THE REORGANISATION OF WASTE MANAGEMENT IN HARJU COUNTY MUNICIPALITIES THROUGH A WASTE MANAGEMENT COOPERATION AND COMPETENCE CENTRE. A SOCIO-ECONOMICAL FEASIBILITY STUDY

Jana Poldnurk, MSc
Tallinn University of Technology, Estonia

Abstract

The current paper presents the socio-economical feasibility study on the reorganisation of waste management in Harju County through waste management cooperation centre. The objective of the research was to estimate the improvement of administrative efficiency, and economical cost-effectiveness resulting from reorganisation of waste management administration. In the analysis two different scenarios were assessed in comparison of the current situation (basic scenario) from the aspects of economical and administrative cost-effectiveness. The waste management situation and cash flow, including waste collection services, source sorting options, waste holders and municipal budgets of waste management administration were mapped. Also a risk assessment of the qualitative indicators was compiled. The main problems of the basic scenario stand in the administrative inefficiency and financial shortage of waste management. The analysed project scenarios enable to improve both administrative efficiency, and solve the funding issue through the direct implementation of polluter pays principle. The municipalities delegate particular waste management duties to the cooperation organisation which reduces the administrative load in municipalities. The public collection network for sorted waste is taken over by the cooperation organisation as well as public awareness raising activities. The financing model of the public waste management bases on the budgets of the municipalities. In case of the full-scale scenario some of the public waste management expenses are integrated into the waste collection fee as administrative expenses. The main results of the research showed that the municipalities can win both financially and in administrative efficiency from the reorganisation of waste management through the cooperation centre.

Keywords: Integrated solid waste management, municipal waste collection, public procurement, recycling and recovery, socio-economical feasibility

1 Introduction

EU Directive 2008/98/EC (waste directive) insists that development of waste legislation and policy is a fully transparent process, and requires that the member states take measures to ensure waste undergoes recovery operations, and to develop the necessary collection system for the mixed municipal waste generated in private households [EC, 2008a, Articles 4, 10, 11, 13, 16]. Since 2005, the organised waste collection scheme (OWCS) has been applied step by step in the Estonian local authorities. The definition for OWCS given in the Estonian Waste Act is following: the organised waste collection scheme is collection and transportation of the municipal waste from the predetermined waste collection district to the predetermined waste treatment facility by a waste company selected by the local authority [EP, 2004, § 66-1].

In the current paper, the waste management (WM) situation in Harju County municipalities is analysed from the aspects of socio-economical feasibility and environmental sustainability, and alternative WM scenarios for the municipalities are drawn. The principle of the advanced OWCS is introduced in details. In the local authorities of Harju County, which altogether host 153,492 inhabitants, the main stumbling block is administrative inefficiency. The reorganisation of the waste management through a waste management center (WMC) would enable a reasonable and effective sharing of the particular waste management tasks so that one specialist handles e.g. issues related to source sorting or public waste stations and collection points network, the other deals with public procurements, another specialist works out the local legislative regulation and waste management plans, organises public relations, advising and awareness raising actions, separate officers execute supervisory or manage waste holders register etc.

The waste management situation of Harju County municipalities was mapped and the socio-economical cost-benefit analysis was compiled within a project “Development of waste management cooperation in Harju County Municipalities”, granted by the European Structural Assistance to Estonia. The aim of the project was to rise the administrative efficiency in the Harju County municipalities, to improve the cooperation in waste management sector, and to provide high-quality municipal waste collection services according to the principles of the sustainable development in the county [HOL, 2012].

In response to the results of the project and the analysis, the non-profit waste management cooperation organisation Communal Services Center of Harju County (HUK, Harjumaa Uhisteenuste Keskus), was established in June 2012 by nine Harju County municipalities comprising 58,783 inhabitants. To date, HUK is gradually taking more responsibility and waste management tasks from its members. The ultimate objective of the organisation according to the full scale scenario is to become the waste management administrative body, cooperation and competence centre, and municipal waste collection customer service for all the 23 municipalities of the county and their inhabitants, involving range of activities such as executing the advanced OWCS, management of public waste stations and collection points for recyclables and domestic hazardous waste, and public awareness raising campaigns.

