OVERCOMING WASTE MANAGEMENT INEFFICIENCIES:

A COMPARATIVE CASE STUDY BETWEEN

SEOUL METROPOLITAN CITY, KOREA WITH TASHKENT, UZBEKISTAN

By

HUSAN, Haydarov

THESIS

Submitted to

KDI School of Public Policy and Management

in partial fulfillment of the requirements

for the degree of

MASTER OF PUBLIC POLICY

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Approval as of December, 2013

ABSTRACT

OVERCOMING WASTE MANAGEMENT INEFFICIENCIES: A COMPARATIVE CASE STUDY SEOUL METROPOLITAN CITY, KOREA WITH TASHKENT, UZBEKISTAN

By

Husan Haydarov

The efficiency and organizational issues of Uzbekistan's waste management system (WMS) have led to challenging new ecological and environmental problems for the main cities and industrial zones of the country. This thesis highlights practical policy and technology reforms that could ameliorate this situation through a comparative case study with the successful WMS model South Korea. Using archival research and semi-structured interview methods, this thesis underscores current structural and organizational challenges of the Uzbek WMS while offering realistic solutions based on South Korean WMS protocols. Detailed research reveals that three main policies turned the Korean model from one of the worst WMS systems to the one of most efficient and effective systems of the World. The conclusions of this research reveal that Volume-Based-Waste-Fee (VBWF) system, the next is Extended Producer Responsibility (EPR) System and the last one is expansion of waste treatment facilities. With these findings, I suggest WMS reforms to the Uzbek government.

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Chapter I

Introduction

> Today no one can deny that the international community recognizes our successful movement towards our great objective - to join the ranks of modern developed democratic states, build a civil society, modernize our life and diversify our economy. And no one can deny the fact that the potential of our Homeland, our material, economic and intellectual might continue growing, our towns and villages are changing and ever prospering.
>
> *--Islam Karimov*
> *President of the Republic of Uzbekistan*

Currently, Uzbekistan is applying different projects for the improvement and the development of infrastructure of the country. Enhancement of waste management systems is a key priority. The waste problem is becoming one of the most important issues in Uzbekistan because the current level of waste production output is at an ever increasing high volume. In addition to managing waste, the benefits of recycling would reduce the need for primary natural resources in manufacturing, reducing the problem of resource depletion and economic issues related to resource procurement. With resource conscious policies paired with environmental protection, measures could improve living standards and establish safe environmental norms, fully recognizing the potential of Uzbekistan.

The normative developmental models indicate that process of developing economy requires the reformation of waste management models towards more efficient models. Improper treatment of waste could cause catastrophic effects such as the spread of deceases or pollution of environment. The current system of waste management system of the country uses informal methods of waste disposal, (as translated from the colloquial Uzbek, “Just hiding from the eye”) by dumping waste into any landfill sites which far from the city. As soon as these sites become full, formal and informal city dumping migrates to another site. If this process continues, the environmental, health, and economic outlook is dire..

With these benefits of reform and costs of complacency, the government of

Uzbekistan could learn from other national WMS systems in order to develop sustainable practices. There are many countries currently using efficient models of waste management, in which the use of landfills is minimal. But among these countries, one of the most efficient and cost effective systems is that of South Korea. Further, Uzbekistan has strong relations with South Korea in a variety of sectors, making knowledge sharing ideal (Press Service of the President of the Republic of Uzbekistan 2013). In truth, South Korea is one of the leading countries of the world on the field of waste management. From 1995 continues changes in Korean WMS as well as implementation of three major policies Volume-Based-Waste-Fee (VBWF) system, Extended Producer Responsibility (EPR) System and expansion of waste treatment facilities made the country one of the leading countries of the world. According to Waste Management World (Waste Management World 2012) Seoul produced 185 billion won ($165 million) worth of electricity or 1.33 million barrels of crude oil from its household waste in 2011. Using the energy generated from waste, Seoul supplied with heating 190,000 households, or 14% of the city's population. By 2030, South Korea is projected to become one of the world's top five green economies if they will increase current energy generation from 2.5% to 10% from wastes. These facts, *inter alia,* make the South Korean WMS an ideal model for Uzbek WMS development.

Research Question

The purpose of research is to analyze and evaluate the Waste Management system (WMS) of Uzbekistan and by studying the successful practices of Korean WMS in order to make reform recommendations for Uzbek WMS. The central questions include:

1. How best can the city administration in Uzbekistan reduce landfill inputs, increase recycling and decrease cost of WMS?
2. What are the benefits and costs of the South Korean WMS model?

3. What aspects of the South Korean WMS model provide solutions for the Uzbek model?

Developmental Issues Specific to Uzbekistan

There are the three major causes for the Uzbek WMS stagnation. The first, the current system of WMS of Uzbekistan needs improvements to organizational efficiency in gathering, removal and disposal of solid waste. A second primary issue is the fixed payment system for solid waste, which is not effective. Unlike that of South Korea, the current Uzbek system does not take volume into account. The third technical issue centers on an insufficient number of special machines and appliances for waste recycling and similarly an insufficient number of trained specialists and professionals for Uzbekistan WMS.

Why South Korea?

The information agency "Uzbekistan Today" on their article "Waste into Revenue" argues that South Korean R&D Center for Valuable Recycling and the Chamber of Commerce and Industry of Uzbekistan organized workshop about recycling waste in the capital city of Tashkent. During the workshop both sides discussed the importance of recycling, the improvement of the country environment, as well as problems and perspectives of WMS of Uzbekistan (RasulovHurshid 2013). From this cooperative meeting, Uzbekistan signaled that waste management would become an avenue for strengthening Korea-Uzbek relations.

This information stated above will give the hope for the research paper that, in the end, the results of the research could be unified and implemented by the government of Uzbekistan.. For the future success of the paper we need to find connection point which can identify the relations or similarities that can unify the Korean experience to Uzbekistan. The following table shows the similarities of both countries in different times but the same type of issues. The table is proof that Korean has same kind of problem with same kind of symptoms.

Table 1: Similarities of both models in given parameters

Issues	Korea before 1995	Uzbekistan in 2013
High level of waste per capit a	1.3 kg	1.2 kg
Low level of waste recycle	23.7%	15-16%
Increase of landfill areas	Nanjido 1978-1993 closed because of Overloaded dump 92 mln. m^3	Zangiota and Hasanboy (2004) landfills closed Because of overloaded Dump
Social issues	NIMBY Syndrome, Public awarenas	
Payment system	Fixed payment	
Financial support	Heavily dependent to government support	
Environmental issues		**90%** of currently working la ndfills and dumps are in poo r condition. (165 out of 182)
Other issues	Illegal dumping	

The upper listed issues of the table are the main parameters of Korean and Uzbek waste management systems. The table shows that both countries had an ineffective management system at one point. But Korea, had a turning point. As of 1995, Korea implemented ground breaking systems for his WMS model. The further detailed discussion of this data will be given Korean Model chapter of the research.

Research Method

This research examined the models of Waste Management Systems by using Archival research methods for both Seoul and Tashkent models. In addition, focused (Semi-structured) interviews with relevant experts underscored the efficiencies of the Seoul WMS model.

Archival research involves seeking out and extracting evidence from original archival records. These records may be held either in institutional archive repositories, or in the custody of the organization (whether a government body, business, family, or other agency) that originally generated or accumulated them, or in that of a successor body. McCausland (2011) in his article “A Future without Mediation? Online Access, Archivists, and the Future of Archival Research” argues that the new era of researchers cannot be described without digital archival data. The author argues that this is good chance for any researcher to get any important data from the any point of the world, so my condition also the same as he described in this article and for my research most of the documents are the digital copies of original documents because of the distance which separating me from some source of data. In the Literature Review section, I will give brief summary of Archival documents which has been used during the research. Also will be described the necessity of those documents for the current research.

Focused (Semi-structured) Interview model were used to collect qualitative data on Korean WMS models and management. In order to make the thesis more realistic I decided to have interview from real players of the WMS system. Seoul City Government and Korean Environmental Corporation (KECO) could be best representatives for the paper because both of these organizations play important role in WMS of Seoul. Both organizations are the part of Korean Government waste management model. The semi-structured interview methods allowed my respondents the time and scope to talk about their opinions on particular questions and which gave me the answers which describe overall model and the how the model works. The set of the questions of interview can be found in the appendix.

Literature review

The necessity of efficient models of waste management systems in Uzbekistan has

become a hotly debated topic for the country because of an increase in the volume of solid waste due to the high dynamics of urbanization, sustainable population growth, internal migration and improvements in the living standards of the population and dealing with problem of waste became everyday task of local governments. Critics from the public of large cities accuse local officials for not putting in place the waste management system as well as everyday collection and transportation of waste out of city and end disposal. During the current chapter we will investigate the regulatory documents of Uzbek WMS which coordinates local officials of the system. And we will review different models that currently using in different countries in order to solve the WMS problems.

For the solution upper listed problems first of all we have to study the regulatory documents of WMS of Uzbekistan such as National Law "About Waste" (National database of Information Search System of the Republic of Uzbekistan 2002). According to the law the obligation on municipal waste is under the control of municipalities of Uzbekistan. And every municipality or city administration has right to choose how to solve municipal waste problem. Therefore the governor of Tashkent city accepted resolution "Additional measures to improve the sanitary and epidemiological conditions in the city of Tashkent, and maintaining the cleanliness of the territories decision governor of Tashkent" (R. Usmanov the Governor of Tashkent city 2012). that plays regulatory role and sets new order for the waste management system of Tashkent city. Under the regulation government applied curbside collection scheme[1] whereas the waste management companies collects the garbage from

[1] Curbside (kerbside) collection of waste is a service provided to households, typically in urban and suburban areas, of removing household waste. Kerbside collection is considered a low-risk strategy to reduce waste volumes and increase recycling rates. Materials are typically collected in large bins, coloured bags, or small open plastic tubs, specifically designated for content (wikipedia 2013).

specific places or waste collection points and collects them only if the garbage is separated into different colored bags (R. Usmanov the Governor of Tashkent city 2012). .

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However government of Tashkent city could apply other alternative method waste collection. The best alternative could be automatically separation of waste in materials recovery facilities[2] as in USA. The method is implemented in US in 1970 and still one of the best alternatives of WMS of United States (Logsdon 1993). The implementation of the scheme could be easier and more convenient for both public and administration. Because the current scheme collects all mixed waste out of the city and separates it in special plants into general for disposal and recyclable waste. But the main disadvantage is high cost for the public and government because of the necessity of building of high cost plants which require huge labor force and high technology.

Investigation shows that the regulation of the Tashkent city governor "Additional measures to improve the sanitary and epidemiological conditions in the city of Tashkent, and maintaining the cleanliness of the territories decision governor of Tashkent" has similarities of new Korean WMS model which is created under Volume Based Waste Fee system policy that has been implemented in Korea in 1995. Ministry of Strategy and Finance of the Republic of Korea together with KDI School of Public Policy created a book about "Volume-based Waste Fee System in Korea". The book covers all necessary sources for the creation of new WMS model of Korea. The book describes the history of the policy which is implemented in 90's in order to solve such problems as high volume of waste per capita, to reduce the landfill use for waste disposal, encourage the recycling business and many other

[2] Materials recovery facility is a specialized plant that receives, separates and prepares recyclable materials for marketing to end-user manufacturers (Wikipedia 2013)

solutions that the country face during it high rate of production and urbanization. Also the book gives analyses of successful and failed practices and real cases and stories of WMS model of Korea. Main similarity of the current policy is Korea also successfully applied curbside waste collection system in range of short time. But Korean model differs from Tashkent with its simplicity and efficiency.

