

Municipal Solid Waste Management in Armenia

Current Trends and Steps Forward

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Thesis for the fulfilment of the
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Georgi Arzumanyan,

Lund, September, 2004.

Abstract

Since the early days of the transition process, the negative impact on the environment is very visible in Armenia. In this situation, there is an urgent need for coherent environmental policy, legislation, and institutional structure. It is particularly necessary for the municipal solid waste (MSW) management sector, which has been neglected for many years.

In this context research has been carried out to contribute to the development of efficient policy approaches for MSW in Armenia. This thesis is an attempt to explore current situation in municipal waste management sector, from the policy aspects to operational issues. For that reason a comprehensive analysis of the whole system was conducted, with particular reference to Yerevan city.

During the study the following main obstacles and limitations for the sector improvement were revealed, such as, absence of the policy concept on MSW, inconsistent legal and administrative framework, absence of data on MSW and lack of financial resources.

Based on the discussions and analysis a few recommendations at national and local level have been made. They could assist decision-makers in their efforts to improve management in the municipal waste sector.

Key words: Armenia, Yerevan, municipal solid waste, obstacles and limitations, policy aspects, legal and administrative framework.

Executive Summary

Municipal solid waste (MSW) is a priority area of concern. MSW represents a valuable source of resources, such as materials and energy. At the same time it is also a source of pollution and land degradation when treated inappropriately. It has significant impact on human health as well.

Along with economic growth and changes in production and consumption patterns MSW generation has steadily increased and, according to estimations, will continue increase during the next few decades. Environmentally sound management of increasing amounts of municipal wastes is among the topics of major concern today in most countries.

However, avoiding waste generation is not always possible, particularly in poor countries such as Armenia. The collapse of Soviet Union led to disruption of the traditional trade chain and led to serious economic decline. Lack of financial resources and unsuitable infrastructure has not allowed following environmental regulation and standards. As a result MSW management was neglected for many years.

The purpose of the research is to contribute to the process of development of efficient policy approaches and measures toward improvement of existing municipal waste management system in Armenia

The main objective of this study is to explore the existing situation in municipal waste management sector and identify main obstacles and limitations that prohibiting the improvement in current waste management practices. To reach the main objective the following questions were considered:

- a. What is the current situation in the municipal waste management sector in Armenia?
- b. What are the main obstacles and limitations faced by the municipal waste management system?
- c. What kind of measures can be taken to stimulate better approach for the municipal waste management practices in Armenia?

The study particularly focused on household waste without any emphasis of specific waste stream such as plastic, paper and other materials. Analysing of the waste management options was focused on urban areas, particularly the capital of Armenia, Yerevan city.

The major limitation faced throughout this research was data quality and completeness. In case of data available, it was difficult to judge whether it is based on perception, or based on old data, or even on actual facts. These variances created difficulties in establishing evolution trends especially for different waste streams.

The study was processed with different categories of research methods and it was divided into three major stages: (i) description of the MSW situation in developed countries; (ii) description of the current situation regarding MSW in Armenia; and, finally, (iii) the analytical framework. Initial data collection was collected in the form of secondary data provided by literature review. In order to collect primary data a surveys via questionnaires was made. Field Study and interviews with the main actors in Armenia was conducted. The analysis identifies the flaws and limitations through policy level to the operation systems. Thus, the analysis carries out a general discussion relating problem with potential solutions on the main components that

could influence the waste management. Therefore, during the discussion process a comparison with developed countries was applied. The paper consists of five main chapters.

Analysis of the current situation of MSW management was revealed a number of obstacles and limitations faced by municipal waste sector in Armenia. The most important were identified during the study are the following:

- Absence of the concept of integrated waste management for Armenia. As a consequence, there is no strategic planning for household waste management.
- Inconsistent legislation. Main factor is an absence of basic Law on waste and non-enforcement of the existing legal acts.
- There is no reliable data on municipal waste generation, composition, disposal, etc.
- Lack of financial resources and technical facilities.
- Even responsibilities were allocated, there is a still uncertainties with actual task allocated to the central, regional and local authorities.

In order to deal with these problems an integrated set of policy measures to change the behavior of stakeholders on waste management issue seems to be necessary. Balanced strategy needs to combine information gathering and dissemination mechanisms, legislative and institutional framework, and the economic tools. Based on these only a systematic shift in waste management away from disposal towards prevention and recycling will be possible.

Referring the above mentioned the following recommendations were proposed.

National level

1. Development of the concept and strategy for MSW management in Armenia.
2. Development of legal framework for MSW management.

Local level

1. Development of Yerevan municipal waste management plan.
2. Optimisation of available resources.

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1 Introduction

Waste is generated by activities in all economic sectors and considered as an unavoidable by-product or material leftovers from economic activity. The impact of waste through generation and accumulation on the environment and human health is significant such as (i) emissions to air, (ii) water and soil contamination, (iii) land degradation and (iv) habitat deterioration. Also, the generation of waste reflects a loss of materials and energy and imposes economic and social costs on society for its management (Ackerman, 1997, EEA¹, 2002).

From these standpoints municipal solid waste (MSW), which is primarily generated by household and/or some commercial and public institutions, is an important waste stream. Even though MSW accounts for only a relatively small fraction of the total waste production (Gandy, 1994, p.4), it represents a considerable resource that can be beneficially recovered. However, current inefficient management options lead to the loss of valuable resources. Particularly, significant quantities of MSW continue to be disposed in landfills, which is still the dominant option. Therefore, disposal of MSW leads to increase the pressure on the environment and human health.

From the environmental point of view MSW has a great importance. This is because many goods and services consumed by households are the result of a long production chain, where there are sources of negative impact on environment at all stages in the life-cycle, beginning with the primary resource extraction to manufacturing, consumption, and disposal.

Another aspect is the current trends in MSW generation. Generation of waste is directly related to economic growth and population income. Along with economic growth and changes in production and consumption patterns waste generation has steadily increased and, according to estimations, will continue increase during the next few decades (UNDP², 2000).

De-coupling of municipal waste generation from economic growth represents an environmental priority for the next two decades (OECD³, 2001). Environmentally sound management of increasing amounts of municipal wastes is among the topics of major concern today in most countries.

Agenda 21, the agreement reached among participating nations at the United Nations Conference on Environment and Development in 1992, and the Plan of Implementation agreed at the World Summit on Sustainable Development in Johannesburg in 2002 emphasizes the importance of waste reduction and increasing of environmentally sound waste reuse and recycling, as the first steps in waste management.

The Plan of Implementation calls to develop “*waste management systems, with the highest priority placed on waste prevention and minimization, reuse and recycling, and environmentally sound disposal facilities, including technology to recapture the energy contained in waste, and encourage small-scale waste-recycling*”

¹ EEA-European Environmental Agency

² UNDP-United Nations Development Program

³ OECD-Organisation for Economic Cooperation and Development

initiatives that support urban and rural waste management and provide income-generating opportunities...”⁴.

Following the recommendations, many developed countries have adopted the principle of the waste hierarchy in order to guide their policies on MSW management. According to that, high priority is given to the waste reduction and prevention measures. In addition, ambitious targets for reduction in specific waste streams have been set up, which may result in changes in the components of MSW and, consequently, organize recycling and recovery operations.

On the other hand, avoiding waste generation is not always possible, particularly in poor countries such as Armenia.

1.1 Background

Armenia is a small, land-locked country with limited resources (see Appendix 1). During the Soviet time it was one of the most industrialized republics. The main types of industries were chemical, electro-machinery, metallurgy, and mining. The collapse of Soviet Union led to disruption of the traditional trade chain and led to serious economic decline.

The arms conflict during the nineties, following by trade and energy blockade complicated the situation, placing Armenia in economic hardship. Since the beginning of the nineties overexploitation of natural resources has increased significantly. Lack of financial resources and unsuitable infrastructure has not allowed following environmental regulation and standards. Also due to economic conditions, state and public interest to address environmental problems was rapidly reduced (National Environmental Action Plan (NEAP), 1998). Environmental pressures were evident in all sectors, and one of the most crucial is the problem of waste.

For instance, in 1980-1990s more than 36 million tons of waste was generated each year in Armenia⁵, including approximately 35 million tons of industrial waste. (National Environmental and Health Action Plan - NEHAP, 2003). They included also 20,000 tons of hazardous waste, which contains mainly heavy metals, such as lead, nickel, chromium, solvents, waste from galvanic production, toxic-chemicals, etc.

Special treatment and disposal facilities for hazardous waste do not exist in the country, and the waste generated throughout last decades has been accumulated within area of industrial factories, or transported to landfills earmarked to municipal waste or just dumped in the rural sites and have become a source of environmental pollution and health problem.

In recent years, however, there is a slight improvement in Armenian's economic situation, and the issues concerning hazardous waste and chemicals management have become more actual and urgent. It has taken an important place in the government agenda. Consequently, a number of regulations were approved and some economic instruments were applied. Moreover, Armenia was actively involved in international cooperation on waste management and certain work was and is still being implemented under international agreements. Therefore, it is obvious that government has developed a sequence of steps for improving the situation in the hazardous waste management sector. On the other hand, municipal solid waste is still growing and new alternatives for waste management should be considered.

⁴ Report of the World Summit on Sustainable Development. Plan of Implementation of World Summit on Sustainable Development. §22(a). 2002. New York, UN Publication.

⁵ Population in Armenia for that time was approximately 3,5 million people.

1.2 Problem statement

Unlike industrial waste, there has not been any improvement in the municipal waste sector. Privatization of the former State-operated system in the waste sector was initiated during the nineties. The process consisted of replacing centralized waste management by the decentralized system, where waste management activities are taken over by communities and the private sector.

Another important aspect caused by the inadequate resources is the fact that the collection, transportation, treatment and disposal of municipal solid waste in Armenia have been neglected for several years. Therefore, existing institutions are inadequately equipped in terms of skills and capital resources to effectively manage the waste problems (NEAP, 1998). Waste collection and transportation activities are quite poor organised.

The actual regulatory and legal framework does not correspond to current needs, and monitoring and enforcement capacity in various agencies is weak. There are no municipal waste management policy programs and plans.

Approximately 1.5 million tons of municipal waste is generated annually⁶ and the only management options used is disposal in landfills.

There are 45 urban and 428 rural waste disposal sites currently in use (UNECE⁷, 2000). These sites do not correspond to sanitary-hygiene norms and standards. Also, the quantity of illegal dumping is unknown. Therefore, landfills degrade the landscape and occupy useful land. In fact, they are significant sources of soil degradation, water contamination, air pollution, and diseases.

As a result, the following aspects determine the importance of addressing municipal waste management in Armenia.

i. Environmental

- Uncontrolled and illegal dumping, as well as landfills is directly contributing to environmental pollution, such as underground water contamination, land degradation and contamination, air pollution, particularly releases of Green House Gases (GHG) and toxic substances.
- Although municipal waste makes up only a small fraction of the total waste stream generation, waste and pollution are associated with the manufacture of products and packaging throughout the whole cycle of the primary extraction of materials, the production process, distribution, retail, consumption and the final disposal (Gandy, 1994).

ii. Economic

- As it has already been discussed in the previous chapter, waste represents considerable resource of materials and energy, which might be beneficially used or removed if an appropriate management option will be applied.

⁶ According to statistics it is correspond to about 300 kg per person per year

⁷ UNECE-United Nations Economic Commission for Europe

- Also the generation of waste imposes additional economic costs on governments for its management, which is quite difficult to cover in the current economic conditions of the country

iii. Social

- Generation of waste reflects a loss of natural resources, materials and energy and imposes economic and social costs on population for its management.
- Unsatisfactory environment leads to population health problems.
- Lack of attention by the government to address waste issues

According to the NEHAP the following targets have been established in order to improve situation (NEHAP, 1998):

- A. To create a rational system of waste disposal, which should be in line with the rules of market economy and would correspond to the requirements of the population, and would ensure the necessary environmental and health safety?
- B. To ensure safe disposal of waste, through its collection, sorting and processing.
- C. To contribute to the introduction of waste-free technologies, processing waste and using it as a source of energy, as well as other purposes.

On the other hand, implementation of the statement was not realised and unfavourable situation in municipal waste sector is still evident. The main question is why? What are the flaws faced by the municipal waste system and how it can be improved.

1.3 Purpose of the research

The purpose of the research is to contribute to the process of development of efficient policy approaches and measures toward improvement of existing municipal waste management system in Armenia.

The analysis done in this thesis can be utilised to help decision-makers, particularly at the local level, in the process of formulation and implementation of sustainable waste management practices.

Therefore, the thesis data can be used as a base for preparation of further project proposals in municipal waste sector for donor organizations.

1.4 Objectives

The main objective of this study is to explore the existing situation in municipal waste management sector and identify main obstacles and limitations that prohibit improvement in current waste management practices.

To reach the main objective of the study, the following questions will be considered:

- d. What is the current situation in the municipal waste management sector in Armenia?

- e. What are the main obstacles and limitations faced by the municipal waste management system?
- f. What kind of measures can be taken to stimulate better approach for the municipal waste management practices in Armenia?

1.5 Definitions of terms used

This subchapter provides descriptions of the core points of this thesis. It facilitates the readers further understanding and prepares him/her for the analytical sections, where a clear perception of the terms is highly beneficial. This is because a clear understanding of the concepts and definitions of waste and related issues, such as disposal, management, recycling, among others are required.

The various definitions in common usage in different countries and organizations are described in literature. In Armenia, according to classification, wastes are divided into five categories depending on their degree of toxicity. Such approach is not relevant in our case. This is because it does not give any information about source of generation and collection methods.

Consequently, for the purpose of thesis the following definitions are adopted:

- *"Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law"* (Basel Convention)⁸.
- *"Management means the collection, transport, recovery and disposal of waste, including the supervision of such operations and after-care of disposal sites"* (EU Council Directive 91/156/EEC of 18 March 1991)⁹.
- *"Disposal means the orderly discarding, release, collection, treatment or salvaging of unwanted or useless non-liquid, non-soluble refuse."* (EIONET)¹⁰.
- *"Collection means the gathering, sorting and/or mixing of waste for the purpose of transport"*(EU Council Directive 91/156/EEC of 18 March 1991)¹¹.

As mentioned before, the thesis attention will focus on municipal waste and on the main source of it, which is the household waste.

Household waste is a concept linked specifically to a waste generation source. However, in practice, waste collected by municipalities from households will often be mixed with similar waste from other sources such as offices, schools, restaurants etc. In that sense the following definitions according to Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste are:

⁸ The UN Basel Convention on the control of transboundary movements of hazardous wastes and their disposal", Article 2.

⁹ EU Council Directive 91/156/EEC of 18 March 1991 amending Council Directive 75/442/EEC on waste.

¹⁰ EIONET-European Environment Information and Observation Network. .

¹¹ Council Directive 91/156/EEC of 18 March 1991 amending Council Directive 75/442/EEC on waste.

- *"municipal waste means waste from households, as well as other waste which, because of its nature or composition, is similar to waste from household";*
- *"municipal solid waste, which is the same as municipal waste, excluding discharges to water as well as human secretion".*

Another important definition is related to Waste Diversion. For the purpose of this paper the concept of "*diversion*" can be understood as the reduction or elimination of the amount of solid waste from ending up in the waste disposal area. (Public Resource Code (PRC), section 40124).

"*Source reduction*" is defined as "*any action, which causes a net reduction in the generation of solid waste.*" (PRC, section 40196). Source reduction does not include steps taken after the material becomes solid waste. Re-use means using the same good or material again without any processing. And, "*recycling*" is defined as "*any process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste*". (PRC, section 40180). In other words recycling includes the returning of these materials to the economic mainstream in the form of raw material for new, reused, or reconstituted products, which meet the quality standards necessary to be used in the marketplace; but does not include transformation of materials.

Composting is a biological process submits biodegradable waste to anaerobic or aerobic decomposition, and that results in a product that is recovered (UNSD/UNEP)¹².

1.6 Scope and limitations

Initially, the research scope was based on considerations of MSW management options towards actions to minimize the amount of waste being disposed of in landfill.

The research was based on the aspect of diversion. The main focus was to develop an effective post consumer waste management by taking into consideration actions such as: (i) reuse strategies; (ii) material recycling; and (iii) composting options.

Unfortunately, the initial phase of the research revealed severe problems concerning data availability, accuracy and reliability. The information when not conflicting was not available and in most cases there was no information at all. Particularly this pertained to waste generation and composition data being the main problem.

Consequently, it was obvious to redirect the research. Since, in case of absence of relevant data and concrete proposals regarding reuse, recycling or composting options the achievement of the thesis goal would have been unrealistic. Taking this fact into consideration, the scope was reviewed and expanded in terms of analysis of the whole system, from policy to operations.

The study, therefore, opted for a broader analysis in order to attain a better understanding of the current situation in the municipal waste sector in Armenia. The reason is that such an analysis can provide a realistic overview of the current situation regarding the municipal waste sector. In addition, it may identify the main problems and driving forces for further improvement, where measures for waste diversion can be implemented, such as development of reduction and minimization options, reuse, recycling and composting.

¹² UNSD-United Nations Statistics Department., UNEP- United Nations Environment Program .

The final research scope is still focused on the MSW. However, it is particularly centred on household waste without any emphasis of specific waste stream such as plastic, paper and other materials.

Therefore, this research excludes considerations concerning Municipal Hazardous Waste (MHW). This is because that MHW comprehends a small fraction in the total municipal waste composition. Moreover, it requires a special treatment and special programs, which are not any longer aimed by this final thesis scope.

Regarding the geographical boundaries, they are limited by Yerevan city, capital of Armenia based on the following reasons:

- i. Yerevan is the largest city in Armenia and it represents one region itself. The population in the city comprehends approximately 40 percent of entire Armenian population.
- ii. The city faces the problem of inadequate waste management associated with land degradation caused by a vast number of illegal dump sites. Moreover, the growing rates of environmental pollution in the area such as emissions to atmosphere and contamination of land and groundwater in the existing landfills and nearby areas.
- iii. Concentration of large industrial facilities in the Yerevan city can serve as an appropriate base for the development of alternative treatment and management options for solution of the waste problem.
- iv. Concentration of governmental power provides a kind of leverage actions in terms of policy formulation and enforcement. Therefore, in Armenia there are no local policies. Any single legislation is adopted on national level.

Since the study, while analysing the waste management options, focuses on urban areas, it will be difficult to extrapolate these results as such to other small cities and countryside areas.

The major limitation faced throughout this research was data quality and completeness.

Background information related to waste management in Armenia was quite poor and not updated. In fact, a comprehensive study regarding the municipal waste sector in Armenia has been never done, which increase the importance of this thesis.

In case of data available, it was difficult to judge whether it is based on perception, or based on old data, or even on actual facts. These variances created difficulties in establishing evolution trends especially for different waste streams and criteria.

A total lack of interest by some sanitation enterprises and local authorities can be considered as an important limiting factor. The low rate of response on questionnaires has not allowed for a complete data set as well a precise vision of the different waste management operators.

On the other hand, the information gaps of the questionnaires were partially covered during the visits through personal interviews. Unfortunately, it was not possible to organise meetings with some major stakeholders at the local level, and some industrial enterprises, particularly the informal sector. For this reason some site specific data was not available.

1.7 Methodology

The study is processed with different categories of research methods and they are divided into three major stages: (i) description of the MSW situation in developed countries; (ii) description of the current situation regarding MSW in Armenia; and, finally, (iii) the analytical framework.

Therefore, several tools are used for gathering data and performing analysis, which are presented in the figure below:

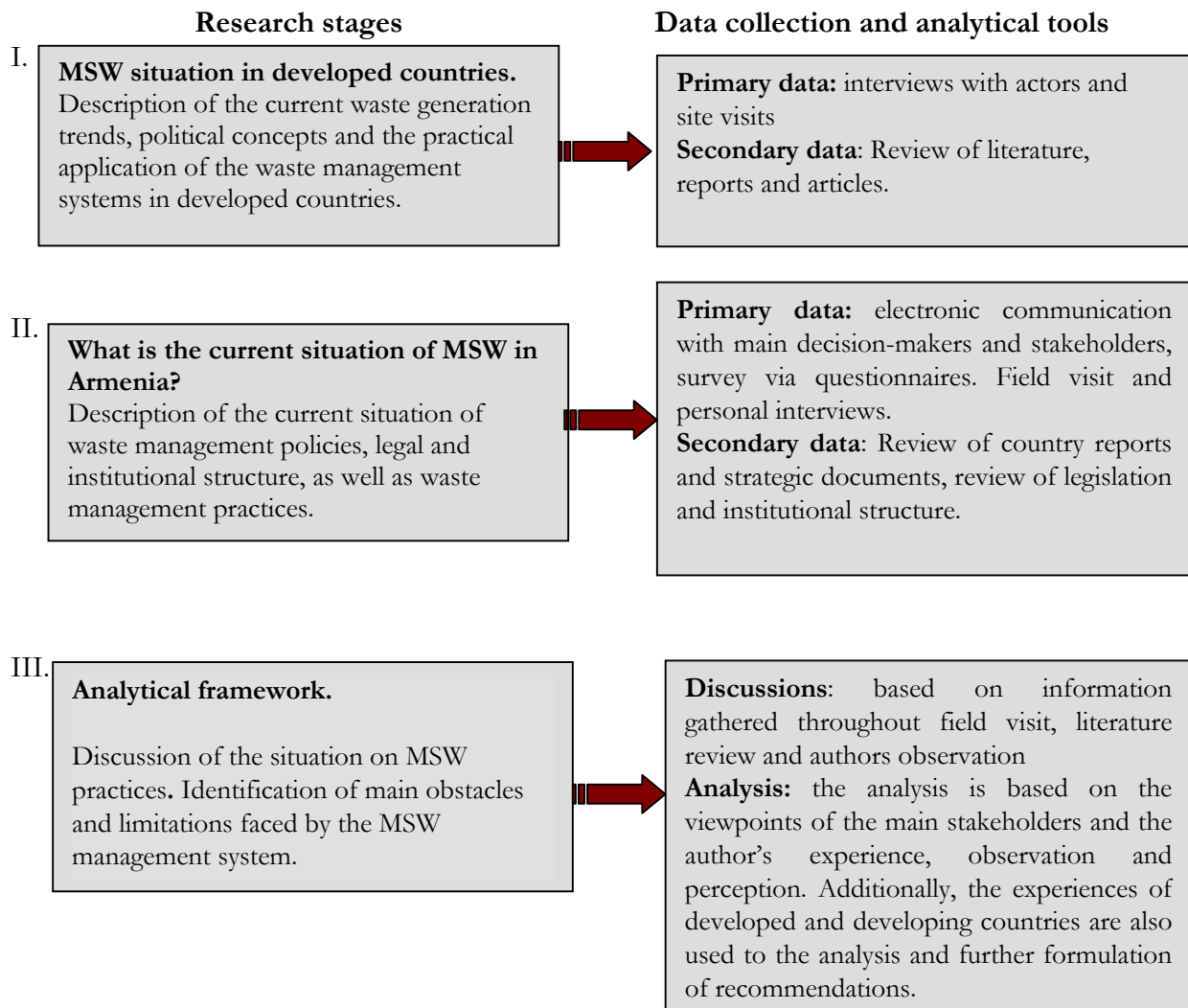


Figure 1-1 Research stages

1.7.1 Data collection

Initial data collection was collected in the form of secondary data provided by literature review to gauge the current situation in the waste management field and trends in developed countries. Mostly the reference materials were from the International Institute for Industrial Environmental Economics (IIIEE) library.