Although involvement of private sector in waste management can help to increase efficiency and effectiveness, it requires an organized public institution to monitor their activities. Sustainable solid waste management will require the involvement of all stakeholders concerned with generation of waste materials, collection and disposal as well as monitoring of activities regarding waste management (e.g. government, private sector and local residents) [Ezebilo and Animasaun, 2011, 682].

2 Materials and methods

2.1 Legislative Background of the OWCS

The main principles of OWCS are outlined in the Waste Act, as follows:

- municipality organises the collection and transportation of the municipal solid waste, including source sorted waste and sorting residues on its administrative territory;
- municipality may delegate the administrative tasks related to execution of the OWCS to other municipality or a non-profit organisation which member the municipality is;
- OWCS may be organised so that the only client and payer of the waste collection fee to the waste collection enterprise is the municipality or a non-profit organisation authorised by the municipality or municipalities;
- territory of a local authority is divided into waste collection districts involving approximately, in general case no more than 30,000 inhabitants;
- a service concession public procurement is held by the municipality or authorised non-profit organisation to choose the waste company, and the licence to provide the municipal waste collection service in the district is granted for up to five years;

- waste holders, both civilians and enterprises, are bound to join the waste collection service at their place of residence or activity, which means that the incorporation to the waste collection system is property-based;
- waste collection fee must be sufficient to cover the investment, operational, closing-down and post-closedown costs of a waste treatment facility as well as the cost of administration, collection and transportation of municipal waste, in consideration of the waste class, amounts and properties, collection interval, and other circumstances which have impact on the costs of the waste treatment;
- municipality organises recycling, recovery and disposal of the waste involved to the OWCS [EP, 2004, § 66-70].

2.2 Waste Management in Harju County

The waste management situation in Harju municipalities was mapped by questionnaires addressed directly to the WM specialists working at the municipalities (quantitative data) and oral interviews with officers from five selected municipalities (qualitative data). The mentioned questionnaires and interviews were the main input data for the socio-economical cost-benefit analysis of the Harju County waste management cooperation centre.

There are 23 municipalities, excluding Tallinn, in Harju County, with the population and size of the territories ranging from 764 to 17,673 inhabitants and from 4 to 708 km^2, respectively [KOP, 2013]. Five of the municipalities represent towns, while the remainder are parishes with village centres and mainly dispersed settlement. Regarding the project, the important socio-economical indicators are those of population and distribution of the waste collection districts. In general, the number of population and population density are relatively low in the Harju County municipalities.

Although the Waste Act allows to form waste collection districts which involve up to 30,000 inhabitants, in Harju County each municipality forms a separate waste collection district, except Kernu and Nissi parishes, which formed a joint district, and Koue parish, which is a member of the Central Estonian WMC and belongs to a bigger waste collection district of that WMC. In the Figure 1, the projected enlarged waste collection districts are drawn, which would optimise the waste collection routes.

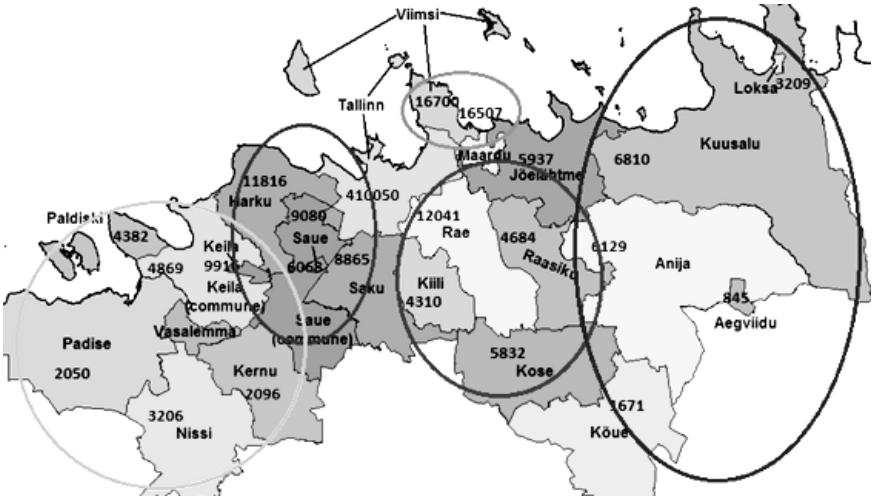

Figure 1. Map of Harju County, numbers of inhabitants and projected waste collection disticts [KOP, 2013 and Kivimagi, 2011]