Another important document is the article of the Republic of Korea “The Extended Producer Responsibility System” (MOE of the Republic of Korea 2003). This document describes the new regulation which is implemented in the country in 2003 which sets obligation for the producer for the entire life of product from the production to disposal. The main of challenging part for the paper is the regulation played significant role for reduction of the waste and the increase the level of recycling in the country.

The last main source for the research is the interviews of with Waste Management Division of Seoul City Hall and Korean Environment Corporation (KECO). The usefulness of the source is they are real time and up-to-date. Specifically the interview results of the KECO gave the new discovery for research where the respondent gave set of documents where he explained the importance of expansion of waste treatment facilities in Seoul and other main cities of Korea.

Chapter II

Uzbek model of Waste management system

This chapter focuses on the overall structure of WMS system of Uzbekistan. The chapter will describe you the current condition of Uzbek WMS system by using several statistical data of different organizations that made research in this field. The chapter also will investigate the organizational structure of the system and its legal bases including current rules and regulations of WMS, which are important parts of overall waste management system.

The Economic Review Journal of Uzbekistan explains that (Norov 2011) in rapidly economically developing and demographically increasing cities of Uzbekistan are giving very small attention to waste management. He compares outcomes of the WMS model of Uzbekistan to European Union countries WMS models. As an example, the author notes that only 5-6% of the Tashkent waste is recycled, whereas in the European Union it exceeds over 40%. Through such examples, the author explains that the government of Tashkent dumps too much waste; instead, the government should use other means of disposal such as recycling or incineration of the waste. The main point of the article is to reform the current WMS model of the city which mainly solves waste problem with dumping. The reform should change the waste to energy.

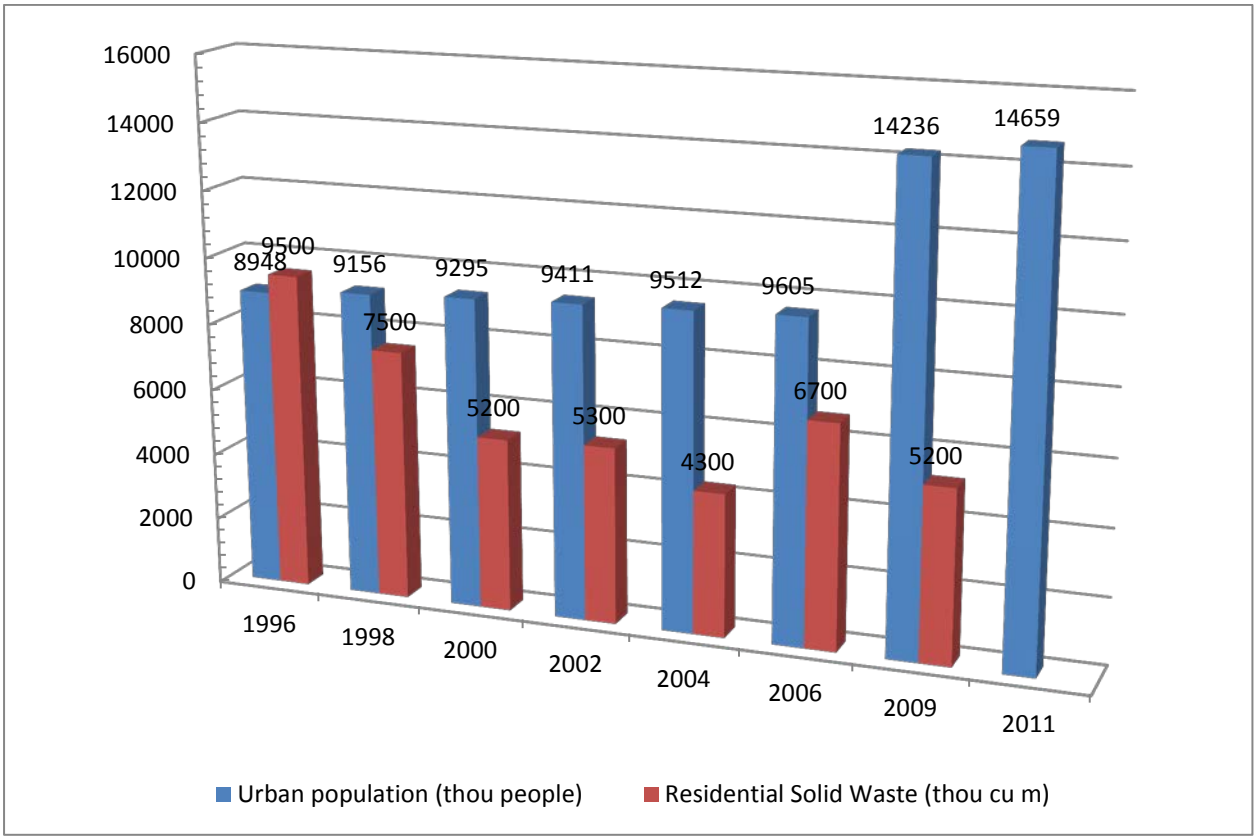
Researchers from the Center for Economic Review also give Demographic and GDP indicators (Table 2 and Figure1) and relation of waste to these factors. Both the table and diagram show that the only the amount of waste delivered to landfills and it varies between 3.4 and 9.5. For the description of the tables the authors state that the most of the waste are coming from the Tashkent and they forecast that in 10 years the volume of the waste to landfills can increase up to 30% (Center of economic review of Uzbekistan 2011/06).

Table 2: Dynamics of Growth in Population, GDP and City RSW during 1996-2010 (Center of economic review of Uzbekistan 2011/06) p. 78

Years	Average listed urban population (thousand people)	GDP growth (%)	RSW, collected and removed to landfills (million m^3)
1996	8,948	1.7	9.5
1997	9,063	5.2	9
1998	9,156	4.3	7.5
1999	9,235	4.3	5.7
2000	9,295	3.8	5.2
2001	9,357	4.2	4.6
2002	9,411	4	5.3
2003	9,451	4.2	3.4
2004	9,512	7.4	4.3
2005	9,565	7	3.6
2006	9,605	7.5	6.7
2007	9,648	9.5	7.9
2008	9,698	9	-
2009	14,236	8.1	5.2
2010	14,596	8.5	-
2011	14,659	-	-

Source: compiled using data of State Statistics Committee, "UzKommunHizmat" Agency, and region (Oblast) administration reports

Figure 1: Dynamics of Urban Population (thousand people) and Increase in Residential Solid Waste (thousand cu m) (Center of economic review of Uzbekistan 2011/06)p.28



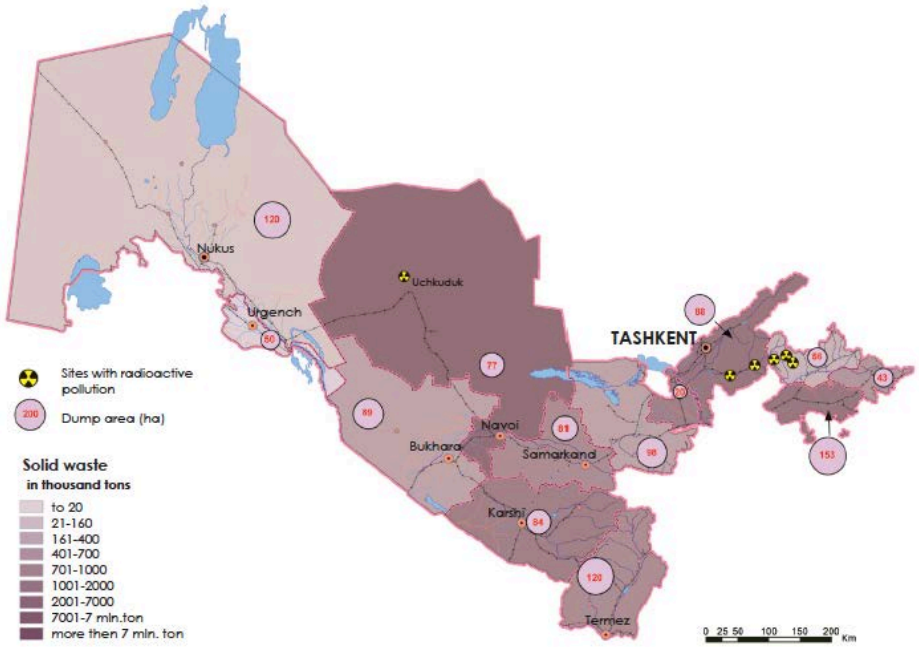
Source data 'UzKommunHizmat'Agency.

Most of waste is dumped to landfill sides which are located around main cities. From the Figure 2 also shows the hazardous radioactive waste, and location and approximate amount of waste, the size and area of the landfill sites. According to the research group general condition of those pictured landfills and dumps of Uzbekistan are as follows: Currently in the territory of the Republic of Uzbekistan operates 182 landfills for gathering and recycling waste dumps, 142 of which are public owned and 40 of which are privately owned. The total capacity of the landfill is 34.5 million m^3, including 27.4 million m^3 of public and private 6.8 million m^3. Total area of landfills and dumps is 629.2 hectare and 151.8 hectare respectively, and only **7.5**km fenced of 101 km perimeter of the landfill. Researchers of Center of economic review argue that the selection of lands for dumps agreed, with the authorities of Sanitary and Epidemic control agency although the range of disposed wastes not installed. As a result, in the majority of this landfills disposal and utilization technology are not exist. Only

38 (or20.8%) of 182 objects has acceptance and control of solid waste centers are organized, and only 17 equipped with weighing technology. 90% of currently working landfills and dumps are in poor condition. In most of them, the sanitary and environmental requirements are not followed. Incoming waste is compacted and partially covered with soil, composting is carried out without compliance production schedules, which have a negative impact on environment (Center of economic review of Uzbekistan 2011/06). The main argument of the researchers is the landfill sites are abandoned and deserted from the control of the local authorities of Sanitary Epidemic control agency and local governments that eventually leading to environmental catastrophes.

The description of the research explains that even if the WMS relies on dumping in landfills, the landfills are not ready or is not in the condition of to accept all the amount of waste. This research also indicates that local governments do not giving proper attention to the conditions in those places. Finally, these conditions can lead to epidemical catastrophes, hazardous environmental accidents as the pollution of underground waters, spread of deceases, CO2 or other greenhouse gas emissions.

Figure 2. **Allocation of solid industrial waste volumes by the regions**



(State Committee for Nature Protection and UNDP in Uzbekistan 2008)

2.1 Organizational structure of Waste management system in Uzbekistan

Organizational structure of the system plays important role on overall management. Table 3 gives us detailed review of organizations structure and institutional level of the WMS of Uzbekistan. Also the table shows the roles and responsibilities of those involved organizations during the management process.