Relevant information was found in hard copy publications, journal articles, electronic abstracts, and on the Internet.

Along with the literature review, this study conducted a parallel review regarding the implementation of municipal waste policies in Central and Eastern European Countries (CEEC). However, this review is presented in the thesis very briefly due to limited scope and length.

Primary data regarding developed countries was collected during fields trips conducted during the master programme at IIIIEE. This data is important to clarify and understand how the MSW system works nowadays. The sources of this data were mainly interviews with the companies' representatives such as the SYSAV and NSR¹³.

Regarding Armenia, the data collection, initially, was focused on secondary data. The information was gathered from existing reports. Primary data was based on electronic communication, which was established among the author and main stakeholders, such as Ministry of Nature Protection (MoNP), Ministry of Urban Development (MoUD), and Yerevan Municipalities. Also, two Non-governmental organisations (NGOs) were interviewed.

Part of the primary data collection utilized two questionnaires in electronic form in order to gather qualitative and quantitative information (see Appendix 2). The questionnaires were designed to group information on:

- i. statistics for waste generation;
- ii. the data on waste management practices; and
- iii. the respondent's data and attitudes regarding policy, institutional, economical and legal aspects.

An introductory letter has been sent with the questionnaires. The letter states the purpose of the research and the author's expectations.

The questionnaires were sent only to the stakeholders responsible for the municipal solid waste in Yerevan, such as the local authorities and sanitation enterprises, Yerevan Municipality, and the Ministry of Urban Development. The questionnaires were fulfilled by the Yerevan municipality, MoUD, Kanaker-Zeytun community and "Sanmaqrum" private sanitation enterprises. As a result of lack of data in MSW sector, the questionnaires were completed partially, where information was available.

The data gathered are the base of the analysis of the problems related to the waste management in general. The analysis used existing legislative and institutional frameworks on waste in order to understand the main inhibiting and fostering factors for further policy development and enforcement.

The rest of primary data were collected by field visit in Yerevan, Armenia. The visit was needed in order to confirm the actual situation in Armenia identified previously by literature review.

The field trip consisted of eight days and personal interviews were conducted with various stakeholders including central, regional and local governments, private sector, NGOs, and representatives from the industry. The list of interviewees is presented in Appendix 3 at the end of this thesis.

¹³ SYSAV-Sydvästra Skånes Avfallsbolag, Malmö. NSR- Nordvästra Skånes Renhållnings AB, Helsingborg.

Personal interviews were conducted in order to fulfil the potential gaps of secondary data and to ratify the credibility and accuracy of relevant data gathered during the initial phase. Also the interviews helped to identify the main problems and flaws in the existing system.

Therefore, face to face discussion allowed to gather additional information about informal sector as well as to reveal personal viewpoints of different stakeholders on the same problem area. These personal interviews, indeed, helped the author to understand the complexity of the problem involve more than policy aspects. In fact, it involves aspects as economic, environmental, technological, social, and so forth.

Additionally, a limited number of informal interviews were done with the households in order to understand the population attitudes regarding waste collection system. Therefore, questions about potential participation in source separation and types of motivations for the households were discussed.

1.7.2 Analysis of collected information

Firstly, the analysis was focused on the understanding of the current situation of the municipal waste management in Armenia.

The analysis in this stage identifies the plans, programmes, strategies on national and local level. Therefore, it identifies the legislative framework and the main stakeholders in the problem area. Consequently, this information presents the current operation systems for collection to disposal.

In the final step, the analysis identifies the flaws and limitations through policy level to the operation systems. Thus, the analysis carries out a general discussion relating problem with potential solutions on the main components that could influence the waste management. Therefore, during the discussion process a comparison with developed countries was applied. This is because of the author's needs in creating a parallel between two different schemes.

1.8 Thesis outline

The following diagram illustrates the outline of the thesis paper with brief description of each chapter.

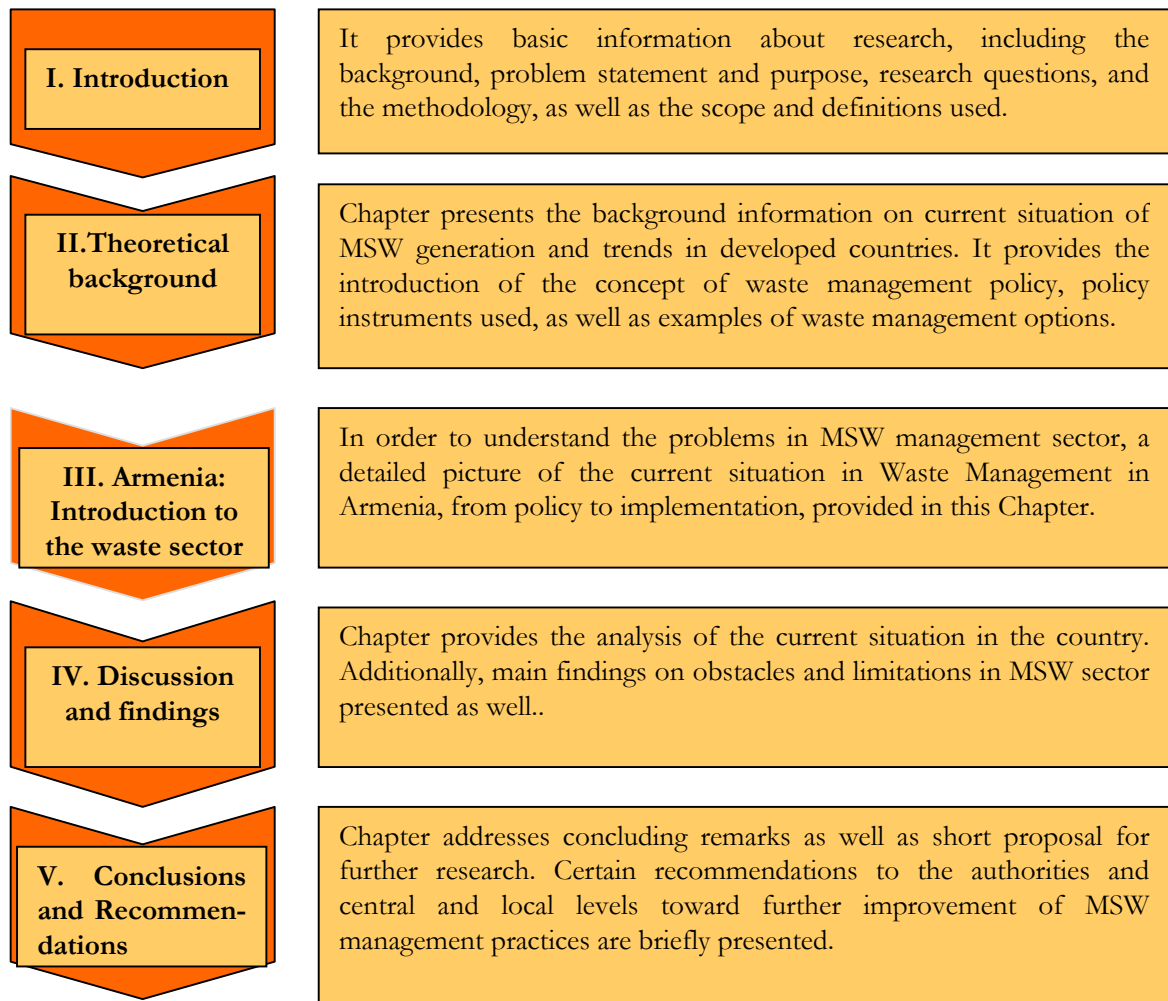


Figure 1-2 Structure of the paper

2 Theoretical background

2.1 Current waste generation and trends

Along with economic growth and changes in production and consumption patterns waste generation has steadily increased over the last twenty years in many countries. For instance, since 1980, municipal waste generated in developed countries has increased about forty % in absolute terms.

In 1997, member states of the Organisation for Economic Co-operation and Development (OECD) produced 540 million tonnes of municipal waste annually, corresponding to about 500 kg per person (OECD, 2002).

A similar picture for European Union (EU) countries can be observed. The total yearly amount of municipal waste collected in Western Europe accounted for over 210 million tonnes between 1998 and 2001 or 550 kg per capita. (European Commission (EC), 2003).

Based on rough estimations, the share of waste generated by households in total municipal waste collected is about 82%, which corresponds to an average of 456 kg per capita (European Commission, 2003).

The Figure 2-1 presents the amount of municipal waste, including household, generated in Western European countries.

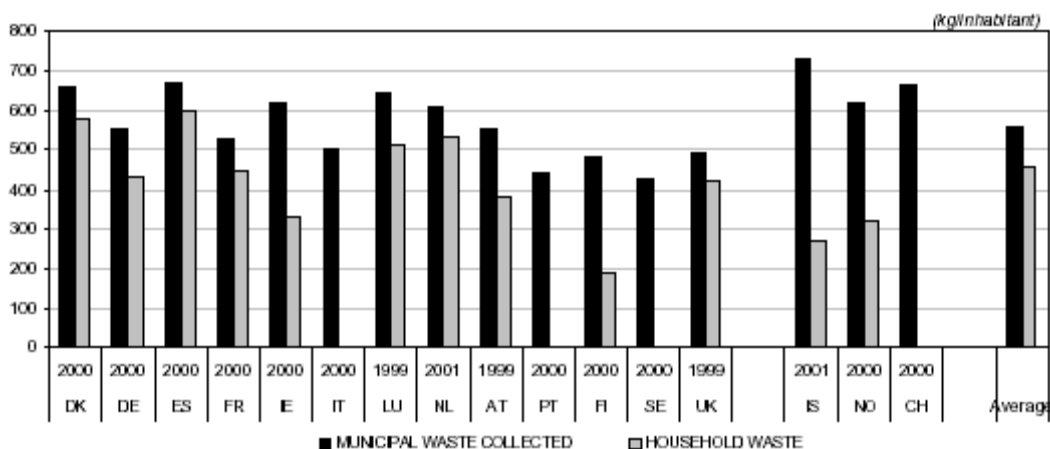


Figure 2-1 Municipal and Household waste generation per capita, Western Europe.

Source: Eurostat/OECD.(2001).

For comparison, in Central and Eastern European Countries (CEEC) municipal waste amounted to 60 million tonnes, an average of 358 kg per inhabitant between 1998-2001.(EC, 2003). In some CEEC, such as Czech Republic, quantity of municipal waste has been decreasing from 372 to 272 kg. At the same time it has been increasing in Bulgaria (9 %), Latvia (12 %), and other states.

The figure below presents the generation of municipal waste in CEEC.

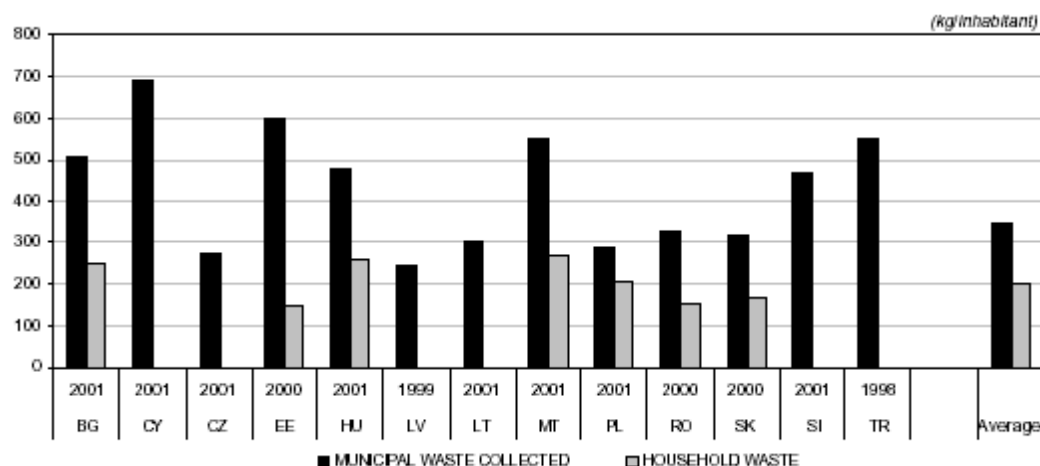


Figure 2-2 Municipal Waste Generation Per Capita in CEEC

Source: Eurostat/OECD

It is important that not only the total weight of household waste is increasing, which could be explained by to the increasing in population, but also the amount of waste per capita. In the European Union region average household waste generation per capita grew 29% between 1980 and 2000 (OECD, 2002).

According to estimation, in OECD countries municipal waste generation will grow another 43 % by 2020 compared to 1997 (See Figure 2-2).

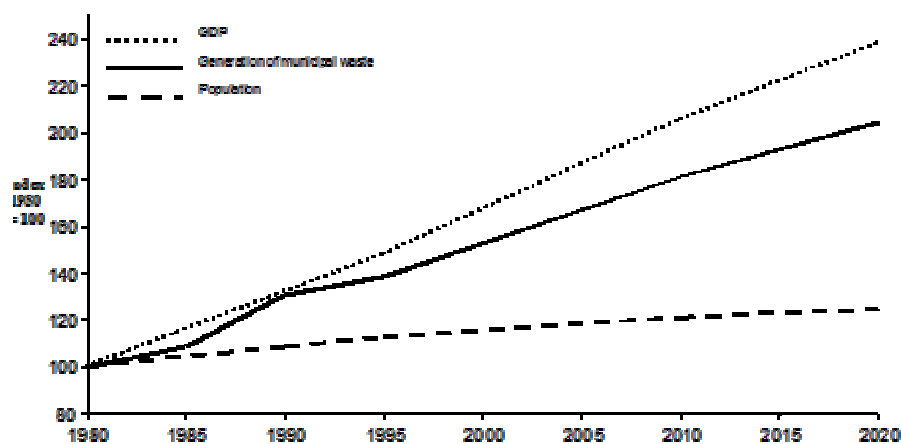


Figure 2-3 Municipal waste generation, GDP and Population in OECD countries, 1980-2020.

Source: OECD. Environmental Outlook, 2001.

Another aspect is composition of municipal waste, which has changed over time. It is obvious that the dominant components of municipal/household waste are organic (i.e., garden and food residue, about 38%,) and paper and paperboard(23%), followed by plastic (8%), metals (4%), and in smaller proportion textile, hazardous waste and bulk waste, such as durable goods, furniture, electrical appliances, etc., durable goods(OECD, 1999).

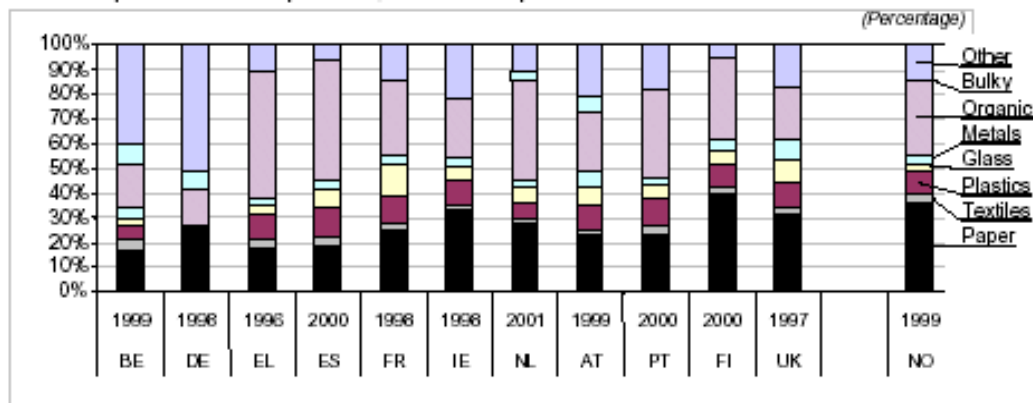


Figure 2-4 Municipal waste composition, Western Europe.

Source: Eurostat/OECD.(2001).

There is a clear trend towards increasing packaging for household goods, including pre-packaged foods and food service packaging (see chapter 2.2).

The main difference between OECD countries and the CEEC lies in share of organic and paper materials. According to the EC report, in the CEE countries the share of paper is lower (14%), as for organic material is higher (43%)¹⁴.

Moreover, waste composition is a vital factor for appropriate waste management option's design, such as material recycling and resource recovery, composting, safe disposal.

2.2 Waste generation drivers

Household waste generation patterns are the result of a series set of factors. The following drivers are considered to be the most influential: (i) economic growth and household income, (ii) awareness level, and (iii) demographic and cultural drivers.

2.2.1 Economic growth and household income

It is obvious that the growth in waste quantities can be difficult to avoid in periods with significant economic growth.

Economic sustainability of the country is directly determined by the market conditions and links to population incomes. Current and expected income and the prices for goods and services are considered the major determinants to create households demand for different goods and services. It is obvious, that *an increase of household income leads to an increase of consumption of products, thus greater potential for waste generation.* (OECD, 2002). Statistics from Netherlands can be a visual case for that statement (Figure 2-5).

¹⁴ Data based on the report of the European Commission "Waste Generated and treated in Europe.Data for 1990-2001.

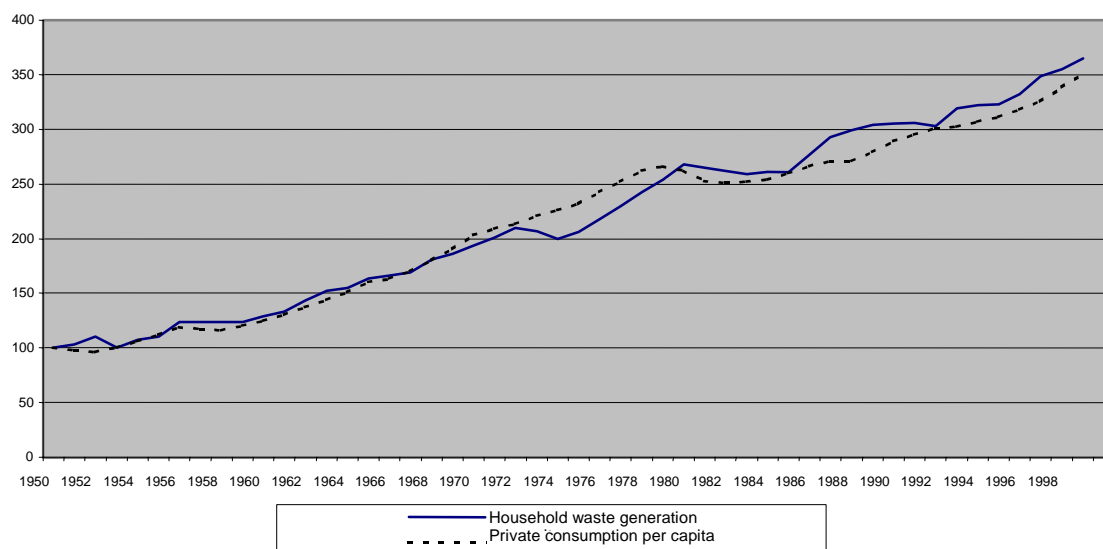


Figure 2-5 Household waste generation and private consumption per capita

Source: RIVM/CBS¹⁵, 2000. (As cited in OECD, 2002).

On the other hand, taking into consideration the current situation of developing and transitional countries, higher economic growth allows for the better development of cleaner production and effective waste management systems. A number of developed countries have already implemented preventative programs towards reduction of waste, material recycling and resource recovery. Although waste management systems are more environmentally friendly, the fact that more waste is being recycled does not mean that the volume of waste generated is being reduced.

Furthermore, there is an opinion that *higher incomes could lead to better purchasing decisions and lower waste generation* (OECD, 2002). General social attitudes to safety and to quality of life will induce some industries to introduce special labels, eco-products, redesign of the production process. Referring to OECD paper on “Household Food Consumption Patterns”, the sector case study report states that high-income citizens able to pay the premium for “green” products, mainly organic food and/or recycled and recyclable products. The same might happen for products with less packaging (OECD, 2002). However, this is not evident and it can vary from country to country.

2.2.2 Information and environmental awareness

Information and environmental awareness are important factors for reducing the amount of waste by influencing the behaviour and forcing people to “act environmentally friendly”.

Waste prevention can be achieved through encouraging consumers to buy products with less packaging, less toxicity, and/or products that can be recycled.

Therefore, active participation of households is quite important in waste management programs, such as separation for recycling, and voluntary actions. And, environmental

¹⁵ RIVM/CBS- Project: Pilot study into a national monitoring project regarding determinants of chronic diseases and health in The Netherlands

awareness is an encouraging factor in this case. There are some observations based on Dutch survey¹⁶, which waste prevention at household level via separation, buying environmentally friendly products are common and are linked with an attitude characterised by environmental awareness.

The literature review also revealed that *“the provision of an adequate infrastructure for recycling system that does not represent high opportunity costs to households, are stronger influences on behaviour than environmental awareness”* (OECD, 2002).

As we can see, major economic growth leads to more waste generation, but it may also lead to better waste management systems as a result of infrastructure and technology development.

2.2.3 Demographic and cultural drivers

Many socio-cultural aspects influence household waste generation, such as demographic trends (e.g., population age and structure, single household's number, work ethics, hours of work, etc), educational level, traditions and cultural values.

OECD sector case studies state, that the most important factors that influence waste generation are population growth, the increasing number of single households, and the rising participation of women in labour market. Meulenberg and Viaene argue that the trends toward smaller families in EU, where both partners have a job, stimulate the demand for convenience and “away from home” consumption. It means that people do not spend too much time on food preparation at home, which leads to reduction of organic compounds in waste stream. On the other hand, the consumption of pre-prepared food will rise; consequently, it will increase packaging.

Also, it is interesting to note how the demographic characteristics can influence environmental behaviour. In case of waste separation a survey in Germany reported that women (93%) are slightly more enthusiastic sorters than men (90%). Another important aspect is the fact that 92% of the population over-thirties in Germany separate their waste, while the younger population around 16 to 29-year-olds are not so devoted – only 87% (OECD, 2002).

The same data but now related to families versus single people. Approximately 93% of the families separate the waste against 84% of single people separate waste (OECD, 2002).

Increasing household income also leads to more consumption. However, increasing household income linked to better education and environmental awareness could lead to the increase of the participation in recycling schemes, and change to “buying behaviour” towards green production.

Environmental awareness and information, generally, are important for changing consumption patterns and increasing household participation in management schemes. Regarding demographic aspects such as population growth, age and structure of household, they can be considered as major drivers of increasing waste generation. As a result, it is clear that there is no equal answer to the question concerning what are the main factors, which can enforcing and/or inhibiting the waste generation.

Different factors exist, and they can have either positive or negative effect. It sometimes can have both of them.