In most Harju municipalities, OWCS and the source sorting of recyclables have been implemented over an environmentally and economically sound range. Compulsory waste collection and source sorting is only applied in settlements. The households that are far from villages and to where the roads have limited load-bearing capacity or are seasonally impassable, are not mandatorily incorporated to the OWCS, meaning they have to organise their waste collection and treatment by their own [Kivimagi, 2011].

2.3 The Socio-Economical Cost-Benefit Analysis

The cost-benefit analysis was carried out by the Estonian Center for Applied Research (CentAR) in cooperation with WasteBrokers LLC, which managed the project. CentAR compiled the financial and socio-economic analysis and the quantitative portion of the risk analysis. WasteBrokers compiled the analysed scenarios, mapped the WM data of the Harju County municipalities and qualitative impacts, and put together the qualitative part of the risk analysis. The objective of the analysis was to estimate if and what kind of waste management expenses could be retrenched by the reorganisation of waste management in Harju municipalities through a WMC and implementation of the advanced OWCS [Jarve, 2012, 4]. The European Commission's methodology for the cost-benefit analysis of investment projects was used for the analysis [EC, 2008b].

The geographical measure of the analysis involves the Harju County municipalities, except Tallinn. The reason for the exclusion of Tallinn is that the main impacts which are in the focus of the analysis (the financial and administrative benefits and savings resulting from the transition from smaller

public procurements separately executed in each local authority to bigger joint public procurements) are insignificant and marginal in Tallinn, which comprises nearly three times more inhabitants (419,830 inhabitants versus 152,728) [Statistics Tallinn, 2013] and three times more mixed municipal waste (94,127 tons versus 31,570 tons, 2012) [EEIC, 2012] on 26 times smaller territory (158 km^2 versus 4,163 km^2) [KOP, 2013] than rest of the Harju County municipalities together.

2.3.1 Financial Analysis

The technical data, investment costs, administrative costs and data regarding possible decrease of particular costs are gathered from sources like waste collection price lists in different municipalities, interviews and questionnaires with the waste management officers of the Harju County municipalities and other public sources like Statistics Estonia and Register of Population). The prognosis of the prices bases on the guidance materials of the Ministry of Finance [EMF, 2009].

The aim of the financial analysis is evaluate the cost-benefit of the project from the organisation's point of view. The cash flow is analysed and in comparison of two scenarios the cost-effectiveness of investments is analysed. Two input tables are compiled, the table of costs and benefits and the table of investments. Based on those tables the net present value (NPV) of the cash flows generated by the investments is analysed and cost-effectiveness of the investments are evaluated. The net present value (NPV) of cash flow is found according to the following equation:

$$FNPV(S) = \sum_{t=0}^{n} a_t S_t = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \cdots + \frac{S_n}{(1+i)^n}$$

, where

FNPV – financial net present value;
S – net cash flow;
n – number of periods (in the current project 30);
i – discount rate;
a – discount coefficient.

After that the financial sources are described and the financial sustainability of the project is evaluated. The analysis is focused only on those benefits and costs which are directly linked to the project, e.g. only those costs in the municipality's budget are taken into account which the realisation of the project may considerably change. Another important principle is that the analysis is always carried out in comparison of two scenarios (investment scenario minus base scenario). The advantage of this approach is that if the investments enable to reduce the expenses in the base scenario, the benefits arising from the investments are clearly detected in the comparison of two scenarios [EC, 2008b].

2.3.2 Risk and sensibility assessment

In the current research the risk and sensibility assessment was carried out in two stages:

1) Mapping of the risks using the standard approach of the risk register where two different rates are assigned on the risks: a) the rate to characterise the impact accompanying the realisation of the risk on the results of the project, where "5" means very big impact, "4" big impact, "3" moderate, "2" small, and "1" very small impact; and b) the rate to characterise the probability of the realisation of the risk, where "5" means almost sure realisation, "4" rather probable, "3" possible, "2" not really probable, and "1" improbable realisation of the risk. Based on the mentioned rates the risk score is calculated by multiplying the rates. According to the value of the multiplication the events will be divided into four groups: a) events with very high risk (score 15-25); b) events with average risk (8-12); c) events with some risk (4-6); d) events with negligible risk (1-3). The events of very high and average risk score should be provided with countermeasures, the events of some risk the factors reflecting the development of the risk should be followed up.