Table 3: Roles of Different Institutions Responsible for Municipal Solid Waste Management in Tashkent (ADB 2012)

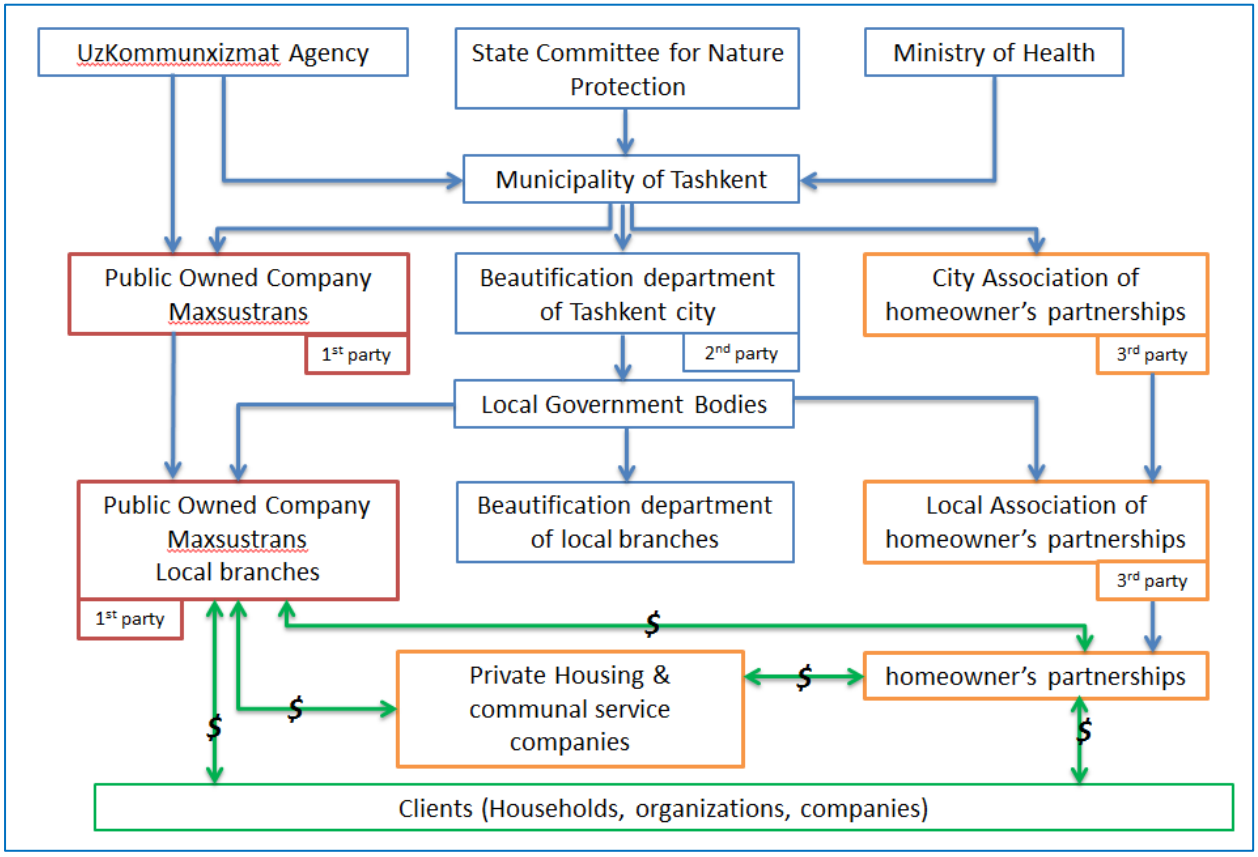
Institution	Roles and Responsibilities
State Committee for Nature Protection (Goskompriroda)	o Oversight of businesses generating industrial and agricultural waste, companies – waste management operators, facilities for waste management maintains the State Cadastre of landfills and waste processing facilities o Conduct of environmental examination and assessment for research and development as well as project design and cost estimates in the area of waste management o Regulating authority for implementation of all activities according to environmental laws and regulations o develops and approves waste generation norms and waste disposal standards o develops and approves waste disposal quotas
Ministry of Health	o State Sanitary oversight of compliance with the Laws on State Sanitary oversight, on Radiation Safety and on Public Health o Establish sanitary norms and rules for waste management; issues state sanitary and hygienic examination report on waste facilities o Monitoring and implementation of the rules and regulations pertaining to all solid waste handling activities o Oversight of the separate collection of waste in all hospitals, polyclinics, clinics and doctor's offices
UzKommunxizmat Agency	o Technical regulation of household waste generated nationwide o Develops government waste management programs and submits them for approval of the Cabinet of Ministers o Monitors the state of collection, transportation, recycling, and treatment of household solid waste

Municipality of Tashkent	o Monitoring all activities of the municipal solid waste management system of Tashkent to ensure its stable and smooth operation.
Local Government Bodies	o Participation in nationwide waste management programs; o Approval of local waste management programs; o Promoting business initiatives in waste management; o Making decisions for location of waste management facilities in appropriate areas; o Supervision of compliance with household waste management legislation.
Self-government bodies "Mahalla"	o Participation in addressing the issues of location of waste management facilities in appropriate areas; o Facilitate sanitary clean-up of residential areas and timely payment of fees for collection of household waste; o Perform public oversight of sanitary and environmental state of waste management facilities.
Public Owned Company Maxsustrans	o Coordinate all the activities of solid waste management system in Tashkent o Landfilling Operations at the Akhangaran landfill site o Development of the solid waste framework of the waste management plan o Preparation of an annual waste report o Generate data and statistics related to solid waste management o Consulting services for the erection of waste treatment plants and new technologies for recycling o Transfer and transport all kinds of municipal solid wastes to Akhangaran landfill o Lease vehicles and contract out waste collection to private operator o Supervise, control, and monitor private companies engaged in transfer and transport activities
Public Owned Company Maxsustrans District Garages	o Collection of wastes within the districts o Conclude contracts with private collectors o Conclude contracts with private companies for material recycling within their jurisdiction o Monitor, control, coordinate and supervise all the activities of their districts.

The organizational structure of the system is wide and very complicated. But the major players of the system for Tashkent start from Municipality of Tashkent city. Legal basis of and role of Municipality are given according to the Law "About Waste"(article 11 "The Control of Government in the field of waste management") management and control of solid waste is one of the main tasks of Administration offices of Cities and Provinces of Republic.

(National database of Information Search System of the Republic of Uzbekistan 2002). In order to describe the complicated structure of the system, the following highlights the Byzantine structure of the regulations of and laws of the system.

Figure 2: Overall picture of Waste Management System of Uzbekistan



Currently, the waste management system of Tashkent city 2 main and many small organizations are mobilized to keep the city clean and work with waste directly and local municipalities and NGOs also involved in the system as mentioned in Figure 2. If we watch activities of 3 parties in the Figure 2 of the model, the city looks clean. But in reality the case is not as we imagine. Too many parties, who are operating in same territory to accomplish the same task, to clean the territory, will create another problem, the so called "territorial problem". Among parties arise territorial misunderstandings or "Who cleans where?"

The three main parts are:

The First party - Maxsustrans: A Publicly owned waste management company

The Second party -The Beautification Department of Tashkent city

The Third party- there are about several hundred (<2000>) Housing and communal services companies and partnerships of homeowners in Tashkent city.

But even these two giant companies with help of several hundreds of little organizations are not enough to solve the WMS problem of Tashkent with population of 3 million (officially 2,695,700 as of 2012 (The State Committee of the Republic of Uzbekistan on Statistics 2012) which is 3 times less than of Seoul where 10.4 mln. (Seoul Metropolitan Government 2012)

As described in Figure 2, there are 3 parties working in WMS of Tashkent and all those 3 organizations doing the same work. The following paragraphs will describe each party's obligations in the WMS.

First party: Public Enterprise "Mahsustrans" is a subdivision of the Tashkent city administration office. According to resolution of Mayor Tashkent city, "…additional measures aimed at improving sanitary-epidemiological condition of Tashkent city and maintenance of purity in the territories." The main task of the Maxsustrans are -gathering, removal and disposal of solid waste. (R. Usmanov the Governor of Tashkent city 2012) As of 2011, "Mahsustrans" has annual contract with more than 378,400 agents and 21,252 businesses, organizations, Housing and communal services companies and homeowner's partnerships (Center of economic review of Uzbekistan 2011/06). It means that the first party plays main role in overall system of the city. The obligation of the party covers all the sectors, from gathering to disposal of the waste. But with one exception, the trucks and workers of the company only removes the garbage and wastes which is located inside of their waste collection points[3] and households and all organization also obliged to deliver their wastes to

[3] Waste collection points (places) are the places where the waste collecting containers are located. In Tashkent

the waste collection points. All other wastes or garages out of the waste collection point won't bother them at all. According to Byev Vladimir (2013) the company has enough resources to fulfill their obligation and government of Tashkent city and other international organizations are financially supporting specifically this company.

But the Government created the Second party (Figure 2) so called Beautification department of Tashkent city. The obligation of this party is set according to Resolution of the Cabinet of Ministers of Republic of Uzbekistan on main tasks of the Beautification department is "Sanitary cleaning objects of beautification (sweeping, watering, cleaning, dust control, snow removal, anti-icing, mechanical cleaning of irrigation facilities management and flushing streets) with seasonal requirements." (NORMA Online database 2010). According to the regulation the department and its 11 district branches are also obliged to clean main streets and roads of city additionally to his main task. It means that, the 2nd party also obliged to do partially WMS obligations to their main of main streets as removal and disposal of the waste. These obligations of second party conflict with the obligations of First party, which only differs with tiny lines between territories. And the first party is automatically excluded from removal and disposal of the wastes comes out of the streets of the Tashkent city based on the regulation of the Cabinet of Ministers (NORMA Online database 2010). As the second party is branch of Tashkent city government, all the financial expenses are covered by the government budget, which comes from tax payments of public. Because of these two parties the local government authorities sometimes face with problem as conflict of obligations and territorial dealing problems. For example, the waste which is located in some parts of the city is not managed by any of these parties and it will stay until

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709 protected and 395 regular waste collection points, with 6300 containers and 3000 containers located in territories of private or government organizations. 348 special trucks of "Makhsustrans" Public owned Company (POC) currently working in overall the city (Byev 2013).

government intervention of the conflict between these two parties. First Party (Maxsustrans POC)does not deal with that waste which is located between the territories as they consider that the waste belongs to Second party (Beautification department) However the second party consider the place where the waste is located as is not their territory and it is not the second parties obligation to deal with it. The problem seems small but it is significant for the city environment.

The Third party (Figure 2): Housing and communal services companies and partnerships of homeowners of Tashkent city. In 2006 Parliament of Uzbekistan adopted new Law "About Partnership of Homeowners" the main Goal of the law is given in the 1st Article: "The purpose of this Act is to regulate relations in the establishment and operation of Partnership of Homeowners in apartment buildings is a voluntary association for the joint management and support the content, preservation and maintenance of the housing fond" (National database of Information Search System of the Republic of Uzbekistan, 2006)(p.1). In other words Partnerships of homeowners (PH) is an association of owners of private residential in one or more compactly arranged apartment buildings, united by a common land with elements of improvement. According to law of homeowner's partnership one of the main task of partnerships is sanitary cleaning of apartment building and attached territory of building (National database of Information Search System of the Republic of Uzbekistan, 2006)(p 11-13). According to the law these partnerships are obliged to control up to 7 apartment buildings and including wastes and beautification of the territories of the apartments. It explains that the other territory out of waste collection points and street are under the obligation of Partnerships of homeowners. From example given by Gazeta.uz (photo 1) it is clear that some residents of the city drop their bag of waste where it is convenient for them. They drop their waste before the street or around their apartments instead of deliver them into waste collection points. And this causes extra problem for PHs

because they weep and clean the attached territories out of waste, leafs and branches of the trees. So, for these services they gather from the public some fixed amount of money in each month.

