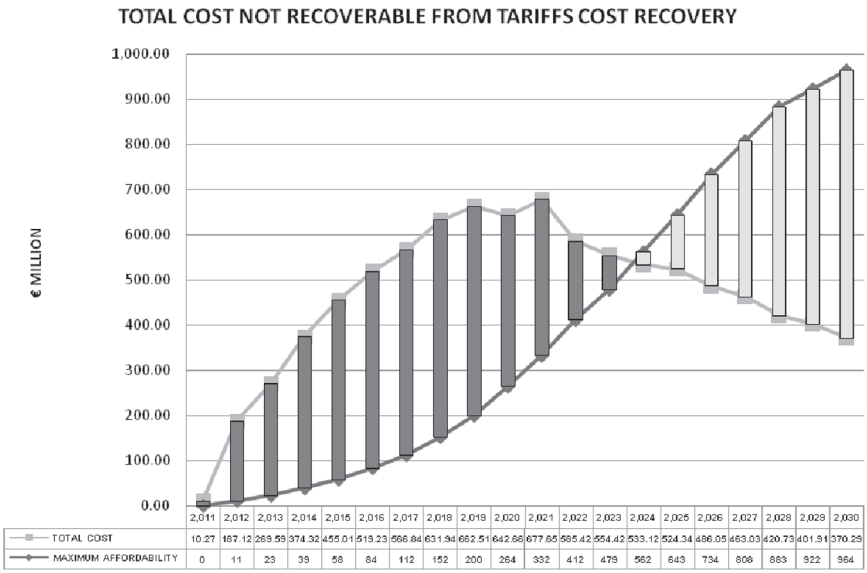

Figure 6: The EAS Base case scenario – total COSTS with achieved cost recovery

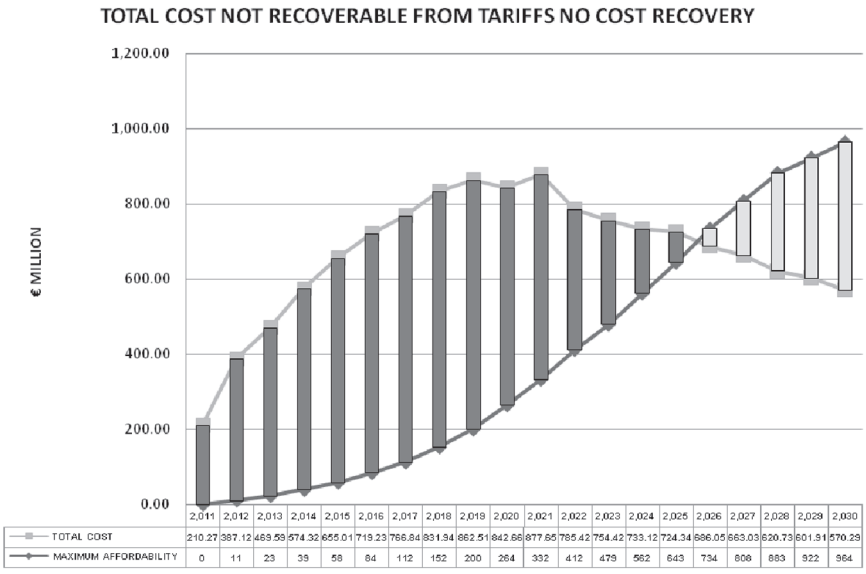

Figure 7: The EAS case scenario – total COSTS with existing tariffs

Figure 4 presents the EAS Base case scenario, with the total OPEX including achieved cost recovery, which actually means that OPEX costs are calculated for new investments only. Figure 4 shows that these costs can be covered by the affordability for new investments.

On the other hand, the EAS case scenario with total OPEX with existing tariffs presented in Figure 5 shows that until year 2022 affordability will not even be sufficient to cover the OPEX costs of the existing infrastructure and new investments. In this case, the total shortage would be in a range of 2 billion Euros.

The comparison of total costs gives us even more alarming results. Until the year 2025, the total costs shortage would be over 6.8 billion Euros.

It may be concluded that not having cost recovery in place in the PUCs, an additional 2.9 billion Euros has to be provided for the water and wastewater sector in addition to the already established gap of almost 4 billion Euros in Serbia.

The National EAS for the Republic of Serbia points out that (Base case scenario – cost recovery achieved):

- The required investments in water would lead to a massive need for the Public Sector to take on debt, almost 2,1 Billion in 2021, before increasing EU support (assuming accession in 2019) and growing affordability permit a reduction in that debt from 2022,
- This figure is much higher than the overall need calculated for the entire Environment. This indicates that there is a cross-subsidy from water to other sectors. This is due to the fact that the Waste and Air strategies are much more defined and economic instruments have been put in place.