2) For the risk and sensibility assessment the Monte Carlo simulation is carried out. It is presumed that all the critical variables may vary occasionally within the limits of the probability function, and based on those occasional values the expanded FNPS is calculated. After that the new occasional values are assigned to the variables and the expanded FNPV is calculated again, and the process is repeated 500 times. As the result of the calculation the probability distribution and expected mean value of the expanded NPV are detected. The mean value may be bigger or smaller than the value calculated in the socio-economical analysis depending on whether the accompanying risks are higher or lower [Jarve, 2012, 73].

2.3.3 The Project Scenarios

Basic Scenario (S0) – the waste management is organised as it was before. The Harju County municipalities organise waste management independently, there is no overboundary cooperation. One or more officers in each municipality execute the waste management tasks, such as implementing the OWCS, occasionally/periodically upgrading legislative documents like waste management action plan and waste regulation, dealing with public maintenance and supervisory, managing public collection points for source sorted waste, running awareness raising activities and keeping the waste holds register. The waste management costs in the municipality's budget (running public waste stations and collection points, domestic hazardous waste collection and treatment, awareness raising activities, public maintenance and trash bins, supervisory and administration of waste holders

register, consultancy and legal advisement) are covered from income tax, environmental tax, financial support is requested from different programmes and funds. Waste holders pay the waste collection fee only for the municipal waste produced at their property.

Limited Project Scenario (S1) – only part of the projected actions is carried out. The municipalities delegate particular waste management duties to the WMC. For example, the public procurements are organised in cooperation and for enlarged/joint waste collection districts (figure 1) by the WMC which reduces the administrative load (less public procurements are organised) and costs (the same amount of administrative tasks are executed with less number of officers) in municipalities. Also the public collection network for sorted waste is taken over by WMC as well as public awareness raising activities. The financing model of the public waste management services is based on the budgets of the municipalities, and the municipal waste collection fees are paid straight to the waste company by waste holders. The financial benefits to the inhabitants as well are expected from implementation of this scenario since in addition to the improvement of cost-effectiveness in the local authorities, the joint waste collection districts increase the volume of the service which may increase competition on the public procurement and result in lower waste collection and treatment fees.

Full-scale Project Scenario (S2) – in addition to S1 scenario, the advanced OWCS is applied which redirects cash flow from "waste holder → waste company" to "waste holder → WMC → waste collection company and waste treatment company". The WMC takes over some administrative functions from the waste company (customer service, accountancy). Part of the public WM expenses (awareness activities, domestic hazardous waste collection, waste holders register) is integrated into the waste collection fee as administrative expenses. This new financial source frees the budgets of local authorities from the mentioned WM expenses. The financial benefits to the inhabitants are smaller than in case of the limited project scenario because the "polluter pays" principle is applied on the larger range and the start-up investments of the WMC are also reflected in the waste collection fees [Kivimagi, 2011 and Jarve, 2012, 5].

2.3.4 Questionnaires and interviews carried out in the Harju County municipalities

The questionnaires involved detailed information about WM situation, legislation and costs in the municipalities budget, collection options for source sorted waste (domestic hazardous waste, recyclables, packaging, WEEE, bio-waste), public procurements of OWCS (problems and opposition during the procurements, tender evaluation models and criteria, data about waste collection contracts and contractors), waste holders

register and the waste collection fees. Fully and relevantly filled questionnaires were returned from 19 municipalities [Kivimagi, 2011].

The interviews with WM officers from 5 selected municipalities (Harku, Joelahtme, Kernu and Saku parishes, and Saue town) covered the topics such as estimation of working time on particular waste management tasks, main problems and challenges in implementation of OWCS and other WM tasks. The average number of inhabitants of the selected municipalities were approximately 7,600 which is a bit higher than average in Harju County (excluding Tallinn), but both the municipalities with population under 3,000 inhabitants and above 10,000 inhabitants were represented [Jarve, 2012, 25].

