Regional Policy Report on the European Neighborhood Policy and Waste Management

Armenia – Azerbaijan - Georgia

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Executive Summary

Waste represents an escalating problem of the world. Starting from the 70th developed countries started to respond to this growing challenge through establishing new policy and mechanisms of realization in the field of waste management. Nevertheless, waste remains a serious problem on the territories of post Soviet countries, including region of the Southern Caucasus. As in the Soviet Union "waste management" was not perceived in its modern understanding of this term, these countries lack basis and experience regarding methods of a steady waste management. Situation with waste management is almost identical in all three countries of the Southern Caucasus, characterized by absence of national policy in the field of waste management; inefficient system of waste collection; unstable landfills; lack of schemes for reducing waste, etc. However, currently all three countries are aware of the importance of waste related problems, especially taking into consideration, that these countries have assumed certain duties in the field of environmental protection, including field of waste management within the frameworks of European Neighborhood Policy. The purpose of present document is to analyze all aspects of waste management system in the Southern Caucasus region, namely: a policy and the legislation in the field of waste management, waste collection and transportation, waste disposal, waste management, waste recycling and handling, reveal problems in all these aspects and analyze them according to principles of a steady waste management and approaches of EU; propose possible ways of decisions or improvements; and after estimation of profitability for each option – develop final recommendations.

Policy and institutional formation in the waste management field

Currently, all countries of the Southern Caucasus lack strategy and national policy in the waste management field. This means, that there are no priorities and purposes established at the national level concerning waste management. Legislation has fragmentary character and frequently there is a lack of mechanisms of implementation. Frameworks for introduction of steady waste management methods are not defined. In addition, institutional problems weaken opportunities of planning, and implementation. Namely: vagueness of responsibility of the state and local establishments concerning various types of waste; weak coordination between state and local authorities and other stakeholders; inefficient redistribution of the state and local budgetary resources and others.

Waste management

Waste management in the region is limited to waste collection/transportation and its disposal at landfills. Waste is not "managed" in a modern context of this concept. Besides, in all the countries waste collection/transportation, and its disposal are inefficient and unstable in many aspects. Delays in removal of waste; poor condition and shortage of refuse tippers, bins and loader yards; unsteady landfills; illegal disposal of waste represent common problems for all three countries.

Besides, there is a lack of mechanisms of control over the quality of services in the waste management filed. System of ecological monitoring is completely nonexistent, and consequently data on the environmental impact of activities in the waste management field. Lack of regular statistical data on quantity and structure of waste content impede process of planning of waste management. Besides the countries lack accurate data on conditions and zones of land fills. There are no schemes of reducing waste and any preconditions for development of steady waste management practices.

Problems caused by waste

Though survey for exact definition of harmful effect on environment and human health caused by an unstable waste management and its illegal disposition haven't been conducted, however it is obvious, that existing land fills are a serious source of the pollution contaminating surface and ground water, soil and air. In most cases land fills don't have collecting filtrate systems. Therefore rain waters, passing through the layers of waste and getting contaminated by harmful substances, reaches soil and ground

waters. Besides the waste from land fills is blown and carried by winds to the surrounding territories. Moreover, in many cases land fills are located too close to the surface water bodies and seas that cause direct contamination of water by waste from landfills. As far as in many cases landfills are not covered by the ground, there are frequent cases of waste ignition causing contamination of air by dioxin and other toxic substances.

Inefficient system of waste collection creates unhygienic conditions favorable for distribution of insects and rodents in cities. In many municipalities nonexistence of waste management services causes creation illegal landfills and uncontrolled waste incineration that causes pollution of atmosphere.

Ways of improvement

Poor condition of waste management control system is related to the lack of financial, technical and human resources, and also with lack of common vision of waste management and political will. There is no clear policy and management strategy in the waste sphere. Waste management is an integrated issue, related with various processes of production and consumption.

Waste management influences all three spheres of stability – economical, social and environmental protection, involving many stakeholders at various levels: state and local authorities, private sector, NGOs, public and others. Therefore stable waste management is not a straightforward process, and should be carried out step by step. Recommendations proposed in the present policies are developed with full understanding of integrated approach of problems of waste management and existing socio-economic conditions in all three countries of the Southern Caucasus. During the process of estimation of various decisions, different aspects were taken into consideration, such as ecological stability, political expediency, financial feasibility, existing infrastructure and administrative resources. In view of all these trends main recommendations for improvement of system have been developed:

Planning, legislative issues, institutional formation and strengthening

- Develop national strategy on waste management and local plans of waste management
- Develop mechanisms of implementation for achievement of goals
- Develop adequate standards and system for obtaining permission for landfills, as well as clear schemes and rules of waste disposal
- Clearly define responsibilities of state and local institutions in regard to various types of waste
- Improve coordination between the stakeholders - state and local institutions, private sector and public
- Establish regular system of monitoring
- Improve reporting system, that means developing mechanisms for monitoring of quality of services in the waste management field and tools of the control over discrepancies
- Develop clear measures against illegal disposal of landfills

Issues of waste collection/transportation disposal and waste management

- Improve system of waste collection and transportation: update means of waste collection and transportation; develop effective schemes of waste transportation; develop adequate schemes for calculation of fees for waste collection and disposal,; strengthen the penalty system.
- Optimize existing municipal solid municipal waste landfills; close illegal landfills; improve waste disposal practices
- Develop mechanisms of management of waste service property. Necessity to involve private sector to provide waste management services on contractual basis between private companies and municipalities.

Introduction

Given the common Soviet past, countries of the Southern Caucasus (Armenia, Azerbaijan, Georgia) have much in common in regard to existing environmental situation, including waste management sector. Inefficient system of waste collection/transportation, leaking landfills, illegal waste disposal, unstable waste removal practices represent main factors creating threat to the environment and human health. Currently the main causes for poor waste management in these countries are common problems with planning, lack of administrative resources, existing unstable practices of waste management, lack of necessary infrastructure and inefficient waste management system.

However, waste is regarded as a serious problem, especially taking into account that existing tendency of urbanization and of population upsurge causes increase in waste generation. All three countries of the region have assumed a number of responsibilities in regard to waste management both at national and international level. Starting from June 14, 2004 Armenia, Azerbaijan and Georgia were included in European Neighborhood Policy, having thus received opportunity to strengthen further political and economic relations with EU. Within the frameworks of European Neighborhood Policy, these countries have assumed responsibilities including responsibilities related to environmental protection, that are reflected in the European Neighborhood Policy Action Plan. Among other spheres of environmental protection of EU Neighborhood Policy, waste management is one of the most priority spheres. Among activities necessary for "reduction of risks for human health through managing of contamination prevention" the Environmental Protection Strategy for the countries of Eastern Europe, Caucasus and Central Asia, enlists measures for "improvement of waste and chemicals management", including: lack of attention towards preventive technological approaches; efficiency of resources and lack of incentives for waste introduction of modern waste handling technologies; modern technologies of waste prevention, recycling and neutralization; inefficient management of industrial and domestic waste; inadequate market for goods produced as a result of waste processing; inadequate incentive for reuse and restoration[1]. Activity plans of EU countries in Armenia, Azerbaijan and Georgia also include responsibilities related with waste management:

Armenia: adopt strategy of radioactive waste management; develop legislative frameworks and basic procedures and ensure planning in key environmental protection sectors, including waste management; further development and implementation of existing national plans and programs, including waste management.

Azerbaijan: develop legislative frameworks and basic procedures and ensure planning in key environmental protection sectors, including waste management; undertake steps aiming at improvement of waste management planning and practices, especially in regard to municipal waste, through sharing information and experience.

Georgia: develop legislative frameworks and basic procedures and ensure planning in key environmental protection sectors, including waste management.

Responsibilities assumed by all three countries within the frameworks of EU correspond with their environmental protection policy priorities and needs. Besides, European Neighborhood Policy actively supports regional partnership and cooperation, including issues related to environmental protection.

Objective of survey

Taking into consideration all the above stated preconditions, project of Eurasia Foundation "Assistance in development of survey of regional policy in the field of environmental protection and European Neighborhood Policy" is targeted at development of policy document in the waste management field in

[1] Partnership in the environment protection sphere in UNECE region: Environment protection strategy for the countries of Easter Europe, Caucasus and Central Asia, the fifth conference of Ministries, Environment for Europe, Kiev, 2003.

the Southern Caucasus for the purpose of stimulating regional cooperation and sharing experience and offers joint solutions of problems related to waste management in the region.

Therefore, objective of current survey is development of a joint policy document for the region for the purpose of improvement of waste management and hygienic conditions and stimulating practices of stable waste management in all three countries of the region, creating of the necessary fundament for the development of economically efficient and stable system of management in the sector.

Methodology

In order to carry out survey task groups and working groups in all three countries have been formed. Task groups consist of experts of law, waste management experts and an economist. Working groups consist of representatives of stakeholder ministries, municipalities, NGOs, private sector, mass media, etc. Survey phase includes the following methods:

- **Desk study** has been conducted at the initial stage of survey. It includes assessment of legislative field; documents, reports; official letters; budgetary expenses; results of previous surveys and other.
- Survey among population was undertaken based on the **quantitative method** for the purpose of finding out the quality of services in the waste management field, situation in the settlements, public opinion and level of participation and other. Survey covers different settlements – 2 neighborhoods in the capitals, 2-3 communities in rural settlements and 2 municipal communities in each of the three countries.
- **Method of profound poll was** used interview different level managers (national and local) in the waste management sphere, as well as other stakeholders, such as waste management experts, private sector, NGOs and other, for the purpose of finding out current and planned events in the sector, as well as problems in the waste management and probable ways of their solving taking into consideration different stakeholders.

Based on the obtained information different ways of improvement have been developed. Each option was estimated considering all socio-economic and environmental protection aspects, including profitability that was conducted by experts-economists. As a result most sustainable options of problem solution have been recommended.

Document structure

The document contains five main sections, covering different aspects of waste management: waste collection and transportation (section 1); waste disposal (section 2); waste recycling and utilization (section 3); policies and legislation in regard to waste management (section 4); waste management (section 5) and attachments. Each section contains: problem description; problem analysis; international experience review; analysis of recommended options; final recommendations.

Restrictions

Survey covers all three countries of Southern Caucasus – Armenia, Azerbaijan and Georgia. Given the fact that waste management represents a broad sphere, covering many branches and stakeholders, survey was narrowed down to level of solid domestic waste (SDW).