¹⁶ Based on Dutch report “Sociaal Cultureel Planbureau” (2000). A cited in OECD Sector Case Studies Report.

The Table 2-1 briefly illustrates impacts of the main drivers on waste generation and management activities.

Table 2-1 Drivers for household waste prevention and recycling

Drivers	Waste Generation	Waste Management (recycling)
Economic Growth	+/-	More environmentally sound technologies for waste management. The more waste is recovered, the less is disposed. Well designed and relevant technical infrastructure could prevent waste generation at source.
Household Income	+/-	Increase of consumption in quality and quantity
Environmental Information & Awareness	-	More and better participation in recycling schemes, which facilitates its management. Even though people do not consider themselves as “environmentally aware”, they sort waste
Demographic changes (population growth, more single household, more female labour force).	+	Increase of consumption in quantity. Increase of specific waste streams, such as packaging waste

(+) more waste, (-) less waste

Source: Adopted from OECD, 2002

Such situation is quite clear when the same designed management system works well in one city but it does not in another. Consequently, a comprehensive approach regarding all these possible factors is necessary in order to establish a well-designed scheme that could be applicable to certain conditions.

2.3 Environmental impacts of household waste management

The environmental impacts from waste are diverse and varied upon the quantity of waste and the quality generated (e.g., organic, hazardous, plastic, paper, metal, etc).

The experience from developed countries shows that waste separation and resource recovery and better technologies for landfill and incineration plants can reduce the environmental impacts of waste, however these waste management processes still cause certain environmental impacts, including land degradation, soil and water contamination, air pollution, including GHG emissions.

The comparative evaluation of the environmental impacts of the waste management process is difficult¹⁷. As a result, the discussion below identifies only the general environmental impacts related to waste generation and treatment.

2.3.1 Air pollution and greenhouse gas emissions

The environmental impacts of waste on air pollution and greenhouse gas emissions depend on the type and quantity of waste and the waste management technology used. For instance, waste incineration is one of the main sources of emissions into the air. The major air pollutants released through incineration are acid gases, poly-aromatic hydrocarbons, dioxins and furans, dust and heavy metals.

In the EU, emissions from incinerators were reduced after 1990 by the closing of many small incinerators and the introduction of cleaning systems and higher temperature incineration, which reduces the release of toxins. Moreover, the incineration process is, generally, used for energy recovery such as district heating. However, despite benefits, waste incineration is criticised because of outstanding environmental burdens caused by flue gases (e.g., dust, carbonates, NO_x, SO_x, and dioxins), solid residues (e.g., fly ash, flue gas gypsum, slag and ashes containing heavy metals, chlorides and fluorides).

Another source of pollution is landfilling. This is because landfills, as well, contribute to GHG emissions. Landfills and dumps accounted for 34% of methane emissions in 1998 in OECD region (OECD, 2002.). According to the OECD Environmental Outlook, waste derived methane emissions in OECD regions will increase by 20% from 1995 to 2020. Comparing this data from OECD countries with non-OECD countries, where waste generation is expected to double, the waste-derived methane emissions are projected to increase by about 140% over the same period. Moreover, a number of studies in the United States found very high levels of highly toxic methyl mercury in gases emitted by landfills (Miller, 2003, p.545).

On the other hand, in the EU and some other countries many efforts have been made to establish gas collection facilities and/or avoiding landfilling of organic matter. Also, special treatment for hazardous and hazardous-containing waste became a strict regulatory norm in the region.

2.3.2 Soil and water pollution

Soil and water pollution is another important environmental and health problem caused by inadequate disposal. This is because the contamination often leads to the damage of ground and surface waters and/or soil degradation.

The extent of these problems may vary according to the waste quality and the conditions of the landfill sites (e.g., construction type, geological structure and capacity of the site).

Waste dumping, which is the direct disposal on or into unsuitable areas, and landfills that are not appropriate regarding to environmental standards can leach toxic substances and nutrients to surrounding areas. As a result, the contamination of groundwater and nearby surface waters by leachate containing toxic chemicals and heavy metals is one of the major problems. One

¹⁷ Many approaches for evaluation have been developed and date back to the late 1960s. Today there are different standards, methodology and approaches (e.g. Life Cycle Analysis) to describe the environmental impacts of a product or a technical process, but no consensus exists on the best methodology and definition. Naming and scope of the subsequent steps of analysis differ from country to country and from institute to institute. The OECD and the EU have been working on the harmonisation of these issues.

strategy against this problem is the implementation of sanitary landfill, which are designed to eliminate and minimize impact through the collection of leachate.

2.4 Policy approaches

Along with the rapid growth of different economic sectors, such as industry, agriculture, mining, especially in developed countries, the environmental problems has become more severe and better recognized.

As a result, the “end-of-pipe” solution was adopted by countries and industries and a considerable reduction of environmental impacts was achieved. On the other hand, the root of the problem was not addressed. Despite reduction, the overall trend for the generation of waste continued to increase.

The initiation of new approaches towards more progressive environmental movement was obviously a necessity. Thus, a shift in the waste management schemes from the traditional “end-of- pipe” approach to advanced models, which are oriented to more sustainable system, was made.

The idea behind this is simple: what is not produced does not have to be disposed. Consequently, waste prevention and minimization became a high priority in any waste management plan.

In fact, most of the developed countries adopted the integrated approach in waste management policy, which does not consider only environmental aspect but includes financial, socio-economical, technical, and political aspects as well.

An important element of this new approach, it is the recognition of public and private sectors as the key actors and their involvement in the decision-making process.

The current EU waste policy considers the following principles (EC, 1999¹⁸):

- *Prevention principle - waste production must be minimized and avoided where possible.*
- *Producer responsibility and polluter pays principle - those who produce the waste or contaminate the environment should pay the full cost of their actions.*
- *Precautionary principle - we should anticipate potential problems.*
- *Proximity principle - waste should be disposed of as closely as possible to where it is produced.*

Based on these principles the hierarchy of waste management options has been set up as:

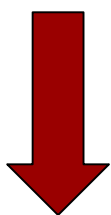
¹⁸ European Commission. (1999). EU focus on waste management. [Online]. Available: http://europa.eu.int/comm/enviromnet/eufocus/waste_management.pdf. (15 June 2004).

1. Prevention/Reduction –



1. Prevention of waste at source of generation through encouraging the efficient use of primary resources, process innovations, improvement of technical facilities, etc.

2. Reuse/Recycling –



2. Reduce the usage of raw materials and energy through reuse of materials after its initial use, without physical or chemical modification (washing and using again bottles).

3. Material recovery from waste that can not be reused through transformation to secondary raw material (needs physical or chemical modification). Waste is considered as a source of material (metal scrap, paper and cardboard, glass residues, etc.)

3. Optimum final disposal -

4. Incineration of waste that can not be reused or recycled with energy recovery system (electricity or heat generation) or without energy recovery (treatment for some hazardous).
5. Landfilling - least favorable option where no further value can be recovered. Reaching this option waste should be treated

Figure 2-6 Waste Management Hierarchy

Most developed countries have already formulated their policy and strategies based on the guiding principles of the waste hierarchy. The hierarchy's design varies in different countries, however all of them give preference first to waste prevention, then to recovery, which includes reuse, recycling and energy recovery, and lastly to waste disposal.

2.5 Instruments for implementation

Different policy instruments have been developed and implemented during the last decades. Countries have designed policy packages that cover the whole “waste chain” and target with different actors involved.

2.5.1 Regulatory instruments for waste management

The regulatory framework is the key element in reducing waste generation and improving waste management.

The installation and operation of waste disposal facilities are generally controlled by legal standards and requirements to minimise the emission of pollutants. The regulations that are applied to landfill sites and incineration plants have been strengthened in a number of OECD countries. Emission standards and operating criteria have been implemented for incinerators of municipal and hazardous waste. Measures to prevent the generation of packaging waste, to limit the heavy metal contents in packaging and batteries, and to safely collect and dispose of waste, have been strengthened in recent decades.

The developed countries have adopted several Acts and standards for economically efficient and environmentally sound waste management. In 1994, the European *Packaging Directive* came into force. It laid down boundary conditions and objectives that must be transposed into national legislation.

The aim of the EU Packaging Directive was to reduce packaging waste all over Europe by 50% by the year 2001, goal that was achieved. Also, it required Member states to reach a recovery level of between 50% as a minimum and 65% as a maximum by weight of all packaging waste. In this case, recovery includes all kinds of recycling, energy recovery and composting (EC, 1999).

Another case it is the EU Directive on landfilling of biodegradable municipal waste¹⁹. Apart from standards related to the construction and running procedures of landfills, the directive sets a number of targets for the reduction of biodegradable municipal waste disposed of on landfills.

By 2006, biodegradable municipal waste sent to landfills must be reduced to 75% of the total amount of biodegradable waste produced in 1995, and by 2016 the same stream must be reduced to 35%. Due to these targets the EU countries had to perform actions for diverting biodegradable waste from landfilling. Indeed, most countries took initiatives to increase the rates of reuse, recycling and composting, and incineration. Some countries, such as “*Austria, Denmark, presents the lowest values and already complies with the targets set by the EU Landfill Directive for 2016*” (OECD, 2002).

Producer responsibility principle

Extended Producer Responsibility (EPR) is increasing as a policy approach under which producers accept significant responsibilities (e.g., financial and/or physical) for the treatment or disposal of post-consumer products.

EPR programmes change the traditional balance of responsibilities among the manufacturers and distributors of consumer goods, consumers and governments, particularly at the post-consumer stage. By the use of such programmes, producers are encouraged to re-evaluate decisions concerning materials selection, production processes, product design, packaging, and marketing strategies in order to reduce the costs of take-back requirements.

Although the idea of EPR began mainly focused on packaging waste, today it has extended its influence. In fact, nowadays, there are a wide-range of EPR programmes in operation for a variety of products, such as vehicles. The current trend shows an expansion of EPR policy to more products, product groups and waste streams (Lindhqvist, 2000).

2.5.2 Economic instruments on household waste

Various kinds of economic instruments can play an important role in reducing waste generation and improving waste management systems. They can range from encouraging waste prevention (e.g., taxes on packaging, waste collection charges) to discouraging the least desirable disposal practices (e.g., landfill taxes).

Environmental taxes and fees are considered as effective instruments. Such instruments aim to make some activities such as separate collection, treatment and recycling of wastes

¹⁹ Council directive 1999/31/EC of 26 April 1999 in the landfill of waste.

economically attractive by increasing the cost up to a significant value to uncontrolled disposal. As an example, landfill taxes can be addressed when the aim is to improve the relative competitiveness of alternative options, like recycling, incineration, etc. The tax does that by imposing a charge on the landfilling.

Fees and taxes

There are different types of waste fees: (i) general taxation regimes, (ii) specific taxes, (iii) fixed fees, (iv) variable fees and (v) variable fees linked to the production of waste (ACR, 2001)²⁰.

In the Netherlands, for example, fees charged to the citizens are used to cover public expenses and finances of the waste management system by the public authority. They can use these money for the improvement of existing waste management system, particularly offer an incentives for waste prevention.

The main economic instruments to reduce household waste generation are collection and disposal fees. Also, they can have a major impact if the fee is related directly to the amount (e.g., weight or volume) of waste generated.

Based on this, it might be more effective to put taxes on product packaging rather than on waste. Such an approach could have an influence directly on the consumers' buying decisions (Porter, 2002).

Another tax could be implemented in landfilling and incineration. Its aim is to provide an economic incentive to the municipality or private companies for waste recovery (e.g., re-use and recycling). Study show, that in Netherlands, due to the stricter regulations for landfill and incineration, costs for waste disposal particularly increased over the period 1990-95. As a reaction to the higher cost for disposal, the waste collection charges have been increased by municipalities (OECD, 2002).

Landfill taxes can be an effective tools, however, if the goal is to promote waste minimisation options, it is important to make sure that the waste producers and operating companies have access to alternative treatment options.

Compare to the EU countries, economic instruments in CEE countries are more revenue oriented. In many cases disposal charges seem to be preferred to taxes (REC for CEE²¹, 2001). The disposal charges become revenue for environmental funds. The REC study states, that disposal charges are generally lower in CEEC in comparison with EU and full cost recovery is questionable (REC for CEE, 2001).

Pay-as-you-throw (PAYT)

PAYT is related directly to the amount of the waste that it will be disposed. Based on this assumption, many pilot projects with the PAYT' scheme have been implemented.

There are different systems of PAYT' such as:

20. See the technical report of the Association of Cities for Recycling (ACR). The Application of Local Taxes and Fees for the Collection of Household Waste. Brussels. 2001.

21 REC for CEE-Regional Environmental Centre for Central and Eastern European Countries.

- based on volume, different container with different volume;
- based on bags, in this system each specific bags related to specific weight must be purchased; and
- based on volume and frequency or weight.

Some case studies “*show that tariff differentiation stimulates a reduction of waste offered for disposal although it is also clear that households perceive the costs of waste generation as being very low*” (EEA, 2002).

The question is does PAYT-type approaches provoke illegal dumping? The experience of many countries, such as US, Netherlands, has shown that complementary programmes such as recycling, yard waste collection, and education can increase PAYT effects on source reduction and recycling rates. Also, they, discourage illegal dumping. However success rates may vary. This is because PAYT communities on average have reduced total waste generated by about 14-27%, while increasing recycling by about 32-59% (Miranda and LaPalme, 1997).

Important to mention, that in order to be successful weight-dependent waste collection fees the system requires to be combined with well-developed recycling schemes.

Deposit-refund scheme (DRS)

Other types of economic instruments have been used for waste prevention such as deposit-refund schemes for certain categories of waste, such as packaging, beverage containers, etc.

DRS essentially is combination of a tax and a subsidy (Turner, Pearce & Bateman, 1994). The consumers of packaging are given the rights to a refund if the waste product is returned to the seller, to an authorised point. The consumer usually may have had pay a kind of deposit at the purchasing point, such as higher price for product. It is important to mention that the refund had to be high enough to motivate consumers to return the container instead of throwing it away.

Deposit-refund systems are in many instances seen as the best solution when very high collection rates are desired (Lindhqvist, 2001). As some studies shows, many of the traditional deposit-refund systems for beer and soft drinks in refillable glass bottles are almost close to 100% return rate.

Lindhqvist states that the return rate is not only dependent on the size of the refund, but also on the level of convenience or inconvenience connected with the return of the containers, as well as the level of awareness or information about the system.

The deposit-refund systems for aluminium cans in Sweden, as well as several other deposit-refund systems in Denmark, USA, Germany, and so on have practised for many years.

It is important to state that in case of DRS the quality of the collected material much higher in compare to other forms of collection.

2.5.3 Informative instruments

The objective of informative instruments can be generically characterised as the influence on the behaviour and willingness of citizens in order to make them act in favour of the environment. This is made by increasing their knowledge and awareness level.

Waste prevention can be achieved through encouraging consumers to buy products with (i) less packaging, (ii) made with less toxic materials or/and (iii) recovered materials, and (iv) products that can be reused or recycled.

A number of tools are used by governmental and non-governmental organisations aiming to increase attention on waste issues. The most common are information programmes, environmental education and voluntary agreements. Various channels of communication, such as TV, radio, newspapers, internet, written material were used for information and education. An important source for waste management/waste reduction information is direct communication. The good approach that is commonly used in developed countries nowadays is labelling.

Information programmes do not require specific regulation, as the participation takes place on voluntary base. Nevertheless effective campaigns require a substantial financial support. As a solution some programme can be linked with a taxation programme. This will make the initiative cost neutral and the taxation could be used indirectly to support the motive of the subsidy programme (EEA, 2002).

Supportive tools: Voluntary agreements

Voluntary agreements (VAs) have gained an increasing attention as an instrument for waste management. Most of the EU countries include voluntary agreements in their waste management efforts for reducing waste generation and increasing recycling.

VAs are normally a consent between authorities and a specific industry about implementation of particular targets in relation to a distinct waste type.

Often the VAs are quite similar to producer responsibility schemes. This is because both of them are based on agreement pact between producers and authorities. As a result, in some cases the agreements can be considered either voluntary agreements or producer responsibility. The difference will be that VAs are softer regulation in comparison with producer responsibility (EEA, 2002.).

The advantage of VAs compared to regulatory is the fact that industrial sector gets involved in the enforcement of waste minimization targets. Also, the VAs are easier to establish than regulatory measures. Since, it is difficult to make a voluntary agreement a political issue.

Consequently, it is possible to combine such agreements with regulation requirements, by formulation of the regulations that contain the details, which have already been agreed with the industrial sector. The Figure 2-5 below illustrates the application of different instruments in waste chain.

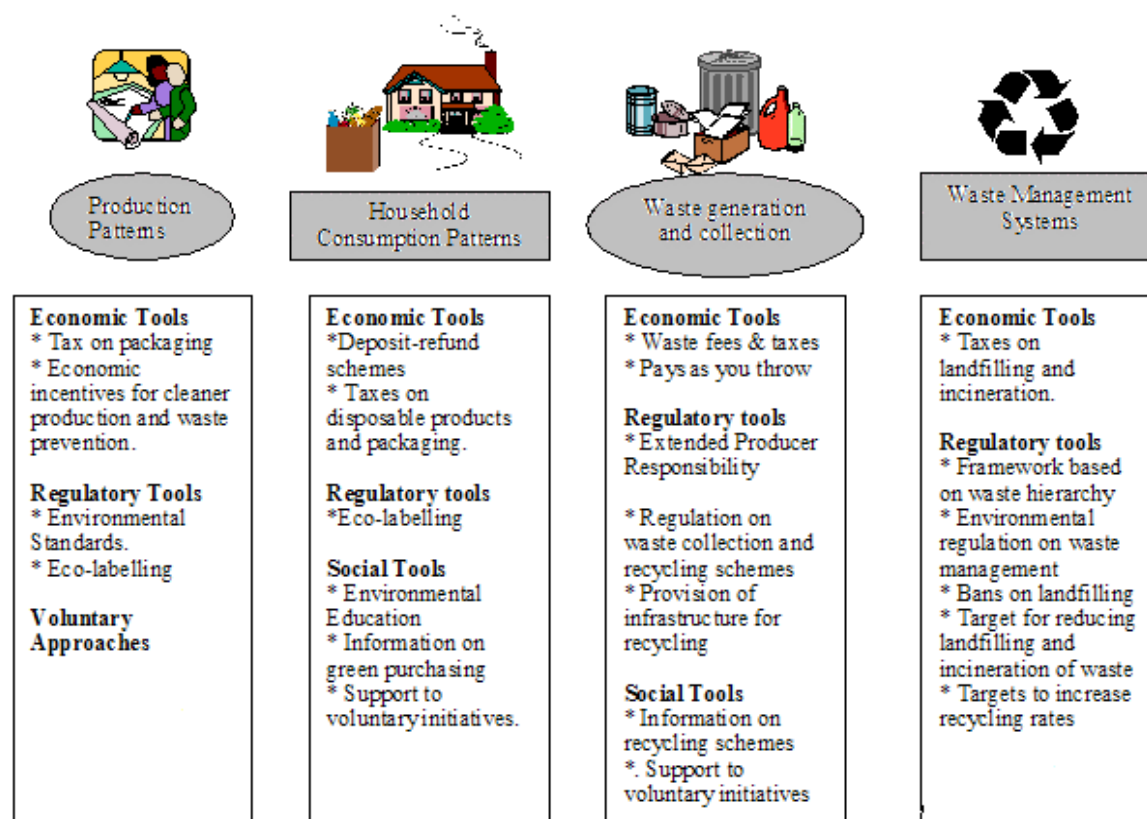


Figure 2-7 Government Policy Instruments for Waste Prevention and Management.

Source: Adopted from OECD Case studies Report (2002).

2.6 Household waste management systems

As mentioned before in the section 2.4, there are various systems for waste management and they may vary country to country. Also, it has mentioned that many developed governments, especially in Europe, are shifting waste strategies from simple collection and disposal to a "waste hierarchy" approach.

In the mid-1990s, 95% of the population in OECD countries had access to the organised municipal waste management services. Approximately 60% of municipal waste went to landfill, 18% to incineration and 18% to recycling, including composting (OECD, 1999).

Although landfill is still the most widely used method, recycling has increased considerably in most OECD countries. The continued implementation of waste management policies is expected to help to further reduce landfilling and increase recycling in the future. According to the OECD's scenarios over the next 20 years, the municipal waste management situation is likely to be changed considerably. By 2020, about 50% of municipal waste is expected to be landfilled, 17% incinerated, and 33% recycled (See Figure 2-6.).

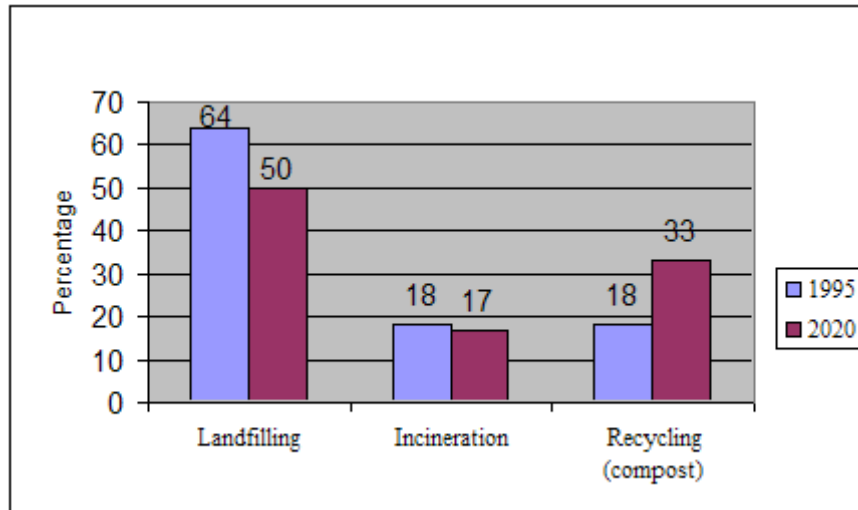


Figure 2-8 Municipal Waste Management in OECD Countries, 1995-2020.

Source: OECD.(2001). *Environmental Outlook*.

Regarding CEE countries the landfilling is dominated option. For a number of countries, such as Bulgaria, Romania it is the only method used (EC, 2003).