Photo 1: Waste collection point in Sergeli district of Tashkent city (gazeta.uz 2012).

Plus, to all the structure (Figure 2) there is also one important player of the system which is part of the Third party, because they directly works with only Partnerships of home owners (the Third party). They are called, Housing and communal services companies (HCS companies) .

Housing and communal services companies (HCS companies) are the companies who made contracts with several Partnerships of homeowners (PH) in order to accomplish their tasks as well as sanitary cleaning of apartment buildings out of waste and attached territories of buildings. These companies can set contracts with PH according to how much land they control. Sometime they control whole blocks where number of apartment buildings can reach 50 (or 10 PH) and territories can be more than 50 hectares. They have right to buy

own waste collection and transportation truck and or they can just contract with First partyfor transportation.

The Association of homeowner's partnerships which is also takes place in Figure 2 is the association who controls and helps both PH and HCS companies in different issues, from financial consultation to transportation of solid wastes by contract.

Legislative chamber of the Oliy Majlis of Republic Uzbekistan (Parliament) on its official website states that "There are 2,327 partnerships of homeowners providing services to 9107 apartment buildings or 426,797 apartments. The city has 11 Partnerships of Homeowners Association, 158 Housing and communal services companies on a contractual basis with partnerships. To improve the service in Tashkent, the city administration planning to open 83 more housing and communal services companies…" (Legislative chamber of the OliyMajlis of Republic Uzbekistan 2012). This statistical data indicates how the whole Figure 2 is complicated, flush with a host of inside players. . Either The Partnerships (PH) and HCS companies face gross mismanagement or simply do not have the capacity to accomplish their objectives. The first issue is scarcity of the workers. More than half of partnership of Tashkent city has shortage of janitors (yardmen, wiper), plumbers, electricians and etc. The government faces a shortage of qualified workers because of low wages. Accordingly, the Uznews.net argues that "Creation of partnerships of home owners was premature…because low salaries of employees and the inertia of residents to PHs eventually leads to the fact that power of partnerships in the hands of random people who cares more about his own pocket rather than services of buildings…" (Uznews.net newspaper 2012). The reason is that the government cannot provide so many qualified managers for those PH and HCS companies. These partnerships and companies cannot collect the money they desired to collect, and because of financial troubles they cannot pay salaries in a timely basis. This is

one of the reasons they have scarcity of qualified managers and workers. The other reason is the waste management system is not the job city resident dream to get. Because there are some cultural taboos that old people keeps the kids, and new married couples away out of garbage and waste in order not get harmed out of daemons and devils. And people think that working in waste management company is for the needy and poor people. That's why the educated people tries not to combine his/her carrier with these kind of organizations.

2.2 Detailed review of rules and regulations of Uzbek WMS Model

On 5 of April 2002 The Legislative Chamber of Oliy Majlis of the Republic of Uzbekistan (Parliament) adopted new Law "About waste." Goals and objectives of the law are given in Article 1: "The purpose of this Act is to regulate relations in the field of waste management. The main objectives of this Act are to prevent the harmful effects of waste on the life and health of citizens, the environment and reduce waste and ensure their efficient use in economic activities" (National database of Information Search System of the Republic of Uzbekistan 2002). This document is the main document from which the entire system is controlled. The article identifies the significance of the document for the society as whole. All other regulations have basic connection to this law. The law also identifies the obligations and roles of the Central and local governments in the overall hierarchy of the system (Table 2).

Based on the in 2012 Mayor Tashkent city applied new resolution about waste (N579) "About the additional measures aimed at improving sanitary-epidemiological condition of Tashkent city and maintenance of purity in the territories." According to the resolution, only in Tashkent separating waste was accepted. So this system is now is in its initial stage. As it was in Korea, Uzbekistan also started it only in one city and further spread of the system is going to be in the near future. According to the resolution, as of August 2012

residents of the capital city, should start separating the waste for multi-colored bags and throw them into the same colored containers of nearby garbage collection point (GCP). The main purpose of adopted regulation - reducing the harmful effects of waste on human health and the environment, improve the ecological and sanitary-epidemiological situation and the implementation of the system in sorting garbage, its collection and processing with the use of modern technology. Rules should be applied from 01.08.2012 in Tashkent and are considered to be compulsory all enterprises, organizations, departments, agencies, local authorities, property owners and residents in the city and guests of the capital («Газета.uz» 2012).

Let me describe the regulation in detail. It is really important regulation for the development of WMS of Tashkent because according to this regulation all households and organizations should to separate the general into recyclable and non-recyclable waste. In accordance with the regulations, waste must be separated into five species, four of which are to provide plastic bags. For the fifth type of waste - used mercury lamps - are special containers. The separation of waste will help the WMS system to increase recycling rate and decrease landfill dumping rate.

1. Blue bags - for plastic wastes. (Plastic vessels, plastic bottles, etc.)

2. White bags – for paper waste. (Paper products, cardboard and other materials that consists of paper.)

3. Yellow bags - for food waste. (The remains of food, including waste from vegetables and fruits).

4. Black bags - for other waste. Other wastes not covered by the above categories.

5. Special containers - for used mercury lamps. Designed to protect the mercury lamps from destruction and prevent the leakage of mercury into the air, water sources, getting it into the ground, and food products. («Газета.uz» 2012)

The author of the newspaper («Газета.uz» 2012) also argues that in accordance with the requirements of the regulation, the legal entities and individuals themselves sort waste and store them on their territory, according to the rules of sanitation and hygiene. Waste should be thrown in a specially designated area of garbage collection points (GCP). The regulation strictly forbids throwing the garbage outside the buildings territory and GCP. Also the regulation separately, emphasizes the inadmissibility the discharge of any garbage from the windows of a moving vehicle on the road. All GCP in the city should have a defined boundary and meet the established health and safety standards and requirements. Furthermore, they must be provided with the necessary number of containers for different kinds of waste (colored bags). The sorted waste in colorful packages should be placed in the container of the corresponding color. For example, white bags going white containers, blue bags in blue containers, –and so forth. A special place will be allocated for containers with used mercury lamps. Construction debris, tree branches and similar waste should be disposed of in specially designed for this place on the basis of the contract of businesses and individuals now for garbage collection or separately hired a special transport (of “Maxsustrans” company special containers or trucks). Mix construction debris with household waste is prohibited («Газета.uz» 2012). The main concern of this part of the regulation is that the general waste which has separated in the bags won’t be mixed with each other in further steps of the process. The advantage could be seen in the length of the time on the improvement of environment and increases of recycling rate.

Another paragraph of the regulation dedicated to responsibility for violation of emission of waste, timely manner collection and disposal of waste materials. The importance of the current paragraph, it describes the economic santions for the violators of the current regulation. the economic sanctions is always main tool of any policy maker otherwise they cannot achieve the subordination of the rule. According to this paragraph those who violated the requirements of the law "On Waste" of the Parliament (April 5 2002) and approved by the rules, and do not carry out their functions relating to waste are responsible in accordance with the Code of Uzbekistan on Administrative Responsibility. For further understanding I want to emphasize the minimum wage amount for the 1 September of 2013 is equal to 91530 Uzbek som as of 15 August 2013 year (President of The Republic of Uzbekistan Islam Karimov 2013), which is about 43.08 USD according to exchange rate for 27.08.2013 (Central Bank of the Republic of Uzbekistan 2013). So under Article 53 of the Administrative Code violation of sanitary laws, health standards, rules and hygienic standards punishable by a fine on citizens from 1 to 3, and on officials - from 5 to 10 times of the minimum wage (MW). Article 91 of the Code says, for violation of environmental regulations for transportation, accommodation, recycling, disposal of industrial, municipal and other wastes there is a penalty for citizens from 1/3 (30% of MW) to 1 MW, and officials - from 1 to 3 minimum wages. Repeated violation within a year will cost a fine of from 1 to 3 times the minimum wage for citizens and from 3 to 7 times the minimum wage for government officials. According to Article 123 of the Administrative Responsibility Code of throwing garbage or other items from the car or of a train, road and municipal transportation punishable by a fine ranging from 1/10 of MW to 1/2 of the minimum wage. Article 161 of the Code provides responsibility for violation of the Beautification of the city, as well as non-compliance with rules to ensure the cleanliness and sanitary order in the form of a fine on citizens from 1/2 of MW to 1 MW, and government officials - from 1 to 2 times the minimum

wage (The Legislative Chamber of Oliy Majlis of the Republic of Uzbekistan (Parliament) 1995).However, the economic sanctions of the regulation are not strong comparing to Korean WMS (Kim and Kim 2012) (p. 77) and they are more confused, hard to follow for the reader.

Also in the regulation the obligations and instructions for the processing and delivering of waste bags are given. The regulation says that according to the decision of the Council of People's Deputies of the Head Department of Beautification bureau and Khokimiyats (district administration) of Tashkent city jointly with the Department of Architecture of the city are obliged to provide the design, manufacture and installation of the establishment of modern garbage bins on the streets and public places of Tashkent. Same time the regulation (paragraph 12) obliges the Department of Economics, Department of Commerce of Tashkent and Khokimiyat (District administration) of the city and the Chamber of Commerce is tasked to develop, together with local producers, to develop the production of packages in required colors and the organization of sale of those bags in all shops of the capital to the public at affordable prices (R. Usmanov the Governor of Tashkent city 2012). Nevertheless, the process is still in stagnation. Even though, the delivering of the waste bag is main point of the current regulation or the start of the new system.

After this detailed review of the regulation, it is become clear even the regulation is very similar to the VBWF system of Korean WMS model but the main difference is the regulation of Tashkent WMS system does not exclude the household and organizations of Tashkent city out of the payment for the waste as it is in Korean WMS model. Where as in South Korea, households and organizations are not be charged for the waste after they switched to Volume Based Fee System (Further detail of the system will be described in next chapter). The waste charge is already included in price of the bag. And this is an incentive for the public to use waste bags instead of paying fixed payment even for the amount they never

waste. The whole point of the regulation of Tashkent city about the bag is just to enforce the public to separate the waste to make convenient for waste management companies to separate the waste recyclable types from general. It means the public is paying money for the waste by purchasing separate bags. If citizens separate out recyclables into designated recycle bins, they will not need to pay as much for their waste disposal, thus rewarding citizens for separation.

2.3 Inefficiency of functioning WMS under Uzbek model in example of Tashkent city.

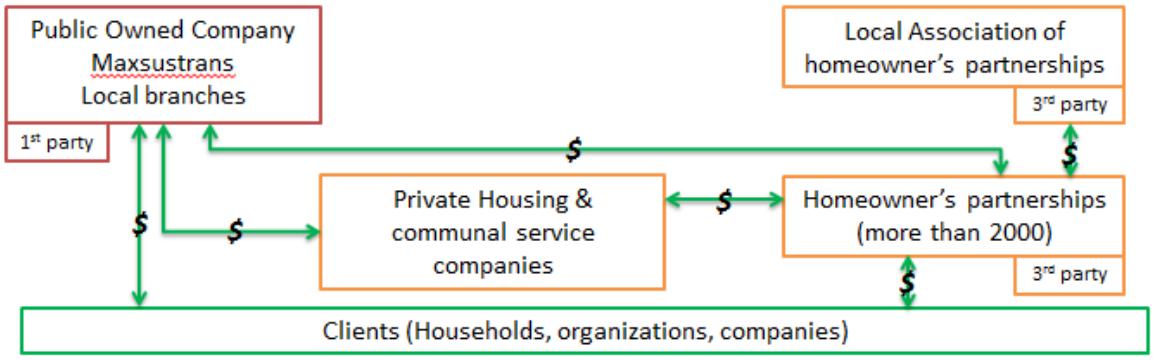
Three areas of the Tashkent WMS exhibit cost and functional inefficiencies:

Initial problem is the Organizational (territorial) and structural problem. The problem results from the absence of direct synchronized links of three parties: “Maxsustrans” Public owned waste management company (First party), Beautification department of Tashkent city (Second party) and Housing and communal services companies and Association of homeowner’s partnerships (Third party) who are directly working with waste gathering, removal and disposal of solid waste. The obligations of each party should be defined by structural bases, not by territorial bases.