The main difficulty during the survey was lack of reliable data about SDW amount and content, total area of landfills and other. Therefore, very small surveys in regard to waste management had been conducted in all the three countries. There is no regular system of registration of statistical data in regard to waste management, as well as actual impact of existing methods of waste management on environment and human health. That is why in many cases proposals and recommendations are developed based on experts' assessment. The same is true in regard to the analysis of profitability of proposed options. Exact analysis of profitability needs special information that is totally lacked. Besides, such calculations are conducted separately for each municipality, as they differ in many aspects.

Therefore, it was not possible in the frameworks of proposed survey. Therefore profitability analysis was also based on experts' common assessment and theoretic calculations.

Section 1: Collection and removal of solid domestic waste (SDW)

1.1. Description of situation

First stage of waste management is its collection and transportation. In spite of certain improvement of waste collection technical aspects and transportation during the last year (renewal of collection capacity

and pool of vehicles, use of contractors' services), significant amount of waste is removed with delays, during transportation sanitary norms are not followed increasing risk for human health and environment.

Waste amount: Total annual SDW amount in the region constitutes 3 mln. 200 thousand tons, including 1,5 mln. tons per year in Azerbaijan (only in Baku – about 0.8 mln. tons), more than 1.0 mln. tons of DSW in Armenia, and about 0.7 mln. tons in Georgia. Amount of domestic waste increases every year.

Waste collection: In the countries of the region centralised collection of SDW and sanitary cleaning of territory is undertaken in capitals and big cities of these countries. In Azerbaijan centralised SDW collection is undertaken only in big cities – Baku, Gianja, Sumgait, Ali Bairamli and Nakhchivan and partially in regional centers. In other settlements (aproximately 200 thousand tons/year) waste is either incinerated or thrown to chanels and ownerless places. The main methods of SDW collection – containers, bunkers and waste bins. Capacity of waste bins is 80-100 liters, containers – 420 litres. In most cases container and waste bin location areas are not blocked and part of waste (approximately 25%) gets spilled. Accoring to our calculations amount of daily SDW produced in Baku constitutes 2200 tons. For full collection of this amount of SDW 28 thousand containers are necessary. Besides, these containers are open and while loading part of waste spills in the streets. Out of 930 communities in Armenia organized domestic waste collection and removal, as well as hygienic cleaning of the territory is conducted only in 48 towns and several tens of settlements located in the neighborhood of towns . Waste removal is implemented by about seventy (68) organizations (mainly private), which operate about 300 refuse tippers and adapted vehicles. This is three times less than the required quantity. The fleet is deteriorated and has not been renewed in the recent 10 years.
Because of low salaries and inadequate working conditions these organizations lack workers.
Low level of hygienic cleaning of settlements and collection of SDW is also influenced by inadequate number of different capacity and purpose waste collection vehicles (waste bins, containers and other) (in some cases they do not even have any). According to statistical data total number of street and yard waste containers constitutes 8000, out of them 4500-yard containers are intended for collection of SDW from the apartment buildings, that do not have refuse chutes. Capacity of such containers varies from $0.7m^3$ to $1.7m^3$. Existing waste containers are open and are mostly in poor tecnical condition.

Centralized system of waste collection is functional only in big cities of Georgia. There are three types of SDW collection in Georgia depending on different settlements: containers, bunkers and bell system. Container system is most commonly used. Bunker system is more common for multi-storey apartment buildings. Bell system is used in old neighborhoods, with narrow streets, inaccessible for refuse tippers. When a refuse tipper rings the bell to let people know about its arrival, people come to the refuse tipper with waste. Negative side of bunkers has been mentioned many times by both city authorities and population. Bunkers get cleaned manually that takes too much time. They also represent source of spreading of rodents. Complete replacement of bunker system by container system is planned during the next two years.
Currently many positive changes have been undertaken in the capital of Georgia – Tbilisi. There are 3700 containers with capacity of 240 liters; 2800 containers with capacity of 120 liters; and street refuse pits in Tbilisi. Transportation of SDW, sweeping and other systems has also been improved.

Nevertheless, in spite of obvious improvements in waste management services, situation in the regions remains the same. This leads to illegal, chaotic dumping of SDW and its uncontrolled incineration, causing air pollution.

Waste transportation: Centralised waste transportation is carried out in capitals and big cities of republics. In Azerbaijan transportation is undertaken by public services of executive authorities, partially municipalities and mostly by contractors. Joint Azerbaijan-German companies "UP-Azerbaijan" and "CASCO" are functional in Baku, in Sumgait joint-company "ADES". Equipment used by these

companies consists of "sidewise infill" and top inlet vehicles. In spite of renewal of the vehicle pool, the main part of waste is transported by old open vehicles, leading accumulation of dirt in the streets of cities. In Armenia collection and transportation of SDW is carried out by the same operators. Big cities face serious problems related to removal of waste from multi-storey apartment buildings (3000 buildings in Yerevan have refuse chutes). As a result of delays with waste removal, inadequate claning and disinfection of refuse chutes, apartment buildings face insanitation, that in turn effects human health and entails spread of rodents. Because of inadequate technical equiment of the system sanitary requirements to waste removal from apartment buildings and street containers are not met. In some cities and villages or certain neighbourhoods waste removal is conducted once a week, or even rarely, whcih is absolutely inadmissible, especially in summer months.
According to the RA Law on Nature Protection and Nature Use Fees, the organizations engaged in collection, transportation and disposal of waste pays to the state 600 drams (1.77$) per one ton of SDW.

In Georgia operators are responsible for SDW removal and they are undertaking waste collection. Waste collection and removal is undertaken on a regular basis in Tbilisi. There are 78 modern refuse tippers and 124 old Soviet standard vehicles, 22 automatic sweepers and other equipment in Tbilisi. Besides, regular disinfection and disinfestations are conducted regularly. However, as has already been mentioned, lack of regular SDW collection/transportation continues to cause serious problems in other regions of Georgia.

Monitoring and control: In Azerbaijan control of waste removal and of waste accumulation places is carried out by sanitation service of the Ministry of Health. Currently no diinfaction of places of refuse bin location after waste removal are carried out, creating insanitation. Surveys have shown that refuse containers contain aerobic spore-forming and nonspore-forming, pathogenic and opportunistic pathogenic micro bacterium as *Escherichia coli, Salmonella tifimurium, Streptococcus faecalis, Poliovirus, Mucor, Aspergillus, Tricho-derma, Penicillum and many others. However, in addition eggs ofa very dangerous for human health parasites (Ascaris) have been found at landfill.* Therefore, nonobservance of sanitation norms and rules of food and nonfood waste collection and utilization from the places of compact settlements, be it places of illegal waste accumulation or rare removal containers, represent potential pathogenic-infectious threat. In Armenia bodies of local self-governance are charged with SDW collection and removal functions. After all, waste collection represents a serious indicator during elections of local self-government, that forces managers of these bodies to adequately conduct monitoring of refuse collection enterprises.

Creation of single SDW management division in the municipality of Tbilisi has improved control and monitoring of service quality in this sphere, since reducing number of operators from 9 to 1 has made the system more flexible in terms of monitoring. SDW operators are directly accountable to city authorities. There are different control mechanisms: instalation of special scales in order to weigh SDW delivered at the landfills; installation of video cameras at the landfills, registering each truck passing landfill gates, as well as providing general panorama of in order to prevent any illegal activities at the landfill territory. Installation of GPS system is planned at refuse tippers is planned which will provide possibility to control distance run by vehicles, number and duration of stops and etc. Besides, a special hotline is functioning inTbilisi since 2006. People can call and express their complaints, which is one of the indicators assisting in estimation of SDW service quality in the city. However, as has already been mentioned, these improvements have only applied to the capital. Situation in other regions of Georgia remains unchanged. Besides, no monitoring of ecological impact of current practices in SDW on environment and human health has been established.

Restrictions and possible unforseen results and plan for solving them: The main restriction is nonexistance of approved state program of reforms in the field. Implementation of reforms without support and financing of governemnt is impossible. First of all government support should be saught.

Problems of the field should be permanently reflected through mass media, implement pilot projects targeted at improvement of system with assistance of international financial institutions.

1.2. Problem Analysis

Tendency to problem complication: There are objective and subjective tendencies of creation of problem complications in all the republics of the Southern Caucasus region. Among them:
Objective tendencies of problem complication

- Population upsurge
- Urbanization
- Increase of GDP per capita

Subjective tendencies

- Nonexistance of waste reduction policy
- Nonexistanse of initials waste classification
- Weakly developed material and technical basis of enterprises of waste disposal and sanitary cleaning,
- Inadequate monitoring system and weak control,
- Low percentage of fee collection for services
- Low level of awareness, population indifference and low life standards
- Nonexistanceof penalty system

International experience: In European countries population pays fixed amount for SDW removal including payment for collection, transportation, recycling and disinfection. In our countries rate includes only cost of SDW collection and transportation that complicates development of the field and does not provide opportunities for market relations and competition. In addition, payment for the SDW collection and removal services constitutes 40-60%.

In developed countries classification of waste is conducted, they use separate containers or tanks for SDW removal. In case of mixed type SDW removal, classification is undertaken at special facilities. Countries of the Eastern Caucasus do not have such experience.
What is more important, SDW collection and transportation is undertaken by organizations with high level of equipment and stable financial turnover.

1.3. Analysis of options

Alternative ways of problem solving:

1. 0-option – no action
2. Improved SDW collection removal systems
3. Modernised SDW collection removal systems

Expected results of alternatives:
1. 0-оǔ option – no action
Low level of equipment of organizations, lack of machinary, lack of containers and waste bins, insanitation of refuse chutes, worsened financial situation. As a result all spectrum of adverse impacts of

SDW gets disseminated in settlements, poluting environment, soil and water resources, posing hazard for human health. These causes increase of rodents and dissemination of deseases.

2. Improved SDW collection and removal system
Bring refuse chutes in order (meeting basic sanitary requirements): repair refuse chute pipes, fix/place refuse chute doors on all floors of, wash and conduct disinfection of refuse chutes at least twice a year, clean and conduct disinfection of the territory adjacent to the refuse chutes.
Place necessary number of closed containers of safe construction in the required places. Place necessary number of street refuse bins in cities and villages.
Also place closed containers in villages, or arrange mobile SDW collection by vehicles with stable and convenient schedule as an alternative. One vehicle can serve neighboring villages (2-3 villages).