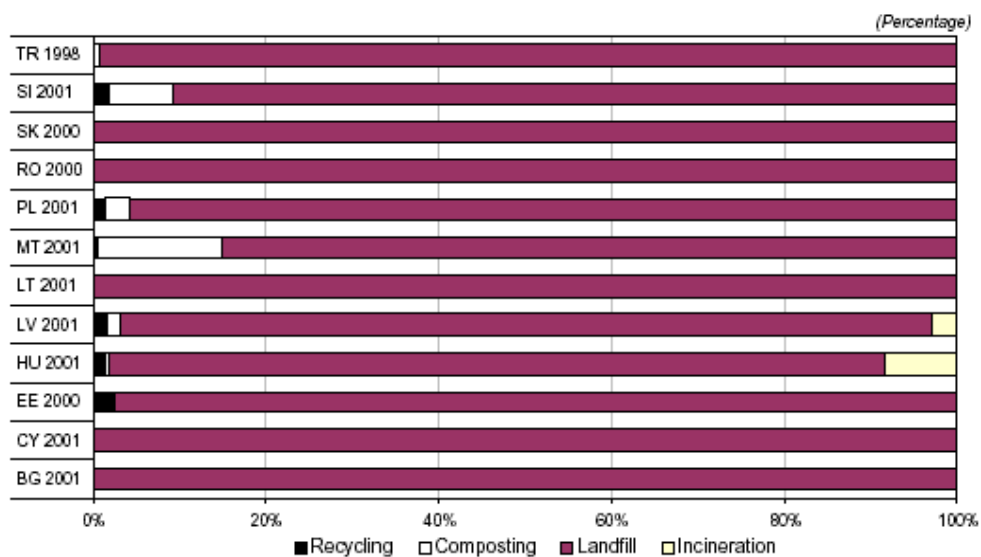


Figure 2-9 Treatment and Disposal of Municipal waste in CEEC

Source: Eurostat/OECD. (2001).

2.6.1 Waste prevention

Prevention is the most desirable waste management option as it eliminates the need for handling, transporting, recycling or disposal of waste. Prevention, by resource optimisation and thus by reducing the potential source of pollution, provides highest level of environmental protection (ETC on WMF²², 2004). Waste prevention measures can be applied at all stages in

²² ETC on WMF-European Topic Centre on Waste &Material Flows. [online]. Available: <http://waste.cionet.eu.int/waste/a/#prevention>.

the life-cycle of a product. During the design stage of a product, consideration can be given to the types of materials to be used, the quantity of materials and the recyclability of the product once it reaches its end of life. (ETC on WMF, 2004). The use of efficient processes in terms of energy and material requirements during the manufacture of a product are other important considerations. Consideration can also be given to minimising the packaging for the product.

Action for waste reduction can take place at both national and local levels (UNEP, 1996). At the national level, the main routes to waste reduction include:

- redesign of products or packaging,
- promotion of consumer awareness, labelling schemes etc., and
- promotion of producer responsibility for post-consumer wastes.

Whereas, at the local level, the main means of reducing waste include:

- diversion of materials from the waste stream through source separation and trading,
- recovery of materials from mixed waste, and
- support of composting, either centralized or small-scale.

Other mechanism could include use of producer-responsibility scheme, encouraging a move from a product-base to a service-based economy (leasing of products instead of selling), option, as well consideration of waste prevention objectives in the Integrated Product Policy.

2.6.2 Re-use and Recycling

In general, after reduction, re-use and recycling are the most attractive options from an environmental and a common-sense perspective.

Re-use of materials is actually more attractive than recycling since it does not require reprocessing. Actually, reuse is a form of waste reduction, which extends resource supplies, keeps high quality matter from being reduced to low quality matter waste, and reduces energy use and pollution associated with manufacturing process.

There are different examples of reusable items, such as metal or plastic lunch boxes, textile shopping bags, e-paper, refillable glass beverage bottles, etc. Some countries have already adopted regulations toward increasing of reuse rates.

In many people's minds recycling is associated with sustainable waste management. Of course, recycling is not at the top of the waste management hierarchy; however it is one of the most straightforward methods of reclaiming value from waste and directly associated with public participation.

The benefits of an increased recycling rate would be considerable. Although, it is sometimes suggested that recycling may not always be the best option, it likely only applies in very specific situation with particular materials. A typology of environmental reasons for recycling might begin with distinction between benefits that arise in waste management process and those are arising in extractive and manufacturing industries (Ackerman, 1997, p.21). In that sense the benefits attributable to recycling include:

- reduction of waste disposal capacities
- reduction the cost of waste disposal for urban areas
- reduction of environmental and health impact from landfills
- conservation of primary raw material and natural resources from being to be extracted
- reduction of energy use and negative environmental impacts during the extraction and manufacturing processes
- increase of environmental awareness and public participation

According to Miller there are two type of recycling for material (Miller, 2003):

- Primary or closed-loop recycling, in which post-consumer waste are recycled to produce new products of the same type, such as aluminium cans to aluminium cans.
- Secondary, or down-cycling, in which waste materials are converted into different and usually low-quality products.

Recycling schemes have been implemented in many municipalities; however the rate for recycling is varies from country to country.

Therefore, if improving recycling of waste generally makes economically sense and people like the idea of saving resources, why is the recycling of municipal waste is still a problem? Waste for industries is easier to collect and recycle, because it arises in large quantity and it is homogenous. In comparison with industry, the household waste recycling process is more complicated, as it arises from a number of sources, in small quantities, and it is heterogeneous. Thereby the collection cost and the content of contamination in household waste are generally higher, and it is not always economically beneficial.

The following factors affecting the recycling value according to Carrington (Carrington, 1996).

- Material content
- Prevailing recycling technology
- Design and construction
- Physical properties of the recycled material
- Demand and supply of the recycled market.

Accordingly, there are two key requirements to improve the rates of recycling. First of all for the success of recycling it is necessary to obtain the purest waste fraction possible. For this reason, source separation and separate collection have to be organised. Current practices show that it is a difficult task, which depends on a number of factors, one of which important is consumer behaviour. On the other hand, if the households separate their waste well, then large quantities of high quality material are produced.

The second requirement is that those materials should be sold on the market at an attractive price. It means that the major obstacle to increasing recycling rates is the inexistence of well designed and related infrastructure.

Organisational schemes

The recovery of recyclables to be manufactured into new material can be achieved in two ways. The recyclables are mixed with other solid waste and separated later in central sorting plants. Or, the recyclable materials are separated at the source or collected as mixed recyclables, which are sorted in Material Recovery Facilities (MRF). Also, materials are brought to drop-off centres or collected at the curbside.

The recovery of the mixed waste stream needs mechanical sorting process. Waste components are separated either manually or by special machines. Subsequent sorting of waste and mixed recyclables means a minimal effort of preparation and collection for the waste producer; however, it is compensated by the efforts requiring energy, labour, and technical capacities.

The quality of the sorted recyclables is lowered as the result of mixing within the container or in trucks, which finally leads to partially recovery of useful material.

In order to prepare the recovery process of the specific recyclables the organisational and technical activities needed for this process shifted from the receptor (i.e., municipality or private sector) to the producer (i.e., household). As a result, the waste producer or generator separates recyclables from his actual garbage and put them into special containers.

There are two types of pick-up system:

- **Drop-off:** containers are placed in a central location near the user and the recyclables are taken by the waste producer to them.
- **Curbside pick-up:** containers are placed near the source of waste generation and the recyclables are picked up from the individual waste producers. The recyclables are generally collected by special bins and transported by special trucks. In this context the need of separation after collection is eliminated. As a result, a high degree of purity is achieved and it leads to overall higher quality of the recyclables.

The selection of the appropriate collection system is one the biggest issues for municipalities. It depends on the following characteristics, such as waste composition, existing collection and disposal systems, processing opportunities, willingness of the population to pay and marketing opportunities.

2.6.3 Composting

Composting is not a new idea. In the natural world, composting is what happens if the leaves pile up on the forest floor and begin to decay. Eventually, the decaying leaves are returned to the soil, where the living roots can finish the recycling process by reclaiming the nutrients from the decomposed leaves.

Composting, also, can be defined as a biological waste treatment method, which is based on the biodegradation of organic substances by various micro-organisms. Composting is the most “natural” way to manage bio-waste, and its cost is generally lower than that of incineration –

above all once this latter has to comply with the provisions of the recent Directive on Incineration (EEA, 2002).

Today, the use of composting for turning organic wastes into a valuable resource is expanding rapidly in the developed countries.

Putting this topic into the policy concept, a large number of countries have stated goals or legislative requirements towards drastically reduction of volume of waste being sent to landfills, and particularly biodegradable waste. Consequently, composting is likely to play a major role in this respect.

A number of benefits can be identified in case of composting. First of all the implementation of composting options reduces the flow of materials into landfills or incinerators, thereby reduces disposal costs.

At the same time, composting yields are a valuable product that can be used a soil amendment or mulch. The compost product improves the condition of soil, reduces erosion, and helps to suppress plant diseases. Moreover, it is complies with state or local regulations or recovery goals, providing a practical management option for a single community or a larger region.

For the success of composting the quality of waste is a crucial factor. Waste which is fit for composting must be organic in nature and less contaminated. The most important compostable wastes include bio-waste (e.g., kitchen waste and green matter), garden and yard waste (e.g., leaves, wood), as well as paper residues. Since the decomposition of organic substances is performed by micro-organisms, however, some mineral components are also necessary for the nutrient balance purposes.

Depending on the degree of decomposition two kinds of compost can be produced (Bilitewsky, at al., 1994):

- *Fresh compost* – it is raw compost which has been decontaminated through rapid decomposition, has been screened to remove coarse particles. However it is not enough to be compatible for plants. Fresh compost contents a high level of organic substances, but it is harmful to plant roots.
- *Mature compost* – it is the compost derived from the fresh one that has been further decomposed to the point of being compatible with plant root.

Therefore, as in case of recycling, the composting is a good tool towards the reduction of waste stream going to be disposed of or incinerated. However, to be beneficial, it requires following to strict quality standards and having accompanied by the appropriate infrastructure for collection, transportation and processing. Also, the important factor is market existence.

2.7 Summary

Along with the economic growth and changes in production and consumption patterns, the total waste generation levels have increased during the last decades in the most developed countries and are expected to keep growing. The main drivers of household waste generation are the increment on the household income and consumption, as well as demographic changes (i.e. increasing population, more single households) and changes in lifestyles (e.g. working patterns, consumption of more packaged products, processed food).

The improvement of the waste management systems is an environmental priority for developed countries. This will require an integrated approach in order to promote changes in present patterns of production, distribution, consumption, collection, and management of waste. The concept of waste management hierarchy was adopted by many developed countries as their base for policy formulation..

Following this concept, a variety of policy instruments (i.e., economic instruments, regulatory, and informative instruments) aimed at preventing waste and improving waste management systems in an environmentally sound manner has already been adopted.

During this chapter, it was clear that a combination of instruments is the most successful toll in motivating improvements towards a better waste management. These instruments along with the development of technical infrastructure can allow the application of sustainable waste management options, such as recycling, reuse and treatment. However, while the resource recovery (e.g., recycling, reuse, composting) has increased considerably, it has not been sufficient to reverse the trend of escalating volumes of waste destined for final disposal. As a result, the major efforts are still needed for waste prevention.

3 Armenia: Introduction to the waste sector

During 1997-98 an improvement in the Armenian economy was observed, and since that time environmental management in Armenia has been going through significant changes. The need for integrated planning became apparent when analyzing the environmental problems in Armenia.

In this situation, there is an urgent need for coherent legislation, clear distribution of responsibilities among authorities, an environmental monitoring, and functional regulatory tools for all sectors. These changes are particularly necessary for the Armenian waste management, which has been neglected for many years.

3.1 Waste policy

The first analysis in the waste management sector was conducted in 1997-98, during the preparation of the NEAP. The major results of the analysis were: (i) unclear and insufficient legal and regulatory framework, and (ii) inadequate institutional structure. Consequently, the following policy objectives for waste were formulated (NEAP, 1998):

- To improve the institutional structure for waste and hazardous chemicals management
- To set up a database on waste management
- To improve the collection, sorting, recycling and transport of municipal waste
- To improve sanitary conditions and maintenance in order to meet standards and norms for municipal waste landfills and industrial wastes disposal sites. To increase the share of the population that is served by municipal waste management systems
- To increase the share of recycled industrial, mainly hazardous, wastes, by increasing the responsibility of producers. To build an installation for the treatment of hazardous wastes, and to organize a control system for their generation, treatment and disposal
- To support enterprises in the industrial and municipal waste management system by the enforcement of economic instruments
- To raise the awareness and improve the education of the public and enable its more active participation in decision-making processes

Based on these objectives the integrated strategy document was developed and the development of a solid waste management strategy was proposed.

According to the proposal the following priority activities were included: (i) the assessment and revision of existing waste collection, transportation and landfill systems and norms, including identification of investment needs and financing strategies; (ii) the environmental impact assessments of existing landfills; (iii) a feasibility study for biogas production from waste; and (iv) the development of waste management training programs (NEAP, 1998, p.36).

The achievement of these objectives was and is still a quite difficult task. Obviously, that a number of activities were implemented in order to improve the situation. However, they were mainly driven by the Armenia's responsibilities within the international environmental

agreements, and in most cases the activities were related to the hazardous waste management sector.

In spite of such improvement, the integrated waste management strategy was not fully developed, and issues of municipal waste sector were remained uncontrolled and out of attention. The next phase of the policy development was NEHAP, which has been approved in August 2002.

NEHAP had a similar problem as NEAP did before, which is the (i) inadequate implementation process for collection, transportation, processing, decontamination and elimination of waste in urban and rural areas, and (ii) absence of technologies for processing and treatment.

Five targets for the municipal waste sector were established (NEHAP, 2002):

- i. To create a rational system of waste disposal, which would be in line with the rules of market economy and would correspond to the requirements of the population, and would ensure the necessary environmental and health safety;*
- ii. To ensure safe disposal of waste, through its collection, sorting and processing;*
- iii. To contribute to the introduction of waste-free or low-waste technologies, processing waste and using it as a source of energy, as well as other purposes;*
- iv. To reduce the adverse effect of landfills on environment and health;*
- v. To organise environmentally sound disposal of hazardous waste, including expired pesticides, expired medicines, etc.;*

Also, it proposed an appropriate range of actions in order to achieve the above mentioned targets at both government and regional level. Appendix 2 describes in the decision of Government to introduce the list of priority action, including responsible stakeholders and time-frame for the implementation. Two of the proposals are presented below:

- i. Develop and implement a national policy and strategy on waste management – 2002-2005*
- ii. Develop and implement the programmes on collection, transportation, processing, decontamination, recycling and elimination of toxic waste – 2006-2010.*

It is obvious that a number of policy objectives have been developed during the last years; however, the more important aspect is the execution of actions. The necessity of creation of the national waste management policy, and/or improvement of sanitary conditions of landfills is still part of the agenda.

3.2 Legislative framework

Article 10 of the Constitution of Armenia guarantees protection of the environment by the state, as well the rational use and reproduction of natural resources.

In principal, environmental legislation has been formulated after the Rio Summit. Nowadays, four codes and 17 laws on the environment and related sector are in force. Except the specific environmental legislation, the environmental sector is also regulated by the Civil, Administrative Violence and Criminal codes. Also, very important is Law on Licensing.

Therefore, inside of the legal framework and in order to support its enforcement by appropriate practical mechanisms, more than 500 regulations have been adopted. However, since the country's independence in 1991 there were no special basic law on waste in the nation.

On the other hand, considering the seriousness of the situation in the waste sector and being driven by international agreements a number of regulatory documents and norms, which contains provision concerning waste, were elaborated. Unfortunately, most of them are still related to hazardous waste.

The following normative acts relating to the municipal waste sector can be highlighted:

- i. *Principles of Legislation on Nature Protection*, adopted in 1991. According to article 27 the industrial, agricultural or municipal organisation, who are generators of waste, should be responsible and cover expenses for waste treatment and utilisation.
- ii. The *Law on Sanitary and Epidemiological Safety of the Population of the Republic of Armenia*. The distribution of the duties, responsibilities and rights between authorities are stated in the law. The more detailed regulations are given in the Decision N 518 on the *Provision of State Hygienic and Counter Epidemiological Servicing*, passed October 12, 1993. Article 23 identifying conditions for sanitary-hygienic expertise for the objects, which can have potential negative impact on environment, particularly through releasing of harmful substances.

A number of directives were approved in terms of allocation of the responsibilities to the local and regional governments:

- the directive of the President of the Republic of Armenia issued January 15, 1996, regarding the *Governmental Structure and the Setting the Regulation of the Activities*. The regulation states the duties and rights of Marzpet (the chief administrator of the region).
- the Law on *Local Self Governance* (May, 2002). The responsibilities of the head of the Community including the responsibilities in the field of waste management are stated in the law.
- the Decision of the Government N51 on March 14, 1997, concerning possessions of the communities. By this decision, e.g. landfills were transferred to the ownership of the communities.

The main law concerning privatization of waste management services is the Law on the *1996-97 Program of Handing-out of State Enterprises and Uncompleted Constructions*, adopted by the Parliament in 1996.

The collection, transportation and treatment of waste as well as data collection concerning waste are regulated as follows:

- In 1997, the Minister of the Environment approved the *Instruction Manual* on the registration, taxation and safe disposal of waste, according to which the solid waste was classified into five categories. However this classification is made according to harmlessness of the substances, and it is not clear define the municipal waste.

- The *Law on Environmental and Nature Use Charges* in 2000. According this the fees for the disposal of waste was established. According to the Law on Tariffs for Environmental Charges the rate is 600 Armenian drams (equal to \$1.1 USD) for the disposal of one ton of the municipal waste (considering in the 5-th category as non hazardous) was approved.

The Governmental Decision No. 92, *Measures to Secure the Implementation of the Program on the Social Economical Development of the Republic of Armenia for 1996*, passed on February 1996.

According to the decision, the new regulation on urban waste collection, removal and safe disposal from the settlements was prepared by the all-national organization concerned with community related issues, the “Communtnt” State Enterprise²³.

Decisions were approved by the government regarding export, import and transition of hazardous and other waste within the country. According to that regulation, the State inventory of waste requires the collection of information on the generation, transport and disposal of waste, including transboundary movement.

It is important to state here that the draft for basic Law on Waste, which was developed by the Ministry of Nature Protection under the consideration of National Assembly. The new law aims to regulate all types of waste, except radioactive, mining, as well as waste that is co-mingled into water discharges and gases released from the stationary or mobile sources to the atmosphere.

The Law will provide some basic principles for the waste management, since the definitions to the responsibilities of agencies, rights of private sector, as well as the creation of waste register. It is important to mention that the requirements for the provision of economic incentives for the organisations are working towards waste reduction, recycling, introduction of cleaner technologies are also included. Further discussions regarding the New Law on waste will provided in chapter 4.2.1.

3.3 Institutional framework

The government structure in Armenia is composed of (i) the legislative branch - the National Assembly; (ii) executive branch - the President, the Cabinet, the Ministries and the Marzpetarans (Regional Governments); (iii) a local-self government and (iv) the judicial branch - the courts and the office of prosecutor.

The environmental administration is characterized by a strong vertical management structure with limited authorities for the regional agencies. The rigidity of this structure combined with the lack of technical and managerial capacity and financial resources has led to a significant fragmentation of the environmental management in Armenia.

3.3.1 The Ministries

The Ministry in Armenia is the sectoral republican executive agency, which elaborates and implements the state policy in the corresponding field and is governed by the Minister.

²³ These state enterprises were transforming to the jurisdiction of municipalities and communities, and also were reorganizing into “Sanmaqrum” CJSC.

Structural Units (e.g., Departments, Divisions, Secretariat) and Separated Units (e.g., Agencies, Inspections) are included within the structure of the “Staff of the Ministry”.

The Structural Units are responsible for the policy elaboration; the Separated Units are responsible for the policy implementation. In addition the Agencies are responsible for the service providing and the Inspections are responsible for the state inspection in the corresponding fields. Indeed, the central agencies are responsible for policy development and drafting of regulations.

State Non-Commercial Organizations (SNCO) and Institutions could also be included within the ministry structure.

Ministry of Nature Protection

The Ministry for Nature Protection is the republican executive body and has overall responsibility for the elaboration and implementation of the state policy in the field of environment protection and sustainable use of natural resources. The ministry performs its responsibility in the waste sector by two main subordinated units and organizations: (i) Hazardous substances and waste management division and (ii) the state environmental inspection.

Hazardous Substances and Waste management Division

According to the statute, the Division implements the following activities in the field of chemical substances and waste management:

- The elaboration of concepts, policy papers, strategies and programmes.
- Drafting of the normative documents and regulations
- Inventory of the chemical substances which are used or generated in Armenia
- Expertise of “ Safety certificates” of the enterprises carrying out hazardous activities, which might be cause accidents

Moreover, the division should coordinate all activities regarding to management of hazardous substances and waste, as well as should carried out their classification.

The State Environmental Inspection

The Inspection is the key environmental enforcement agency. According to Regulation, the main goal of the State Environmental Inspection is the promotion to the protection of the environment and natural resources sustainable use and its reproduction.

The Republican Environmental State Inspection had a network of the 11 regional branches with the headquarters in Yerevan. The territorial authority of the regional offices is identical with the administrative borders and they are usually based in the Marzpet headquarters. The Minister of Nature Protection is the official Senior State Inspector and there is a Chief Inspector who manages the Inspection.

The Inspection controlled the compliance with the environmental legislation in the following areas:

- the import, export and transboundary movement of the hazardous waste
- preservation, neutralisation, treatment, transportation and disposal of waste, as well as hazardous chemical substances
- provision of gathering of the environmental charges for the hazardous waste according to actual volumes

If the violation of the Law is determined, the Inspection can impose: (i) corrective measures; (ii) fines; (iii) damage compensation; and (iv) refer crime to the prosecution.

The Inspection functions upon the annual work-plan. The overall working plan summarizes the regional inspection work-plans and must be approved by the Ministry.

Related units

The related units to the Ministry for Nature Protection are:

- Division of Environmental and Nature Use Economics: Responsible for the elaboration of economic instruments for the regulation of waste and hazardous chemicals
- Centre of Monitoring of Impact on the Environment: Performs partial regular monitoring of the quality of surface water and air pollution. Monitoring Center has five stations in the Yerevan. Currently only three of them are operated. They are used for to perform analyses of eleven pollutants, including four basic concentrations for dust, sulphur dioxide, nitrogen oxide and nitrogen dioxide. Also specific measurements are carrying out for the identification of chlorine, chloroprene, benzene, toluene, xylol, lead and ethyl-benzene. Also they analyze some Persistent Organic Pollutants, such as DDT, Lindane.
- “State Environmental Expertise” state non-commercial organization: Implementing the expertise and environment impact assessment of the proposed activities, including projects, programs, construction and manufacturing objects, etc.

Other ministries and agencies

In addition, the Ministry of Health, the Ministry of Urban Development, State sanitary-epidemiological Inspection of the Ministry of Health, and some other ministries and agencies have responsibilities in the waste management sector.

Table 3-1 below presents the distribution of authorities among main stakeholders at central level in the waste management sector.