Other inefficiencies of the system can be identified in payment system. Figure 3 highlights the complicated system of payment for waste collection problem. In this Figure 3 it is hard to follow the flow of money from Clients to the service providers. So it is better to follow from the service providers to the client in order to understand why and how the public paying money for the waste. The First party directly gets money out of clients, in fixed amount accordin to the Table 4 for the removal, transportation and disposal of the waste out of the garbage collection points by using their own force. The second party is not shown in the figure because the Beautification departments are financed directly by government. And

the third party collects money in fixed amount (Table 4) from the public for the collection and removal of the waste under their disposal by using own force or by using Private Housing and communal service companies (PH&CSC) and for the transportation and disposal of the waste they pay for the First party or again to PH&CSC. Payment system of waste is inefficient because citizens fail to understand the payment structure.

Figure 3: Structure of payment system



This structure is broken down by proportionate costs in Table 4[4].

Table 4: Waste fee system (mezon.uz 2013)

First party-POC Maxsustrans		
Households per person (per year)	27,600 soum	$12.6
Government organizations (per ton)	7,047.8 soum	$3.21
Private organizations (per ton)	8,037.6 soum	$3.67
Third party- Homeowner's partnerships (approximately ~25% of total money charged for the whole service are allocated for removal of waste)		
Households per year	~48000 soum	~$22
Government organizations	no money charged	
Private organizations	60000 soum	$27

[4] There is no data about payments between Private Housing & communal service companies Homeowner's partnerships.

Chapter III

Study of Korean WMS model

Implementation of three main policies of the Korean WMS model has dramatically improved this system. They are first of all “Volume-based Waste Fee System in Korea” (KimKwang, KimYoon Jung 2012). The second is “The Extended Producer Responsibility System” (MOE of the Republic of Korea 2003), and the last important policy is expansion of waste treatment facilities. Let’s review each of the policies and the share them in the whole development process in detail.

The Ministry of Strategy and Finance of the Republic of Korea together with KDI School of Public Policy created a book about Volume based waste fee system implementation (1995). According to UN website report “In particular, the amount of landfill and incinerated wastes has greatly decreased since 1995 due to the continuous increase in recycling caused by the implementation the Volume-Based Waste Fee System”_According VBWF System, households and small sized commercial sectors are required to purchase specified bags to throw away their garbage, thus waste collection fee is charged in proportion to the amount thrown away (KimKwang, KimYoon Jung 2012),

Extended Producer Responsibility (EPR) System: The EPR System holds producers accountable for the entire life cycle of their products in order to incite innovation in product design, materials use, and business management through economic incentives (MOE of the Republic of Korea 2003)

Expansion of Waste Treatment Facilities: According to KECO (Lee 2013) explained the importance of Expansion of Waste Treatment Facilities in Seoul and other main cities of Korea. After the government decision of expansion of waste treatment facilities in

every huge city has opened as Incineration, Mechanical biological treatment or Landfill Gas Power plants. Which turns the waste to energy.

In the following parts of the chapter we will review of each policy in detail by examining structural changes and differences from the previous system. I will paraphrase each change, significance and the main achievements of the system by taking examples from historical data. At the end, I will give my own comparison analyses by comparing similar parts of Uzbek WMS model to Korean WMS model.

Volume-Based Waste Fee System in Korea

In 1995 in order to solve the WMS problems such high level wastes, landfill size, and the high cost of developing the waste recycling sector, Korea applied new Volume-Based-Waste-Fee System (VBWF). According to the system households and small sized commercial sectors are required to purchase specified bags to throw away their garbage, thus waste collection fee is charged in proportion to the amount thrown away. Before the system applied Korea had waste collection fee was charged on a fixed rate through property tax or monthly fee regardless of the amount disposed (53). (KimKwang, KimYoon Jung 2012)

The main achievements of VBWF System:

- **Reduction of waste** from 1.33kg to 0.99 kg per person as of 2006 (Ministry of Environment of the Republic of Korea 2006);
- **Increase in recyclable wastes** from 26% in 1994 to 213% in 2006 or 27900 tons per day from 8927 tons per day (Ministry of Environment of the Republic of Korea 2006).

- **Economic benefits accrued** from 1995 to 2004 are more than 8 trillion won (US$8 billion) resulted from avoided waste treatment and market value of increased recycling products (UNESCAP 2012).
- **System sets barriers on illegal dumping** and burning in rural area;
- **The financial independence** of the cleaning administration increased from 14% in 1994 to 29.6% in 2000; (KimKwang, KimYoon Jung 2012)
- **Ecological benefits**: The reductions have resulted in reduced contaminated water from the landfill, reduced pollution from incinerators and efficient use of lands due to the avoidance of constructing new landfill (UNESCAP 2012)

Detailed Review of the Main Achievements of Volume Based Waste Fee System

Waste Reduction

The new system totally differed from prior system where as charging for waste was fixed rate basis. New VBWF system required from people to use the waste bag according its location. So general wastes of users (householders) should be separated to different bags according to garbage type and for other bulky wastes such as used home appliances and furniture in advance the user should report the location, size or important information to local administrative agencies so the civil servants can collect them. Some problems appeared in the beginning because of the low level of public awareness. According to the reports of Ministry of Environment in the first year the reduction rate of waste was 37% (56) (KimKwang, KimYoon Jung 2012), most of the reduction proportion was in large cities, than smaller sized cities following by villages. The importance of the waste reduction is it will help the production system minimize the use of resource and energy that eventually leads to economic benefits both producer and government. We can summarize the whole point to less waste, less trouble.

Increase in Recyclable Wastes

The recycling of the waste is significant process of waste management system, because the recycling gives second life for the material (product) which already played its main role. The main concern of the process it will increase the value of the waste and decrease the cost of the system. Besides, the recycling is source of cheap resource for businesses which is related to paper, plastic, wood, metal and etc. The main way to achieve high rate of recycling in WMS is separating of recyclable waste from general waste. There are mainly two ways to separating the genera waste: the user (households or commercials) separates or the waste management company separates. In VBWF system Korea set obligation to user (households or commercials) to separate the waste, that cuts the cost of separation for the waste management companies. According to the system (Figure 4), main separation will be made by residents (households) and commercials, according to the type of the waste it will be directed to private collectors or local government or recycling companies who are the main interested party of the system. Selling of recyclable waste also stabilizes financial independence of waste management companies as and recycling companies who can easily by the resources for appropriate price. The next paragraph will explain the overall financial structure and achievement financial achievement by implementing VBWF system.

Financial Independence

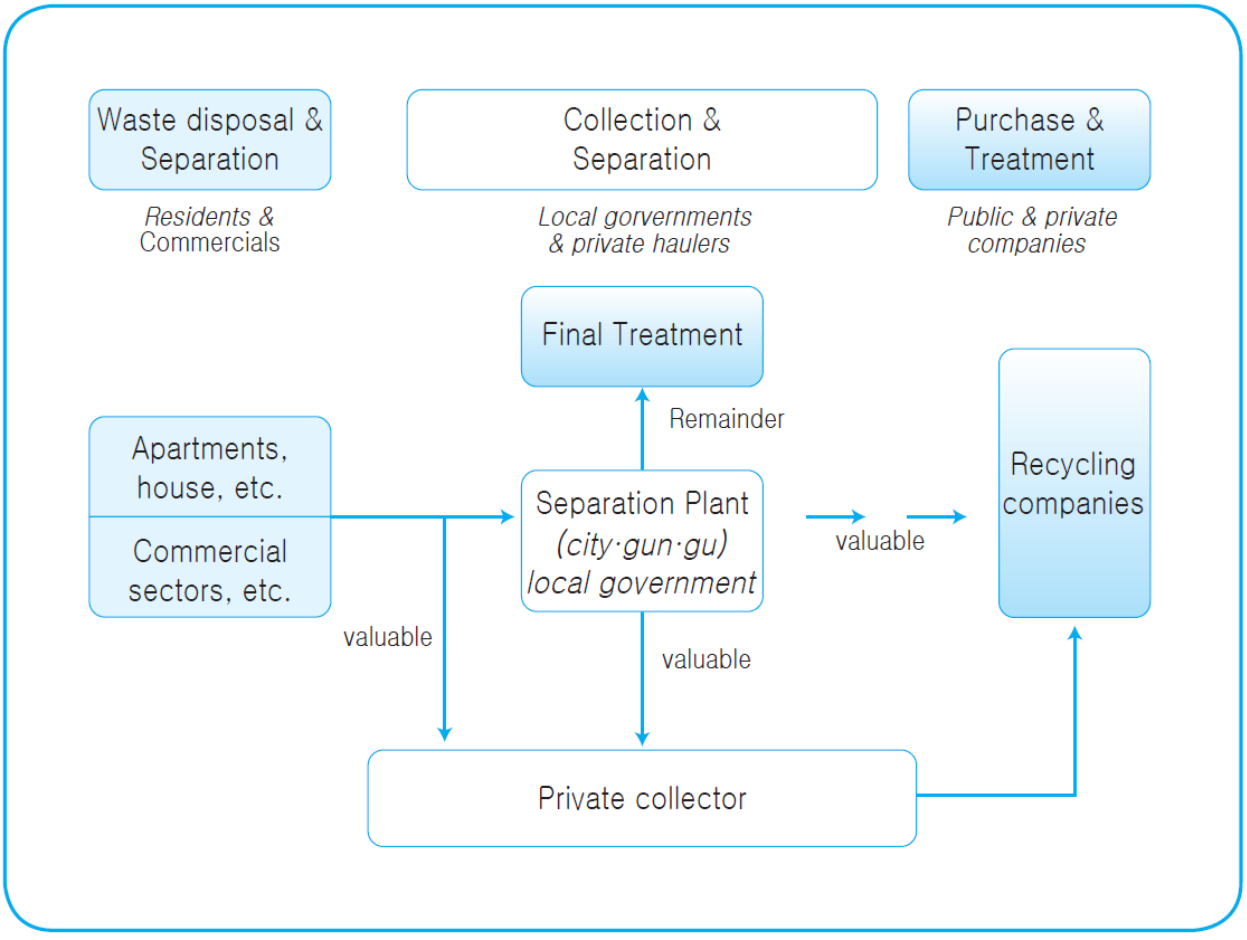
From 1987-1994 (before implementation VBWF system) the payment system of Korea waste collection fee was charged on a fixed rate through property tax or monthly fee regardless of the amount disposed. Total budget for Waste management formula was as follows (Kim and Kim 2012):

Total Budget for Waste Management = State budget subsidy + Local Budget Subsidy

+ Loan + Municipal Bond + Etc. + Fee collection

But the system was inefficient and Government of Korea found the simple and very effective way of collecting money for the waste. The next Figure 4 describes overall picture of waste fee collection system.