Equip organizations: purchase required number of vehicles for waste loading from close containers, special vehicles for SDW collection, ramming and removal, special vehicles for cleaning and washing the streets.

Provide timely removal of SDW from housing estates, improvement of transportation conditions at the expense of reducing the possibility of waste scattering and pollution of streets and roads.

Provide timely removal of SDW from containers at least twice a day and once in two days from the refuse chutes.
Create normal, safe conditions for the workers: working clothes, masks, gloves, boots etc.
Raise population awareness.

Increase percentage of payment for services.

3. Modernized SDW collection and removal system
Carrying out waste classification: place closed containers in the vicinity of apartment buildings for different types of waste. Purchase special vehicles for transportation of these containers. Place necessary number of closed containers of safe construction in the required places. Place necessary number of street refuse bins in cities and villages.
This will allow reducing of load on transportation, since after classification, the odorless domestic waste will be separated from biodegradable parts of waste and quantity of the waste to be urgently transported will be reduced. Sanitary conditions of waste collection sites in blocks will be improved. Besides, there will be a possibility of further efficient use of waste, as paper, pasteboard, metals and polymer materials.
Bring refuse chutes in order (meeting basic sanitary requirements): repair refuse chute pipes, fix/place refuse chute doors on all floors of, wash and conduct disinfection of refuse chutes at least twice a year (in summer period – every month), clean and conduct disinfection of the territory adjacent to the refuse chutes. In this case refuse chutes are used only for food waste (glass, plastic, paper and other waste is collected in street sorting containers).
Also place closed containers in villages, or arrange mobile SDW collection by vehicles with stable and convenient schedule as an alternative. One vehicle can serve neighboring villages (2-3 villages).

Equip organizations: purchase required number of vehicles for transportation of close containers, special vehicles for SDW collection, ramming and removal, special vehicles for cleaning and washing the streets.

Create washing and disinfection system for vehicles and refuse chutes and garbage recipients.
Provide timely removal of SDW from containers at least twice a day and once in two days from the refuse chutes.
Create normal, safe conditions for the workers: working clothes, masks, gloves, boots etc.
Establish and aprove waste collection and removal scheme for each settlement.

Raise population awareness.
Increase percentage of payment for services.

1.4. Recommendations

Analysis of options has justified necessity of reforms in the field of waste collection and removal. As a short-term and present outlook (3-5 years) an option of improvement and development of existing SDW collection and removal system should be concidered. In the long-term outlook objective of improved SDW collection and removal system should be considered. That needs permanent development and carrying out measures for preparation of adequate conditions for improvement.

From the strategic point of view it should be taken into consideration that improved SDW collection and removal system does not guarantee 100% of waste collection all over the republic. Many small settlements in Armenia are located in the remote areas and even in case of availability of technical means, it is not alwasy possible to arrange regular SDW collection. First of all other infrustructure should be improved (ex. improve road conditions, arrange campagne for raising population awareness and so on).

However, availability of technical means will greatly contribute to increase of waste collection scale and cover new territories. Conducting reforms of respective enterprises structures, as well as establishing new ones becomes necessary. Law on local self-governance allows integration of several communities for a common goal. In order to decrease administrative expeses establishment of several big enterprises, that would serve several communities becomes necessary. These communities can establish these enterprises and have their share in the share capital. therefore, communities will get opportunity to jointly manage SDW collection and removal.

Working with public is also very important:

1. Develop activity plan for effective involvement of population in waste collection and classification, including the following:
- Conducting regular cleaning of housing territories atracting interested people under the following motto: “clean street, clean neighbourhood, clean city”.
- Conduct training of population in waste classification.
- Implement small demonstration projects for waste classification with participation of population.
- Undertake propaganda of possible negative effects of waste on human health.
- Change of tariff system for public services and payment for receiving additional services.

For introduction of new tariff policy, development of normative for calculation of tariff for collection and disposal of SDW.
Besides, development of waste reduction schemes in the long-term outlook is very important, such as recycling/reuse of SDW or producers responsibility.

In total required capital investment in the sphere of SDW collection and disposal for Armenia constitutes:

Activities of improving SDW collection and transportation system	**Total expenses, thousand USD**
Renewal of waste collection scope	4000
Renewal of refuse tipper pool	15000
Total:	***19000***

Detailed calculations of alternatives are provided in Attachment 3.

Section 2. SDW disposal

2.1. Description of situation

The only way of SDW management in the countries of Southern Caucasus is taking it to landfills. It is very difficult to determine exact number of landfills in these countries, as in addition to official landfills there is a big number of illegal landfills. In the towns of Armenia there are 60 municipal solid waste landfills, which have been constructed in Soviet period. At present they do not meet sanitary-hygienic and ecological requirements to modern landfills. 37 of landfills have town-planning permission. Besides, there are landfills in villages with a total area of 158 ha.

In total there are 63 official landfills in Georgia with a total are of 233.15 ha. Most of them do not have a special permission, required by the law; in Azerbaijan total number of landfills is around 200 with a total area of 900 ha, 4 of the official ones are in Baku.

Lack of data about exact number and area of landfills, as well as SDW scope and its content is obvious for all three countries. There is no new official standard for landfills, and the old standard is not met. Concept of "official" landfill and "permission" are quite conditional. A term "official" relates to more or less organized landfills, used by SDW collection/transportation services. Some of them have permissions of official institutions. Nevertheless, most of the permissions have been issued in the past and do not take into consideration environmental impact and therefore have formal nature. Design of these landfills is primitive. In this regard, both official and illegal landfills are equally hazardous for the environment and human health. Illegal landfills simply make problems of contamination even more aggravate and hampers SDW registration.

Existing landfills of domestic solid waste represent source of serious contamination as none of them is designed based on the principles of environmental protection. In most cases waste is thrown at a specially allocated territory – without further leveling and covering. There are no drainage systems in place therefore dangerous solutions soak through all levels and presumably cause soil and ground water contamination. Most landfills do not have sanitary zones and fences, causing contamination of water bodies and adjacent territories with waste from the landfills. In most cases waste does not get condensed and covered with ground causing fire, contamination of air with dioxide and other toxic substances. Landfill access roads are mostly in bad condition and dirty.

Overwhelming majority of landfills in the region was designed during soviet times without taking into consideration environmental risk assessment and geomorphologic research of territory. Many of them are located in the vicinity of water bodies and settlements. In some places in Azerbaijan in windy days smell and smoke as well as small particles of burning waste reach suburbs of the city.

Besides, there is significant number of illegal landfills located along rivers, public places and other. In Azerbaijan illegal waste discard takes place at every landfill.

Tendency to problem complication: SDW represents an increasing problem all over the world. There is a tendency of waste growth. Different countries solve this problem differently. Similarly, there is a strong tendency of waste growth in the Eastern Caucasus region. In Armenia amount of MSFW has increased twice and reached 1 million ton per year. According to the short-term 5-year forecast amount of SDW in Georgia will continue growing by 2.5% per year. this means that during next 5 years SDW amount will increase from 303 200 tons per year (2007) to 335 000 ton/year. This constitutes 13%

growth in comparison to 2006 – 296 000 t/year. According to long-term forecast, during a 15 year period amount of waste will increase to 486 000 ton per year[2].

Currently level of nonfood solid domestic waste NSDW growth in Azerbaijan constitutes 5% per year. According the forecast for Baku, amount of SDW may increase 2.2 times.

This growth means increase of challenges related to SDW management. Existing landfills, especially the ones functioning for 15 and more years may be overfilled during the nearest future. Given existing unstable practices, nonexistence of special standards for landfills, lack of schemes and rules for SDW disposal as well as nonexistence of control and monitoring system, new landfills will aggravate damage to the environment.

Moreover, illegal landfills occupy more and more territories. In many cases ravines and open pits and some times water reservoirs are used for throwing SDW, causing serious contamination of water bodies. Practice of chaotic and illegal disposal of SDW increases challenges and cause even more serious danger for the environment.

One more problem in Armenia and Georgia is nonexistence of special landfills for industrial and dangerous waste, such as chemicals, accumulators and batteries, or waste containing heavy metal. Getting mixed with domestic waste it turns domestic waste into dangerous refuse. Currently in many cases dangerous refuse is disposed at NSDW landfills. Without solving this problem more and more dangerous refuse will get accumulated in the environment, especially taking into consideration that due to economic growth, and increase in industrial activities, amount of dangerous refuse will grow.

Complications with problem solving: Obstacles hindering improvement of SDW system management, especially development of stable waste disposal practices are more or less similar for all three countries:

- Lack of political will;
- General planning problems;
- Nonexistence of new standards and clear requirements for landfills, as well as rules and schemes for SDW disposal;
- Nonexistence of any schemes for reduction of waste volume and policy of waste removal from landfills, including SDW recycling/reuse and its minimization;
- Unclear responsibilities of involved institutions, weak institutional coordination;
- Weak administrative resources – lack of effective compulsion mechanisms, nonexistence of control/monitoring systems at landfills;
- Lack of statistical data on SDW;
- Weak infrastructure – nonexistence of modern equipment and technologies;
- Financial problems;
- Low level of public awareness.

Problems of general planning hinder development of SDW management schemes, observing rules for waste disposal and policy of its reduction. Nonexistence of new standards for landfills and rules for SDW disposal (policy problems) together with institutional cooperation and unclear responsibilities weaken co-ordination, accountability and compulsory measures (administrative resources).

Lack of political will hinders improvement at all levels; planning, policy development and implementation.

Lack of financial resources influences all problem aspects. Financial problems limit investments in infrastructure, as well as hinder strengthening administrative resources, introduction of high standard technologies, construction of modern sanitary landfills, development of recycling schemes and other.

[2] ”Policy of SDW management Tbilisi”, developed within the frameworks of “Caucasus city network” project, 2007

Nonexistence of exact data about number and content of SDW hinders planning process and weakens control.

2.2. Problem analyses

Problem aspects

Planning problems

- Nonexistence of common SDW strategy

Legislative issues

- Nonexistence of appropriate new standards and system of permissions for landfills, as well as clear schemes and rules for SDW disposal
- No policy of outlet of waste from landfills, reduction of disposed SDW, such as recycling, waste minimization, producer's responsibility etc.

Institutional problems

- Unclear responsibilities of state and local institutions in regard to different types of waste (industrial, medical, biological etc.).
- Weak coordination between stakeholders – state and local institutions, private sector, public.

