



# **9. International Quality Conference**



## **CONFERENCE MANUAL**

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## 9. International Quality Conference Conference manual

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*Sincerely yours,  
President of Organization Committee*

*Prof. dr Slavko Arsovski*



**9<sup>th</sup> IQC**  
**QUALITY  
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## PERFORMANCE ANALYSIS OF SOLID WASTE MANAGEMENT COMPANIES IN THE REPUBLIC OF SERBIA

**Abstract:** *In the context of increasingly domestic concern about profitability of domestic, publicly-owned, solid waste management companies, the need for economic analysis has occurred. In this paper financial statements of private and public companies in Serbia were analyzed, with comparison on the financial indicators basis. The efficiency and effectiveness indicators of five selected mutual comparable pairs of private and public companies were analyzed. For the purpose of financial analyze chosen companies were assembled in two clusters – private and public one. The results indicated that private and public companies are experiencing difficulties in business, for different reasons. Public companies are paying high interest rates for credits taken to cover losses from previous years. Although, they have increased operating efficiency, they still have losses. On the other side, private investors are constantly improving financial indicators after very low starting point that is the result of high initial investment and short business period.*

**Keywords:** *Efficiency and Effectiveness Indicators, Private Investors, Profitability, Public Companies, Waste Management*

### 1. INTRODUCTION

In previous years there is a strong governments' call for privatization of public services looking at efficiency as main reason as long as cutting public subsidies for covering losses. The states are taking serious steps in encoring private sector to enter waste operation, either independently or in cooperation with private sector. The linkage created can influence on sectors efficiency and create possibility for new jobs.

Waste management can be organized through: pure private service, pure public service and hybrid form of public private partnership, where public ownership is mixed with private operation [1]. Privatization in waste sector is spurring across the globe, currently 50% of EU population is supplied by private sector [2]. The situation is especially obvious in waste collection service where most of the services are organized through PPP (private-public partnership) leading to cost cutting and relaxing budget expenses ([3],[4]).

However, researches related with privatization are giving mixed results. Cruz and

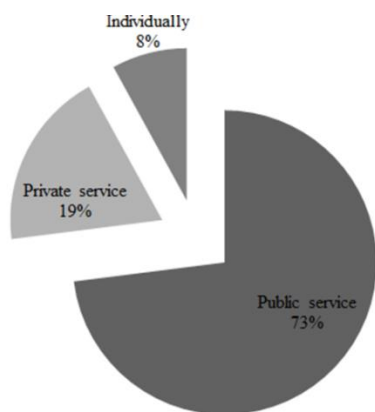
Marques [5] found that without strong contractual instruments, the levels of service are likely to decrease and final price to customer will increase. Further, Benito, Bastida and García [6], showed that public production is actually preferable while Kemper and Quigley [7] showed that there is no clear evidence and confirmation in favor of private sectors.

In order to compare private and public services, the efficiency and effectiveness indicators of selected companies have to be involved. While efficiency indicators define the relationship between a system's input resources and output products (or services), on the other side effectiveness indicators measure a system's ability to meet its objectives [8]. Also, in this study profitability of Serbian private and public companies related with waste collection, were examined. Information from Business Register Agency [9] covering financial data was used as well as information from national research project covering waste collection across all Serbian counties and municipalities [10]. The problem with financial data we were facing is related to the short observed period

which didn't give us possibility to use different models for financial analysis. The companies until recent had no obligatory to publish financial statements, which presents main constrain related with financial information. The model used was the most appropriate having in mind available information, with clear conclusion about differences in conducting business among private and public companies.

## 2. STUDY AREA

Serbia is a country located at the crossroads at Central and Southeast Europe, covering the southern part of the Pannonian Plain and the central Balkans. According to 2011 census, Serbia has a population of 7.2 million inhabitants in 2.5 million households. Serbia covers the area of 88 361 km<sup>2</sup> and is divided into 161 municipalities. Waste management in Serbia is mainly based on the landfilling [11], while average municipal waste generation rate is 0.87 kg/capita/day [10]. Municipalities are responsible for waste prevention, collection and processing of households waste. Over 2 million households are covered with waste collection services (1 888 183 by public and 199 753 by private service), and the rest – 459 582 are individually managed (people alone organize waste collection in rural areas), which is shown in Figure 1.