Table 3-1 *Distribution of authorities in the waste management sector*

Institution	Responsibilities
Ministry of Urban Development	<ul style="list-style-type: none"> - Territorial development and planning. - Planning and the development of state policy in Municipal and apartments sector. - Elaboration of Provision of mechanisms for the introduction of Municipal policy principles
Ministry of Health	<ul style="list-style-type: none"> - Elaboration of the state policy aims to provision of sanitary-epidemiological safety of the population. - Planning of activities and control over the enforcement of sanitary norms and standards, as well as hygienic-epidemiological activities. - Organisation of research for the identification and prevention of negative impacts of environmental components on the human health
State Hygienic and Epidemiological Inspection of the Ministry of Health	<ul style="list-style-type: none"> - Control over the enforcement of the sanitary regulation and norms by the Legal persons and individuals. - Analysis and assessment of the situation regarding to the sanitary-epidemiological safety of population. - Hygienic expertise during the land allocation process for construction, waste disposal, etc.
Ministry of Trade and Economical Development	<ul style="list-style-type: none"> - State regulation over the import and export of chemical substances and waste.
State Custom Committee at the Government of Armenia	<ul style="list-style-type: none"> - Control over the import and export of hazardous substances and waste, performing of necessary measures.
State Statistical Service	<ul style="list-style-type: none"> - Gathering and provision of the data regarding to use and management of waste and chemical substances.

3.3.2 Regional government

The Constitution and four Laws adopted in 1995 and 1996 establish the new territorial administration. The 39 regional governments were transformed into 10 regions called “Marz”, subdivided into communities defined as “Hamaink”. The City of Yerevan constitutes a region in itself.

The Governors (e.g., “Marzpet”) who implement the Government’s regional policy and jointly administer the regions with the local self-governing bodies represent the executive authority.

The Marzpets are appointed and dismissed directly by the Cabinet. The President appoints the Mayor (e.g., “Qaghagapet”) of the City of Yerevan. The state budget finances the Marz administration (e.g., “Marzpetaran”).

In accordance with the President’s Decree “On State Government in the Marzes of the Republic of Armenia” (PD-726, 1997) the Marzes: (i) supervise the constitutionality and

legality of decisions taken by local self-governing bodies; (ii) assure the implementation of the decrees of the President and Government; (iii) implement the regional economic and social development programs; and (iv) coordinate the state agencies functioning in its territory.

The Marzes among others have responsibilities for secure protection of state property, natural resources, cultural heritage and other protected objects.

In the field of environment Marzpet:

- participates in elaboration of national environmental programs and makes provisions for their implementation in the Marz area;
- is responsible for enforcement of environmental legislation in the region;
- Cooperates with environmental NGOs.

In the field of waste the regional authorities are organising the process of municipal waste management (e.g., collection, transportation and disposal). According to the same President's Decree the regional authorities are responsible particularly for the waste treatment and recycling. In case of Yerevan city the municipality is a kind of owner of the Nubarashen city landfill as well.

In order to coordinate such activities in each regional administration the Department of Municipal and Housing Affaires has been established. The department responsible for environmental protection, known as a Department of Ecology was also founded.

3.3.3 Local self-government

In the first year of independence there were no private enterprises involved in waste management activities. All operations regarding waste collection, transportation and disposal was carried out by the state enterprises called "Communtnt" that were under the Ministry of Urban Development control.

In 1996 the Presidential Decrees specified the responsibility of the regional authorities, and, lately, the local self governments have been approved. Since that time responsibilities for municipal waste collection were transferred to local authorities.

The local government (e.g., "Hamainkapetaran") is in charge of the property management in the district and resolves problems of local significance.

According to article 45 of "Law on Local Self Governance" the head of community is obligated to enforce the organisation of protecting the environment, land and forest resources under the own property. In a particular sector the community leader is responsible for the protection of land from the contamination by chemical and radioactive substances, as well as from the contamination by waste.

Currently, local authorities have full responsibility for the organisation and control of waste management activities, which includes municipal waste collection, as well as street cleansing, transportation and disposal. Set up of waste charges or service fees from the population also under the responsibilities of local authorities.

3.3.4 Private sector

In 1994 the government introduced the new reform program with four goals: (i) consolidation of the new role of the state and reduction of the size of the government; (ii) creation of enabling environment for private local and foreign investment and for the development of competitive market; (iii) attainment of macro-economic stabilization; and (iv) divestiture of state owned means of production through privatization.

In 1996 an effort was made to accelerate the privatization process of medium and large-scale enterprises. In March of the same year the country adopted the programme for the Transfer of State Enterprises and Unfinished Construction's Objects for the period of 1996-1997. However, privatization is sometimes mistakenly having seen as a way to solve all of a government's problems in sector (UNEP, 1996).

Following the regulation, the property of the municipal state enterprises was transferred to the private companies. However, the appropriate governmental decision on municipal property has been established municipal ownership over landfills.

Nowadays, the private sanitation companies, mostly known as "Sanmaqrum", are responsible for the waste collection and transportation, as well as managing of the waste fees collected from the populations. These enterprises have status of Closed Joint Stock Company (CJSC) or Limited Enterprises (Ltd) and operate based on the agreement with communities. It is usually one year agreement, which addresses the responsibilities of both actors but in very general terms.

Regarding to the collection of fees from the populations, these companies have agreements with household or condominiums for the service provision and the procedures for charging the fees. Currently, six CJSC and four Ltd enterprises are operated in the municipal sector (Danielyan, et al. 2003).

In spite of sanitation enterprises the situation for landfills is different. According to the legislation, state organisations had the possibility to create a sort of State Closed Joint Stock Companies (SCJSC), where at least 51 % of share should be belong to the government.

In practice, most of these enterprises were with 100 % of government's share. The idea was based on the opportunity for the state entities to gather additional financial resources from some specific activities and organised partially self-financing system. Based on that principle Yerevan Municipality has been established "Municipal landfill" SCJSC with the management rights of the city landfill. In 2002 the Economic Court of the Republic of Armenia was declared the Company bankrupt. According to the decision of Yerevan Municipality the landfill was rented to two enterprises, "Megakhod" Ltd and "Ekotekhard" Ltd.

According to their statutes, the companies aim to organise municipal waste disposal activities, as well as to establish recycling treatment and gas recovery facilities.

3.3.5 Non-Governmental sector

Public awareness about environmental issues has varied over the last few decades. Because of the economic hardship of the last ten years much of this concern has been lost. There is little understanding or interest on environmental issues. However, an active participation of the population in the decision-making process and operational activities is considered as the most important part in the waste management chain.

The experience of developed countries shows that the degree of importance, which the public assigns to environmental issues, is crucial for the environmental management. The National Environmental Action Plan of Armenia identifies several issues as obstacles in this process, such as:

- Absence of timely and accurate information on environment;
- Non-appearance of the environmental issues on the agenda of political parties;
- Forceless non-governmental organisations (NGO).

The special role in the increase of public awareness and in the organisation of different campaign should be corresponded to the NGOs.

According to the NEAP the role of the environmental NGOs in the public life is not significant. They do not seriously affect either public opinion or behaviour of the political groups and parties. The activities and impacts of the NGO movement are considered to be fairly limited at present.

The effectiveness of NGOs is limited by a number of factors, including the lack of coordination and cooperation with the ministries, the lack of resources (i.e., inappropriate membership fees), and reliance on external sources of income (i.e., private sponsorship and grants from overseas organisations).

At present, around 80 environmental and ecological NGOs are registered in Armenia which can be considered as active. In general these organisations focus on the environmental education and training, review of new initiatives and their environmental impact, dissemination of information, participation in discussions and development of key national environmental projects. However, as it has been stressed above, after the economic chaos in the beginning of 90s the majority of the NGOs are not performing the function of “watchdogs” of Government policies and activities in the field of environment.

It is important to mention that from more than 80 active NGOs only two-three of them are focusing their activity on the waste management sector. In fact, most of them focus on activities related to human health issues. In generally, the role of environmental NGOs in the waste sector is not significant.

Public Information Centre on Municipal Policy

With support of the German “International Migration Centre” in 2003 the Ministry of Urban Development was established the public information centre called Municipal Policy-Public Information Centre.

The centre works closely with the Department of Municipal and Housing Policy of the Ministry. The main purpose of the centre is provision of support to the sustainable municipal solid waste management, based on three main directions: (i) economic feasibility, (ii) environmental protection, and (iii) public acceptance.

According to the statute, the centre implements its activities due to organisation of technical support, professional trainings, information distribution and public awareness.

3.4 Economic instruments

In order to reduce the negative impact on the environment and provide a basis for sustainable use of natural resources, as well as generate additional financial resources and in order to fulfil the budget, the Law on Nature Use and Environmental Charges was adopted in 1998.

According to this law, the charges for the disposal of hazardous substances into the environment, disposal of industrial and “consumption” of waste, as well as production and import of environmentally hazardous commodities were included. Regarding the statistics, the application of such tools has generated a significant amount of additional revenue to the budget. The share of environmental and nature use charges in the GDP of the Armenia was increased as well (see Appendix 4).

The tariffs for the disposal of waste have been regulated by another Law on Tariffs for Environmental Charges, which was adopted in 2000. According to this law 600 Armenian drams, equal to \$1.1USD, is collected for the disposal of one ton of non-hazardous waste, or waste classified in the 5th category. Municipal waste is considering as 5th category.

During the last years an large increase in the revenue from charges for the disposal of waste were observed as well.

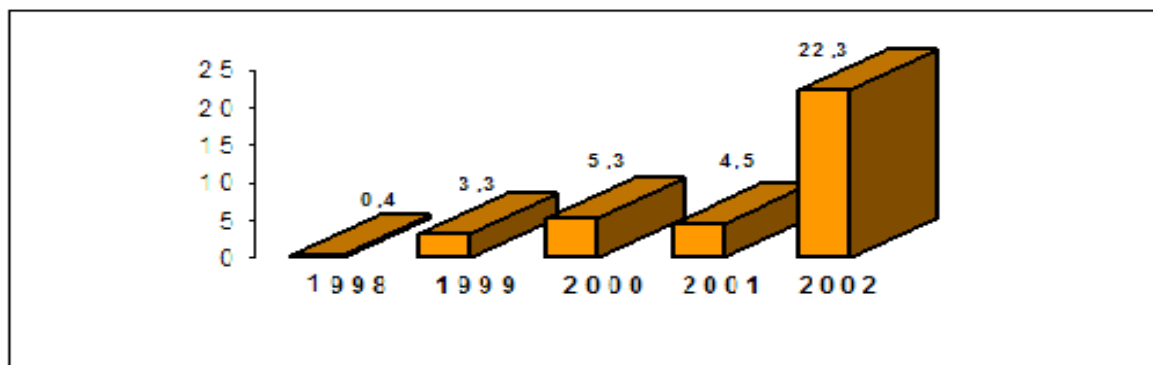


Figure 3-1 Actual Revenue from Environmental Charges for Disposal of industrial and Consumption Waste (in million drams)

Source: Ministry of Nature Protection of the R.A. (2003). Ministerial Report. From Aarhus to Kiev.

The increase in revenues can be explained mostly by the increase in collection as a result of work of the environmental inspection. However, in the calculation, it was included the waste from industrial facilities and in reality the main revenue is generated from the disposal of industrial waste. Thus, increase of revenues from the disposal of municipal waste is not evident.

Another mechanism, it is the service fees from the population for the waste collection. According to legislation, population fees are established by the Municipal council and varied from 60 to 100 Armenia drams (equal to 10-18 US cents) per month in different communities.

Usually, these fees are collected and managed by sanitation enterprises in order to cover expenses for the collection, transportation, and disposal of waste. However, the result of

interviews and questionnaires²⁴ revealed that the total amount of money allocated from the budget and collected from population is two-three times less than actual financial requirements.

3.5 Current waste management system

3.5.1 Generation and composition of MSW

Before the waste management options can be developed, there is a need to characterise the volumes and composition of the waste stream. This is particularly important when considering waste minimisation policies and specific material for recycling or other options.

In case of Armenia, the data regarding waste generation and composition is quite inexact and non reliable. Nonetheless, according to the data for the period of 1985-1990 about 1.5 million tons of municipal waste was generated per year (UNECE, 2000)²⁵. This is equal to 370-430 kg per capita a year.

On the other hand, according to UNECE data the amount of waste per capita for 1996-97 is in the range of 247-285 kg. The municipal waste contains about 85% of household and the rest is non-hazardous industrial waste.

Currently 12,700 m³ of municipal waste is generated in the country per day. Also important that the amount of waste generated in urban areas is five times more than in rural.

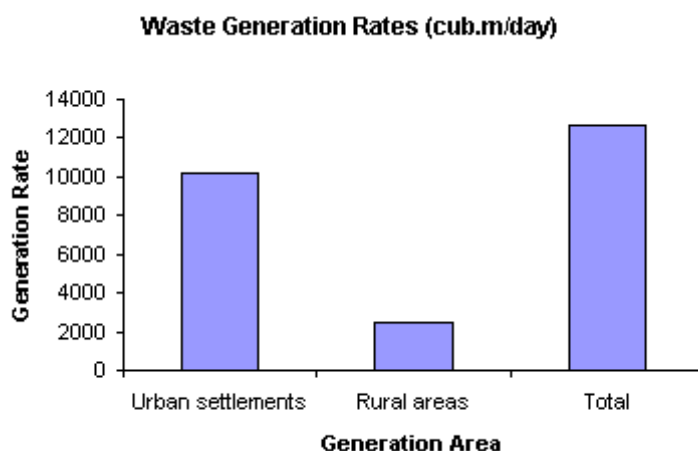


Figure 3-2 Waste generation rates

Source: http://www.grida.no/enrin/htmls/armenia/soe_armenia/english/waste/munsolwt.htm

According to Yerevan municipality²⁶, 400,000 tons of municipal waste is generated in the city annually. The waste composition has been identified only in two towns: Hrazdan and

²⁴ Data from questionnaire, filled up by Mr. Samvel Suqiasyan, the Executive Director of “Sanmaqrum” CJSC of the Qanaker-Zeytun community of the Yerevan . Received in June 30, 2004.

²⁵ UNECE(2000). Environmental Performance Review. Armenia.

²⁶ Data based on the result of questionnaires.

Yerevan²⁷. For general understanding of the trends in the waste generation the Figures 3-3 and 3-4 below present the composition of the municipal waste in Yerevan city before and after 1990 (according to weight).

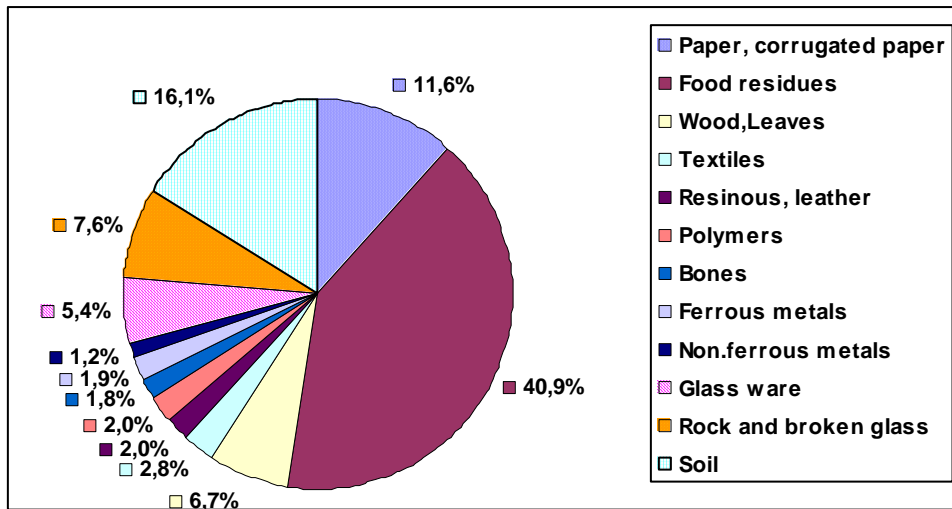


Figure 3-3 Composition of MSW in Yerevan city before 1990.
Source: EPR, 2000. Based on Country Overview Report
by The EU TACIS Programme.

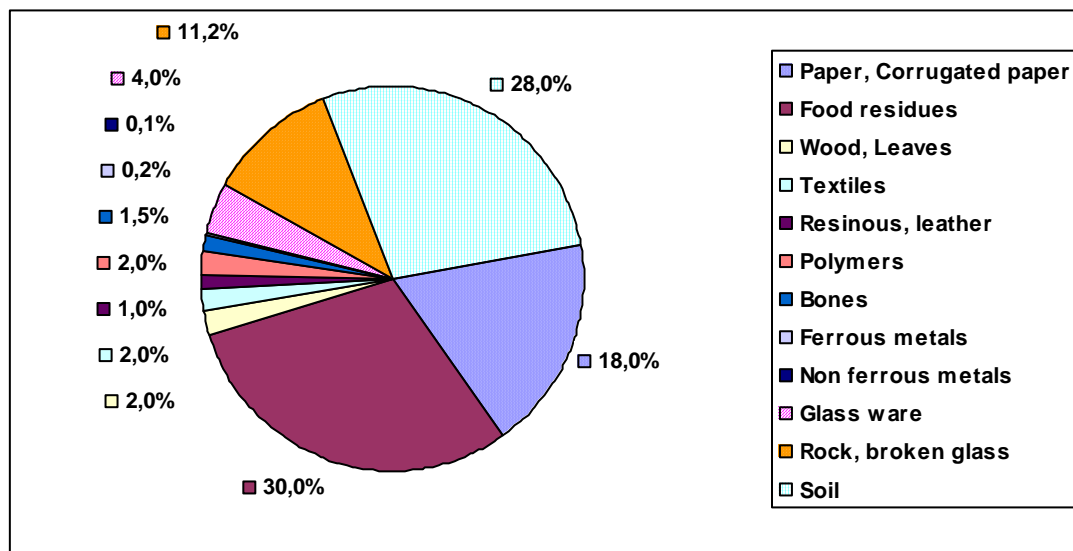


Figure 3-4 Composition of MSW of Yerevan city after 1990.
Source: EPR, 2000. Base on Country Overview Report by
by The EU TACIS Programme.

²⁷ There is a study on waste composition for the Artashat and Yeghegnadzor cities in other two Marzes was conducted within the scope of National Project for Armenia „Regional Development of Marzes,, by EU.

Interesting data was provided by the Yerevan Municipality. According to that the following composition are typical for Yerevan city (see Table 3-2).

Table 3-2 Yerevan: waste fractions

Fractions	%
Paper, corrugated paper	21
Food residues	22
Wood, leaves	0,5
Textiles	4
Resinous substances, leather	3
Polymers	2,0
Hazardous substances	0
Ferrous metals	0,5
Non-ferrous metals	0
Glass ware	5
Soil	30

The table presents a reduction in amount of food residues, and elevation in amounts of paper and soil. It is also quite interesting, that there is a small difference in the quantities of metals, and there is no change in quantities of polymers.

Moreover, the result of the survey shows that some communities have data regarding waste composition, which is different from official statistics. According to the data provided by the “Sanmaqrum” CJSC²⁸, the amounts of organic fraction and the paper are equal to 40 % each. The same figures are from the year of 1999 to 2003. However it does not provide any idea about real conditions. This is because of the fact that the result is based on a single community only.

These constant values for the entire period may lead to the conclusion that the waste generation trend is more or less stable and there are no big changes in generation for the last five years. However, taking into consideration the current economic development trend and population income in Armenia, it is quite difficult to accept such a constant situation. Chapter 4.1.1 will address the analysis of waste generation trend in details.

3.5.2 Collection and transportation

In the capital, the areas requiring cleansing are divided into zones of 6.7 million m² of urban significance (e.g., streets, parks, gardens, etc.) and Municipal significance that is about 3.5 million m².

Approximately 4,000 metal bins or containers are located within the city (Yerevan Municipality, 2004). Containers are used in the houses having no more than five-storey apartment buildings and for the private houses. It is estimated that 2,512 buildings of five-storey or less and 52,137 private houses are located in Yerevan (Danielyan, et al., 2003).

²⁸ “Sanmaqrum” CJSC-it is a company who is responsible for municipal waste collection, transportation and disposal in Qanaker-Zeytun Community of the Yerevan city. The company operates based on agreement with local-self government.

The large containers are located within the household areas in special allocated places, however they are open-air and do not have lids. Also, there is no protection from homeless animals, as well as rats, flies, etc. As a result, the sanitary conditions around the households in most places are quite unfavourable, particularly in summer time.

According to data (Sukiasyn, 2004, Babayan, 2004), there is a trend to increase the quantity of containers from year to year. In Qanaker-Zeytun community, for example in 2001 was set up 105, in 2002-115 and in 2003 almost 130 containers. The containers are for mixed waste and the waste is not sorted before or after collection.

Starting with the six-storey houses, rubbish chute systems are in service. Waste is concentrated in small storage rooms and picked manually by shovels. Approximately 2,040 buildings with such a system exist in Yerevan.

Municipal wastes are collected by dustcarts approximately once or twice per week and directly transported to the landfills. However in some areas the garbage is picked up once every second week, but in others daily.

The full containers with the waste scattered around is quite common picture for some places. The situation gets more complicated in summer time, when the average temperature is quite high around 30-35 degree C⁰. In this period, unpleasant odour is common, particularly in the housings with chute system.

There are 150 trucks that are declared in service in Yerevan but in currently use the number drops to 135 trucks in operation (Yerevan Municipality, 2004)²⁹. There are two main types of trucks with the capacity of 7.5 cubic metres and 22 cubic metres³⁰. This corresponds to 2.5 and 7.1 tons appropriately. Also some part of private trucks is used. The average capacity of those cars is estimated as six cubic metres. It is important to mention, that the fleet has not been replenished during the recent 16-17 years, so the machines are physically worn out. To maintain the trucks in service the pieces from the other truck that are not in operation are used. Such poor physical conditions lead to the increase of impact on environment during the operation. An important aspect is energy consumption rate and the emissions during the transportation.

The cleansing of waste from the streets is done manually. Also small amount of street cleaners are in service. Usually they use just water for the cleaning. As it was explained above the collection activities in Yerevan city are implemented by specialised sanitation enterprises. They are operating based on agreement with community. According to the agreement, part of expenses is covered from the community sources, mainly allocated from the state budget. This money is mainly used for the street cleansing and other sanitation activities. Another source of financial resources is the collection fees from the population, which according to the Division of Communal Affairs of the MoUD average collection rate for the Yerevan city is about 60% (Tumanyan, 2004.).

Some citizens are not willing to pay or have not the ability to pay these monthly fees. In some cases they can use common garbage bins located in the area, or just dump their waste into the streets. In that case sanitation enterprises also pick up the waste during street cleansing and the collected waste is transported directly to the landfill without any sorting or treatment.

²⁹ Information based on the result of questionnaires.

³⁰ Based on the estimation done during the Soviet time, 3q.m. of municipal waste is corresponding to one ton.

Informal sector

Besides the official collection system, uncontrolled collection system of specific waste stream in the streets, household areas and in the landfills was identified. All dustbins in the city are divided among the groups of poor people. It is terrible, but there is really strong competition among these groups for the number of containers, location, etc. Several times per day they check the content of dustbins and pick up useful materials. First of all glass bottles, plastic bottles, paper and cartons. Certain quantity of food residues, metals, garden waste, textiles or other waste streams can be selected as well. During the winter time almost all combustible waste are removed, including plastic boxes and rubber.

Part of the material is used for their own purposes, such as clothes, sources for heating, sometimes food; however the main idea of collection is to hand up waste to the special collection point. There is a particularly trend for collection of bottles and cartons.