Weak compulsory mechanisms

- Nonexistence regular control and monitoring system
- Weak compulsory mechanisms, such as responsibility for noncompliance, for illegal waste disposal and other (as high penalties, cancellation of license etc.)

Financial issues

- Lack of financing for: improvement of waste disposal practices (SDW compression and covering with a layer of ground, landfill fencing, repairs of access roads etc.) technical re-equipment of landfill equipment, development of regular monitoring schemes, development of waste reduction policy, construction of modern, landfills meeting sanitary requirements.

Lack of willingness

- Lack of motivation among state and local authorities for improvement of the existent SDW management system
- Low level of public awareness, low level of local tax collection for waste removal/payments for services per capita.

All these problems are interrelated in many aspects. For example weakness of legislation weakens compulsory measures – nonexistence of clear rules of SDW disposal hinders control of relevant service providers; unclear responsibilities of state and local institutions weaken accountability. Lack of willingness influences both policy development and implementation. Political will is very important as investment in infrastructure, development of control and monitoring systems are responsibilities of government and very much depend on the level of priority of SDW problems in political agenda. Lack of financial, technical and administrative resources hinders planning and development of stable SDW management or improvement of existent practices. Low level of public awareness does not contribute to improvement of SDW management methods, as well as does not represent power for decision making institutions.

Previous problem solving attempts: In last years some positive changes in SDW management system have taken place in Tbilisi, capital of Georgia. Specifically:

Improved coordination and institutional/administrative resources

- United service of SDW management has been created in city municipality, responsible for all activities related to waste collection/disposal.

Improved responsibility/accountability

- Operators-contractors of SDW services, including operators of waste disposal became directly accountable to city authorities.
- Compulsory-control mechanisms for operators have been significantly improved: special scales have been installed in order to weigh SDW, delivered at the landfills; video cameras at the landfills have been installed, registering each truck passing landfill gates, as well as providing general panorama of in order to prevent any illegal activities at the landfill territory. Installation of GPS system is planned at refuse tippers is planned which will provide possibility to control distance run by vehicles, number and duration of stops and etc. This will make imposible disposal of waste outside of the landfill territory.
- High penalties for illegal waste disposal have been introduced.

Financial issues/infrastructure

- Big investments in means of SDW management have been mane during the last several years.
- Taxes for waste removal have increased from 0.4 GEL[3] to 1.2 GEL per capita; for businesses and organizations new more adequate taxes have been introduced. Tax collection has improved.

However in other regions of Georgia situation with SDW has remained the same.

Besides, several projects have been funded by international organizations during last ten years. Among them, for example, projects financed by UNDP, GEF and Georgian government, development of National Activity Plan, implementation of Stockholm convention on Stable Organic Contamination (May 2003 – December 2005); starting from September 2006 – development of Environmental Protection National Activity Plan also financed by UNDP.

In 1997 Dutch consulting organization "Heidemij Advise" with support of World Bank Agency have completed a project of Municipal Service Development. This project targeted assessment of current situation in SDW management sphere and has presented a long-term strategy and general plan.

Several surveys have been conducted by association German Technical Cooperation (GTZ). Among them: "Waste analysis in Tbilisi", 2003; study of SDW management infrastructure in Tbilisi and Telavi within the frameworks of Caucasus City network, 2003; "Analysis of SDW sector in Tbilisi and recommendations for improvement", 2005. Besides, within the frameworks of Caucasus City network GTZ developed strategic plan for SDW management in Tbilisi.

In addition, within the frameworks of Kyoto Report, Japanese company "Shimzu" in cooperation with Tbilisi municipality is planning to implement a project "Utilization of gas produced at Tbilisi landfills". This project targets on withdrawal of hotbed gas from Tbilisi landfills and, if possible, convert it into electricity. Both landfills are ready for the process of monitoring for assessment of annual production of methane.

In 2004-2005 a consulting project for development of financial strategy for NSDW sector was implemented by OECD together with Ministry of Urban Development of Armenia.

Within the framework of TACIS project of European Union, the Ministry of Urban Development has developed consulting project on SDW management in 2 marzes (Ararat and Vayots Dzor).

Besides, in 2005 organization "Autobahn invests Centre" developed a project "Utilization of industrial and domestic waste in Yerevan for 2005 – 2008".

[3] 1GEL (Georgian Lari) equals to $1.65US or 2.22 EUR

Starting from 2005 Japanese company "Shimzu"is planning to develop a project for collection and utilization of gas at Nubarshen landfill in Yerevan. Besides, preliminary researches at landfills of two other cities – Vanadzor and Gumri have been conducted.

Some attempts for waste compression and its incineration for energy conversion are undertaken in Azerbaijan, but these projects have not been implemented yet.

For implementation of Stockholm Convention National Action Plan has been developed. Plan includes measures for utilization of domestic and medical waste. World Bank program "Apsheron Project" targeted at implementation of SDW management. In addition, Japanese company "Shimzu" is panning to develop a gas utilization project in Azerbaijan at one of the landfills in Baku. It is planed to convert a produced gas into power energy.

Stakeholders: Main stakeholders in SDW management sphere are government sector, private sector, NGOs and public. Equal involvement of all stakeholders in decision making process is a key factor.

Government level

- Ministries – Ministry of Environment Protection, Ecology, Ministry of Health Care, Ministry of Municipal Development, Ministry of Territorial Management

Local level

- Local self-government bodies – regional, municipal, rural
- SDW collection/disposal organizations

Private sector

- Private operators-contractors – private companies with Ltd status, hired by municipality on a contractual basis for implementation of SDW removal/disposal services.
- Private companies, using recycled materials in their production (mostly paper, glass and plastic).
- Environment protection NGOs.
- Public

In all three countries of the region there are similar stakeholders. Ministries mainly deal with development of state policy, whereas, self-government bodies directly manage SDW. In different countries SDW operators are either state organizations, or private contractors. In addition there are several companies dealing with recycling of paper, glass, plastic and other materials.

Criteria of assessment problem solving options: Proposed options will be estimated according to the following criteria:

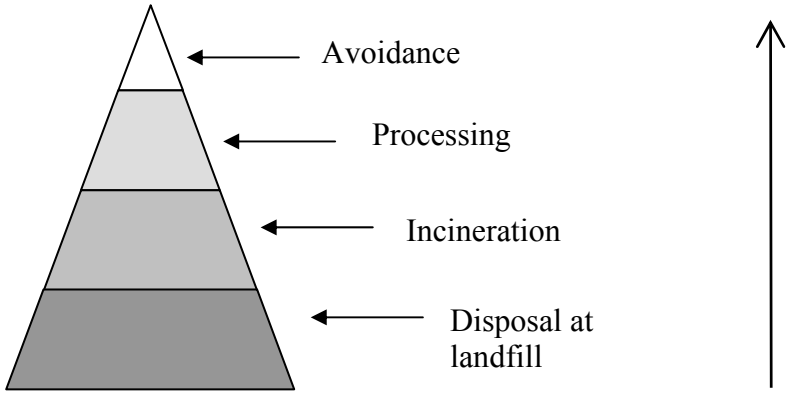
- Stability of environment
- Political compliance
- Financial feasibility
- Existence of infrastructure
- Administrative resources

All possible alternatives will be taken into consideration in order to reveal the most appropriate one. Unfortunately, the most favorable option from the environmental protection point of view are not always appropriate from financial, administrative, technical and other stand points. Therefore it is necessary to develop proposals that will consider all these pros and cons for specific choice.

2.3. Aspects of stable SDW disposal, International experience

Waste hierarchy: Starting from 1970 attitude towards SDW in the developed world and problems caused by it has changed fundamentally. It was admitted, that waste was not only source of environment contamination, but also a valuable resource, providing possibility to save raw materials. Besides, due to waste increase, as a result of population upsurge and industrial activity growth, in the second half of the 20th century there is shortage of areas for landfills. At the same time dangerous products stemming as a result of technologic and consumption revolution has increased toxicity of landfills.

Most of developed countries have started responding to these increasing problems by new strategy in regard to SDW, which is directed towards reducing waste and less harmful methods of their cleaning. As a result, gradual transition from waste accumulation at landfills and its incineration to the methods directed to recycling and SDW minimization has been undertaken. This tendency is reflected in a so called waste hierarchy that is becoming fundament of SDW strategy in all industrial countries.



Pic. 1 **Waste management hierarchy**

Disposal at the landfill - the lowest priority in the hierarchy - in the past was considered to be the cheapest processing of SDW, nowadays is associated with increased conservation and social expenses, harmful for the environment and human health. SDW incineration also causes environment pollution and threat for human health. Only recycling-reuse, energy recovery and special SDW volume minimization and avoidance are considered as ecologically and economically viable, as these means use of minimal amount of raw materials and energy.

Experts in SDW management consider that using effective strategy 69-80% of waste can avoid landfills. Therefore it is very important to dispose it with minimum risk for the environment and human health.

During centuries, waste was thrown into lowlands, ravines and other places in the vicinity of human settlements. However modern *sanitary landfills* have quite complex constructions. Waste is regularly leveled by layers and covered with clay and plastic foam. Landfill bottom is covered by second tight padding consisting of several layers of clay, thin plastic (geomembrane) and sand. Saturated solution (polluted rain water, soaking through solid waste) accumulate in the padding, preventing it from soaking to ground waters. Accumulated saturated solution gets pumped from the landfill bottom and is transferred to the wastewater cleaning station. Several drills are made around the landfill for the monitoring purposes. After filling up, landfill is covered with clay, and gravel and upper ground layer to prevent water from soaking inside. Besides, modern landfills are equipped with connected pipeline system, collecting gas – a product of waste decay (methane and carbon dioxide).

EU policy in SDW sphere: EU policy in SDW sphere is strictly directed towards stable waste management. Initially waste hierarchy was known as EU Hierarchy for SDW, first published in the EU Second Activity Program on Environment Protection (1977 – 1981). Currently it constitutes integrated part of all corresponding regulations in the field of SDW.

Regulation 2006/12/EC of the European Parlament and Council of August 5 2006 on SDW defines main frameworks of waste management in EU countries, replacing previous Regulation 75/442/EUC.