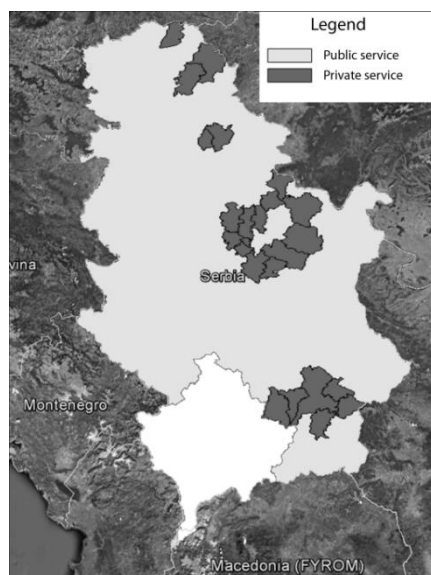


**Figure 1** - Share of private and public sector in waste collection in Serbia

Several years ago all companies in waste collection business were state owned. Almost

each municipality had own waste management company which was taking care of waste collection and disposal (most of collected waste from Serbian municipalities go directly to landfill). This was not always efficiently especially in small municipalities. There are many studies which confirm that number of inhabitants have a crucial impact on system efficiency. Marques and Simões [12] showed that the systems have a theoretical optimal size if they comprise about 300 000 inhabitants.

Six years ago first private company from waste collection business started to work in Serbia. At this moment these companies are providing services to citizens covering 8% households and serve different number of municipalities – from one to ten. Figure 2 shows the area covered by public and private waste management companies in Serbia. Individually organized waste collection are not shown at Figure 2 because they represents rural parts of municipalities and almost every municipality has some rural parts which are not covered with waste collection service.



**Figure 2** - Area covered by public and private waste management companies in Serbia

## 3. METHODOLOGY AND DATA

For comparison purpose, two clusters were created, one consisting of publicly-owned waste collection companies and one consisting



of private companies. In order to compare two clusters certain criteria have to be defined. Factors such as the population size and density, covered area, the amount of collected waste, the street network and traffic conditions have a great influence on waste collection and transport costs ([13],[14]). Hence, in this research the criteria for clusters' creation were number of households served, size of the territory covered and amount of waste

collected. The mutual comparable companies should nearly have the same value for the above mentioned parameters. For each of the five private companies one mutual comparable public company was found (for example as a mutual comparable private company which covers ten municipalities one public company that covers one municipality with similar number of households, territory and amount of waste collected was chosen).

**Table 1.** Descriptions of mutual comparable private and public companies

Com pany	Service	Total /served populati on	Total /served households	Coverage (%)	Area (km <sup>2</sup> )	Density (inh./km <sup>2</sup> )	Waste per capita (kg/year)	Price (€/inh.year)
A	Private	93 338 /89 310	33 745 /32 261	96	1430	65	254.19	13.0
B	Public	137 462 /80 880	40 174 /25 580	64	1554	88	288.08	10.12
C	Private	136 210 /121 805	41 886 /37 239	89	1812	67	222.24	14.98
D	Public	132 051 /110 169	46 375 /38 902	84	1324	99	243.44	11.3
E	Private	313 432 /272 607	100 466 /87 944	87	3034	103	251.96	12.9
F	Public	250 482 /191 928	85 269 /66 049	77	2620	95	266.29	12.04
G	Private	20 659 /17 870	5721 /4975	87	344	60	253.54	10.2
H	Public	35 582 /15 634	12 443 /5234	42	411	86	223.87	9.7
I	Private	43 087 /38 824	13 660 /11 498	84	695	30	203.72	10.66
J	Public	41 337 /35 963	15 533 /13 513	87	487	74	254.52	16.9

The table 1 shows main characteristics of private and public waste management companies in Serbia chosen for purpose of this research. Private companies cover from one to ten municipalities. On the other hand, each chosen public company covers only one municipality. When considering the population in the municipalities, only one municipality with population over 100 000 citizens is served by private company. Another big cities (more than 20) are served by public companies. In general, private companies cover more rural parts of the municipalities then the public ones, so coverage of area is greater. Collected waste per capita, for the chosen companies, varies in the range 203.72 to 288.08 kg/year.