The methodology applied in this strategy can be extended to include increases of tariffs. Without any doubt, the increases have to be paced and municipalities should find specific ways to subsidize the vulnerable groups.

Case Studies of the Exiting PUCs

To illustrate the state of PUCs in the Serbian water sector, the data for selected PUCs will be elaborated and presented. The municipal PUCs were selected on the following criteria:

1. On the availability of data. There are 165 PUCs in the Republic of Serbia that are in charge of the water supply. The selection was made from the data collected by the Municipal Infrastructure Support Programme in the period from 2006 to 2010. This programme, funded by the EU, was part of the technical assistance program in the environmental sector. In total, so far, assistance was provided to more than 40 municipalities in the various sectors and for different stages of project development.
2. The technological processes of potable water treatment. This criterion was mainly related to the possibility of comparing operational costs.
3. Finally, municipalities were selected for their different sizes and different quantities of water billed to the customers.

The following documentation and data sources were used:

- Feasibility Study Leskovac: Wastewater Collection & Treatment and Water Supply Extension, Municipal Infrastructure Agency Support Programme, December 2007,
- Feasibility Study Petrovac water supply system rehabilitation, Municipal Support Programme North East Serbia, May 2008,
- Feasibility Study Pozarevac water supply system rehabilitation, Municipal Support Programme North East Serbia, May 2008,
- Tariff Development Plan, Rehabilitation of Urban Water Supply and Sewage Systems, in Novi Sad, Nis, Kragujevac and Belgrade, Phase III, Consulting Services for the Implementation of the Institutional Support Programme BMZ ID 2002 70 165,, May 2009,
- Feasibility Study – Kolubara Regional Water Supply Scheme: Valjevo - Mionica – Ub – Lajkovac – Lazarevac, Municipal Infrastructure Support Programme, December 2009.

Water Price

The selected municipal PUCs with data on billed water and the average water price in 2008 are given in the Table 8, while the location of the selected municipalities is given in Figure 8. PUCs have different tariffs for inhabitants and industry (some of them also for so-called institutional consumers), but only the average price of water per PUC is given in the following table. The number of inhabitants connected was provided by the Statistical Office of the Republic of Serbia.

Table 8: Selected PUCs: connected inhabitants, billed water quantities and average water price (yr. 2008)

Municipality	Number of inhabitants connected	Water billed (m^3)	Average water price (RSD/m^3)
Novi Sad	297,000	27,932,184	24.66
Nis	233,000	23,907,000	29.66
Kragujevac	153,188	13,899,277	25.19
Petrovac	13,000	848,795	18.03
Valjevo	62,500	4,905,959	39.51
Pozarevac	51,000	5,116,000	54.1
Leskovac	85,000	5,423,243	59.79
Mionica	12,000	982,000	35.91
Ub	6,418	567,000	58.19
Lajkovac	8,750	445,000	52.58
Lazarevac	28,357	3,094,000	87.83

Assuming an average exchange rate in 2008 of 85 Serbian dinars (RSD) for 1 Euro, it can be seen that prices are in the range from 0.21 to 0.71 Euro/m^3, with the exception of the price in Lazarevac. Lazarevac is the only municipality that imports part of its water from a neighbouring municipality.

Figure 8: Location of selected municipalities

Billed water per capita

Data on billed water (consumption) per capita in selected PUCs are given Figure 9.

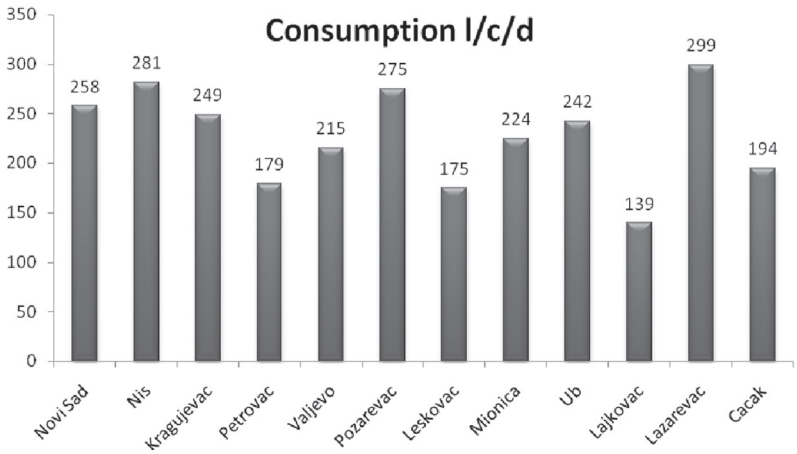

Figure 9: Water consumption (billed water) per capita l/c/d (2008)

Water Losses

Unfortunately, it was not possible to perform a full and detailed analysis of Non-Revenue Water (NRW). A number of the chosen PUCs had problems with the accuracy of the main water meters, let alone the division between losses on main lines, reservoirs and pumping stations and losses at connections, as would be required using the IWA indicators. Therefore, calculations were restricted to the ratio between the total volume of water abstracted and the total authorized volume of water used. Where possible, this ration was calculated or assessed by PUC employees.