Tabel 1. The WM tasks and time spent on execution of those tasks in Harju County municipalities [Jarve, 2012, 26]

Waste management tasks	Days a year	Proportion in WM tasks
Updgrading and composing WM action plan, waste regulation and other legislative documents, tracking their performance, development of WM infrastructure	12	6,5%
Keeping waste holders register	41	22,2%
Management of public ollection points network and waste stations, collection of domestic hazardous waste and source sorted recyclables	24	13,0%
Implementation of the OWCS, public procurements	2	1,1%
Supervisory on OWC contractor, communication and issues with the contractor	36	19,4%
Supervisory on waste holders unincorporated to the OWCS, dealing with exemptions and applications for exemptions	36	19,4%
Awareness raising activities, advising, councelling	34	18,4%
TOTAL	185	100%
Number of working days a year	255	73%

3. Results and discussion

3.1 The main waste management problems in Harju County municipalities

3.1.1 Administrative inefficiency and lack of competence

The numbers of inhabitants in the municipalities range from 764 to 17,671 [KOP, 2013], and each of them has a fully functioning administrative body, covering public services from social assistance to road maintenance and waste management. This results in multiplicity of the administrative tasks of the public officers – one specialist must handle several problems such as the source sorting of municipal waste, environmental and waste awareness raising activities, maintenance of public areas and containers etc. [Kivimagi, 2011]. As it is revealed from interviews and presented in the table 1, in an average municipality 0,73 full-time work load is needed for waste management tasks [Jarve, 2012, 25]. This makes 16,8 full-time work loads

(23 · 0.73 = 16.79) per whole Harju County and 0.11 work loads per 1,000 inhabitants.

Based on the work experience at the Environmental Department of Tallinn City Government, the author confirms that the implementation of the OWCS (organising public procurements and managing the concession contracts, keeping waste holders register, advising waste holders, supervisory on waste holders) in a municipality comprising nearly 420,000 inhabitants needs a full-time work load of six chief officers, and 0.5 part-time work load (management, coordination) of the head of the waste division in the Environmental Department and one officer (dealing with the exemptions, advising and supervisory) in each city district (8), estimatedly total 14.3 full-time work (6 + 0.5 · (1 + 8) = 10.5) loads which makes 0.025 workloads per 1,000 inhabitants. Thus the administrative efficiency per capita is 4.4 times lower in Harju County compared to Tallinn City.

In addition, the lack of competence is revealed when analysing the WM legislative documents of the Harju County municipalities. In many cases the waste management action plans and waste regulations were expired and not in accordance with the state legislation. 15 municipalities out of 23 had waste regulations updated earlier than 2009 when some important changes in the National Waste Act came into force. The lack of competence appeared also in the OWC public procurement documents resulting in oppositions and suing of the OWC procurements by the waste companies in 10 municipalities. In 9 cases exterior competence like legal advisement or public procurement consultancy was bought in [Kivimagi, 2011].

An organization can have an organisational structure designed for flexibility without having to make compromises on the level of (organisational) efficiency. Nevertheless, while improved organisational efficiency implies improved administrative efficiency, through reducing the administrative overhead, flexibility will at best have a neutral influence on administrative efficiency [Evans and Davis, 2005].

According to Fox and Gurley (2006), the declared main goals of municipal concentrations are falling service delivery costs, more even or equitable provision of services and better planning across a metropolitan area. For the Nordic countries Steineke (2010) concludes: “In all Nordic countries, a central argument in promoting municipal mergers is that public welfare services are more efficiently produced in larger municipalities.“ [Bonisch et al, 2011, 5].

The reorganisation of WM through a cooperation and competence would mitigate and/or eliminate both the administrative inefficiency and lack of competence regardless which project scenario would be implemented. The WMC can compile a regional waste management action plan and appropriate drafts for waste regulation and public procurement documents.