Regulation 2006/12/EC requires that coutries, members of EU undertake appropriate steps to prevent, reduce waste production and hazards related to it: develp pure technologies, saving use of natural resources; recovery of waste through recycling and other processes; development of appropriate technology for final disposal of hazardous materials, contained in waste, meant for recycling (Article 3); undertake necessary measures for safe disposal of SDW withoutcreating risk for human health and without use of processes and methods, threatening environment, specifically: with no risk for water, air, soil and flora and fauna, not causing trouble bu noise or smell, without reverse impact on nature or unique places.

Order (EU) No 2150/2002 of European Parliament and Council of November 25 2002 on statistical data in SDW sphere requires existence of regular, commensurable, updated and describable data about production, recycling, reuse and disposal of SDW, that is very important for monitoring of Council policy in the sphere of wastes.

Regulation of Council 1999/31/EC of April 26 1999 on landfills and regulation 2000/76/EU on waste incineration is targeted at effect of SDW recycling and disposal on environment. The main goal of the regulation on landfills of – determination of operational and tecnical requirements for SDW landfills in order to minimize their environmental impact – polution of surface water bodies, ground water, soil and water, greenhouse effect, as well as hazard for human health (Article 1). For reduction of amount and toxicity of wasten at lanfills it determines types of SDW, that should be received at different classes of landfill (Article 6), that will prevent mixing of hazardous waste with other types of waste; establishes limits in regard to waste and methods of recycling, inappropriate for landfills (Article 5); encourages preliminary SDW cleaning before disposure at landfills (Artcle 6); defines strict requirements for issuing permissions for landfill expluatation (Article 8-9); defines procedures of control and monitoring at the stage of expluatation (Article 12), as well as closing landfills and their further service (Article 13).

Regulation 2000/76/EU of European Parliament and Council of December 4 2000 on SDW incineration is directed towards prevention of negative environmental impact and impact on human health, limiting air, soil, surface water bodies and ground water pollutinon, by emmisiions from SDW incineration (Article 1). Regulation defines requirements on provision and receipt of waste at incineration stations (Article 5); conditions of exploitation for incineration stations (Article 6); quantitative limitations of emmision to air (Article 7) and other requirements.

2.3. Option analyses

Options for SDW disposal/recycling

Option 1 – SDW incineration

Option 2 – construction of new sanitary landfills

Option 3 – modernization of existing landfills

Option 4 – gas utilization at landfills

Option # 1 Incineration

- Ecological stability

People often argue if waste incineration has a higher priority in the SDW Hierarchy than its disposal at landfills. Both are regarded as potentially hazardous for the environment and human health. *Landfill* represents source of heavy metals and toxins, reaching adjacent ground water and soil, as well as explosive and toxic gases spreading in the atmosphere. *Incineration* also produces toxins and heavy metals. Prevention of emission requires expensive filters. At the end used filters as well as quarter of the incinerated waste paste also requires disposal at landfill.

Therefore, incineration is not regarded as a stable and ecologically acceptable option for handling SDW. Besides, in contrast to EU, with strict requirements to incineration, there is no policy in Eastern Caucasus that would regulate waste incineration, which in turn may present undesirable context in terms of development of ecologically hazardous and unstable incineration practices.

– Political acceptability

Because of economic conditions construction of incineration stations strongly depends on private investors. There are certain barriers complicating investments in this sector. First of all this is **lack of data on quantity and content of SDW**. In order to undertake estimation of waste incineration method sustainability, it is necessary to define exact quantity of waste and its *thermal value,* this depends on SDW composition (composition of organic components). Secondly, as has already been mentioned, **a policy on SDW incineration method application does not exist**. This means that there are no requirements to incineration stations, emission standards, system of permissions, rules of toxic ash disposal remaining after incineration and etc. **There is no control and monitoring** for inspection of such stations.

Therefore political readiness to development of incineration is also unsatisfactory. Moreover, this may cause resistance of environmental and health care NGOs and public.

– Financial feasibility

As a rule construction, exploitation and maintenance of incineration stations is very expensive. Therefore, waste incineration with energy recovery requires big investment and import of basic equipment, which is also very expensive. Incineration of 1 ton of SDW needs 100 € (~ 137 $). For example, for Tbilisi expenses will exceed 30 million GEL (~ 17 mln. $). Covering this amount from taxes will be impossible. That's why investors need clear guarantees that produced power energy will be purchased from them. However, electricity produced as a result of incineration is expensive and needs subsidies. Based on past experience it is undesirable that state invests in such subsidies. Therefore, this option seems expensive for this region.

– Administrative resources

Current administrative resources can not ensure appropriate control and monitoring of incineration stations.

– Existence of infrastructure

There is no infrastructure for incineration of SDW. Construction of such infrastructure totally depends on investors.

Landfills

Most likely landfills will remain the main method of handling SDW in the Southern Caucasus region in the nearest future. Therefore to encouraging of more stable waste management and reducing ecological hazard of landfills is very important. In this context two options may be considered: construction of new, modern sanitary landfills; and modernization and optimization of the existing ones. These options are not mutually exclusive but are dependable on financial and other factors.

Option # 2 Construction of new sanitary landfills

– Ecological stability

From the ecological stability stand point, sanitary landfills are less hazardous for the environment. However, as a whole, landfills are not considered stable waste handling method, as even sanitary landfills have problems in regard to long-term safety. Even modern isolation systems can not stand long-term natural erosion. Moreover, there is certain level of contamination of ground water and atmospheric

emission even at well designed sanitary landfills. Among other problems are dust and slow SDW decay. Besides, no stimulation and waste reduction is undertaken.

However, when SDW disposal is required, sanitary landfills represent the best choice from the environmental stand point.

– Political acceptability

Construction of sanitary landfills requires existence of data on quantity and type of waste. Amount of waste is important for choosing appropriate method of SDW disposal, for example for determination of the area for waste disposal, or determining number of such facilities at given territory. Methods appropriate for small amounts, such as waste encapsulation in stable materials may be inefficient for managing large amount of SDW. Besides, it is important to know physical and chemical characteristics and level of toxicity and hazardous of waste in order to make the right choice of materials for landfill construction, appropriate for this waste. As has already been mentioned, all countries lack exact data on SDW.

Besides, as in case of incineration, **there are no clear requirements (rules) for design of modern landfills and any appropriate system of issuing permissions and schemes of control and monitoring.**

– Financial feasibility

Construction, exploitation and maintenance of modern landfills are very expensive. Total expenses for disposal of 1 ton of SDW constitute 10 € (~ 13.7 $), including expenses for construction and exploitation. Minimum exploitation time of such landfill should constitute 20 years.

Taking into account economic situation in all three countries, construction and exploitation of such landfills seems financially undoable.

Option # 3 <u>modernization of existing landfills and SDW disposal practices</u>

This means:

- Optimization of existing landfills – closing of illegal landfills, which means reducing their number
- Modernization of SDW disposal methods – covering with ground, fencing, rehabilitation f roads, reducing soaking and ignition risks, development of waste disposal schemes for more efficient use of landfill areas
- Establishment/rehabilitation of sanitary zones
- Improvement of waste registration, establishing statistics
- Improvement of control and monitoring

– Environmental stability

Improvement of SDW disposal practices will stop cases of ignition at landfills, smell, contamination of water bodies and adjacent territories. Besides, closure of illegal landfills will mitigate burden on environment. However, problem of soaking and emission from landfills can not be solved with the indicated methods.

– Political acceptability

All these activities are realistic for all three countries of the region there are no barriers from the political acceptability stand point. Certain institutional changes will be required for the system to be more efficient. For example, currently fee for waste disposal in Armenia is transferred to state budget, whereas all activities at landfills should be funded from local budgets. However a local budget in most cases is

not sufficient. Presently, 3.15 Gel (1.78 $) in Tbilisi and 60 dram (0.18$) in Yerevan is spent for disposal of 1 ton of SDW, which makes impossible even speaking about the development of the system.

– Financial feasibility

Even though modernization of the existing landfill exploitation will increase exploitation expenses, it represents the least expencive option, accaptable from the environmental stability stand point.

Expenses for modernization of landfills in Tbilisi will constitute up to 3 € (~ 4 $) per 1 ton of SDW. This constitutes 300 000 t * 3 € = 900 000 € (1 230 417 $) per year. However, they can vary from municipality to municipality and condition of landfills.

Initial stage of SDW disposal system modernization in Armenia will cost around 63 295 000 $, out of which:

construction of control points for refuse tippers:	
Construction	$ 16 250 000
Exploitation expenses	$ 650 000 per year
Personell salaries	$ 2 250 000 per year
Staff equipping and training	225 000 $ per year
total:	**$ 19 375 000**
Technology	
Bulldozers: 350-370 unit x $ 75 000	$ 26 250 000 – $ 27 750 000
Graders, bulldozers and excavators: 200 units x $ 80 000	$ 16 000 000
Drivers salaries: 550-570 p x $ 300	$ 165 000 – $ 171 000
total:	**$ 43 920 000**

However, further modernization, including development of new technologies (waste classification and cleaning of filters), requires additional expenses. Besides, this will entail significant institutional and legislative changes, as well as will require development of controla and monitoring systems.

Waste classification	
Sorting yard: 25 units x $ 200 000	$ 5 000 000
Exploitation expenses	$ 200 000
Personell salaries: 25 x 10 pers. x $ 500	$ 125 000
total:	**$ 5 325 000**
Filter assembling and cleaning	
Investment for 320 landfills x $ 45 000	$14 000 000
Exploitation costs	$ 576 000 per year
Personell salaries: 320 x 2 p x $ 200	$ 128 000 per year
total:	**$ 14 704 000**

Expenses for assembling and cleaning of hazardous filter constitutes 30-80 $ per landfill, that is an average of 45 000 $.

Besides, establishment of control and monitoring system (inckuding monitoring of technical activities and ecological monitoring of air, water and soil) will cost up to 15 000 $ per landfill. In total for 60 landfills this will constitute: 60 x $ 15 000 = $ 900 000.

Improvement of current landfill conditions in Baku will cost around 1 mln. USD, including:

Fencing of landfills: 3200 м	$ 144 000
Construction of offices, 4 offices with the total area of 400 м^2	$ 100 000
Technical equipment: buldozers, excavators, 8 units	$ 400 000
Modernization of communication infrastructure	$ 200 000
Annual fuel expenses	$ 66 000
Annual personnel salaries	108 000
total:	**$ 1 018 000**

- Existence of infrastructure

Given poor condition of technical equipment at landfills, investment will be required for special technical equipment for SDWdisposal and ramming: buldizers, excavators, graders. Most of landfills require fencing, control points and washing/diinfection equipment for refuse tipper, filter collectors and other.