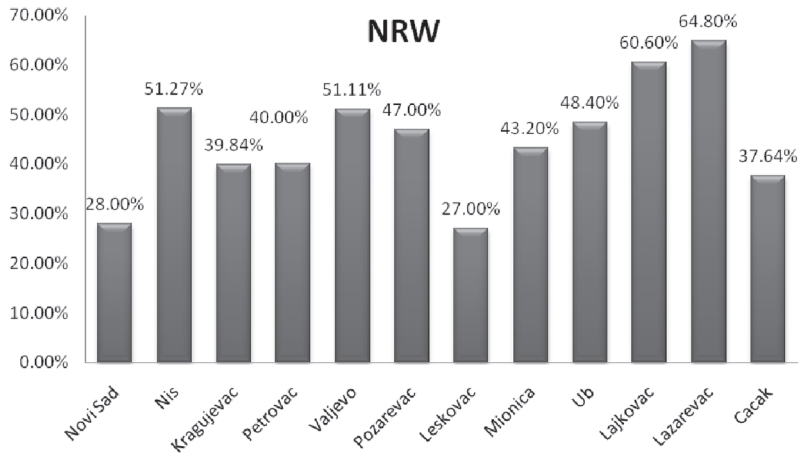

Figure 10: Non-Revenue Water (2008)

Number of Employees

The number of employees per service connection for selected PUCs is given in Figure 11. A general remark is that in the smaller municipalities very limited resources are available to the PUCs. Difficult working conditions accompanied with relatively small salaries makes it very difficult for management to attract skilled staff. On the other hand, hiring more administrative staff than required was observed in PUCs.

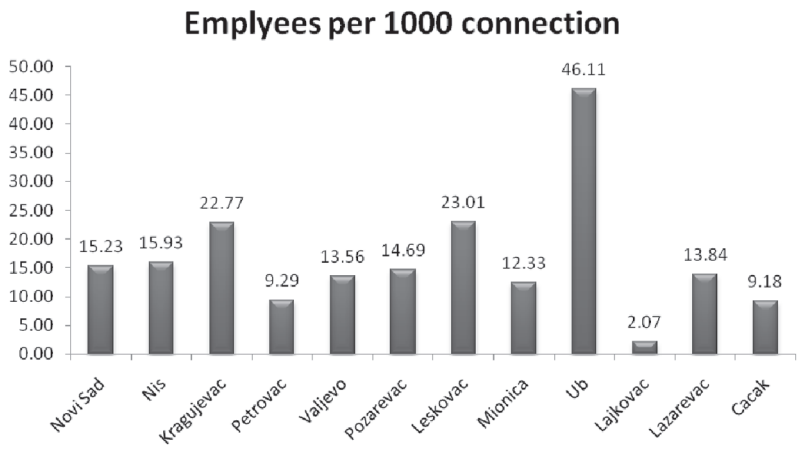

Figure 11: Employees per 1000 service connections (2008)

The only two PUCs where the calculated ratio is not between 10 and 20 employees are Ub and Lajkovac. The reason is that in Ub staff is also assigned to other duties (solid waste, open markets, etc.), whilst in Lajkovac staff from other departments, not formally assigned to water supply perform these duties as well.

Data from Figure 11 indicates that most of the PUCs in Serbia are overstaffed. In the literature it can be found that this indicator has mean value of 2 staff per 1000 connections in developed countries. The reasons for this are various. Salary levels, separation and outsourcing of non core activities are maybe some of the most important. However Tynan and Kingdom (2002) suggest that a target of 5 or less staff per 1000 connections is achievable. Additional analyses are needed to define the target number of employees and the level of salary costs.

The number of employees should be analyzed together with data on salary costs (labour costs). The structure of the costs of the selected PUCs for year 2009 is given in Figure 12.