Another form of collection happens “door-by-door”. People look mainly for glass bottles and cans from the apartments. Second stage of the collection is taking place in the landfill. The similar materials are collected there. Part of combustible wastes such as rubber, paper, cardboard, wood are picked up and used by people as a heating source in winter time. The people in the landfill come mainly from the surrounding settlements.



Figure 3-5 Informal Pick Up of Waste on the Landfill

Regarding the collection points, it is important to mention, that the formal or legal point exists only for glass bottles. Quite often some private places, such as outdoors storage rooms, or garages, which are places where people are asking for all types of metal scrap can be observed. Usually, small collection areas, which can be just small tables, are located near to open markets. These collection points are visible; however official authorities have no data regarding their activities.

Another important issue is transportation. The current fleet is quite old, fuel demanding and expensive for operations. The financial conditions of the enterprises do not allow investing in to new fleet. For instance, price for one truck that is imported to Yerevan can be estimated as \$15,000 USD. Due to high costs there are number of cases when the garbage trucks do not reach the landfill and empty the trucks in the nearest ravines, near the roads, or other places.

Another aspect is amount of trips. Because of lack of financial resources instead of pick up waste everyday, they do it twice per week. In that case significant economising in fuel can be obtained. Also there are a number of non-registered private trucks operating. They mostly transport construction waste from private sites.

For instance, people can pay to a driver around \$ 20 USD for 4-5 tons of waste. At best, in the evening, truck can go to the landfill and pay only \$1-2 USD to the watchman. In other cases truck can be emptied at any places around the city.

3.5.3 Waste treatment and disposal

Currently, the main treatment method used for municipal household waste is landfilling. There is no recovery of recyclables. Indeed, only a small amount of glass reuse is still present.

The number of companies, such as “Coca-Cola”, “Bjni Group”, “Kotayk” that is a beer company, and other local producers of beverages organised their own collection of bottles in shops, restaurants, etc.

For that reason a kind of deposit refund system was established. It is quite simple and based on the idea that consumers pay the full price of beverage, including the cost of bottle. Depending on type and quantity, this price for one bottle can fluctuate from 10 to 25 % of the total cost of the product.

The consumers can return empty bottles in the nearest trade point and get their money back. The manufacturer picks empty bottles up from the shops and reuses them in the process. There are no special agreements, organisations or other retailer chains in this system. It seems convenient for the population, and effective for the companies. However, such system operates for only limited types of glass bottles, and does not cover plastic containers.

Another case is related to paper or carton recycling. There is a Company in Ararat Marz, which recycle the carton waste into egg boxes. Furthermore, there is an old recycling facility, which is in operation since the Soviet time. Its name is Byureghavan glass factory in Kotayk region. Unfortunately, there were no possibilities to neither visit the company nor obtain any available data. Except the cases for beverage containers mentioned above, almost all other household waste is deposited in landfills and/or in uncontrolled dumping sites.

Armenia has 45 urban and 429 rural landfills for municipal waste. Most of them are constructed without special planning and environmental impact assessment procedure. They do not correspond to elementary sanitary-epidemiological and environmental requirements. Moreover, according to UNECE data, about 900 communities are not covered by MWM system at all. The waste from Yerevan city is dumped at one big landfill, which is located in Nubarashen highway, covering area of 53.3 hectares. The landfill is situated in distance 8-9 km from the city centre; some neighbourhood settlements are located quite nearby.

Nubarashen landfill site (Figure 3-6) has handled the solid waste of Yerevan City ever since its establishment in 1960. The landfill site is divided into three sections, each covering an area of 17-20 ha. The first section started service in 1960 and became full in 1985. The next site has been in service from 1986 until the present days and another one has been set aside for future use.



Figure 3-6 Nubarashen Landfill. Yerevan City.

The following main activities occur at the municipal landfill: storing, pressing, parting. The taking of solid wastes, as a rule, is carried out by size, in non-pressed state (i.e., in that physical state), which is envisaged by a treaty, concluded by organizations, specialized in sanitary cleansing.

Garbage trucks, loaded with household waste, tip in dump and discharge the garbage into the site allocated for that day. It is important to mention that there are no special facilities for measurement of waste quantity and identify quality. General calculation based on the number of trucks.

There is a registration journal, where the number of vehicles, name of the sanitation organisation and the manifest of drivers are registered. Usually 180-190 trips are carried out daily, which are correspond to about 400 tons of waste³¹.

Compression of waste should be performed according to the decision of Yerevan City Council³². All those activities, indeed, should be ideally implemented but in practice most of them are not carried out. This is because of the lack of financial resources. It is important to say, that since the collapse of the Soviet Union, the heavy machinery fleet, similar to the waste collection tracks of sanitation enterprises, were not updated. No new investments into improvement of technical facilities were made.



Figure 3-7 Heavy Machinery Fleet of the Nubarashen Landfill.

³¹ Pogosyan, Martin. Director of the “Megakhod” Ltd. Personal Interview. Done in Yerevan, August 5, 2004.

The landfill is divided into two parts and maintained by two private companies, “Ekotekhard” Ltd with the area 21.2 hectares and “Megakhod” Ltd with 31.1 hectares. Companies operate based on the rent agreement with municipality. There are no legal requirements to have licence for the landfill’s maintenance.

The area containing the waste is mostly under the responsibility of “Megakhod” Ltd. Monthly fees for leasing is equal to 160 USD. The operational cost, established by the municipality, is equal 8-10 US cent for one cubic metre of waste, which is not sufficient for minimum maintenance. Additional fees have been charged by the company. They represent approximately 18 US cents for cubic metre.

Except main Nubarashen municipal landfill, another small site with area of 2.4 hectares exist in Achapnyak community.

This landfill supplies only the mentioned community. This area was allocated for the landfilling purposes in the beginning of nineties. According to the decision of Yerevan Municipality, it was created as a temporary landfill. However this site is still in operation without any legislative base.

The result of interviews³³, as well as author’s own observation reveals that also five or six illegal dumping sites exist in the capital, which is big enough to be considered an issue of concern. However there is no official data on those (see Figure 3-8).



Figure 3-8 Illegal dump site in the Yerevan's surrounding area

Landfills do not have protective walls, leachate control wells, filters and gas collection system, and the relevant data is not collected. This is because of inappropriate infrastructure in almost all landfills concerning waste decomposition and generation of GHG, dioxins and other hazardous substances, odour, etc.

There is no permanent monitoring or control system for the emissions. Only certain analysis is performing by the state sanitary-epidemiological inspection for the water quality.

³² Executive Committees of the Yerevan City Council. Decision N554 of March 2, 1998.

³³ Kosemyan, R. Head of Ecology Department of the Yerevan Municipality. Personal Interview.(Conducted in August 5, 2004.); Pogosyan, M. Director of the “Megakhod”Ltd. Personal interview. Conducted in August 5, 2004).

Important to mention is that open incineration of waste is quite widespread. According to Director of “Megakhod” Ltd, sometimes it is only possible solution for specific waste streams, such as medical residues, spoiled food. It is a sort of “guarantee” to protect the people, who are picking up the waste in the landfill, from diseases and/or from the use of spoiled food.

Informal sector

Similar to case of waste collection and transportation certain illegal infrastructure for reuse and recycling opportunities exist. As an example, plastic bottles can be reused by different people or small companies as a container.

They wash the bottles that are picked up from the waste and use them as a container for kerosene, milk, and etc. There is no figure about scale of such operations, but it seems to be small.

Even though there is no official data from the authorities, during the field study a number of alternative opportunities for plastic recycling were identified.

There are small scale enterprises for the plastic recycling operating in Yerevan. They have some collection points and use the plastic waste as raw material for the production, such as plastic basins, pipes for sewage system, as well as soles for the shoes. However, nobody knows anything about quality of these products since it is not clear whether they contain toxic substances or not for example. The enterprises in most cases operate illegally, without any special permission. There is no data on the number of such manufacturers, as well as on production volumes.

Another interesting case is the recycling of paper. According to the data of the State Environmental Inspection of the Republic of Armenia³⁴ there are ten recycling companies operating in Yerevan (Qamalyan, 2004). Important is that most of them are registered as legal entities.

The main raw material that these companies use is printing paper, and probably newspapers. It can be assumed that paper with heavy metals and harmful substances content should be well treated and companies need good technical facilities, which in the case of Armenia it is doubtful to be met. Consequently, a question arises about quality of the production and conformity to the technological standards. According the information, the inspectors check the level of discharges to the water only (Qamalyan, M. 2004). It means that there is no control on the processing phase, and there is no guarantee that this paper is safe for the health. To be competitive on the market and in order to get trust of consumers their very “easy” decision using foreign labels such as labels from Russia was applied in order to cover the paper recovering procedures.

The figure below presents the current waste management structure in Yerevan city, including illegal activities (see Figure 3-9).

³⁴ Qamayan, Marzpet. Deputy Head of the State Environmental Inspection of the Republic of Armenia. Personal interview. Done in Yerevan, August 10, 2004.

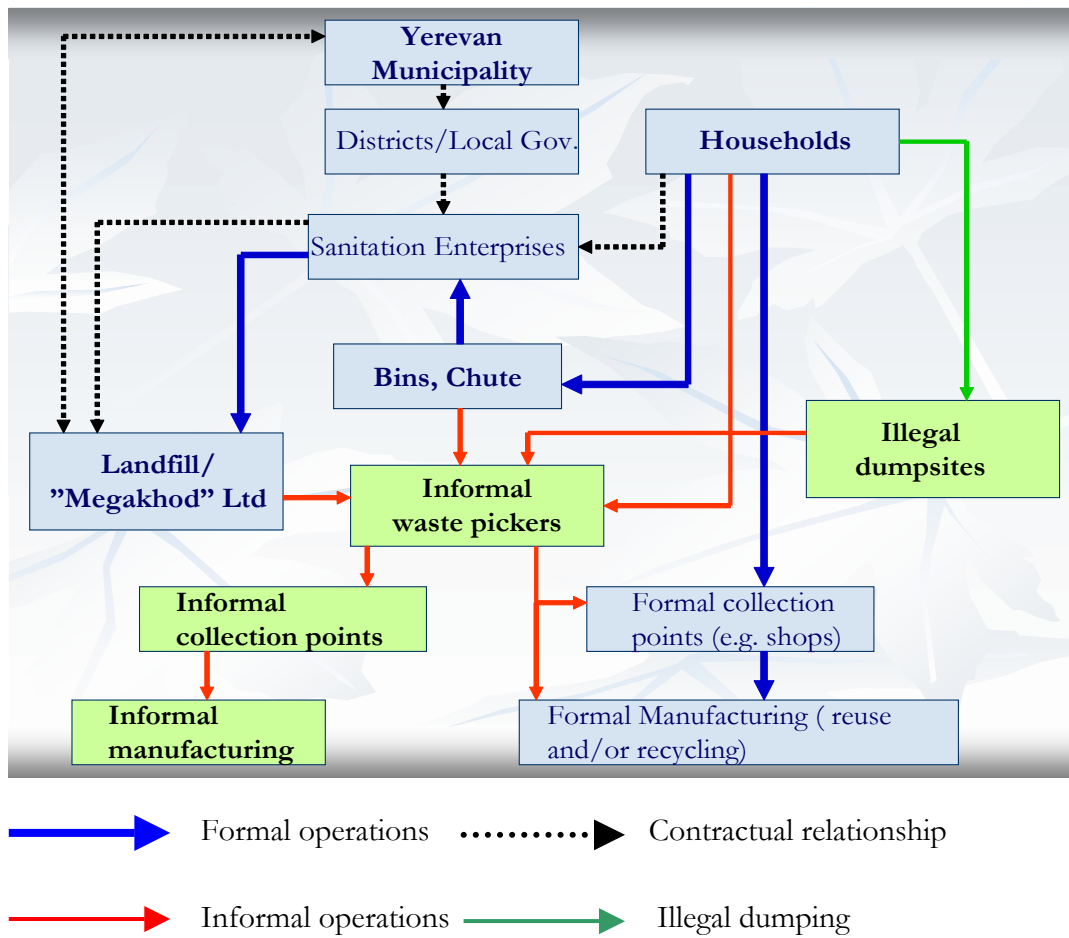


Figure 3-9 Waste management structure in Yerevan city

3.6 Waste related programmes and donor's activities

Important to state here that the waste management issues, even though recognised as an important aspect it was not yet addressed by the Donor Community. Only a limited number of projects, presented below, have been implemented in Armenia.

Additionally, there is a World Bank project, which is expected regarding to the health and environment in Yerevan. Consequently, part of it relates to the regulation of medical waste issues.

3.6.1 National Project on POPs Enabling activity (on-going)

In 2001 Armenia signed the Stockholm Convention on Persistent Organic Pollutants (POPs). In the framework of the convention, the country is carrying out a National Action Plan on POPs.

The Plan contemplates monitoring and assessments of these substances, discovering and reporting of pollution sources, and assessing impact on the environment. The Project was

launched in 2002 and will be complete by the end of 2004. The project is being conducted by the MoNP and implemented by the support of UNIDO and GEF³⁵.

3.6.2 Yerevan City Landfill Gas Utilization Project (negotiation process)

Since 2001, the Japanese Shimizu Corporation has been working with the Government of Armenia and Yerevan Municipality.

The company has conducted a feasibility study into a number of Cleaner Development Mechanism (CDM) projects. One of the proposals was to collect landfill gas from Nubarashen landfill and burn the methane in a co-generation system in order to generate electricity and supply heat. The project crediting period is 16 years, and the aggregate reduction of emissions during this period is estimated as 1.456×10^6 ton-CO₂.

In addition, it is anticipated that the project will contribute to the appropriate running of the landfill site.

3.6.3 “Regional Development of Marzes” National Project for Armenia by EU (on-going)

The Ministry of Urban Development has received requests from Ararat and Vayots Dzor marzes, strongly emphasizing the need for the establishment of adequate MSW management plans, integrating into EU models and standards.

The project will complement the EU “Regional Development of Marzes” National Project for Armenia by bringing expertise to the local community administrations in order to build their capacity for the preparation and installation of MSW Management Plans.

There are two main objectives that have been identified:

- To develop Integrated Sustainable Municipal Solid Waste Management Plans for Pilot Communities in Ararat and Vayots Dzor Marzes.
- To implement a public awareness campaign to increase public awareness and understanding of waste management issues, the intention being to bring about a cultural change towards sustainable waste management methods.

3.7 Summary

Waste management issues in Armenia have been neglected many years in terms of attention from the government. Only a limited number of documents describes waste management problems. As a result, there is no integrated policy or strategy concept on the waste management sector.

There are certain legislative norms and regulations on waste management, however, it can be stated that the complete legislative framework on municipal waste has been not formulated.

³⁵ UNIDO-United Nations Industrial Development Organization, GEF-Global Environmental Facility.

At present time, different institutions are responsible for waste management. The authority along with responsibilities for municipal waste management has been delegated to local governments. Furthermore, important process of privatisation of State enterprises has been done. Consequently, the function of collection, transportation and disposal of municipal waste was transformed into private sanitation enterprises.

Sanitation companies organised collection of household waste and the street cleaning. And, they are in poor technical and financial conditions. Indeed, they have no possibility to measure waste generation and composition. As a result, there is no concrete data on type of waste generated. The only function that is provided by the enterprises it is the collection of garbage and transporting to the landfill. There is no prior separation or waste treatment.

The landfills are not relevant to the existing standards and most of them operate like open dump sites. Open combustion, emission of GHG and other toxic substances, land and water contamination are all typical aspects of landfills in Armenia.

As a result of low living standards and high unemployment rate, there is an increasing number of people, who can be observed collecting different waste mainly bottles and glass residues, and metal scrap and delivering it to special points or private manufacturers. The operation of the informal waste collection, reuse and recycling is based on these operations.

Very low level of involvement of the population and NGOs in the decision-making process can be observed. There is a lack of initiatives towards increase public awareness.

4 Analysis and findings

The chapter presents an analysis of the current situation in Yerevan concerning the municipal waste management system, as well as analysis of regulatory framework. The potential influences in the municipal solid waste sector were also discussed. Therefore, it also presents the main findings from this analysis.

4.1 Discussion on municipal waste management practices

4.1.1 Composition and generation

Generally, the collection related to past and present data provides an opportunity to estimate the future generation trends. This estimation may be useful during the planning of further activities in order to decrease the uncertainty associated with the waste composition (OECD, 2002).

Unfortunately, in case of Armenia this was hardly possible. The calculation of waste compositions is not a permanent process, and current data used is based on studies done in the end of nineties.

During the field visit, the author aimed to identify how this calculation was and is still being done. According to some sources calculation has been made by the group of experts in very small area in the landfills (Pogosyan, 2004). In the other sources it was mentioned that these figures are an approximation of the data collected during the Soviet period. In any case this is the only available official data.

The data in the Figures 3.3 and 3.4 show a significant enlargement of the paper fraction and reduction of organics. Also, according to the data obtained from the Qanaker-Zeytun community³⁶, the amount of paper and carton in waste is equal to 40 %. Therefore, this is quite difficult to explain.

This is because based on the experience of Europe, usually, the increasing paper shares with time addresses the growing preference in packaged food consumption in household (OECD, 2002). Taking this into consideration and the quite low incomes of Armenian population and consumer expenditure of household's incomes, the idea of using packaging food at home seems to be unrealistic since more than 70 % of total income of households is spent on food.

Another important aspect is the cultural factor. The cultural tradition of Armenians is still to spend a lot of time for food preparation at home. Therefore, all products are mainly bought at open markets, which means that they are not treated before and not packed. Obviously, that in the Armenian case the share of food residues should remained high.

It is highly important to consider the data related to source of generation and landfills separately. This is because it is necessary to identify the causes of increments in the landfills' data. For example, the Figure 3-4 presented an increment of the amount of soil. This can be explained by identifying the source, which is the growing of construction activities in capital. As a result, certain amount of recovered soil with other construction residues is found in the landfills, but this process is performed without any control by sanitation enterprises.

³⁶ Qanaker-Zeytun is name of the one of the twelve districts of the Yerevan city.

The same effect happens regarding food residues. If the content of food in city's garbage bins is equal approximately to 30-40 %, why do the data in landfills show around 20-25% ? (Aleksnadryan, 2004). This is the result of the informal collection by poor people and homeless animals (e.g., such as dogs and cats) and/or rats and birds.

Another unclear aspect of the composition of the waste is the low content of polymers. According to figures (see Figure 3-4), just 2% of polymers (based on weight) are in the waste. Interestingly, through discussions among central and local officials and interested parties, the consensus was that plastics such as bottles (i.e. PET, PE, HDPE, and others) and plastic bags are, certainly, the most visible problem of MSW.

According to Deputy Head of State Environmental Inspection, PET bottles and plastic bags are visible everywhere. This is because, nowadays, they are used quite widely and their inappropriate disposal may be expected to increase. In order to develop any model for the system improvement, it is clearly required monitoring actions and reliable data. Unfortunately, data regarding the quantity of polymers and its impact on environment are missing at the present time.

Finally, it is clear, that this kind of picture mostly is the result of absence of monitoring on waste composition, than the divergence of result. In any case, in spite of some inconsistency between data, it seems that the organic fraction was and still is the major one. It is the main factor that determines the viability of composting, while the other fraction, such as paper or plastic, determines the feasibility of recycling options. Therefore, the possible waste disposal solutions are heavily dependent on waste composition, which is almost unknown in Armenia.

4.1.2 Collection and disposal

The collection of municipal waste in Yerevan is performed by the private sanitation enterprises. According to interviews, the main problem for the PSE is lack of finance. In order to understand how is the money generation scheme is operated, the influences behind were observed.

Almost each community in Yerevan has contract with PSE. The contracts usually are quite unclear in describing the service being offered. The main obligation is collect and disposed off removing of municipal waste. However, there is no clear vision about what kind of waste to be managed. Quite often some construction and/or medical waste can be found in the bins and the waste collectors have no guideline how to deal with it. As a result, a mixed mass of waste is transported to the landfill.

In case of household situation, the contract is clearer. The contract is signed among PSE and household for the collection. In practice the only obligation consist of providing good and timely service for the population. However, "definition of good services" does not exist. According to contract, households have to pay monthly fees to the operators, however collection rate is quite low³⁷.

³⁷ Even in Yerevan collection rates are two-three times more than in other regions, the collected amount is not sufficient for the necessary service provision. According to data from the MoUD, the average collection rate for Yerevan city is 60 %.

Some individual households refuse their waste collection services. Their argumentation consists of dissatisfaction concerning the service provided³⁸. Consequently, people deal with their waste by themselves. The result is not the most appropriate since there is always a certain amount of garbage in the street. According to the contract between the municipality and PSE, the PSE is responsible for street cleaning as well. Consequently, the PSE obviously ends up collecting the garbage from the streets and results in increasing of the cleaning costs.

Another gap in the contract is the lack of enforcement mechanisms. Even if the population does not pay monthly fees, the companies have not any mechanism to enforce the payment. The only way to solve the problem is through the court, which is not feasible because of the high cost and long time.

According to the existing procedures, the communities pay to the PSE on a monthly base. The payment is made on the basis of a document, well known as an Execution Act. Payment requires a verification and approval of the Act, however, the scope of verification procedure is unclear. Apparently it does not happen in many cases.

Indeed, there was an opinion (Srapyan, 2004), that fees collection should be the responsibility of municipalities. This is because the opinion believes that collection of fees by the private companies might result in:

- Illegal dumping (no payment, no collection, or collection without control)
- Low effectiveness and efficiency of operations (extra cost in case of non payment, service under the standard level).

In most developed countries, such as Sweden, the waste management is considered as a public responsibility. The municipalities are usually responsible for waste collection and disposal. They are also responsible for the fees collection from the household. In many cases the municipalities form a contract for five, which can be up to 20 years with private companies for the organisation of waste collection and disposal. In example of Lund city the Municipality owned company is operates. The company has contract for three years with municipality, as well as a number of contracts with recycling enterprises (Kristensen, 2004). The long time contract period enables private companies to invest in the infrastructure and get a reasonable return.

Through the separate collection system the private companies are able to organise recycling, or reusing, and sell recoverable materials. This is a type of steps to help to reduce the cost for operation and promote low prices for bidding procedure in order to gain tender from the municipality. The result is that private companies deliver services according to the contract's requirements.

In case of Yerevan city, the tender procedure does not require of the participants to demonstrate existence of technical specifications, neither waste collection plans, nor certain level of trained staff. The analysis has observed that the most of the private sanitation companies are the same state sanitation enterprises, operating before. Indeed, it seems that they just have changed the legal status of State CJSC to CJSC to comply with the legislation. Even the staff is the same.

³⁸ Data based on the informal interview with two families in the Nork-Marash community of Yerevan city.

Definitely, sustainable waste management is just available in the presence of an appropriate level of financing. Nevertheless, the lack of finance is not the only problem that exists hindering it. The professional skills and experience of the authorities and company's staff are also very limited. Most of them have not appropriate background and knowledge about modern waste collection systems. Therefore, there is not any special education program on waste management in the country. In fact, there have never been organised training programs in this field, which is particularly important for the regional and local authorities.