Figure 4 | Collection Systems for Recyclable Waste (68) (KimKwang, KimYoon Jung 2012)



According to the Figure 4 there are only 3 main players of the system, which work with each other without repeating of each other's tasks. The algorithm of system works as following order the first player is the local government or public owned waste management company, they produces special type of bags (mainly 2 types for food or organic wastes "yellow" and "white" bags for other types of the waste) and sales to the public (households

and commercials or organizations) through the second player of the system are groceries or shops which are located in the territory of local government . The public buys area designated bags and disposes them in the appropriate waste collection points, located nearby. The first player in the public owned waste management company gathers the bags with wastes and separates them into recyclable and organic wastes and sells the third player is recycling company(s). The public, however, only pays for the waste bags, not the disposal of recyclables.

The overall costs of VBWF system from the production of waste bags, to waste disposal are all included in the price of the bag. The system guarantees the financial stability of each playing parties of the system. The financial situation of the Public owned waste management company can be calculated by using the following formulas, which identify the financial independence of the companies comparing pre VBWF system companies.

Financial Independence = Profits after sales of waste bags + Profits from recyclable materials + Fees for the disposal of large waste + etc. (penalty)

According to Kim Kwang and Kim Yoon (KimKwang, KimYoon Jung 2012) the formula integrates each player into single system. One cannot be isolated from the system. The unification of the players into single system stabilizes the whole system and each individual player.

Profits after sales of waste bags- identifies the result from subtracting of total cost of waste bag production and sales from total revenue of sales of waste bags. So the current formula combines the local government (First player) costs for producing of the bags and sales cost of commercials (groceries and shops- the second player).

Profits from recyclable materials- result from subtracting of total cost of recycling from sales of recycled materials that unifies the first player with third player (recycling company)

Fees for the disposal of large waste- government charge or the disposal of the large wastes as construction material or inventory, equipment waste.

The following formulas are used to calculate the price of waste bags which is main tool for the local government to measure the cost of the whole waste management system.

Price of waste bag=waste disposal cost perℓ by the capacity of bag x burden of residents + production cost of waste bag + sales charge

Burden of residents (%)=income from sales of waste bag ÷ collection, transportation and treatment cost x100

Sales charge=(waste disposal cost perℓ by the capacity of bag) x burden of residents + production cost of waste bag) x ratio of sales charge ÷ ÷(1-ratio of sales charge)

Using the upper listed formula local governments can identify the price of the waste and all related costs for the waste including gathering (sales of waste bags), transportation and disposal.

Preventing Illegal Dumping

Preventing illegal dumping stabilized the new VBWF system. Stability of the system will guaranty the long run of the new policy. In order prevent the breakage of the government

used different techniques to prevent illegal dumping. One of the techniques to crackdown on violators of VBWF system is that illegal dumpers tracked by using security cameras located different places around the city. Furthermore, violators also tracked by special monitoring group organized under local administration, working on rotating shifts 24 hours a day. Illegal dumpers has penalized up to USD 900 according to the law (77) (KimKwang, KimYoon Jung 2012). In the long run the monitoring of illegal dumping decreased because public accepted the importance of the system and end result is the number of illegal dumpers dramatically decreased or disappeared. According to blogger Jang H. Yoon (YoonJang 2013) in Ulsan metropolitan city of Korea 382 surveillance cameras has been installed. For the year 2012 Ulsan city government charged 382 illegal acts for 57.4 million KRW. The example shows that the technique for preventing illegal dumping is working successfully. These are the important achievements of the system.

Public Awareness and Familiarizing the VBWF to Public

Another important aspect for the stability of the policy is public awareness and familiarizing of the VBWF to every citizen of the country. In order to enhance the public awareness and familiarize the system to public the government of Korea allocated budget for implementing educational programs for public officials and advertisement of the new VBWF system using different tools of mass media. These efforts resulted in improvements in all sections of the system, including positive environmental changes, sanitary improvement of residential areas, and reduction of waste as well as increase of recyclable waste (KimKwang, KimYoon Jung 2012). The familiarizing of the project into public plays significant role in the development of the new WMS model. The results can be measured with reduction of the waste, increase of the recycling rate, and a decrease of illegal dumping.

Reduction of Landfill Size

Before the VBWF system, the increasing size of landfill occupied lands of Korea threatened the environment of country. Because of the rapid growth of population and industrial development the threat was disastrous in huge cities of the country, as well as in capital and metropolitan city as Seoul. For example from 1978 to 1993 year at Nanjido landfill site 91,972,000 cubic meters of garbage dumped, where the height of dump reached to 98 meters high and landfill occupied 2715900 square meters of land (Wikipedia 2009). After implementing the system the lands used for dumps decreased gradually, some of them closed at all. KDI school states that “The analysis on the first year of the Volume-based Waste Fee System showed that the total amount of waste decreased by 27%, and that recyclable materials increased by 35%. Thanks to the reduced waste and increased recyclable materials, it was possible to save KRW 300 billion as well as save landfills as much as 661,157 m²”(56) (KimKwang, KimYoon Jung 2012).

After the implementation of the VBWF system the government of South Korea subsequently implemented another policy ″Extended Producer Responsibility (EPR) System”. The main point of the current policy is the obligation of producers for their product. The detailed information will be given in following parts of the chapter.

Extended Producer Responsibility (EPR) System

In 2003 Ministry of Environment of the Republic of Korea in his official web site (MOE of the Republic of Korea 2003) informed that the government set into force new policy called “Extended Producer Responsibility (EPR)” System. The system makes responsible all producers for the waste out of their product from the process of production until the discard of the product. The main advantages of the current policy are safety of the

waste and increase of recycling rate. According to the Ministry the system initially has been created in Germany in 1991 and also different types of the system has also successfully implemented in other countries such as Sweden (1991), Norway, Taiwan and USA.

In order to understand the basic concept of the system I drew following Figure 5:

Figure 5: Algorithm of the responsibility of EPR system

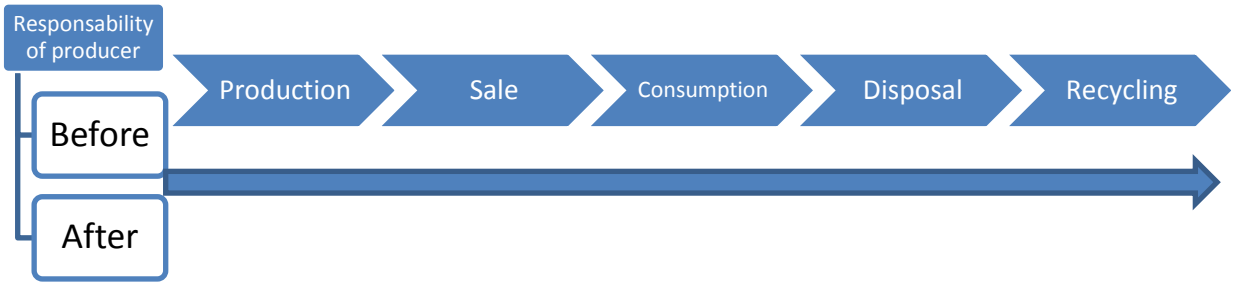


Figure 5 shows that the producer of any products takes responsibility of the waste out of the product from its production date to the recycling point including selling, consumption and disposal. Also, the implementation of the system helps to consumers easily identify the recyclable waste from unrecyclable waste and properly separate after consumption as it

Figure 6: Separate discharge label of EPR system (Ministry of environment 2003)

Type	Label
Plastic	PET, HDPE, LDPE, PP, PS, PVC, OTHER
Metal	Steel, Aluminum
Paper	Paper cartons
Glass	Glass

shown following Figure 6:

According to the Ministry web site (MOE of the Republic of Korea 2003) after successful promotion of the system in the beginning of 2003 the leading companies of the country such as LG, Samsung and Daewoo jointly invested 20 billion won to create Metropolitan Recycling Center for Electronic Appliances. The expansion of recycling facilities and enhance recycling capacity, MOE is still keeping financial and institutional support for the development of such facilities. Nationwide there are 227 public recycling centers, 74 built between 2000~2003. In 2004, 44 are in construction with a total of 17.1 billion Won (14.9 million USD) secured in national funds after the creation of the first facility. The creation of these facilities played important role for the reduction of waste in promotion environmental friendly life style, increase of recycling rate and the next important factor is creation of new jobs in the economy of the country.

Expansion of Waste Treatment Facilities or Major steps for "Waste to energy"

The base of the current policy even before the EPR and VBWF system, the system started from 1986 when Korea gave right to local governments independently handled waste management when country faced to major challenges of high rate of waste per capita, low rate of recycling, high rate of landfill site usage for disposal of waste (Ministry of Environment of The Republic of Korea 2011), (Lee 2013). This right gave the local governments to take important actions to prevent WMS problems that Korea faced too.

With support of central government in different parts of the country local governments created new projects in order to make reduction for dumping waste to landfills by creating new facilities. This was major step to turn the Waste into Energy. But the projects could not get developed without other two systems as Volume-Based Waste Fee System in Korea and Extended Producer Responsibility (EPR) System. After implementation of the

other two systems, the “Expansion of Waste Treatment Facilities policy” shifted to new step. Where all the 3 polices unified into one model created new Korean model of Waste management system. The main purpose of the model is Low rate waste, high rate of recycling, turning waste to energy, reduction of the landfill size and to make the landfill size useful for the future generation or simply recovery of the earth, to create the environmental friendly life.

Before moving to the comparison between two models of WMS of Korea and Uzbekistan, we have to give attention to the following table which clarifies the paradigm of the old WMS model which existed before 1995 and the new model which has been created after 1995, by giving exact results end achievements of the models in stated parameters.

Table 5: **Waste Management Shift of South Korea**

	Before 1995 model results	After 1995 model results
Policy Objectives	Rapid industrialization and Economic growth	Shaping pleasant living environment
Approach	Waste treatment and Reduction	Reduction, recycling and safe treatment of wastes
Policy Means	Waste pollution Optimum treatment system Safety management	Volume based waste fee system implementation (1995), EPR system expansion (2003) and expansion of waste treatment facilities
Policy shift	Waste treatment Reduce	3R Reduce Reuse Recycle

Waste per capita		1.77 kg in 1981 2.30 kg in 1990 1.30 kg in 1994	1.30 kg in 1994 1.01 kg in 1996 0.99 kg in 2006 0.95 kg in 2011
Waste recycle		10-15%	From 23 % to 83.7%
Treatment ratio	Landfill	81% (1994)	17.2% (2011)
	Incineration	15% (1994)	23.7% (2011)
	Recycle		59.1% (2011)

Comparison Uzbek and Korean WMS models

After the detailed review of the regulation and rules, other major parameters of the both models of Seoul and Tashkent, including such policies as Volume Based Waste Fee (VBWF) system, Extended Producer Responsibility (EPR) System and Expansion of Waste Treatment Facilities and their role for the development of the model we have to give attention to Table 6 which shows the major differences from different prospective such as Institutional, legal, technological and financial prospective. Institutional level involved organizations perspective explains the different organizations attracted for the system. Legal acts and laws perspective describes the legal bases of the system and main regulatory documents which identify the main roles of the attracted organizations. Whereas, Technological capacity part shows the main assets of the system that helps the management of the overall activity. In Financial management and payment system part we can find the main formulas that in both models uses for financial management of the system and the types of the payment systems for the waste charge. The last part of the table is Land fill site

capacity here we can find comparison of the models of landfill use. The importance of the current part is in both models uses landfill sites for majority of waste disposal cases and further the analyses of the comparison table will be given in next paragraph.