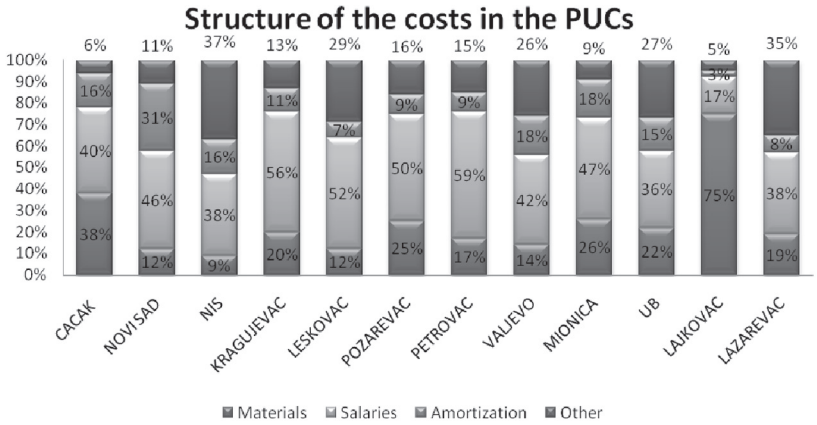

Figure 12: Structure of the costs in the PUCs (2008)

Labour costs are in the range of 36% (Ub) to 59% (Petrovac). These results of the financial analyses may be distorted to a certain extent by the correctness of applied amortization rates showed in Figure 15 and also by the often relatively high level of other costs. Tynan and Kingdom (2002) set 39% as the share of labour costs in the total costs of the company as an achievable result.

A detailed analysis of this issue goes beyond the scope of this paper, but presented data lead to some conclusions. According to the indicator of the number of staff per 1000 connections, Serbian PUCs have up to 3 times more staff than required. According to the criteria of share of labour costs in the total costs, labour costs are up to 50% higher than necessary. We are of the opinion that, taking into consideration social and economic sensitivity of this issue, Serbian PUCs may set this indicator to a number of approximately 10 in the following midterm period, followed with a plan for further reduction to 8 staff per 1000 connections, as proposed by Schwartz (2006).

Brief Financial Comparative Analysis of Selected Public Utility Companies

For all selected PUCs, except in Lajkovac and Mionica, the official Balance Sheets and Profit-Loss Statements were analyzed. PUCs in Lajkovac and Mionica are officially classified as small companies and therefore have no obligation to submit this data to the Agency for Business Registers. In the following subparagraphs, several economic characteristic of the PUCs are examined, namely: profitability, percentage of the amortization and net value of the PUC by calculating percentage of written-off value of the book value of the PUC.

Profitability

As shown in Figure 13, only three PUCs showed positive results for the year 2009.

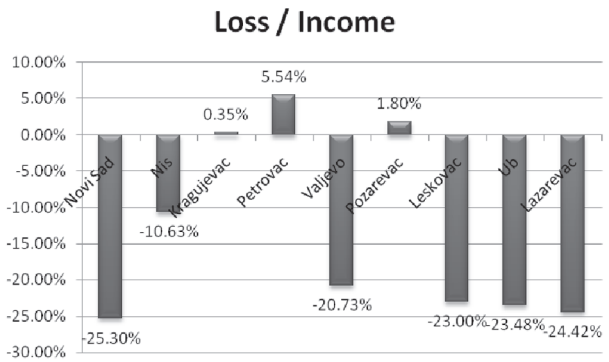

Figure 13: Loss/Income in percentage (2009)

Comparing profit/loss to the profit/loss statement with total income, the municipalities of Kragujevac, Petrovac and Pozarevac showed a small profit.

However, when the subsidies are deducted, which were usually listed under the item “other incomes” together with services to third parties in balance sheets, the situation reveals different figures (Figure 14).

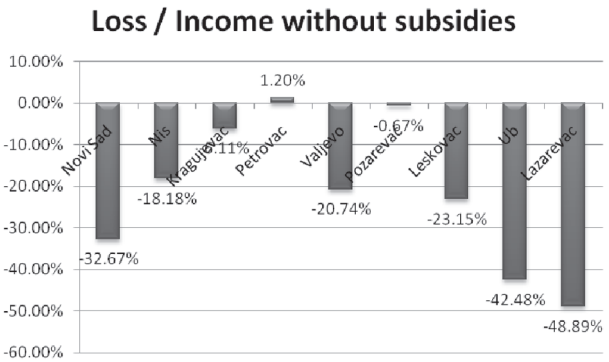

Figure 14: Loss/Income without subsidies in percentage (2009)

In this case, only the PUC in Petrovac had a small profit of approximately 1 percent whilst all other PUCs had losses in the range of 0.5 to 50%. These data once again prove that water prices are too low for proper operation, let alone development, of the PUCs.