In some terms, the sanitation enterprises are flexible enough to organise their own collection scheme. The thesis analysis revealed that sanitation enterprises are quite passive and mostly depend on the government's decisions. And, unfortunately there is no waste management plan in the community that could serve as an incentive to them (Sukiasyan, S. 2004). As a result, they are free to develop their own plans but they are still operating without any planning, which seems that they only think about "daily revenues" and they are not much interested in innovation processes.

In terms of disposal, it was revealed that the main option dealing with generated household waste is landfilling. This is because in the absence of control from the state authorities a number of illegal dumpsites increased significantly. The fact was recognised by almost all the interviewees. However, concrete data regarding their scale are missing. Typically, there is a lack of monitoring of the impact from the landfills, which can be explained by the lack of capacities of relevant agencies.

In terms of inappropriate maintenance of the landfill, the main problems revealed were lack of financial resources and the technical capacities. Most of the machinery used is in the end of their use life. Additionally, there are other limitations regarding to the effective maintenance of landfills, which is going to be presented in further discussions.

One of the most important aspects founded during the field visit was the existence of informal collection and recycling infrastructure. The informal sorting process at street bins, landfills, and dumps sites is very common in Yerevan. This practice is particularly quite dangerous since the municipal wastes may contain biomedical and industrial wastes contamination in some cases. The risk is increased by the fact that the pickers never use protective clothing, masks, gloves, etc. In addition, children are numerous among pickers.

The local authorities do not have the capacity to enforce prohibition of picking, which is a sensitive topic from the social point of view (UNEP, 1996). Many poor people survive from the income provided by this type of activity. Very poor people, indeed, obtain part of their basic needs from the garbage.

Definitely, the municipality faces difficult issues regarding the informal sector. As a result, the legalisation of these enterprises and the establishment of the appropriate legal infrastructure related to the collection and recycling as an alternative waste management is very important. It may lead to the reduction of the amount of waste being disposed in landfills. Also, it may provide additional social and economical benefits.

Based on the data from questionnaires, it was quite clear the necessity of waste recycling. However, in the questionnaire, when it presents the question about using of existing informal recycling infrastructure was asked a large optimism was not observed.

The local authorities are not valuing this informal collection as a resource for recycling (Engibaryan, 2004.) This is because they view the size of this informal as an insignificant

influence due to its small scale. This argumentation is mainly based on the perceptions, which can be considered as difficult judgement because of the absence of the data. And, the question about the amount of recyclables remains without answer so far.

The experience of developed countries shows that in many cases source separation, when it is supported by the municipal authority, not necessarily reduces the amounts of wastes to be disposed (UNEP, 1996). This is because the most valuable recyclables are removed from the municipal waste stream by waste generators, through deposit refund system, as well as informal sector. As a result, local authorities would not be able to recover the high costs of separate collection by selling the residual recyclable materials.

On the other hand, Armenia has a number of processing enterprises operating nowadays, which means that there are capacities for alternative waste management. This idea is supported by the presence of industrial facilities in Yerevan city.

According to the Director of “Nairit” CJSC³⁹, all possible technologies for material recycling such as plastics, tires, metal, and glass are already in place. This is because; the recycling of some waste streams was performed before during the soviet time. However, at present time the scale, economic feasibility and environmental impacts of the processing is questionable.

4.2 Obstacles and limitations

4.2.1 Absence of Policy Vision

Practice of many countries shows that effective waste management should be driven by an integrated policy, consistence with national and sectoral development goals.

The concept of sustainable waste management is almost missing in Armenia. Absence of concept or strategy on waste management was stressed by all the interviewees as one the most crucial. Consequently, the absence of municipal waste management plans is important aspect of the current situation in the country.

Ideally, municipal waste management plans for Yerevan city as whole, and for the each community should be developed based on the general policy concept.

As it as been presented in chapter two, the integrated approach in waste management policy was applied by a number of countries. It is apparent, that prioritisation of waste management options towards prevention and minimisation became a top priority in any waste management plan. Principle of prevention, producer’s responsibility and polluter’s pay principles were accepted. Based on those the waste management hierarchy principle has been adopted by the developed world. Presence of such approach provides certainly guideline for the formulation of waste management goals and objectives. It’s provided base and serves as a kind of guideline for the establishment of waste management strategies, and action plans.

The question of prioritisation of waste management options may be problematical for Armenia. The reason behind is critical situation in almost the whole sector, and, accordingly, urgent steps should be performed for the whole system. Current economic conditions of the country do not allow carrying out activities in all sectors simultaneously. Thus step by step approach seems to be applicable.

³⁹ “Nairit-2” CJSC was one of the biggest Armenian chemical enterprises. It was only one factory in the Soviet Union for the production of synthetic rubber.

It is obvious, that some documents have already been adopted, such as NEAP and NEHAP. Study revealed that these documents are considered as an obligatory that have to be developed as a requirement of international organisation. In reality, it seems to be in the focus of interest only of the agencies, which have developed the documents, than of the whole government.

Another problem is the declarative nature of the existing documents. For instance, the NEHAP has proposed a priority action list and formulated some targets and recommendations in the municipal waste management sector. Nevertheless, the results of interviews identified, that the responsible authorities have no clear vision of how to achieve these targets, even though these targets are just conceptual. Documents do not provide the basis for the development of concrete mechanisms and instruments for the enforcement.

Except the development of a policy paper, it is equally important to create a continuous evaluation process. An appropriate feedback should avoid negative outputs and improve the enforcement process permanently. Actually, there is no recognition of importance of such process; at least it is not implemented in practice.

It should be noted that the development of the waste management policy has also been hampered and will remain a problem because of the lack of adequate information and data. As long as accurate and timely information is not available, decision making and the enforcement processes will be unfeasible. It is quite important in case of municipal waste management. It is almost impossible to develop waste management plan, and consequently operational options without information on municipal waste flow.

4.2.2 Inconsistent legislation

According to Armenian government officials the main problems in waste management sector is the inconsistency of legislation. The absence of a Law on waste was recognised as one of the primary inhibiting factors for the improvement of the waste management sector⁴⁰. Author's experience revealed that the Environmental Laws in Armenia are more a policy document than regulatory instruments; in most cases they are establishing general principles, which is does not match the situation on the ground.

The law making process is dominated by the executive agencies. Quite often the law development process is based on enthusiasm of sector-responsible department and performing without any financial support. Moreover, the process sometimes is not coordinated with the other responsible governmental institutions, and particularly with local authorities. In addition weak participation of non-governmental stakeholders and first of all waste management operators at the beginning stages leads to identification of gaps in the future. Among them the most important is the lack of mechanisms for the implementation of law.

The legal framework for municipal waste management can be considered as incomplete, inconsistency and unclear. First of all there is no comprehensive body of law concerning municipal waste. It appears that the collection and disposal of household waste has not yet been identified as a priority issue (MoUD, 2004).

Even though the rights and responsibilities of waste managers are spread among various bills and regulations, these regulations do not provide clear justification of functions (NEAP,

⁴⁰ Almost all interviewees (Aleksandryan, Srapyan, Kosemyan, Ghlichyan, Sargsyan, at all.) considered these fact as primary important for the waste policy in Armenia.

1998). For instance, the lack of precision concerning waste types and waste operations lead uncertainties in terms of who is responsible for what kind of waste? The existing laws very often create conflicts and confusions about the responsibility of different actors. The article (38) of the Law on Local Self-governance deal with public utilities and provision of amenities makes it mandatory to organise waste management. However there is no specification about type of waste (only household waste or other waste streams as well).

Provisions for the regulation of waste, for example restrictions on where to place landfills and on calculation of utilities charges, including waste management fees and landfill tax, are spread over different laws. There may also be numerous regulations, which may be difficult to locate because laws could be issued without a full legal basis.

There is a gap in environmental coverage in the waste management law, because there are no requirements for reduction, recycling or other alternative options. The standards and targets addressing the reduction of waste were not established. The regulatory framework is not based on the waste “hierarchy”.

To use law as leverage for the policy implementation is the major challenge for Armenia in the legal field (NEAP, 1998).

Draft Law on Waste

The new draft of Law on Waste was developed by the Ministry of Nature Protection and was adopted by the National Assembly in the first reading in June 2004. Elaboration of the law is definitely considered as a large step forward.

Study revealed, that the process of formulation and the concept of law itself are quite interesting and non synonymous. NEAP stated, that *“the good environmental law, is a law which (i) reflects the environmental policy; (ii) is consistent with overall legal framework; and (iii) is feasible to implement”*(NEAP, 1998).

The first aspect is the relevance to the current environmental policy. As it was explained in chapter 4.2.1, there is not any unified waste management policy or strategy paper. From point of view the formulation of the sectoral legislation should be based on the integrated policy concept, which should clearly prioritise the significance of different waste streams and appropriate waste management options. If it is not done, it is quite difficult to consider all possible aspects within one law. As a result, the regulation is lacks precision as regards of different waste types and operations.

According to the article (2) the new Law aims to regulate all types of waste, except radioactive, mining, as well as waste which is co-mingle into water discharges and gases released from the stationary or mobile sources to the atmosphere. Therefore, in article (4) there is a general definition for waste, which is considered as the products, resources or residues, as well as other goods generated during the manufacturing or consumption phase and lost their primary consumer property. The general definition may be acceptable, but paragraph four of the same article provides the definition of hazardous waste as well.

The question of municipal waste, as well as other type of waste is not considered. Hazardous waste and particularly industrial hazardous waste is an important issue for the country. However, the situation in some special waste streams, such as medical or construction waste is unfavourable. Study identified, that the slant to hazardous waste management in the new draft

is dominated, which will create problems in the future for the regulation of the other waste streams.

In terms of consistence with general legal framework, there is no controversy; because in the case of municipal waste the legislation is pretty poor. There are no legal requirements on municipal waste collection and transportation, specification of management options, reduction targets, and so forth.

According to number of sources, the landfills in Armenia do not correspond to sanitary hygienic norms (UNECE, 2000, NEHAP, 2002). During the field study it was identified, that such norms do not exist. To be precise, these are soviet norms, which were developed in 1987. It is not possible to follow to these standards with current administrative structure and economic conditions of the country. However the new Draft does not consider any requirements regarding to the landfill management. The absence of regulation regarding landfills is an important factor. Certainly, improvement of regulation should be made. In that sense the EU directive on landfills can be used as a basis.

Additionally, the feasibility for implementation is an imperative factor. The Draft does not consider any concrete instruments for the enforcement. It is expected, that a number of regulation at the Cabinet level should be adopted. Effectiveness of such regulations in many cases depends on subjective factors and does not consider real demands. Such regulation can be changed quite often. As a result the absence of a stable basis for the development of the long-term waste management options is evident.

In terms of enforcement submitted draft provided certain requirements concerning operational permits for the organisations dealing with the waste management. It is clear states, that permits are required for the hazardous waste operators. Still it is not clear what about municipal waste.

4.2.3 Unclear Institutional responsibility

During the interviews it was identified, that the lack of financial resources, managerial, technical and human capacities is the common characteristics of all agencies involved in the waste management sector. Nevertheless, the necessity to define clear responsibilities of institutions in MSW management sector is crucial.

The government authorities recognize their weakness of the management structure; however, they are trying to take over complete responsibilities in the field. As a result the conflict of interests among different ministries and agencies is quite typical. The situation when agencies do not share the information to other stakeholders is not an exception.

The lack of inter-sectoral collaboration in waste sector is evident. Therefore, the processes of policy formulation and decision making in the waste sector are implemented by the limited number of agencies, and sometimes a number of stakeholders is not involved in the process.

One more aspect is overlapping of responsibilities. For instance, the Ministry of Nature Protection is responsible for the formulation of general policy in waste sector. At the same time the Ministry of Urban Development is responsible for the formulation of policy in Municipal sector. And the municipal waste is considering as the part of it.

It is important to mention, that the environmental governance system was criticised before as a strong vertical management structure with limited authority for the regional and local

agencies. Currently, the decentralization of functions is made. However, even though the responsibilities of waste management agencies at the central, regional, and local levels were setup by the appropriate regulations, a number of uncertainties still evident.

On the institutional front, the Marzpet system is an extension of the State structure aimed at ensuring regional aspects of State policies. What seems certain from the legislation is the autonomy and rights of Local government to perform independently. Nevertheless they wait for the decisions of central and regional governments to get things done. In the most cases it can be explained by the lack of managerial capacities, human, technical and financial resources. On the other hand, "centralised behaviour" is dominated and the power of central government is strong, even though local authorities in some cases have more rights and responsibilities.

4.2.4 Economic and financial unsustainability.

The relatively low rates of disposal and user charges for the municipal waste does not allow for full cost recovery for the collection and transportation system. Data on collection efficiency are scattered. It appears that proper revenue collection is a challenge in Armenia (Harutyunyan, 2004). In economic theory taxes usually represent income to the state budget (Porter, 2002). In case of Armenia similar system is used for the charges. They do not have any direct relations to environmental protection in terms of the use of revenues.

Study revealed that current economic instruments and insufficient investments together do not generate enough finances to promote waste disposal techniques other than landfilling. One of the most important factors in terms of economic instruments is social acceptability and impact on low-income households.

The big question is how environmental charges are calculated in Armenia. According to the Head of Division of Environmental and Nature Use Economics of the MoNP, most of the environmental and nature use charges do not correspond to the actual requirements (Harutyunyan, 2004). The calculation, mainly, takes into account only limited economic aspect. For instance, nature use charge is estimated based on market price for the resource, and finally is equal to 10-15 % of total price of resource. In case of charges per ton of waste, it is not clear finally, what kind of aspects was taken as a basis? These charges even are not equal to the marginal cost of collection and disposal activities. It is obvious, that the impact of the waste on the environment, as well as human health was not considered. In other words, externalities were not measured at all.

The charges, including penalties for exceeding permissible pollution limit, are defined in terms of specific pollutants on the per ton basis. In that sense, hypothetically, Nubarashen landfill can be considered as a big source of air and water pollution with the range type of substances, including hazardous. It is not clear, who should be responsible for the impact from the landfills?

The lack of control over the enforcement is evident. Even if charges will set up for the pollution, the landfill's company or state monitoring authorities will not be able to carry out control.

In terms of scale, there is an opinion (Harutyunyan, Qamalyan, 2004), that the rate of charges is extremely low. In case of the municipal waste, may be this is true. The price \$1.1 USD for one ton of municipal waste is very low. The rates of penalties are also quite low. According to the data from the MoNP, it is much easier to pay the penalty and continue to operate in the same way.

One more important aspect is who is going to pay the charges. An example can illustrate complexity and inflexibility of the tax regulation. “Municipal Dump” SCJC was responsible for the maintenance of the Yerevan Nubarashen landfill. Economic court of the Republic of Armenia in 2002 took under the consideration the statement of the Environmental Inspection against the company on tax debts in 342.2 million Armenian drams. The problem was related to the disposal charges of municipal waste in landfills. It is obvious, that waste generator should be responsible for the disposal tax. The Company is responsible only for the disposal of waste in the site. However, according to the Law on Nature Use and Environmental Charges, the charge is estimated based on the volume and the level of harmlessness of the waste accumulated in the landfill during certain period of time. In the end of the process the “Municipal dump” company was recognized as insolvent and the operation was stopped.

The similar problem was revealed at the local levels. The service fees from the population for the waste collection, which are established by the community council varies from \$0.09 to \$0.2 USD per person per month. In financial terms the difference is quite tangible. However, it is also unclear, which criteria were served as a basis for the established fees.

In the most European countries the municipalities are responsible for the collection of fees from the households. There are different approaches applying in different countries. Usually fees can be based upon the size or value of the property, amount of waste generated, such as volume or weight.

In Yerevan payment based on a tariff per cubic meter and an estimated annual volume of waste collected. From the result of interviews (Engibaryan, 2004) it was evident, that the main calculation was made taking into consideration the solvency of the households. Fact states, (Sukiasyan, Badalyan, 2004), that the actual money collected from the population, together with the allocation from the budget does not cover the operational costs of sanitation enterprises. It means that PSE should work with negative balance since the beginning. In that sense what is the reason to develop this business?

It is obvious, that in scope of insufficient financial conditions sanitation enterprises will not be able to make any investments into infrastructure, such as innovation of fleet, containers, technology for the treatment, etc.

It is important to state, that the mechanisms applied in Armenia are mostly directed on control measures. Even in terms of fiscal instruments there are no incentives for the private sector, such as concessionary tariffs, etc..The unsustainable economic situation of the country, as well as insufficient legislative framework creates a number of barriers for new investments, particularly in the waste sector.

Finally, even though several economic instruments have been introduced, the country still suffers a weak regulatory role of economic tools in reducing the volume of waste and related pollution. Supporting legal and institutional frameworks still need to be improved. *It will be necessary to carry out an “environmental adjustment” to economic development targets* (MoNP, 2003).

4.2.5 Lack of data and awareness

The review of the exiting reports and statistics, as well as information gathered throughout interviews revealed absolutely inconsistency in data. The fact of absence of reliable data on MSW generation, composition, and disposal is evident.

The critical situation with data is one of the major imitating factors. Based on precise and accurate data it is only possible to develop relevant waste management options and identify long term objectives and targets.

During the study there were no specific instruments observed for awareness rising for the public. A limited number of workshops and seminars have been organised, however participations is quite limited. Moreover, the main topic for the discussion was related to hazardous waste. In terms of the municipal waste management there are no any special educational programs or trainings, TV programmes, advertisement etc, even for the sector's employees. The only possibility to get some information is newly opened Public Centre in the Ministry of Urban Development. However, if we will take into account that centre directly linked to the Department of Communal and Housing Affaires, it might be assumed, that the information provided still limited.

There is a significant lack of understanding on municipal solid waste issues on the side of the public sector. Public knowledge and the willingness to allocate time and energy to cleanness and waste reduction are rather limited. However, during some informal interviews with households, it was observed that willingness to separate household waste was more among people with average income. Availability of appropriate separate collection facilities was also found as a driver for separating waste. Some of the families were not interested to spend additional time and efforts for separation without additional incentives.

Understanding of the dynamics and the costs of MSW management needs to be increased among the public. People have no idea why they pay certain amount of money for the collection, when at the same time neighbour region pays a different fee. Most of them are not satisfied with current collection system, however they are not voted against as well. Some of the people just refused the service of its sanitation enterprises.

In any case, the public must be aware of the need for proper waste management and should be encouraged to participate in the process, as a part of protection of their social and natural environment

4.3 Main findings

Based on the discussions above, the study revealed a number of obstacles and limitation in the MSW management in Yerevan city. The factors, such as an absence of policy concept and MSW management plans, inconsistent legislation, unclear institutional framework, lack of financial resource, etc are common for entire country. It is quite difficult to prioritise those factors according to significances. They are all interrelated. It is impossible to develop waste management plan without appropriate legal framework, and implement it without financial resources and technical infrastructure.

Table below summarizes the major findings regarding to the obstacles faced by the MSW management system.

Table 4-1 Main Obstacles and Limitations in MSW Sector.

Obstacles/Limitations	CAUSE
POLICY CONCEPT	
1. An absence of an integrated waste policy	<ul style="list-style-type: none"> ⇒ low recognition of the importance of environmental problems in general ⇒ lack of understanding of the importance of waste issues and their potential ⇒ lack of methodological expertise, managerial, technical and human capacities to develop the policy ⇒ lack of accurate data
2. Waste issues are not considered from the economic perspectives	<ul style="list-style-type: none"> ⇒ absence of the capacity to articulate the environmental issues in the economic reform ⇒ lack of knowledge on waste minimisation technologies.
3. The policy instruments do not reflect the reality	<ul style="list-style-type: none"> ⇒ no standards and targets for waste reduction ⇒ the charges and fees are not realistically calculated ⇒ there are no incentives to reduce waste generation or to optimize waste utilization ⇒ capacity to implement and enforce policy instrument is minimal
REGULATIONS	
4. Inconsistent legal framework	<ul style="list-style-type: none"> ⇒ absence of legislative basis for solid waste management, ⇒ the Laws are generally considered as a policy document rather than a normative act and consequently the implementation requires number of regulations ⇒ concrete targets for the waste reduction should be determined
5. Lack of implementation and of enforcement	<ul style="list-style-type: none"> ⇒ minimal capacity of enforcement agencies (financial, technical and human resources) ⇒ specific “legal culture” (absence of enforcement by the individuals) ⇒ lack of data and information for public ⇒ lack of monitoring and absence of data on municipal waste generation, composition, import, etc.

ADMINISTRATIVE FRAMEWORK

7. The Administrative structure is highly centralized	<ul style="list-style-type: none"> ⇒ vertical administration and “centralised behaviour” is still very strong ⇒ regional and local governments have not enough power and resources to design and implement regional policy
8. Conflict of interest among stakeholders	<ul style="list-style-type: none"> ⇒ responsibilities in the waste sector are not clearly distributed
9. The local authorities does not have enough capacity to play a role of the leading agencies	<ul style="list-style-type: none"> ⇒ lack of methodological expertise, managerial and technical capacity, and financial resources to conduct environmental planning, regulation drafting, project management, etc. ⇒ lack of cooperation and coordination among the public and private sectors and NGOs

OPERATIONAL/TECHNICAL ISSUES

- ⇒ absence of community MSW management plans
- ⇒ lack of reliable data on waste composition, generation, collection and disposal
- ⇒ lack of professional skills, as well as limited technical and financial resources of the PSE
- ⇒ absence of monitoring and control system
- ⇒ the reporting system between central, local, regional governments and the private sector very limited

5 Conclusions and Recommendations

5.1 Concluding remarks

Experience of OECD countries shows that waste management has improved significantly in the last two decades. Major efforts have been done toward waste prevention and minimization. However, certain actions still need to be performed, such as significant changes in production patterns, distribution systems, consumption patterns, etc.

Development of policy based on hierarchy approach, relevant regulatory frameworks, environmental standards have been catalysts for more environmentally sound waste management systems and for motivation the participation and investment of the private sector in waste management. Different policy instruments have provided a strong incentive to speed up the rates of diversion from waste disposal to prevention and recovery.

Unlike the developed countries, preparation of coherent waste management policy has not been the priority task in Armenia during the transition period. The years of economic difficulty that followed the independence, rapidly reduced the attention of the government to solve waste problems, and the environmental awareness on waste issues in Armenia has remained low.

The concerns related to the waste issues have augmented from late 90s. Since then many initiatives such as NEAP, regulatory frameworks and some economic instruments regarding to waste issue have been taken. However, in the context of general economic hardship and absence the proper infrastructure, including collection, transportation and processing facilities, it was almost impossible to activate sustainable management options.