3.1.2 Lack of waste, inhabitants and cooperation

The number of inhabitants and sizes of the territories vary on a large scale as well as the indicators of the waste generation per capita and per square kilometre. Although there are some municipalities with higher population density (e.g. Saue town 1,358 inh/km^2), the median of the population density in Harju County municipalities is only 51 inh/km^2 (average 210 inh/km^2), the size of an average collection district is 6,977 inhabitants and 190 km^2, and annual MMW generation 1,432 tons (2012). Considering only the number of inhabitants, all the municipalities form remarkably smaller waste collection districts than allowed by the Waste Act (30,000 inh, see chapter 2.1). Since the OWC public procurements have been held individually and in different time the waste companies (5 different enterprises sharing the market in Harju County) also differ in the neighbouring municipalities in many cases, meaning the waste collection routes cannot be optimised over-boundarily [Kivimagi, 2011].

As mentioned in chapter 2.2, most of the Harju County municipalities do not cooperate and have organised WM independently. In the table 2 the projected enlarged waste collection districts are presented with the timetable of transition. The districts are formed from neighbouring municipalities comprising roughly number of inhabitants according to the regulation of the Waste Act. The projected transition period depends on the validity of the current OWC contracts.

Table 2. Projected waste collection districts, timing of transition and implementation of the OWCS [Kivimagi, 2011]

Waste collection district	Inhabi-tants	Territory (km^2)	MMW (t/y)	Period of transition
Keila parish, Keila town, Kernu, Nissi, Padise, Paldiski town, Vasalemma (I)	28,417	1,095	5,528	2013-1/8/2016
Harku, Saku, Saue parish, Saue town (II)	38,140	530	8,886	2013-1/1/2016
Maardu town, Viimsi (III)	34,029	96	8,211	immediately
Joelahtme, Kiili, Raasiku, Rae (IV)	29,302	677	4,969	2013-1/1/2014
Aegviidu, Anija, Kose, Kuusalu, Koue, Loksa town (V)	23,604	1,777	3,901	2013-1/6/2014

The new OWC public procurements can be arranged so that municipalities join the new OWCS when the previous contract ends. The enlarged waste collection districts can be applied in case of both scenario S1 and S2. The main benefits arising from the enlarged waste collection districts are: 1) the optimisation of the waste collection logistics and routes, increase of the waste amounts and number of waste holders in a district which may tighten the competition and reduce the waste collection fees at the procurements, 2) and decrease of the number of public procurements (5 OWC procurements instead of 21 in a five year period) which increases the administrative efficiency.

3.1.3 Limits of the WM budget in the local authorities

The waste management budget of a local authority is covered by two main sources: the landfilling tax from the municipal waste originating from the municipality and the income tax of the local inhabitants. The budget includes the municipality's expenses on the domestic hazardous waste collection, management of public waste station or collection points for recyclables and other source sorted waste, and awareness raising activities. The mentioned tasks are essential and compulsory administrative activities which a local authority in Estonia have to perform according to the Waste Act.

In Macedonia, in two regions with comparable characteristics (area, population, population density, ratio of urban/rural areas, waste generation) a study on issuing concession for regional integrated solid waste management was carried out. Waste management in Macedonia is not satisfactory due to the fact that the public sector has no financial capacity to invest in equipment modernization, has not built any landfills that would make sure that environmental impacts are minimized, and the price of the service has not been formed in a manner that would create an enabling environment for the *Polluter Pays Principle*. At present, it is the public utility companies that provide the solid waste management service in the majority of municipalities. This situation prevents competition, as a result of what the service level is not in line with the requirements of the European Acquis, nor are the principles underlying the Waste Management Law observed, which law has been fully harmonized with the relevant EU Directives. In addition to the unsatisfactory service level, the current costs for waste management are not covered because of the relatively low price of the service and the low rate of fee collection [MEPP, 2009].

In Harju County, most of the municipalities the awareness raising activities stand in the passive information about the WM regulation and options on the municipality's website, the possibility to call to the local officer on one's own initiative, and maybe a short news or an article in a local newspaper few times a year. Only six municipalities out of 23 spent some extra money on awareness raising campaigns in 2010 [Kivimagi, 2011]. The lack of advising and awareness raising activities results in waste holder's ignorance and disregard which appears in littered public areas and collection points.