For purpose of this paper, database from

Business Register Agency [9] was used as well as results of national research project gathering information about waste collection across all counties in Serbia [10]. The aim of this study was to collect information about waste collection practices and procedures in Serbia, starting with company's ownership structure (private or public), price of services, number of households and area covered. The information covered 2 547 518 households and 131 companies involved in waste collection. The research showed that 1 888 183 household use public and 199 753 use private waste collection service. Also, it was found that 459 582 households organize waste collection individually. In the research each company was stored (private or public) in appropriate county

making easy comparing. With the purpose of identifying comparable companies, certain characteristics as parameters such as number of households, density of population and yearly amount of residual waste per capita were set.

In order to define system's performance of selected companies the efficiency and effectiveness indicators were analyzed. Efficiency indicators define the relationship between a system's input resources and output products (or services) while effectiveness indicators measure a system's ability to meet its objectives [8].

The aim to form homogenous clusters came from necessity for comparing profitability across private and public sector. Two groups were tailored. First, consisting of public and second, consisting of private companies in waste collection business. Groups are comparable because the selected companies are covering similar number of households, density of population and picking similar amount of waste.

The financial analysis of companies' performances is relying on publicly available information, published by authorities delegated by national governments. The companies are obliged to publish financial statement which can be analyzed through vertical and horizontal methodology. Also, financial statement analysis methodology is using different ratios in order to measure company's performances.

The horizontal and vertical financial statement analysis is focused on business financial data during one year, and ratio usage gives opportunity to cover business performances across longer period of time. In order to have base for waste collection companies performances analysis, the financial statement analysis has been conducted with ratio usage during observed period (2011-2013).

Having in mind inability to collect precise information from publicly available resources, we have constrain our research with next ratio numbers: Gross profit margin as gross profit divided with net sales, Operating profit margin as operating profit divided with net sales, Net profit margin as net profit divided with net sales, Return on Assets (ROA) as net profit divided with total assets, and Return on Equity (ROE) as net profit divided with shareholder's equity.

Also, as indicators for liquidity analysis next were used: Current ratio as current assets divided with current liabilities and Current,

reduced, ration as current assets-inventory divided with current liabilities.

The methodology we have been using in our research, we can find in similar research ([15],[16],[17]).

Financial information about companies came from Business Register Agency [9] at which Serbian companies are obligate to provide all information related with financial status each year. Used information covers period from 2011 to 2013 during which the level of assets, the level of capital, net revenue, and number of employees were analyzed.

The instruments used in analysis were related to the financial indicators and ratios showing profitability and liquidity of both clusters, making possible comparison between. The data collected from BRA were publicly available, but because of legal issues the name of the companies and their full reports are not presented. For profitability analysis next indicators were used:

- Gross profit margin as gross profit divided with net sales,
- Operating profit margin as operating profit divided with net sales
- Net profit margin as net profit divided with net sales
- Return on Assets (ROA) as net profit divided with total assets
- Return on Equity (ROE) as net profit divided with shareholder's equity.

For purpose of liquidity analysis next indicators were used:

- Current ratio as current assets divided with current liabilities
- Current, reduced, ration as current assets-inventory divided with current liabilities.

## 4. RESULTS AND DISCUSSION

### 4.1 Efficiency and effectiveness of companies

The first important indicator in analyze of company is price of product or service. In the table 1, it can be seen that in four of five cases the price per inhabitant in municipalities having a private service is higher than the price in municipalities having a public service. There are two reasons that can explain this situation. The first reason can be found in higher expenses in private companies caused by their short history and high start investment. Also, the first sanitary landfill in Serbia was founded

by private company and maintenance of this kind of landfill is more expensive than maintenance of landfill (non-sanitary) used by public company. The second, and maybe main reason, is that public companies have a support of city's budget to cover the losses that the private do not have.

In order to compare private and public services the efficiency and effectiveness indicators of selected companies should be involved [8]. According to collected data these indicators were calculated and shown in Table 2.