Option # 4 Collection and utilization of gas at landfills

It is desirable that gas collection projects start in all three countries. Since 2005, within the frameworks of Kyoto Protocol, Japanese company "Shimzu", in collaboration with relevant municipalities has started implementation of feasibility studies for biogas utilization in the landfills of Yerevan (project has already started), Gyumri and Vanadzor, applying Clean development mechanisms, with financial support of the Government of Japan. Presently monitoring actitivites are undertaken to determine annual amount of methane produced by landfills. Project is environmentally sustainable as it reduces amount of gas produced by landfills, and financially feasible, as it is completely financed by Japanese side.

According to the preliminary researches in Armenia, implementation of a gas collection project at Nurabash landfill will require 16 years and 8 million USD. As a result 1.4 megawatt of power energy will be produced.

2.4. Final recommendations

Turn towards sustainable future means reducing waste, requiring disposal at landfills or incineration to the minimum. This means, stimulating waste recycling, its reuse, minimization and avoidance of actions that occupy heist position on the SDW hierarchy.

However, taking into account economic conditions and trends in all three countries, in environmental, financial, political and administrative aspects, the third option – **optimization and modernization of existing landfills** is the most sustainable.

There is no real basis for development of incineration of SDW. There is no appropriate strategy and SDW data is unsatisfactory. Besides, the project, as well as produced power is very expensive. Moreover, it is hazardous from the point of view of environmental impact, especially because there are no control/monitoring mechanisms in these countries.

Construction of new landfills requires much less financial resources than incineration of SDW, however at this stage it also seems expensive. Exploitation of such landfills will increase SDW tariffs several times, which is unacceptable for population.

Therefore, at present modernization of existing landfills represents the most acceptable option, especially as it may bring some profit, for example as a result of gas collection at landfills and its conversion into power energy, or waste classification and recycling. However, this will again require additional expenses

– investment and increase of SDW tariffs. Some institutional changes may be required for better cost sharing between national and local budgets. It should also be admitted, that in long-term outlook construction of new landfills will be required, as life time of landfills is limited.

In addition, for improving SDW management planning it is required to define exact number and composition of waste and undertake regular collection of statistical data. Besides, monitoring of environmental impact assessment and hazard for human health should be undertaken periodically.

Section 3. Recycling and reuse of SDW

COUNCIL DIRECTIVE of 15 July 1975 on waste (75/442/EEC) defines and exposes notions of recycling and reuse of waste.

- Re-use of waste
- Recycling of waste
- Recovery of waste
- Use of waste as source of energy
- Incineration without energy recovery
- Land filling

3.1. Description of situation

In the countries of Southern Caucasus (SC) system of SDW recycling and reuse is weakly developed. As already mentioned above, the most wide spread method of recycling in these countries is landfilling, using elementary technologies (disposal, ramming and covering with ground). There are no temporary landfills for disposal and further SDW classification). They do not undertake classification of SDW and landfills. Very often no basic sanitary and ecological requirements at landfills are met.

Though in the countries of SC they no SDW classification is undertaken at national scale, however there are private organizations that manufacture goods from waste (paper, glass, plastic, metal and other). There are 29 organizations that use different fractions/components of SDW (paper and cardboard – 4200 ton/year and metal 26500 ton/year).

In Armena and Georgia small companies reuse paper for production of toilet paper and packaging materials. Tbilisi paper factory is the biggest company in Georgia, that manufactures packaging materials and cardboard boxes from waste (capacity 25 tons/gay). There are problems with collecting paper waste (no infrastructure and transportation expenses) and factories do not function temporarily. “Ksani Glass” company (capacity 15 tons/day) in Georgia in addition to receiving waste from Georgia, receives glass waste also from Armenia and Italy, for manufacturing bottles for softdrinks. The main problem related to glass procesing is unstable supplies and quality of waste. Assosiation “Metaloplastic” collects plastic in the street annd landfills and produces containers. Capacity of company is 700-800

kg/day. Working with farmers in different regions of Georgia organization "Elkana" conducts composting. Compost is used as fertiliser in housekeeping.
Presently there are no other types of SDW recycling and reuse.

Tendency to problem complication: In the environment where there is no waste classification and recyclying proceses, valuable waste (glass, metal, paper and other) gets often lost. Thanks to recycling of these resources, developed countries get annual enviconmental and economic benefits.
On the other hand, there is no data on actual amounts of SDW and its composition which in turn makes impossible re-use of waste, recycling of waste and recovery of waste.

Existing barriers to solving a problem:

- lack of experience in the countries
- Mixed SDW collection – nonexistence of sorting,
- Nonexistence of data on real waste amounts and its composition,
- Lack of experience,
- Nonexistence of market for recycled commodities,
- Lack of finances,
- Weak state and public control,
- Unprofitable sphere for private operators,
- Low level of public and business sector awareness.

International experience: Most wide spread and common methods of SDW treatment – thermal destroy (incineration) and burial at special landfills.

World wide practice of utilization of different SDW types is provided in % in Table 1,

Utilization method	USA	Great Britain	France	Germany	Austria	Italy	Russia	Japan	South Korea
Incineration	17	7	37	21	73	13	6	59	18
Burial at landfills	81	92	53	73	19	84	94	38	79
Composting	-	1	10	6	7	3	-	1	2
Other	2	-	-	-	1	-	-	2	1

Table 1 demonstrated that incineration as a method of SDW utilization is widely used only in some European countries and Japan. Waste burial at landfills is the main method used.

3.2. Problem analysis

Aspects of SDW recycling and reuse problem: The following aspects have been revealed in the field of SDW recycling and reuse:

- lack of state support,
- lack of SDW classification processes,
- inadequate infrastructure (technical and financial),
- lack of temporary landfills for waste classification,
- lack of experience,
- lack of data on waste amount and composition,
- low level of public awareness

Previous attempts of problem solving: In 2005 with support of Japanese Government, Corporation "Shimitsu" started development and implementation of accumulationa and utilization of hotbed gas at Nubarashen landfill in Yerevan, Armenia, and its implementation has already started. Since 2006 reserch activities at landfills in Vanadzor and Gumri (Armenia).

Company “Mitsubishi” and Government of Azerbaijan have signed an agreement on implementation of the project named “Introduction of clean development method utilizing methane gas, accumulated at waste landfill in Baku” (Both projects in Armenia and Azerbaijan are directed towards introduction of clean technologies within the frameworks of Kyoto Proticol).

In 2005 organization “Autobaninvest Centre” has developed a project “Utilization of industrial and domestic waste in Yerevan region, Armenia for 2005-2008”.

In 1963 an experimental factory for SDW recycling was built in Baku. The factory was desigh so that it would be sorting received SDW and produce compost (fertiliser). In 1991 the factory recycled 1,8 mln. $м^3$ of SDW and was producing 15800 tons of compost, however because fact it contained metal and glass only 5800 tons of compost was sold and the factory was stoped. In Azerbaijan a project of SDW inciniation at Balakhaninski landfill has been developed. However it has not been implemented yet. ЕБРР project : «SDW collection and utilization in Baku” was envisaged production of compost and energy recovery. However this project has not been implemented as well.

World Bank has developed a project - «Absheron Project» that is planning to implement number of activities in regard to SDW management at Absheron Peninsula. The project is approved and its implementation will start in 2008.

Stakeholders:
1. Government bodies (Государственные органы (Ministry of Environment Protection, Ministry of Health Care, Municipal Construction, and Territorial Management)
2. Bodies of territorial and local self-government (regional, municipal, rural)
3. International organizations,
4. Enterprises (state, private)
5. Public

Criteria of assessment of options:

- Readiness – political will,
- Financial, technical capacity,
- Cost efficiency,
- Stable SDW management system,
- Existence and capacity of infrastructure
- Readiness of population,
- Return/self-repayment for a 5 year period

3.3. Analysis of options

Alternative ways of problem analysis:

SDW landfilling

Recycling and reuse with landfilling

Use of waste as source of energy

Incineration without energy recovery

Expected results of alternatives:

Landfilling

This means that landfilling remains to be the only way of waste recycling in all, with basic operations (waste distribution and covering with ground layers).

SDW recycling and reuse with landfilling

This option envisages extraction of valuable waste components that will be used as resources. This requires classification of SDW either during collection process or at special sorting systems. Such valuable resources as paper and cardboard, glass, plastic, metal and others are extracted from SDW. Also organic components for compost production are extracted. However organic components are not cleaned and obtained compost can not be used as a fertilizer for agricultural crops. Such compost is usually used for green plantations and forestland.
Other unsuitable waste components are moved to landfills.
Recycling of mixed SDW is undertaken by compression, ramming into briquettes of up to 500 kg for reducing the size and storing at a smaller territory. In the future these briquettes can be used as power resources.

SDW incineration without energy recovery

SDW incineration without energy recovery- very widely used method of waste utilization, as it significantly reduces use of land for landfills (reduces waste amount 10 times), and allows to utilize heat from incineration for energy recovery. It reduces water and soil contamination. However, in spite of multistage cleaning of filters, this method is not safe: gases produced as a result of SDW incineration come into atmosphere and contain substances hazardous for the environment and human health.
Disposition of big amounts of ash-slag waste (up to 27%) and filters that require burial at landfills as hazardous waste is a big problem.

Use of waste as source of energy

Recently new technologies of SDW recycling are widely used in developed countries – paralysis. SDW is incinerated at very high temperatures (800^0-1200^0C) and recover power energy at generators. This method can also be used in our countries as it provides possibility to use waste accumulated at municipal landfills and re-cultivate soil allocated for landfills. This requires determining SDW calorie content at landfills.
Landfills can also be used for production of biogas. Using drainage equipment methane and other hotbed gases can be extracted and with gas generators recover thermal or power energy.

3.4. Financial-economic calculaions of options

Indicators for assessment of each option:

Landfilling

Assessment of this problem solving option is provided in section “Waste disposure”.
Assessment shows that disposure of 1 ton SDW at landfills costs 13.7$ US. Consequently, landfilling of 1 mln. ton SDW produced in Armenia per year will require 13.7mln$, for Georgiадля and Azerbaijan consequently 4,6mln.$ and 34.2mln$ (given that Georgia produces 335000t SDW/year, and Azerbaijan – 2.5mln.t/year SDW)* .