The coefficient associated with awareness of solid waste disposal laws has a positive and statistically significant effect on the respondents' perceptions of solid waste management services. This reveals that respondents who were aware about waste disposal laws were more likely to be satisfied with solid waste management. If a respondent is informed about laws regarding solid waste disposal, the probability of being satisfied with

solid waste management increases by 0.099. People who are informed about laws are often more learned and should know more about rights regarding the environment [Ezebilo and Animasaun, 2011, 684].

The reorganisation of the WM through the WMC synchronises the public collection options for source sorted waste and improves the waste awareness regionally by taking those administrative tasks over from the municipalities regardless which project scenario would be implemented.

3.2 The financial feasibility and qualitative benefits of the Harju County WMC

3.2.1 The Financial Net Present Value

The cash flows of the project scenarios (S1 and S2) were analysed and compared to the basic scenario (S0). As a result of the comparison, the financial retrenchment for the municipalities from the implementation of the project scenarios was determined (Financial Net Present Value, FNPV). In addition, the financial benefit for the waste holders from the implementation of one or other project scenario was calculated (expanded FNPV). Through this approach, cash flows were analysed from the point of view of the waste holders. The analysis facilitates planning quality improving actions in a cost-neutral way, which means that if a project scenario is to be realised, the project is considered to be beneficial or at least cost-neutral as long as the Net Present Value of the costs of any additional activities do not exceed the FNPV of a project scenario.

Relying on the main results of the socio-economical cost-benefit analysis for the Waste Management Centre of Harju County Municipalities, from the point of view of the municipalities, both of the project scenarios (S1 and S2) are worth realising compared to the basic scenario (S0). The FNPV is larger than zero in both cases (table 3), meaning the municipalities can financially win from the reorganisation of waste management through the cooperation centre.

Table 3. The Investments Profitability Index [Jarve, 2012, 6]

Scenarios	S1-S0	S2-S0
Financial Net Present Value (FNPV) (thousands €)	1,238.2	4,715.5
Expanded FNPV (thousands €)	3,036.4	1,357.6

In case of scenario S1, the benefit 1.2 million euros comes from the labour saving, meaning the WMC is capable of executing same amount of WM tasks with less number of employees – the gain stands in improvement of efficiency. This number can be interpreted so that if the Harju County municipalities decide for implementation of the scenario S1, then in addition to that, they can development their waste management and implement additional WM activities in the range of expenses which NPV don't exceed

1.2 million euros, and the total WM expenses of a municipality still stay lower than those are in case of scenario S0, meaning present situation.

In case of scenario S2 the benefit for local authorities is remarkably bigger (4.7 million euros) because some for the WM activities presently financed from the municipalities budget will be transferred on the wallets of inhabitants/waste holders, and same time the income of the municipality doesn't decrease. In this case the municipality wins in all the expenses which accompany the WM tasks the WMC would take over.

Observing the financial profitability of the project from the waste holder's point of view (the expanded FNPV), then the outcome is different because the scenario S2 brings along increased costs (investments, loan interest, V.A.T) while the scenario S1 delivers to the inhabitants the majority of the benefits arising from the implementation of the project with less expenses.

3.2.2 Qualitative risk assessment

In the table 4 some selected and most important risks are presented which realisation may affect the results of the project in a negative way. The risks are provided with the countermeasures which would mitigate or eliminate the impact and probability of the realisation of the risks.

Table 4. Selected risks, their impact, realisation probability and countermeasures [Jarve, 2012, 64-66]

Risk	Impact	Probability	Score	Explanation and countermeasure
Some municipalities are not willing to cooperate – the project may become more expensive for the incorporating members, or the expected market share cannot be gained because the procurements cannot reasonably conjoined.	5	4	20	It is an important risk. The only reasonable countermeasure is communication between and within the municipalities and explaining the benefits of cooperation. Both the project team and HOL must contribute to this.
There will be more opposition and suing of the OWC procurements which will cause the delay of the launching the WMC and the advanced OWCS.	4	5	20	The impact is big and probability very high, but the problems can be anticipated and mitigated by highly professional and juridically reliable public procurement documents.
Separation of waste collection company and customer service (scenario S2) brings along the communication issues and the service quality may drop, especially in the phase of launching the project. The clients are not satisfied and the qualitative benefits will be not realised.	4	4	16	Such developments have a big impact and without countermeasures the realisation probability would be also high. To avoid it a quality management system should be implemented where all the procedures are described in details.
Lots of overdues and delayed payments or bills unpaid by waste holders, which increases the need of circulating capital and decreases the profitability of the project.	4	3	12	The impact would be big and probability moderate. The countermeasure is careful planning of the finances, also strict supervisory and prosecution in cooperation with municipalities.