**Table 2.** Efficiency and effectiveness indicators of waste collection and transport

Company	Service	Efficiency indicators			Effectiveness indicators	
		€/ton	€/stop	€/ton km <sup>2</sup>	*km <sup>2</sup> /cost	Person/cost
A	Private	51.15	13.81	0.036	1.23	0.077
B	Public	35.13	8.78	0.023	1.90	0.099
C	Private	67.41	20.90	0.037	0.99	0.067
D	Public	34.48	8.28	0.026	1.06	0.088
E	Private	51.21	11.27	0.017	0.86	0.078
F	Public	45.23	10.40	0.017	1.13	0.083
G	Private	40.23	10.06	0.117	1.89	0.098
H	Public	43.36	11.27	0.105	2.71	0.103
I	Private	52.33	16.22	0.075	1.68	0.094
J	Public	66.43	21.92	0.136	0.80	0.059

\*Values of Effectiveness indicator km<sup>2</sup>/cost are multiplied by 1000

Efficiency indicators show how efficiently the company uses the charged money for given services. The company with lower efficiency indicators works cheaper compare to company with higher indicators. Table 2 presents the calculated efficiency indicators: cost per ton of collected waste, cost per collection point (communal vehicle stop) and cost per ton and covered area. This table shows, more or less, the same trends obtained in table 1 – public sector at lower price.

On the other hand effectiveness indicators measures system's ability to meet objectives of the system. These indicators (person per total price and square kilometer per total price) should be high. There is no great difference between private and public companies concerning effectiveness.

#### 4.2 Profitability analysis

The gross profit margin (GPM) is a measurement of a company's manufacturing and distribution efficiency during the production process. The gross profit margin is calculated by using next formula:

$$GPM = \frac{\text{Gross profit}}{\text{Net sales}} = \frac{\text{Total revenues} - \text{Total expenses}}{\text{Net sales}}$$

The previous formula includes all revenues (not just from operating activities) and all expenses (not just the one related with operating activities). If company is achieving higher gross profit margins during observed period or comparing to the competition, this means it is increasing efficiency in business. In this analysis, information from financial statements showed negative gross profit margin which implies low efficiency in public and private sector. Further analysis showed that one reason for negative gross profit margin can be found in high credit debt (public cluster) and high initial investment (private cluster). Credit debt is related with the problem of customers' payments from previous years, where public cluster experienced difficulties in non-paid services. Because of non-paid services, public cluster increased interest rate expenses as non-operating expense for covering losses. Private sector, as can be seen in Table 3, is constantly improving gross margin profit, leading to a

conclusion that they are solving problems related with customers' payments more efficiently.

**Table 3. Gross profit margin 2011-2013**

Year	State companies cluster	Private companies cluster
2011	-0.05	-0.39
2012	-0.04	-0.23
2013	-0.08	-0.06

Operating profit margin (OPM) is the total pre-tax profit business generated from its operations. It is calculated by using next formula:

$$OPM = \frac{\text{Operating profit}}{\text{Net sales}} = \frac{\text{Operating revenues} - \text{Operating expenses}}{\text{Net sales}}$$

The formula is showing that operating profit margin is related with core activities of company excluding revenues and expenses obtained in side activities. Here, interest rates as an expense were excluded, leaving only information related with efficiency in waste collection. This indicator is showing how efficient company is in organizing operating activities, in this case waste collection business. Table 4 indicates that operating profit margin is showing increase at the private and growth at state cluster. The positive operating profit margin is sign that both clusters (state and private) are efficient in waste collection business, with private constantly improving. The efficiency can be explained by increased customers' payments during observed period.

**Table 4. Operating profit margin 2011-2013**

Year	State companies cluster	Private companies cluster
2011	0.01	-0.004
2012	0.05	0.18
2013	0.06	0.40

Return on assets measures a company's earnings in relation to all of the resources it had at its disposal (the shareholders' capital plus short and long-term borrowed funds). Thus, it is the most stringent and excessive test of return

to shareholders. ROA for short tells an investor how much profit a company generated for each € in assets. Comparing private and public clusters it can be seen that both are experiencing negative ROA with difference that private one is decreasing significantly negative trend, as shown in Table 5.