SDW recycling and reuse with landfilling

а) sorting facility.
- building (1200м^2),
- technical equipment,
- transport.

Sorting facility includes sorting, stowage and packaging equipment for transportation, washing and disinfection and warehouse for integrated products.

б) annual expenses
- salaries,

- exploitation expenses.

Exploitation expenses include: power energy, public services, fuel, materials, repair works and other.

в) landfilling, exploitation of rebuild landfills.

Technical and economic analysis of this option is provided in section " disposure".

3.5. Recommendations

Analysis of SDW utilization technologies does not provide confidence that they may be effectively implemented in the nearest future given the developed situation in the region. The main conclusion of the analysis is that waste handling technologies that are proved to be efficient in the West do not allow solving a problem of such a scale and complexity in our conditions. Other maximal effective options of waste handling that will consider existing situation in South Caucasus should be sought.

Therefore, as it has been stated in the previous part, taking into account existing socio-economic conditions in the region, improvement of existing landfills and practices of SDW disposal will be the best option.

Section 4. Legal regulation of SDW

4.1. Description of situation

Number of laws and national programs in regard to waste management have been adopted in the Republics of the region. Special laws on waste have been adopted in Azerbaijan and Armenia. Draft law on waste has been developed in Georgia which has not yet been adopted by the parliament in is subject to further changes and elaboration. However there are laws on municipal waste management at local level in the capital – Tbilisi.

National legislation: <u>In Azerbaijan:</u> several legislative acts touching upon different aspects of domestic waste regulation have been adopted.

а. Law on ambient air protection. Chapter 3. Article 16. Chapter 4. Article 28.
б. Law on environmental protection. Chapter 7. Article 47.
в. Law on industrial and domestic waste. Article 4, 11, 12, 13, 18, 24.
г. Law on fundumentals of town-planing. Chapter 1. Article 1, 3, 4. Chapter 2. Article 12.
д. The following national programs and action plans have also been approved:
- National program on ecologically stable socio-economic developement. Paragraph 4, 6. Clause 32, 33, 34.
- Packag plan of activities for improvement of envcironmental conditions in the Republic of Azerbaijan. Clause 4.5, 4.11, 7.1, 7.6, 7.10, 7.11.

However, law about industrial and domestic waste adopted on June 30, 1998 is directly related to this problem. Number of ammendments on toxic waste to the law have been adopted in 2007.

Law about industrial and domestic waste adopted of June 30, 1998.

This law defines government policy in regard to protection of environment from industrial and domestic waste, formed as a result of human activities as hazardous substances and items, to reducing their detrimental effect, to ensuring ecological balance in the nature, to utilization of waste as a secondary raw material, as well as regulating waste interrelationship, including hazardous eemissions, waste water and radioactive waste.

<u>Article 4.</u> Principles of state policy on waste:

- protection of human health and ecological balance in the nevironment;
- scientific justification of ecological balance and protection of social interest of poppulation;
- establish waste enterprises, involving state and private organizations and foreign investors;
- create and introduce low-wasted technologies;
- utilization of economic and other stimulation for inclusion of waste issue in economical interests;
- control of ensuring of observance of rules on environmental protection, standards of ecological balance, hygienic and sanitary norms;
- ensuring state registration of waste classification and its passportization;

- ensure awareness of organizations and stakeholders;
- consideration of public opinion in making decisions related to population nterests;
- social protectibility in regard to waste issues;
- consideration of national interests in realization of international cooperation related to waste issues.

Article 11. Requirement to waste dsiposal
Article 12. Requirements to cleaning of dwellings from domestic waste
Article 13. Requirements to waste transportation
Article 18. Economic regulation of activities related to waste issues.
Economic regulation of activities related to waste issues is based on principles of monetary compensation for accumulation, disposal, utilization and desinfection of waste, taking into consideration its amount, level of safety and norms of dsposal.

Compensation for accumulation, disposal, utilization and desinfection of waste is determined considering amount, type and other indicators.
Money obtained for compensation of juridical and physical persons is spend on environemtal protection activities.
Forms of economic stimulation related to waste mangement and its mecanisms, as well as rules of monetary compensation for infringments of waste accumulation, disposal, utilization and desinfection are defined by relevant bodies of executive power.
Artilce 24. Responsibilities for breach of waste legislation
Juridical and physical persons breaking requirements of waste legislation respond to disciplinary, administrative and criminal liabilities in compliance with Legislation of the Republic Azrtbaijan.

Main points of other legislative acts are provided in Attechment 1.

In Georgia: National law on waste has not been adopted yet.
Responsibilities and duties of solid municipal waste management bodies are defined in *Organic law of Georgia on Local Self-government (1997)*, which transfers exclusive duties on planning and carrying out collection and handling of waste or municipal purchase of these services to local self-governemtn[4].
Law about Capital of Georgia –Tbilisi (1998) defines responsibilities and duties of Governemt of Tbilisi. According to Article 23^1 of the law, Government of Tbilisi is responsible for waste removal and activities related to cleaning of the city as well as for SDW management (avoidance, collection, transportation, reuse, recycling, sorting, cleaning and landfilling). Besides, the law provides many different options, according to which city authorities may carry out their responsibilities through: a) minicipal agencies, b) minicipal purchases, c) defining rules for SDW operators providing services, d) defining conditions of agreements between SDW operators and users[5].

Law of Georgia on Licenses and Permissions (2005г.) regulates activities that negatively effect the environment and human health. Corresponding regulative document determines a list of environmental impact activities requiring permission, including activities related to SDW cleaning and disposal. Permissions for environmental impact activities are issued by the Ministry of Environment and Natural Resources of Georgia.

There are several by-laws regarding collection, distribution and disposal of solid domestic waste, as well as rules related to fees for waste and its removal.

Code of Administrative Violations of Georgia (1984) defines penalties for illegal throw of industrial and domestic waste. At the same time there are many other laws regulating issues, related to SDW, for example regarding hazardous chemicals, transit and import of waste, radioactive security and others.

[4] *Organic law of Georgia on Local Self-government (1997).*, Article 16
[5] *Law about Capital of Georgia –Tbilisi*, 1998г., Article 44^1

In Armenia: To regulate the process of waste management the following laws and by-law were adopted:

a. Law od Republic of Armenia on waste. Article 7, 8, 9, 10, 11.
b. Law od Republic of Armenia about sanitary-epidemiologic security of population.
c. Law od Republic of Armenia about bodies of local self-government
d. Law od Republic of Armenia about licensing.
e. Law od Republic of Armenia about environment and nature management
f. Law od Republic of Armenia about environmental tarifs

Decisions of the government of the Republic of Armenia as well as about 20 ministerial normative acts in the development of the RA Law on Waste that regulate:

- norms of waste formation, handling and recycling
- registering places allocated for landfilling

Law od Republic of Armenia on waste (Adopted 24.11.2004)

The law regulates relationships in the process of waste collection, transportation, storage, handling ad recycling, as well as aspects related to possible avoidance of environmental impact and effect of human health.

The law does not apply to

- radioactive waste
- waste that gets mixed with waste water and spell into natural water-bearing systems
- substances that get into atmosphere in the form of gaseous sources of contemnation
- waste of minig industy.

The law determines waste

Waste – industrial and domestic waste/raw material remains, formed in the process of production or consumption, as well as goods that lost their initial quality.

The law also determines such notions as: waste producer, hazardous waste, collection , storage, recycling, desinfection, removal, disposal and burial of waste, as well as cadast, certification and classification of waste, landfills and places allocated for waste disposal.

The main goal of the law is to determine common governemt policy in the firld of waste management and introduction of environmentally safe stimulating mecanizms and activities.

Tendency to problem complication: In Azerbaijan: In spite of existence of coresponding legislative basis, process of solid waste management remains unsolved and does not provide desired results. The reasons are as follows:

- indistinct distribution of responsibilities among reletavi structures
- low economic efficiency of tariff system
- inefficiency of penalties for infingement of sanitary norms during waste collection and transportation process
- nonobservance of sanitary norms of landfill maintenance

In Georgia:

Lack of appropriate legislative basis complicates:

- introduction of stable SDW management methods, complying with EU principles regarding waste management issues
- determining clear standards and systems of issuing permissions for landfills and clear schemes and rules for SDW disposal
- establishment of clear classification system for different types of waste
- establishment of clear responsibilities among different establishments regarding different types of waste. other than municipal (industial, medical, biological and others)

- set up regular statistics on SDW
- developemt of optional schemes of SDW management (recycling, reuse, etc.)
- development of practices for producers' responsibilities.

In Armenia

- state has not defined and regulated types of waste that can be disposed at landfills
- nonobservance of technical and sanitary requirements of landfill organization,
- nonexistance of schemes (maps) of landfill sites as well as nonexistence of sanitary zones
- no activities for registration of waste amount, quality and morphological content are undertaken
- waste accumulation at illegal places – creation of uncontrolled landfills
- nonexistance of special landfills for hazardous waste
- low level of payments and nonexistence of financial support from the government side.

Existing barriers to solving a problem:

- lack of developed mecanisms for realization of relevant laws – for all countries of the Southern Caucasus region
- lack of relevant national and international standards
- no clear strategy of solid waste management
- corresponding state bodies and waste producers do not have serious robligations for reducing the amount of waste.

International experience:

Legislative acts of EU:

- COUNCIL DIRECTIVE of 15 July 1975 on waste (75/442/EEC)
- COUNCIL DIRECTIVE of 19 December 2002 establishing criteria and procedures for the acceptance of waste landfills pursuant to Article 16 of and Attachment II to Directive 1999/31/EC (2003/33/EC)/
- Directive 2006/12/EC of the European Parliament and of the Council of 5 April on waste (this is the codified version of Directive 75/442/EEC as amended).

Cooperation with EU in the process of legislative management in the region

In Armenia

On March 23, 2006 Government of Armenia approved National Program on implementation within the frameworks of an Agreement on Cooperation and Partnership between EU and Armenia. For the purpose of development of the given program, starting from 2003 with efforts of organization AEPLAC /Armenian European Legislative Centre/ a group of experts was formed that has estimated situation in Armenia and outlined main tendencies for approximation of armenian legislation with european.

The second stage of the given program (January-June 2007) represented estimation of institutional potential for implementation of the National program. Results of the undertaken activities and analysis of existing situation are provided in section "Environment", sub-section "Waste" as well as a list of all Framework Directives of European Parliament and Council of EU, principles and aproaches that should be introduced in the policy of Republic of Armenia in regard to waste management.