Table 6: **Comparative analysis between Waste Management System of Seoul metropolitan city, Korea and Tashkent, Uzbekistan**

Contents	**Seoul metropolitan city**	**Tashkent city**
Institutional level and Involved organizations	1. Ministry of Environment 2. Ministry of Trade and Industry 3. Ministry of Science and Technology 4. Local Government 5. Environment and waste management corporations	1. The State Committee of the Republic of Uzbekistan for Nature Protection; 2. The Ministry of Health of the Republic of Uzbekistan; 3. Uzbek Agency "Uzkommunkhizmat"; 4. Local government (City and district) officials who are involved in WMS of Tashkent according to the law “About Waste” (Article 11). 5. Maxsustrans Public owned company who officially engaged in WMS of Tashkent (ADB 2012). 6. Beautification department of Tashkent city according to Resolution of the Cabinet of Ministers of Republic of Uzbekistan (NORMA Online database 2010). 7. Housing and communal services companies and partnerships of homeowners of Tashkent city according to the Law “About Partnership of Homeowners”
Regulatory documents	1. The Waste Control Act 2. Act on the Control of Trans boundary Movement of Hazardous Wastes and Their Disposal 3. Act on the Promotion of Saving and Recycling of Resources 4. Promotion of Installation of Waste Disposal Facilities and Assistance, etc. to Adjacent Areas Act	1. National Law “About Waste” 2. Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "About the measures to improve the organizational affairs of the Beautification of Tashkent city” 3. Mayor Tashkent city resolution (N579) “About the additional measures aimed at improving sanitary-epidemiological condition of Tashkent city and maintenance of purity in the territories”
Technological capacity	Korea totally has 16 RDF boilers (4 out of 16 is located in Seoul and working for city)	1. In Tashkent 709 protected and 395regular waste collection points, with 6300 containers and 3000

	10 facilities that generate biogas from organic waste (1 is working for Seoul city waste and located in the city), 3 facilities for converting landfill gas to energy sources (1 is working for Seoul but located out of the city), 1 facility for recovering heat energy from incinerators (Mapo incineration plant located in Seoul and working for the city) (UN 2009)	containers located in organizations (ByevVladimir 2013) 2. 348 special trucks of "Makhsustrans" Public owned Company (POC) currently working in overall the city (98 of them are new). Planned to buy 63 more new special trucks. (ByevVladimir 2013) 3. No Waste treatment facility
Financial management and payment system	**<u>Financial Independence</u>= Profits after sales of waste bags + Profits from recyclable materials + Fees for the disposal of large waste + etc. (penalty)** No fees directly charged from households or commercials and organizations for the municipal waste. The fee for the waste is included in the waste bags price, so the households or commercials and organizations obliged to buy for the waste removal. No debtor and creditor relations between companies and public (households and organizations)	**<u>Total Budget for Waste Managment</u> = State budget subsidy + Local Budget Subsidy + Loan + + Fee collection + Etc. (penalties')** Including loans from international financial institutions as WORLD BANK (US$24m. on May 21,1998) and EBRD (US$19.2m.) (The World Bank 2008) Also, Uzbekistan planning to attract $100 mln ADB loan for project on household waste recycling (investor.uz 2012) Fixed payment system, monthly fees will be charged from households, regardless of the amount disposed. From Government and private organizations the fee charged for the ton of the waste. (mezon.uz 2013)
Land fill site capacity	SUDOKWON Landfill Site Management Corporation (SLC) with capacity of 20 mln. m^2 and daily can proceed 18000 tons of waste and operating since 1992. SLC produces 30 mln. USD worth electricity out of landfill gas (Ministry of Environment of Rep. of Korea 2007).	the city has three inter-district transfer stations, Khamza, Yakkasaray and yunusabad staions which yearly over than 600 tons or 1355 mln m^3 of waste delivers from Tashkent city to landfills of Akhangaran city which is located 32 km from the main city; Ahangaran landfill site opened in 1966 with territory of 59 hectares, 58 hectares of which is already occupied. And 30 more hectares is planning to open in near future; (gazeta.uz 2012)

The following paragraph will give major differences of both models according to the Table 5: Institutional level and involved organizations- the major difference of the current part of the system is Korean model is managed under Ministry level which is really important for the efficiency of the current model. However, in Uzbekistan the overall system is

managed under the State committee for Nature Protection and partially dividing main obligations with Ministry of health. This kind of evasion of responsibility can create number of problems in overall management system such as blaming each other, not my job syndrome, or not delegating problems in some occasional circumstances.

After reviewing Regulatory documents in detail it is obviously the Korean legal basis of WMS model more clearly regulates the whole system by delegating all responsibility in each authorized organization of the system. The regulatory documents composed of strict articles which will not allow the violators to violate or bypass the laws. And all necessary articles are located in one act which makes the document more transparent. However, the Uzbek counterparts of the documents are hard to understand. For example, the main regulatory act of the system National Law “About Waste” of Uzbekistan does not include the responsibility for the violation of the law. The measures for the violation of the law are given under article 53 of the Code of Uzbekistan on Administrative Responsibility that confuses readers. So one of the main problems of the documents is that in order to understand the whole system, the reader must read extensive lists of the documents in order to understand the system.

The technological capacity of the system is main asset of the any WMS model. After the implementation of policy of Expansion of Waste Treatment Facilities the number of facilities which turns the waste to energy or to make it useful in industry. Some options include biogas generating landfills, Refuse Derived Fuel (RDF) plants or incineration plants which radically changed the system from cost of the budget to profitable businesses. If we compare the same parameters of the WMS of Uzbekistan, we find only one company with some trucks and containers just for the removal and delivery of the waste to landfills. The recyclable parts of the waste which consists about 14-15% of total waste are collected by private companies from the waste collection points of the city (OSCE 2006)(8). The other

85% of the waste are not treated by the company and straightly dumped into landfills.

In each model the most significant part is financial management and payment systems. The financial structure of current Uzbek WMS model and old Korean WMS model are very similar. In both models the government budget is major source for the handling of the system, and the amount of fee charge is taking lower place. But the Korean WMS model completely changed the structure by reforming the entire financial system. The new structure decreased the government intervention to the system by cutting of the fixed payment system and by replacing to VBWF, where there is no direct payment from the user to the companies. The efficiency of the system is there are no Debtors and Creditors in the financial structure. However, in the Uzbek model there are both households and organizations with sufficient amount of credits from waste management companies which stagnating the whole system. Center for Economic Review also confirms on their research that Maxsustrans POC has in trouble because of large amount of debts from his customers which the company cannot collect (Center of economic review of Uzbekistan 2011/06).

Landfill site capacity analyses shows that Korean model takes advantage of efficient use of each square meter of earth by properly dumping the waste and by transforming it from waste to composted material which can be used as fertilizer and taking out a significant amount of gas for heating and electricity production and leading the model to sustainable development. But Uzbekistan, in contrast, misses a chance to turn the waste to useful resource. The improper waste disposal today is creating fundament for inevitable future disasters. The first damage is the waste hills ruin the useful life of the earth and making it useless for future generation (55) (State Committee for Nature Protection and UNDP in Uzbekistan 2008). The second the CO2 or other hazardous gas is polluting air and which eventually leads to spread of catastrophic deceases surrounding area (56) (State Committee for Nature Protection and UNDP in Uzbekistan 2008). Also the untreated waste dumps will

lead to spoil of under earth water canals and also makes source for water related deceases (56) (State Committee for Nature Protection and UNDP in Uzbekistan 2008).

Conclusion and Policy recommendation

In this paragraph we can find short conclusion by describing how to create new model for Uzbekistan and the role of Korean experience for the model. The major steps to create new model can be achieved only by finding the solutions of the current problems. The solutions of the problems of current Uzbek model can be found in the long experience of the Korean model because Korea had same type of problems in same conditions as we had seen in Table 1.

The first recommendation for the new WMS model of Uzbekistan is to create single hierarchy in institutional level that can be managed by one institution which takes all the responsibility that system has. The single hierarchy will be efficient because it will suspend the problem such as evasion of responsibility which is main reason for the stagnation of the model development. Preventing the double responsibility for the same problem will reduce the time and red taping.

The second is unifying of all waste management related regulatory documents into one unique act that simplifies the process for readers. The strictness and transparency of the act is also important to decrease the number of violators. The significance of strict law makes the regulation more useful and future fulfillment and acceptance of its requirements by public. The advantage of single hierarchy is helps the system to implement remodeling or easily accept new changes of policy without hurting other parts of the government.

The third important step requires the government of Uzbekistan to allocate a sufficient budget and implement regulations which should allow the expansion of waste treatment facilities. The creation of new waste treatment facilities would decrease future unnecessary

costs. According to UN Sustainable Development Platform (UN 2009) the government of Korea allocated Hundreds of billion Korean won in order to implement 3 main policies of Volume Based Waste Fee (VBWF) system, Extended Producer Responsibility (EPR) System and Expansion of Waste Treatment Facilities and government achieved net benefit over 1.1 trillion won only in 5 years. The example shows that Uzbekistan should spend now in order to achieve future benefits. The main benefits will come from the creation of such facilities as Incineration, Mechanical biological treatment or Landfill Gas Power plants which turns the waste to energy and useful resources.

The fourth important requirement is the reformation of financial structure. The reformation of the structure is implementation of Volume Based Waste Fee system (VBWF) in Uzbekistan. The significance of the VBWF system are, the system is convenient for the public which unifies government and other parties into one single party and makes the overall system easy to understand and to control (Figure 7). In the Figure 7 under the name of Waste management facility (WMF) all 3 parties of Figure 2 are unified into 1st player. Player#1-WMF and Player#3- Public (households and organizations) are connected with each other through Player#3-Waste bag sellers (groceries and shops). Where the player #1 will produce waste bags (in different colors), sells them to public through player #2 and at the end the public (player #3) uses it and puts it into waste collection points and player #1 removes it and separates them and utilizes in settled manner. The main advantage of the system there will be no debtor and creditor issues between player #1-WMF and player #3-public and also waste fee collection problems. The system simultaneously gives advantage for player #1-WMF to cut the cost related to waste fee collection and debtor and creditor accounting costs. The advantage of player #2-groceries and shops can have profit out of selling the bags. Also, the new system (Figure 7) gives advantage to player #3-Public by cutting their cost for the waste. The public pays only for the volume that has wasted. No extra charge needs to be included.

Figure 7: **Waste management system**

The government of Uzbekistan for the efficient management of new model should use following formulas of Korean WMS system

Formula#1: Financial Independence = Profits after sales of waste bags + Profits from recyclable materials + Fees for the disposal of large waste + etc. (penalty)

Formula#2:Price of waste bag=waste disposal cost perℓ by the capacity of bag x burden of residents + production cost of waste bag + sales charge

Formula#3:Burden of residents (%)=income from sales of waste bag ÷ collection, transportation and treatment cost x100

Formula#4:Sales charge=(waste disposal cost perℓ by the capacity of bag) x burden of residents + production cost of waste bag) x ratio of sales charge ÷(1-ratio of sales charge)

Each formula of the VBWF system of Korea are related with each other and cannot exist separately. The first formula identifies the financial independence of the system, giving financial stability to the overall model. The next formula is used to calculate the price of the

bag which is one of the part of formula #1. The price of the formula is really important for the each player. If the price over valued then its real price the whole new project can fail because, no one buys expensive bags where the other bags are much cheaper than the specific bags. Formula #3 helps the system identify the burden of residents. The formula calculates the percentage of income per transportation cost. The fourth formula identifies sales charge including all expenses related to bag.