3.2.3 The qualitative benefits arising from the project

Both of the project scenarios are financially and socio-economically beneficial compared to the base scenario S0, yet there are some important qualitative impacts which emerge especially in case of scenario 2:

1) All the WM services are provided by the WMC, one and stable contractor for a long time. WMC provides the waste collection and treatment service, customer service and call centre, advising, counselling and other WM information, including source sorting, OWC service details, billing, solvation of the current problems and complaints on the waste collection etc. Waste holder has a single contractor for all the WM services regardless the waste collection enterprise may change in every five years due to the public procurements. For all the WM services there are unified and systemised website, message and graphics.

2) The quality of the WM services improves. There are unified waste collection service quality, conditions and fees for all the WM services in all the waste collection districts. The waste collection service will be equally available for a fair price all over the county both in village centres and periphery, independent on the waste collecting company or waste collection district. The quality, conditions and fees of the public collection network for source sorted waste and recyclables will be unified. The WMC is responsible for the quality of the WM services.

3) The cash flow is transferred through the WMC. It is a key factor for the local authorities that the scenario S2 enables to launch a new financial source for some of the waste management public services. Savings in the administrative costs arise from the consolidation of the supporting services and economy of scale. WM service fees are transparent, all the components of the waste collection and treatment costs are separated, services are procured by WMC. Some of the expenses of the public collection network are integrated to the waste collection fee, thus the waste holders are motivated to sort waste and use the public waste stations or collection points.

4) Public network of waste stations and collection points is unified regionally. The network of public containers, collection points and waste stations is optimised geographically. Conditions and information about the source sorted waste and its acceptance are unified all over the county.

5) Supervisory becomes more efficient. The WMC can provide the municipality with immediate input for supervisory and procedural act. The debtors will be not only left out from the waste collection service but also prosecuted.

If the local authorities consider the qualitative impacts arising from the project sufficiently important, then it would be reasonable to implement the scenario S2, if not then the results of the financial analysis support the implementation of the scenario S1.

4 Summary

The benefits, regardless of which project scenario would be implemented, arise mainly from three circumstances:

- the improvement of the administrative efficiency: the WMC is capable of doing the work of the municipalities with less number of employees;
- the optimisation of waste collection logistics and transportation – instead of 23 municipalities and waste collection districts, the enlarged over-boundary waste collection districts are formed between several municipalities;
- tighter competition at the public procurements – the separation of waste collection and treatment services enable smaller transportation companies to enter the waste collection market, breaking down the vertical monopolies.

From the aspect of local authority both scenarios are worth of implementation – the FNPV is bigger than zero in both cases, meaning the municipalities can financially benefit from the reorganisation of WM either according to the scenario S1 or S2. Considering the financial indicators only and presuming that to a local authority financial benefit for the inhabitants is the priority, then the scenario S1 should be implemented. However, the scenario S2 involves several qualitative advantages, which also should be considered. For a municipality it is definitely important, that the scenario S2 enables to launch a whole new financial source (waste collection fee where to some of the WM cost are integrated) for the WM tasks thus freeing the budget for those expenses. In addition, there are several qualitative advantages which unfortunately were not possible to evaluate quantitatively but which occur better in case of scenario S2.

In terms of scenario S1, the benefit is 1.2 million euros, which arises from administrative efficiency, since the WMC can do the same work with fewer officers. In scenario S2, the financial benefit for the municipalities is even bigger, approximately 4.7 million euros, mainly due to the integration of the public service costs that are financed by the municipalities to the waste collection fees, while the income of the municipalities does not decrease as a result of this transmission.

The financial profitability (expanded FNPV) for the waste holders is different from that of the municipalities. The implementation of scenario S2 is accompanied by larger costs (investments, loan interest, VAT) while scenario S1 could provide most of the benefits arising from the reorganisation of waste management through the WMC, with less expense.

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