Analysis of the current situation of MSW management has revealed a number of obstacles and limitations faced by municipal waste sector in Armenia. The most important identified during the study are the following:

- Absence of the concept of integrated waste management for Armenia. As a consequence, there is no strategic planning for household waste management.
- Inconsistent legislation. Main factor is an absence of basic Law on waste, as well as non-enforcement of the existing legislative documents.
- There is no reliable data on municipal waste generation, composition, disposal, etc.
- Lack of financial resources and technical facilities.
- Even when responsibilities are distributed, there is a still uncertainties with actual task allocated to the central, regional and local authorities.

In order to deal with these problems an integrated set of policy measures to change the behavior of stakeholders on waste management issue seems to be necessary. Balanced strategy needs to combine information gathering and dissemination mechanisms, legislative and institutional framework, and the economic tools. Based on these only a systematic shift in waste management away from disposal towards prevention and recycling will be possible.

5.2 Recommendations

Waste generation and waste reduction reflects many complex economic and social factors. In order to improve the situation in the MSW management sector, the sequence of steps, including combination of regulatory, economic and informative instruments should be undertaken at both central and local level. It is clear, that in the current economic conditions it is not possible to realize all necessary actions. However, the problem of inappropriate management of municipal waste is evident and, certainly, decision should be made.

Based on the international experience, taking into consideration discussion in the study as well as opinions of the relevant stakeholders in Armenia, the following proposals have been selected in order to improve current situation in Yerevan, and in Armenia as whole.

5.2.1 National level

Development of the concept and strategy of MSW management in Armenia

The study revealed that certain efforts, such as decentralization of power in municipal waste management activities, introduction of disposal fees, development of legislative acts have already taken place, but a clearly defined strategy or concept is missing.

Taking an example of EU countries, a waste management concept in Armenia should be based mainly on the following two principles:

- *Prevention principle - waste production must be minimized and avoided where possible.*
- *Producer responsibility and polluter pays principle - those who produce the waste or contaminate the environment should pay the full cost of their actions.*

Based on those prioritization of action, similar to the hierarchy should be identified. Important to note, that the hierarchy advocated in many industrial countries with high standards of living (see chapter 2.4) may not be appropriate in the case of Armenia. It should be adapted to local conditions. In case of Yerevan, probably, the first priority for the municipality can be the diversion of organic components from the post consumer MSW stream (for further composting). The reason is that organics are the largest fraction of MSW and the furthestmost reduction in waste for disposal can be achieved.

The second priority can be maximum recovery of polymers, without separate collection by the municipal authority. It could be achieved by encouraging waste reduction, collection and materials recovery by the private sector, both formal and informal (UNEP. 1996).

The strategy should have clear short, medium and long term objectives together with proposed solutions on how to reach these objectives. Solution should be clearly defined but also be flexible enough, especially in the long term. It is obvious, that proper political support should be accompanied with provision of sufficient resources to make their fulfilment possible. It is quite important, that work towards these objectives, possibly in the form of implementation plans, should be controlled, monitored and adjusted to current conditions with a focus on enforcement.

Development of legal framework for Municipal waste management

Taking into account, that the current draft Law on Waste⁴¹ does not address the requirements of the municipal waste sector, the aspiration of this proposal is: (i) to address the most urgent municipal waste problems according to the priorities which should be established in the concept paper. (ii) to create the basis for the continual improvement of the overall legislative framework, including provision of appropriate instruments and incentives mechanisms for the implementation;

It is very important to have clear definitions of each waste, as well as waste operations such as collection, recovery and disposal. Definitions adopted by the EU framework directives on waste can be basis. These definitions reflect international practices and will facilitate further approximation towards EU regulations. Also distribution of waste tasks between regional and local authorities should be clarified.

Issue on Licensing for the private waste companies dealing with waste collection, treatment and disposal should be considered.

5.2.2 Local level

Development of Yerevan municipal waste management plan.

In order to organise timely and effective service planning process of waste management activities is necessary. Based on the proposal done within the framework of National Project “Regional Development of Marzes” for Armenia (MoUD, 2004), the following structure for the plan can be proposed:

Background block: The background part of the waste management plan includes consideration of local, regional and national decisions on waste management practices appropriate to the local conditions. It is include information on existing policies, principles, legislation. Also will describe a set of objectives need to achieved.

System block: Data on field should be gathered and analyzed, including waste composition, generation source, collection and transportation aspects. Financial aspects should be considered. Assessment of objectives and evaluation of problem should be done. Possible solution to these problems needs to be identified.

Planning block: Determination of political objectives, e.g. of priority of waste management options is the main part of this element. Development of indicators should be considered, in order to monitor and evaluate if the objectives are met, and how these objectives may be met most effectively

Additionally, there are two important factors should be taken into account:

⁴¹ Taking into consideration short time period, it will not be possible to make enough changes in the current draft in order to correspond it to the requirements of municipal waste sector. It will takes more analysis, time and efforts, which probably will be not accept from the political point of view

- Data collection framework and monitoring system for MSW should be created,
- Informational campaign and public consultation process should be organised. The local communities should be involved in the preparation of waste management plans.

Optimization of available resources

In general the collection and transportation of waste is the most expensive part of the process. And in case of Yerevan all money are spent for those purposes only. In that sense the optimal use of local resources, such as financial, technical, labour or institutional entities seems to be quite important. According to UNEP technical guidelines, the local resources include the commercial formal and informal sectors operating in the area. The usage of these resources should be carefully considered as part of waste planning management process (UNEP, 1996).

As we could observe from the chapters above, informal collection and recycling sector exist in Yerevan. There is no trend for the reduction of scale until the general standard of living and employment opportunities have reduced poverty and unemployment.

From this point of view reorganisation of informal sector can be an alternative for the local authorities, and particularly for the PSE. However the primary stage of formalisation seems to be impracticable, since there are no incentives for small-scale producers and individuals to become legal entities.

Involvement of the informal sector can be at the stage of waste collection. They already remove recyclables from the containers, or throughout door to door collection. Another opportunity is creation of small-scale cooperative and allocates part of responsibilities to them. Similar approach was quite successful in a number Asian and Latin American countries (UNEP, 1996). In that case it will be a good opportunity for them to have regular income and a regular job, better working environment, less competition.

5.3 Issues for further consideration

The following ideas presented below can be a potential subject for the further research.

- Throughout the discussions with stakeholders the author understood that Armenia wants to develop the recycling sector. In that terms the evaluation of recycling opportunities for the MSW in Armenia and identification of potential waste streams, which will be feasible for the recycling can be a subject of the study. Additionally analysis of market conditions for the recyclables should be covered.
- In order to develop waste management options toward waste reduction, reuse and recycling, the question that arises concerns the choice of instruments to provide appropriate economic incentives. In that sense the scope for using economic instruments and the types of instruments, including fiscal measures to achieve waste reduction can be studied as well.

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Abbreviations

CEEC	Central and Eastern European Countries
CJSC	Close Joint Stock Company
DRS	Deposit-Refund System
EEA	European Environmental Agency
EU	European Union
EC	European Commission
EPR	Extended Producer Responsibility
GDP	GDP Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gases
HDPE	High-density Polyethylene
IIIIEE	International Institute for Industrial Environmental Economics
MHW	Municipal Hazardous Waste
MRF	Material Recovery Facility
MoNP	Ministry of Nature Protection of the Republic of Armenia
MoUD	Ministry of Urban Dev
MSW	Municipal Solid Waste
NEHAP	National Environmental and Health Action Plan
NEAP	National Environmental Action Plan
NGO	Non- Governmental Organisation
OECD	Organization for Economic Development and Cooperation
PAYT	Pay-as-you-throw
PE	Polyethylene
PET	Polyethylene Terephthalate
PRS	Public Resource Code
PSE	Private Sanitation Enterprises
POPs	Persistent Organic Pollutant
REC	Regional Environmental Centre
SCJSC	State Close Joint Stock Company
SNCO	State Non-Commercial Organisation
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Program
UNIDO	United Nations Industrial Development Organisation
UNSD	United Nations Statistics Department
VA	Voluntary Agreements
WSSD	World Summit on Sustainable Development

Appendices

Appendix 1 Country Background

Appendix 2 Survey Questionnaires

Appendix 3 List of interviewers

Appendix 4 State Budget Revenues from the Environmental and Nature Use Charges

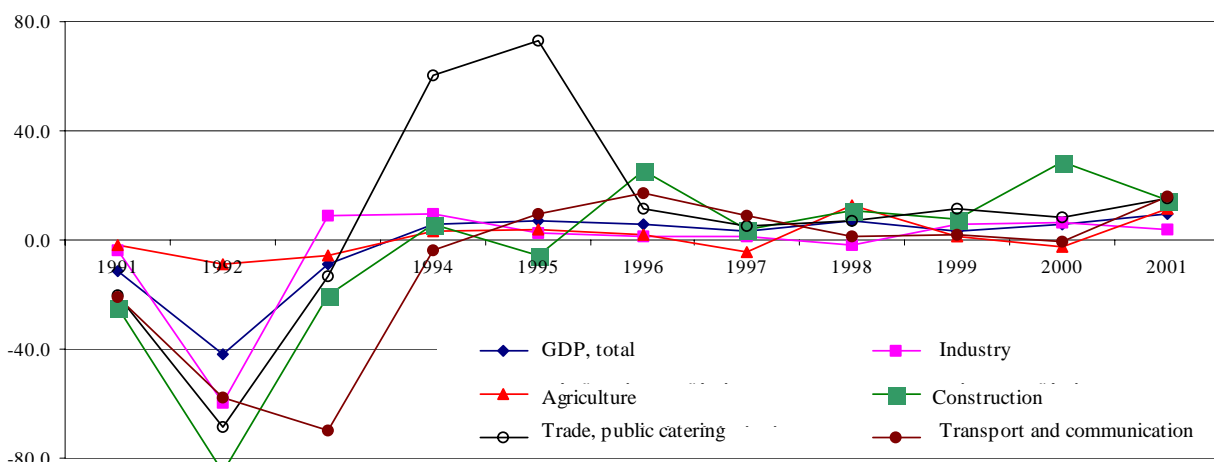
Appendix 1. Country Background



Armenia is a landlocked and mountainous country that has small territory, high population density, fragmented relief and located at the altitudes ranging from 380 through 4095 m above sea level. The territory of Armenia is 29800 square km, the population – 3.2 million. Out of territory of Armenia the settlement areas - 4,6%, industrial facilities – 5,5%, forests

– 11.2%, specially protected areas – 10%. Per inhabitant of Armenia it gets 0,9 ha of land.

Over the last ten years, the economy of Armenia has travelled a complicated road full of abrupt ups and downs (National Assessment Report, 2002). Still in the shock of the 1988 Spitak disastrous earthquake, the newly independent country found itself in a mainstream emerging out of a crisis on normal operation of basic transport and communication routes due to regional military and political conflicts, a lengthy and severe blockade, an energy crisis due to the lack of internal energy resources, a transition caused by economic policy targets in the light of integration with external markets, and a break-up of former economic ties (National Assessment Report, 2002).



Annual GDP Growth (based on contribution of the main sector to the GDP).

Economic reform in Armenia proceeded on the background of an acute economic decline up until 1994. Between 1991 and 1993, GDP fell by almost 60%. Over the same period, per capita income from \$1.810 USD to \$560 and industrial production decreased by 80 %. an average annual rate of about 18%(NEAP, 1998, p.1). Starting in 1994, the economic downfall was successfully ceased, and a certain macroeconomic stability was achieved.

Before the enactment of the RA Law “On Administrative and Territorial Division of RA” (December 11, 1995), the republican territory was divided into 37 regions and 4 cities (Yerevan, Leninakan, Kirovakan and Dilijan). Since January 1, 1996 the Republic has been divided into 11 marzes, including Yerevan with the status of a Marz. At present Armenia has 930 communities, including 47 urban, 871 rural and 12 district communities. There are 48 cities (including Yerevan city) and 952 rural settlements in the Republic of Armenia, 8 of which belong in city communities, while the remaining 944 villages comprise constituents of rural communities.

Yerevan city has the territory is 227 km², with 6413 ha of agricultural land, including 1506 ha of arable land. District communities are 12 in number, and total population (as of January 1, 2002) is 1246.1 thousand people (32.8% of Armenian population). The share of Yerevan in total republican industrial production in 2001 comprised 50.3%, in gross agricultural output - 1.1 %, in retail turnover – 80.5 %, and in services – 76.3 %.

Appendix 2. Survey Questionnaires

Questionnaire N1 - Yerevan.

Organisation: _____

Person name/surname: _____ Position: _____

Phone/Fax: _____ e-mail address: _____

Population of the Area	1000 people	1999	2000	2001	2002	2003
Part of the population which is provided by the MSM system	%					
Amount of collected waste fees - Per person /or/ - based on quantity of waste	Armenian dram					
Actual rate of collection	%					
Quantity of bins/containers located within the area	# of items					

Waste generation, transport, treatment and disposal						
1.Generation of Municipal Waste	Unit	1999	2000	2001	2002	2003
Total amount of generated household/municipal waste	1000 ton					
-including household hazardous	1000 ton					
Quantity of the waste imported to the Country /if data exist/	1000 ton					
Composition of waste /can be shown according actual classification used/*1	%	1999	2000	2001	2002	2003
- Food residues - Paper/Corrugated cartoons - Garden waste - Textile						

<ul style="list-style-type: none"> - Glass Residues/bottles - Non-ferrous metals - Ferrous metals - Soil - Polymers/Plastics - Leather/rubber - Hazardous substances - Others 						
2. Amount of collected household waste which is picked up by the Municipal enterprises in compare with the total quantity of generated waste	Unit	1999	2000	2001	2002	2003
	%					
Among them						
- recycling						
- treatment						
- incineration						
- reuse						
- disposal on the landfills						
3. Existing Capacities for the waste management and disposal / please point out if such facilities exist, even they are not in use nowadays/	unit	1999	2000	2001	2002	2003
a/ Recycling stations/plants	#					
Capacity	tons/per day					
Actual working capacity (in comparison with total capacity)	%					
Number of employees	# of people					
b/ Incineration stations/plants	#					
Total Working Capacity	tons/per day					
Actual working capacity (in comparison with total capacity)	%					
Number of employees	# of people					
c/ The landfills	#					
	Area/hectares					

Capacity	ton					
Number of employees	# of people					
d/ Transportation facilities	# of units					
Dust trucks	#					
Actually operated	#					
Capacity	ton					
Type of the fuel and consumption rate	Litre/km					

*/Please fill in any available data, if there is no information for the required period of time.

*1 Please point out, if the waste composition is calculated according to volume or weight.

--

Questionnaire: Waste 2 - Yerevan.

Organisation: _____

Name/Surname: _____ Position: _____

Phone/Fax: _____ e-mail address: _____

1. Policy aspect

- What kind of classification do you use for the municipal waste? What types of waste are considered as municipal?
- Is there a Municipal waste management plan for the Yerevan city?
- Is there a waste management strategic programme? If yes, please point out the main first three priorities.
- Which are the main responsible authorities in the municipal waste management sector?
- What kind of main problems can be stated regarding to inefficient waste management from your point of view? How important is the role of the environmental issues?
- Which main gaps can be identified and what kind of urgent steps need to be applied?

2. Legislation

- What are the main laws and legal acts which regulate the municipal waste sector?

- Are there any regulations concerning the limitations of the quantity and quality of waste which should be disposed of, as well as regulations by which the reduction targets for the waste were established.
- From your point of view, how the new Law on Waste will satisfy to the current requirements.
- What are the main gaps and what kind of possible changes should be done in the current legislative framework /please note the main principles/?

3.Financial aspects

- The amount of money allocated for the municipal waste (according to the sources)
 - State budget of the RA /please fill in according to the articles/
 - Other sources
 - Real requirements
- Who is responsible for the collection and maintenance of fees collected from the populations?
- Are there any allocations planned for the development of alternative waste management options (such as composting, recycling, incineration with energy recovery, etc.)
- What kind of payment and tax systems are used for the waste disposal?

4. Control and monitoring

-How can you evaluate the effectiveness of the control or monitoring which is performing by the state authorities in the waste sector?

a/ high

b/ satisfactory

c/ low

d/ does not perform at all

Please indicate three or four main causes in case if your answer is corresponding to c/ and d/.

- What kind of system exists for the measurement and identification of quantity and composition of waste collected?

-As it has been stated in a number of sources, existing landfills are not corresponding to the sanitary-hygienic standards. What kind of activities are implementing in that direction?

5. Additional data

- Are there any data about illegal dump-sides?
- Are there any data concerning the collection and recycling of the waste by private persons or by an informal sector?

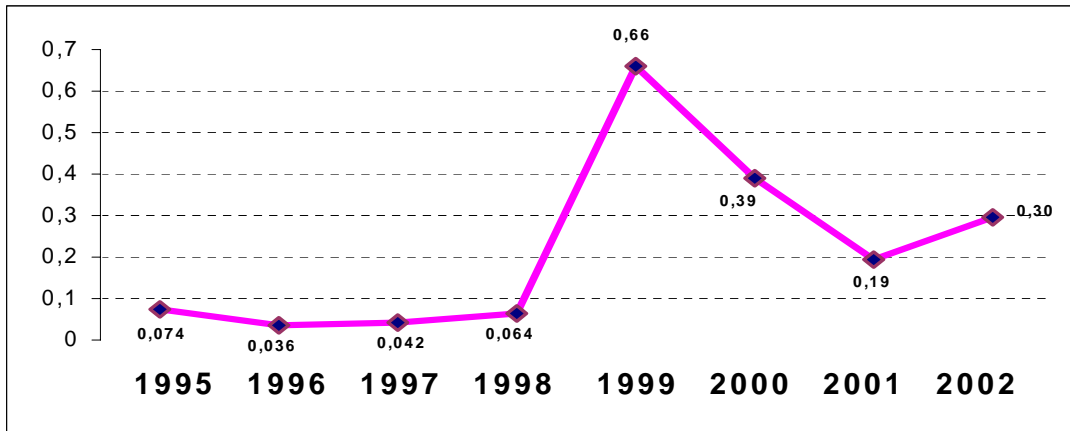
Appendix 3. List of Interviewees

Name	Position	Contacts
Mr.Johanny Kristensen	Marketing Assitance, Lunds Renhollning, Lund Minicipality, Sweden.	(4646) 355393 Johanny.Kristensen@lu.se
Ms.Anahit Aleksandryan	Head of Division of Hazardous Substances and Waste Management, Ministry of Nature Protection	Tel: (3741)585326, 538838 analeks@freenet.am
Ms.Julieta Ghlichyan	Head of Department of Normative and Methodological Documents, Ministry of Nature Protection	Tel: (3741) 585394 Julieta_Ghlichyan@yahoo.com
Mr. Ashot Harutyunyan	Division of Nature Protection and Environmental Economics, Ministry of Nature Protection of the RA	Tel: (3741) 585349 Amalia_ashot@yahoo.com
Mr. Aram Gabrielyan	Head of Department of Environmental Protection, Ministry of Nature Protection of the RA	Tel: (3741) 534652 aram@nature.am
Mr. Marzpet Qamalyan	Deputy Head of the State Environmental Inspection of the RA	Tel: (3741) 567424
Mr. Sirekan Ohanyan	Head of Department of Natural Resources and Urban Development, Government Office of the RA	Tel: (3741) 528894
Mr. Samvel Srapyan	Head of Division of Municipal Affairs, Ministry of Urban Development of the RA . Also Representing Public Centre on Municipal Policy	Tel: (3741) 564316 munpro1@freenet.am
Ms. Nune Bakunc	Chief Specialist of the State Hygienic and Anti-epidemiological Inspection, Ministry of Health of the RA	Tel: (374 1) 520660, Mobile: (374 9) 423181 Nuneb11@web.am
Mr.Romik Kosemyan	Head of Department of Ecology, Yerevan Municipality	Tel: (374 1) 582173, 585631 kosemyan@yerevanmayoralty.am
Mr. Ashot Sargsyan	Head of Department of Housing and Municipal Affaires, Yerevan	Tel: (374 1) 585722

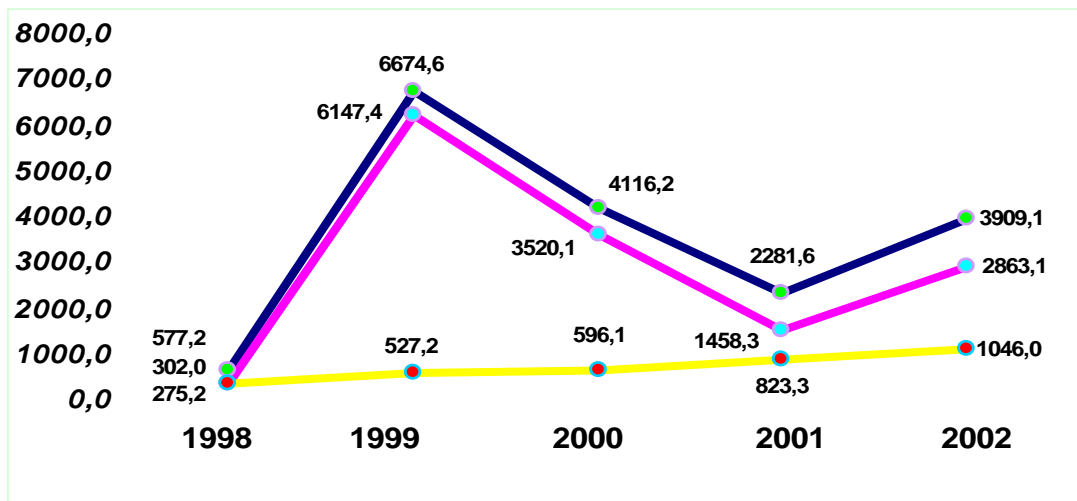
	Municipality	
Mr. Felix Engibaryan	Advisor to the Taxapet (Leader of the Community) of the Kanaker-Zeytun Community of the Yerevan City	Tel: (374 1) 28 9068
Mr. Marat Pogosyan	Executive Director of the “Megakhod”Ltd, Yerevan, RA	Tel: (374 1) 541134
Mr. Albert Sukiasyan	Executive Director of the “Nairit-2” CJSC, Yerevan, RA	Tel: (374 1) 485470
Ms. Diana Harutyunyan	Project Coordinator, National Capacity Self-Assessment Project, UNDP/Ministry of Nature Protection of the RA	Tel: (374 1) 583920 Diana@nature.am
Prof. Aida Iskoyan	Chairman of the “Environmental Public Advocacy Centre” NGO, National Focal Point of Aarhus Convention in Armenia	Tel: (374 1) 539255, Mobile: (374 9) 420021 epac@arminco.am

Note: All interviews were conducted in Yerevan, Armenia during the field study, which was carried out in August 2-9, 2004.

Appendix 4. State budget revenues from the Environmental and Nature Use Charges



Share of Environmental and Nature Use Charges in the GDP of the Republic of Armenia (in %).



- Public budget revenue from environmental and nature use and preservation fees charges, total (in million drams)
- Public budget revenue from environmental charges nature preservation fees (in million drams)
- Public budget revenue from nature use fees charges (in million drams)

Dynamics of the Public Budget Revenue from Environmental and nature Use Charges during the 1998-2000 (millions Armenian drams)