The last major step for the reformation of the new model is efficient use of each square meter of earth allocated for landfill by properly in accordance with sanitary requirement dumping the waste and by transforming it from waste to composted material which can be used as fertilizer and taking out of it huge amount of gas for heating and electricity production and leading the model to sustainable development.

Other important steps that should be taken by Uzbek government is to familiarize the WMS system to the public, because mass media is not supporting and not working hard over introduction of the WMS system related policies to public. Promotion of the new model and its new policies will stabilize the long run of the projects. Also, the mass media tools will help the government to attract new companies for recycling business and turn the waste to resource and materials. For the stability of the project government should enhance controlling and monitoring responsibilities though local governments and NGO's as it is practiced in South Korea.

The implementation of Volume Based Waste Fee (VBWF) system, Extended Producer Responsibility (EPR) System and Expansion of Waste Treatment Facilities in Uzbekistan gives number of important advantages for the government. First of all environmental improvements such as prevent of soil degradation, air pollution and increase water quality that eventually makes country attractive for tourists and investors. Next is decrease of waste per capita which means, efficient use of natural resources and increase of productivity.

Following advantage is decrease of landfill size because of implementation of new waste disposal methods instead of dumping. Also current advantage turns the Waste to Energy or turns the waste to resource. that will increase recycling rate and decrease the use of natural resources. The next advantage is solution of Debtor & Creditor problems between waste management companies (First party and Second party)and Public that subsequently increases financial stability of waste management companies and development of entire waste management system . The development of waste management system helps the government to cut extra expenses for waste which improves the economy. Also new jobs can be created by building of new Incineration plants, Mechanical biological treatment facilities or Landfill Gas Power plants.

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Appendix 1

Seoul city Government interview

Respondent: Dr. Kee Young Yoo,

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1. How the city waste management system has created (history)? What were the main changes?

폐기물관리시스템은 어떻게 만들어졌습니까? 주요변화는 무엇입니까?

폐기물관리는 관리목표 설정, 시설 확보 및 운영, 수집운반 프로그램 실행, 사업이행조직 구성 운영, 재원조달로 구성된다.

1990년 현대적 개념의 폐기물관리가 도입된 이후로 감량과 자원화를 늘리고, 에너지회수도 늘리고, 매립량을 줄이고, 배출자. 생산자. 정부가 역할을 분담하는 방향으로 변화하고 있다.

Seoul city waste management system has been formed since the early of 1990's.

The management system consists of five elements: setting the goal, ensuring and running the infrastructure, implementing waste collection program, running the organization to collect or treat waste, and financing.

Seoul city waste management has pursued and achieved to enlarge the source reduction and recycling of waste, do waste-to-energy much more, share responsibility or burden for waste management among waste generator, product maker and governments.

2. What kind of challenges has Seoul City Hall overcome uring their management history?

관리에 있어서 어떤 종류의 어려움과 문제점을 서울시청에서 극복하였습니까?

복잡한 수거체계(쓰레기종량제, 세분화된 분리배출 등)에 대해 시민들이 불편해하고, 폐기물처리시설(소각시설, 매립시설, 음식물처리시설 등)에 대해 입지를 반대하고, 폐기물처리시설(특히 소각시설)의 인접지역과의 공동이용에 반대하였는데, 수년간의 설득, 주변지역에 대한 경제적 지원, 건강영향조사 등을 통해 극복하고 있다.

Sophisticated waste management demands better things about well-sorted waste collection, various type of facilities, lots of collection labor and vehicles, and fiscal payment.

So it has caused inconvenience to waste generators and number of people complaining about waste facilities, which being close to him and jointly used with neighboring local governments, much more than before.

Several measures like volume based waste fee system, briefing, financial support, an investigation of health conditions, and so on, were very helpful to get urging challenge looser.

3. What is the role of Seoul City Hall on waste management system today?

서울시청의 폐기물관리시스템의 역할은 무엇입니까?

서울시는 광역자치단체로서 산하에 25개 기초자치단체로 구성된다.

폐기물을 수집운반하고 관련 계획을 수립하고 재정을 투입하는 것은 기초자치단체의 업무이다.

서울시는 각 자치구들이 독자적으로 확보하기 어렵고 공동으로 사용할 시설(소각시설, 매립지)을 설치 운영하고 자치구들이 건설하는 처리시설(음식물처리시설, 재활용품선별장 등)의 설치비용과 기술을 지원한다.

자치구간 갈등이나 사업을 조정하고, 새로운 프로그램, 장비, 기술, 사업표준, 홍보방법 등을 개발 보급하고 사업을 독려하는 것도 서울시의 역할이다.

Seoul city government, as a metropolitan one, consists of 25 local governments.

25 local governments are responsible for planning waste management, waste collection and securing financial resources.

Seoul city government do not manage or treat any waste in firsthand, but help 25 local governments by securing landfill site or waste-to-energy facilities which 25 local

governments could use jointly, doing financial and technical support to build waste treatment facilities which local governments want.

Conflict control and project coordination between local governments, new program development, searching for advanced technology, business process standardization.. all things listed above are additional roles of Seoul city government to support 25 local governments' waste management.

4. What are the main tasks and obligations of Seoul city officers of waste management department?

   폐기물관리담당 서울시 소속 공무원을 중요역활과 책임은 무엇입니까?

"3"의 서울시 역할을 수행한다.

The main tasks and obligations of Seoul city officers of waste management department are same as the answer of Question 3 above.

5. What are the main tools of Seoul City officials in effective management of waste (<u>because of</u> strict laws, strict monitoring, public awareness by using media or press, human capacity, technological capability)?

   서울시의 폐기물을 효과적으로 관리하기 위하여 서울시청공무원들은 어떤 조치를 취할 수 있 습니까 (언론과 첨단기술을 통한 법적인 제약, 관리감독, 시민의 인식)?

예산지원, 조례제정, 지침제정, 자치구간 사업실적 평가에 의한 우수사례 포상, 사업의 필요성 및 효과에 관한 논리개발, 공청회, 대중매체를 활용한 홍보 등

There are lots of tools including financial and technical support, establishment of city regulation, establishment of guideline, evaluation and award of project achievement by local governments, logic development of any project, making statistic and release, public hearing, enlightenment using mass media, cooperation with NGOs and so on.

6. What are the successful results of Seoul city waste management projects (overseas if applicable) and the reason for success?

   서울시의 성공적인 폐기물관리프로젝트의 결과는 무엇입니까 (가능하다면 해외사례 포함)? 그리고 그 이유는 무엇입니까?

1) 재활용율 60% 육박 : 모든 상품포장재와 음식물쓰레기를 분리수거하여 자원화하고, 상기품목에 대해 배출자수수료를 면제하는 쓰레기종량제를 실시하여 시민들이 분리배출을 하도록 유도

2) 4개 대형소각시설(Waste to Energy Facilities)을 25개 자치구가 공동 활용 : 10년이상 주민건강상태 모니터링과 주변영향지역에 대한 보상 확대

In Seoul. recycling rate is reaching up to 60% of waste generated. It has been achieved by source separation of all packings, recovery of food waste as natural resource alternate, and excellent waste fee system that separated recycling materials are fee free.

Joint use of four waste-to-energy facilities with neighboring local governments is also a successful project. Before Joint use, four waste-to-energy facilities had been run for waste from local government where they are.

Success of joint use are thought to thanks to long-term health condition monitoring more than 10 years and financial support to residents who are living within designated area.

7. What are the unsuccessful projects that Seoul Metropolitan city held and reason for failure?

서울시의 프로젝트중에 실패한 사례는 무엇이며 이유는 무엇입니까?

1) 4개 대형소각시설(Waste to Energy Facilities)을 장기간 소재 기초자치단체만 활용 : 건설단계에서 공동이용에 관한 이해와 약속 없이 시설건설 추진

2) 음식물처리업자와 자치구간 처리비 갈등 : 관내 공공처리시설이 음식물쓰레기 발생량의 30% 정도만 처리할 수 있고 나머지는 민간시설에 위탁처리함으로써 공공의 협상여지 고갈

Before joint use of four waste-to-energy facilities, they had been run for waste from local government where they are. which means failure of their management in the early stage. Initial failure were caused by constructing facilities ahead without effort to get residents neighboring facilities understood about Joint use.

Last year, there were severe conflict between local governments and private food waste treatment facilities about tipping fee of food waste. The latter asked for tipping fee as much as possible, in the other hand local government complained that asked tipping fee was too high. The conflict is likely to end up the win of private food waste treatment facilities because they took the advantageous position that more than 70% of food waste from Seoul has been treated by them under contract.

8. Finance: What is amount of subsidy the City allocates (or allocated) to finance to projects related to waste management system, including recycling?

재정: 폐기물처리 및 재활용을 위한 프로젝트를 위해 정부에게 보조받은 지원금은 얼마입니까?

1) 자치단체에서 폐기물처리시설(소각장, 음식폐기물처리시설, 재활용선별시설, 재사용관련시설 등) 건설시 정부에서 건설비(부지보상비 제외)의30% 지원

2) 자치구에서 상기시설 건설시 서울시에서 국비외에 건설비의 35%지원

Seoul city government allocates 0.5% of total budget to waste management and local government does around 10%.

When Seoul city government try to construct facilities like incinerator, food waste treatment, Material Recovery Facility, other recycling facility, Korean government give 30% of capital cost as waste management subsidy to Seoul city government.

If local governments try to do, Korean government give same rate to local governments and Seoul city government do also 35% of capital cost additionally.

9. What is the amount of gains and losses from these projects?

이 프로젝트를 통해 얻는 이득과 손실은 무엇입니까?

정부의 지원으로 자치단체의 건설비용 부담이 감소되어 폐기물처리시설 설치 촉진

Waste management subsidy from Korean or Seoul city government help local governments to construct waste treatment facilities easily by reducing burden of budget expense.

10. Are there any External parties that Seoul City Hall works jointly or under the control of Seoul City Hall during their management system?

서울시가 관리, 감독을 하기 위해 공동으로 일하는 제3의 업체가 있습니까?

1) 폐기물처리시설(소각시설)의 운영 민간위탁

2) 매립지관리공사에 의한 수도권매립지 운영

3) Seoul Resource Center(폐휴대폰 등 가전제품 분해 선별) 민간위탁운영

Four Seoul Waste-to-energy facilities have been run by some privates companies under contract.

Seoul Resource Center which is implementing urban mining project of Seoul city has been run by a privates companies under contract.

A capital area landfill site which Seoul city, Incheon city and Kyonggi province use together has been run by a third sector company.

11. What are the future development plans of Seoul City Hall about waste management system?

폐기물관리에 대한 서울시청의 미래발전계획은 무엇입니까?

매립의존도 최소화를 위한 분리수거 및 폐기물처리기반 확보

거점수거 확대에 의한 수거효율성 증진

재사용 업사이클 촉진

2030년까지 세계 제일의 재활용도시 구현(폐기물관리 목표)

To lessen the dependence on waste landfill, enlarge waste-to-resource and infrastructure for waste treatment within Seoul border.

Collect waste efficiently by adapting station collection from door-to-door

Encourage waste reuse and up-cycle industry

Until 2030, endeavor to make Seoul a recycling leading city in the world