Subsidies provided by the local self-government are usually not directly shown in the companies' balances but are hidden as different kinds of investment resulting in a loss/income ratio which is usually different. This is particularly the case for investments and reconstruction works where local authorities (municipality, directorate for land, etc.) are transferring assets to the PUC only after obtaining usage permits which can be a time consuming process.

Amortisation and Net Value

Amortization in the PUCs was calculated in line with the following regulations:

- The Rulebook on the nomenclature of non-material investments and capital assets with rate of amortization (O.J. FRY 17/97 and 24/2000),
- The Rulebook on divisions of assets and determination of amortization for tax purposes (O.J. RS 116/2004 and 99/2010), and
- Internal accounting regulations of the PUC.

Here the problem is that amortization is calculated on the basis of book values which, as a rule, are smaller than the real fair value of the assets. This results in a shortage of funds for renewal of assets.

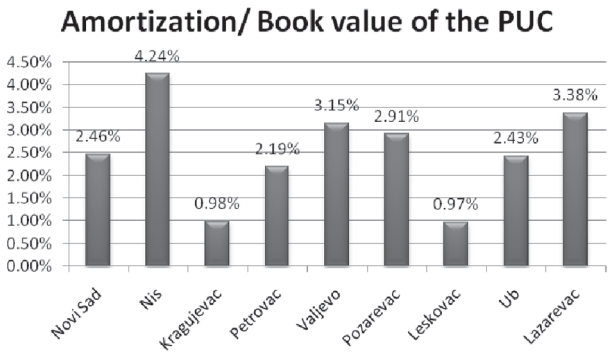

Figure 15: Amortization in percentage of book value of the PUCs (2009)

The reduction of the book value of assets for selected PUCs for the year 2009 is given in Figure 16.

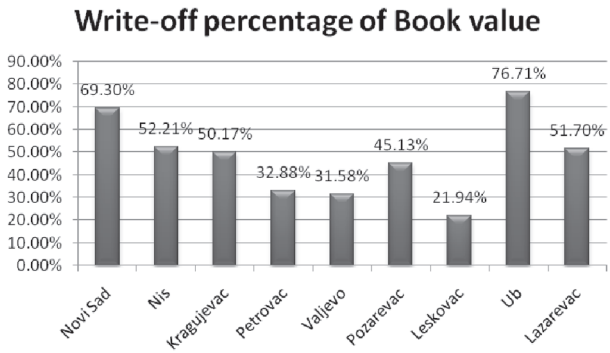

Figure 16: Percentage to which book value of PUC asset is reduced (2009)

This indicator shows that the water supply and sewerage infrastructure in selected PUCs is old and that, in the near future, significant funds will be required just to maintain present standards and service levels.

By superimposing Figure 16 and Figure 14 (Loss/ Income without subsidies in percentage), a further conclusion can be made that PUCs showing the highest losses are the ones where investments in renewal are urgently required.

Conclusion

This paper is focused on estimating the total investments required in the water and wastewater sector in Serbia. Results from several studies, projects or models were presented and compared, and it was concluded that different studies/models predict a similar amount of investments. Annual cost of the existing and new systems were then analysed. Also, several studies and methods were compared, and the following issues affecting reliability and accuracy of predicted amounts were identified:

- Models used to estimate investments and costs in some other EU accession countries, like "Romania 2003", assumed that full cost recovery of the existing systems had already been achieved. Data from the existing PUCs clearly indicate that this is not the case for the current state of water fees and tariffs in Serbia.
- Assessment of annual costs for the existing systems, especially the assessment of amortization, is not reliable. Most of the previous studies were using the book value of a PUC in order to assess the costs of amortization. In several of the case studies presented, these values proved to be highly inaccurate.

The model developed within the National Environmental Approximation Strategy for the Republic of Serbia was used to assess OPEX and total costs for water supply and sewerage, where the model was adapted to include additional costs described above, namely the additional cost for reaching a full cost recovery for the existing systems and for amortization. Therefore, the model was adapted in order to fill in the gap that currently exists between tariffs (and subsequent income of the PUC) and full costs recovery. The results show that costs increase significantly, while affordability is adversely affected.

Basic technical and financial data for 10 selected municipal PUCs are presented and analysed. Data prove that water prices are too low for achieving full cost recovery. Moreover, the structure of costs

reveals that labour costs are higher, while there are indications that share of amortization in total cost is lower than needed. From the data shown, it is clear that selected Public utility companies are suffering from chronic under-investment, assets and equipment are becoming obsolete and water tariffs are insufficient to cover both operational and maintenance costs and amortization. This results in poor economic performance of the companies and assets deterioration, which eventually may lead to a reduction in the level of service.

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