**Table 5. Return on assets 2011-2013**

Year	State companies cluster	Private companies cluster
2011	-0.05	-0.07
2012	-0.04	-0.08
2013	-0.08	-0.01

Return on equity reveals how much profit a company earned in comparison to the total amount of shareholder equity found on the balance sheet. A business that has a high return on equity is more likely to be one that is capable of generating cash internally. The higher a company's return on equity compared to its industry, the better. Comparing clusters, from Table 6 it can be seen that private one is improving ROE although it is negative and state one has steady negative ROE without tendency to improve it.

**Table 6. Return on equity 2011-2013**

Year	State companies cluster	Private companies cluster
2011	-0.10	-0.45
2012	-0.09	-0.61
2013	-0.20	-0.03

The current ratio is a test for company's liquidity. It calculates how many currencies in assets are likely to be converted to cash within one year in order to pay debts that come due during the same year. An acceptable current ratio varies by industry. For most industrial companies, 1.5 is an acceptable current ratio. As the number approaches or falls below 1 there is a need to take a close look at the business. Looking at the clusters, current ratio is quite low in both clusters but again state cluster is showing tendency of decreasing and private tendency of increasing (Table 7). This information leads to conclusion that private companies are investing efforts to improve its

business and it is reflecting in financial statements.

**Table 7. Current ratio 2011-2013**

Year	State companies cluster	Private companies cluster
2011	0.84	0.33
2012	0.88	0.53
2013	0.71	0.53

## 5. CONCLUSIONS

In the recent years in Serbia there is a strong call for privatization of public services looking at efficiency as main reason. In this research the performances of waste management companies were analyzed. First private waste management company started with work six years ago and at this moment there are five private companies in this business providing services to 8% of total households in Serbia. In order to compare private and public sector in waste management five public companies were chosen to create five mutual comparable pairs. The parameters to create these pairs were number of household served, size of the territory covered and amount of waste collected. For each compared pair criteria was price of service as well as efficiency and effectiveness indicators. According to conducted research, in four of five cases public company provides services at lower price compared with private company. In order to compare the cost of private and public service level, assessment should go beyond simple comparison of costs as such. Therefore, efficiency and effectiveness of the waste management companies were analyzed. These indicators show similar trend as comparison according to price – public companies are more efficient. But after all, it cannot be stated that public service level operates cheaper and hence more efficiently than private operating companies. As first, in this research a limited number of public companies were used, there are numerous public companies with higher price of services but they didn't match the established criteria. Private companies have a big starting investment expenses and in many cases higher expenses for sanitary landfill maintenance. The main reason for more

efficiently public companies lies in a fact that these companies have a support of city's budget through public subsidies, which are not available to private companies.

For the profitability analyses chosen companies were assembled in two clusters – private and public one. The information gathered from publicly available financial statements covering business of state and private waste collection clusters are showing negative indicators and ratios at both sides. The main difference is that private cluster is showing strong improvements in decreasing negative financial results. The reason for negative results in private companies can be found in their short history and high starting investment expenses which mean that in future it will be very interesting to compare them with state ones. On the other side, state cluster is experiencing difficulties because of the debt inherent from previous years when payments were at very low level. In order to cover losses, public companies were forced to make credit arrangements which have high interest rates making financial indicators very murky.

According to findings of this study, it can be concluded that both private and public companies should carry out certain improvements to reduce costs and increase efficiency. One of feasible option for optimization of operating costs, most particularly in big cities, is improving the process of waste collection and transport. That should be done by using modern technologies such as Geographic Information System (GIS), Global Positioning System (GPS), General Packet Radio Service (GPRS), making a general methodology for costs reduction that can be applied to any waste management company in Serbia.

The main constrain we have been facing through out research was scarcity of data because until recently companies in Serbia were not obligated to publish financial data. The model we have used is the most appropriate regarding information publicly available and it gives clear insight in financial performance. The future research will go further, exploring possibility to organize public-private partnership in municipalities not having enough resources to organize waste collection as a public service.

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