In Azerbaijan:

Program of Harmonization of National Legislation with EU Legislation is in the stage of development.

In Georgia:
Harmonization of Georgian legislation with EU legislation represents an important part of agreement on partnership between EU and Georgia. Activity Plan for Implementation of National harmonization Program represents a list of the most important EU directives, including those related to SDW that Georgian legislation should harmonize with in the sphere of SDW.

4.2.Problem analysis

Aspects of legislative regulation of waste management: Legislative regulation represents a corner stone of waste management and is not well developed in the countries of Southern Caucasus. The problem is not only necessity to elaborate new laws and ammendments to the existing ones, but also lack of clear mecanisms for their implementation, as well as incompliance of national legislation with european standards at all stages of waste maangemen, collection, transportation. strorage, recycling and utulization that does not allow to increase efficiency of the whole system of waste management.

Previous attempts of problem solving: Number of laws hve been adopted for the purpose of legislative regulation of the waste management process in the countries of Southern Caucasus, that are presented in clause 1.1.1. In addition in some countries, for example in Azerbaijan draft laws on regulation of landfill maintenance and uncontrolled ignition of waste have been elaborated within the frameworks of preparation of National Activity Plan in regard to Stockholm Conference. Unaccounted aspects of laws about Domestic and Inductrial Waste are defined. Within the frameworks of development of the strategy of hazardous waste regulation ammendments to the law on Domestic and Industrial Waste have been elaborated.

Stakeholders:

- office of public services and executive committees of cities and regions.
- Ministry of Environment and natural Resources (Nature Proetction)
- bodies of local sef-government
- waste producers, including population
- Ministry of Health Care
- private operators
- Ministry of Town-planning
- Teritorial management Committee/Ministry

Criteria of assessment of options: Options have been assessed according to the way they stimulate achievement of project goal – formation of stable SDW management system including:
- bring existing legislative and normative acts in compliance with european standards
- create legislative conditions for commercialisation and improvement of investments in the SDW field
- development of sample contract forms
- establish standards for SDW and new landfills
- development of method for establishment of tariffs for SDW servcies
- development of tariff mechanisms

4.3. Analysis of alternative

Alternative ways of problem analysis:

- ***0-option- do nothing***
- **Elaboration of regulating documents on realization of existing waste management legislation.**
- **Harmonization of existing national legislation with European**

Expected results of alternatives:

- ***0- option- no action***

In case of "no action" revealed problems of tecnical, financial and institutional nature become more complicated, due to subsequent sanitary-ecological, health, social and economic problems. In this case the problem is complicated by the fact of nonobservance of convention signed by the countries and responsibilities for stable develoment.

- **Elaboration of regulating documents for realization of existing waste maa\nagement legislation.**

1. As a result of this option, amendments to the existing legislation will be developed (on waste, environmental protection, town-planning, criminal code, tax code) in order to improve process of sorting, collection, transportation and storage of waste, increase responsibility of waste producers and applying of strict sanctions by controlling bodies. By-laws on landfill maintenance and observance of sanitary-hygienic requirements have been elaborated. By-laws for reducing taxes for contractors and attenuating crediting regime will also be developed. With this purpose possibility of utilization of Oil Fund and Environmental Protection Fund resources in Azerbaijan will be assessed.

- **Harmonization of existing national legislation with European**

As a result of second option relative national laws will be brought in compliance with european standards and necessary ammendmends to relevant laws will be adopted.

Financial-economic calculations of alternatives are provided in the attachements ….

4.4. Financial-economic calculations of alternatives

Armenia: Type of organization of activities for both alternatives is almost the same, i.e. it is required to:

a) form an interministerial working group,

b) organize workshops and round table meetings,

c) invite international experts for developmet of specific recommendations and instructions for elaboration of different legislative and normative regulations,

d) organize training courses to developed countries for memebrs of working group – to research and discuss international experience.

e) maintain tecnical personell who will elaborate specific legislative documents, based on the results of researches and discussions and submit for consideration to interministerial group.

Implementation of activities for reformation and revision of legal base for waste management requires implementation of two-year project, approximate cost of which in Armenia will amount to USD 478.000, and in Azerbaijan – USD 59.600.

4.4. Recommendations

1. Development of recommendations on amendments of relative laws according to directives of EC of June 15 1975 on waste management (75/442/EEC) Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to to Directive 1999/31/EC(2003/33/EC)

2. It is necessary to adopt Framework Law on Waste EC that will define main rules and responsibilities in regard to management of industrial, medical, hazardous and other waste.

Section 5. Institutional Structure and SDW management

5.1. Description of Situation

The law of Armenia "On Waste" defines and distributes responsibilities of Armenian government, government management bodies as well as territorial and local self-government bodies. Functions of these structures are defined by laws regulating waste management sphere and their by-laws.

Main functions and responsibilities of Armenian Government in the field of waste formation include: development and implementation of policy, introduction and provision of relevant mechanisms for waste less technologies and, adoption of necessary by-laws in the field of domestic and industrial as well as hazardous and prohibited waste.

Functions and responsibilities of Ministry of Environmental Protection include: determining categories of hazardous waste, issuing permissions for disposal of sites dealing with waste utilization, conducting ecological expertise in regard to project documentation on construction, rehabilitation and exploitation of landfills, conducting state cadastre of waste, registering waste amounts, setting up registry, conducting monitoring etc.

Functions and responsibilities of Ministry of Healthcare include: development of sanitary and anti-epidemiological norms and rules related to prevention of hazardous and dangerous impact on human health, process of formation, collection, transportation, storage and recycling of waste as well as control over observance of established norms, establishment of sanitary-hygienic requirements for production obtained from waste and issuing conclusions and etc.

Functions and responsibilities of Ministry of territorial management include: issuing permissions for waste disposal (together with authorized bodies), drawing up schemes for sanitary cleanings and waste removal, registering in regard to waste formation, handling, disinfection and removal, waste certification within the limits of administrative borders, as well as liquidation of unlicensed and uncontrolled landfills.

In Azerbaijan the following bodies are responsible for SDW control:
1. Cabinet of Ministers
2. Ministry of Environment and Natural Resources.
3. Sanitary-epidemiologic services of Ministry of Healthcare.
4. Ministry of Emergency Situations
5. Ministry of Economic Development.

In Georgia Ministry of Environment and Natural Resources is responsible for development of national policy. Ministry is responsible for: development of national strategy, state environmental control for import, export, and transit, utilization, recycling and landfilling of industrial, toxic and other hazardous waste.
Function of collection, handling and disposal of SDW is responsibility of bodies of local self-government. In Tbilisi responsibility over SDW management lies on municipal body – Municipal cleaning service. Main functions of this service are: collection, transportation and removal of SDW. This service hires private companies (Ltds) as operators that are responsible for collection and transportation of SDW, sanitary cleaning of streets and maintenance of containers. According to the contract other operator undertakes waste disposal at two landfills of the city.

In Armenia local self-government bodies are responsible for: control of waste removal, drawing territorial sanitary schemes within their borders, some other functions that local self-government bodies are responsible for according to the law "About local self-government" (2002).
Increased efficiency and financial security of SDW collection and removal activities were the main reasons for delegation of responsibility for arranging public waste to private operators in most cities of Armenia. At the same time function of control over activities of private operators remains with local self-government bodies.

Tendency to problem complication: The law of Armenia "On waste" and other laws that regulate public waste sphere there are no functions and responsibilities mentioned in regard to Ministry of town-planning, which, according to its Regulations, is responsible for development and implementation of state policy in municipal economy, a component of which is waste removal and sanitary cleaning of residential parts. .
Local self-governing authorities are not able on their own to fully provide implementation of the authorities related to SDW assigned to them by law.
Private operators (organizers of collection and removal of waste and organization and exploitation of landfills) are selected through a tender process and cooperate with local authorities and population on a contractual basis. In case of signing a contract with local authorities, these organizations provide services for a certain agreed, fixed amount, that does not depend on the payments made by population, or quality of services. On contractual basis with organizations collecting and removing waste, organizations operating landfills dispose SDW at the landfills for scanty amount (60 dram for 1a ton of SDW).
A problem of SDW management in the region is complicated by a low tecnical level of operators, lack of finances for development of system and lack of support from the side of government.

Existing barriers to solving the problem:

- Task sharing among different authorized bodies and unclear kj,./ devision`123454
- lack of contractual relationship between population and operators of waste collection and removal,
- weak and uncontrolled coordination among stakeholders (government structures, municipalities, private sector, local population),
- weak government and public control,
- unprofitable sphere for private operators,
- poor financial condition of operators,
- poor technical equipment of operators (lack of technical, financial and human resources).

International experience: In EU countries waste management is regulated by relevant directives. Problems of waste management are divided by domestic, industrial and hazardous waste. At the same time government coordination is undertaken by special agencies and government bodies. Basically, Agencies have coordination function.

Government determines a list of waste related issue management of which is responsibility of local self-government bodies, as well as list of waste that can be disposed at SDW landfiills. National legislation of EU countries implies licensing of waste management activities including SDW (in Armenia licensing is required only for managing hazardous waste). SDW management functions are undertaken by organizations of local self-government bodies or private companies by signing long-term agreements with local self-government bodies.

In EU countries families pay fixed amount for the services of collection, transportation, removal, recycling and disinfection of SDW (in countries of SC tariff covers only waste collection and transportation that does not encourage development of SDW management sphere).
Experience of introduction of new tools of tariff police in the field of SDW handling in countries of ОЭСР has shown that tariff police will be more efficient if it is linked with following objectives:

- Transfer fro "norms of waste formation" to payment charge based on volume/weight of removed waste which will require appropriate tariff structure;
- Forfeit of possibilities to obtain unjustified profit (rent) by operator including on behalf of internationalization (accounted in tariff) of external factors – both negative (payment for contamination) and positive, by introduction of consolidated tariffs.

At the same tome tariffs should be established based on existing requirements for financing, including approved investment plans and/or production plan.

5.2. Problem analysis

Aspects of SDW management problem: The following aspects have been revealed in the field of institutional structure and SDW management:

- unclear coordination of functions among authorized management bodies,
- weak control,
- poor level of infrastructure (technical and financial),
- lack of monitoring,
- lack of penalty system,
- poor financial situation of operators.
- low level of collection f payments for services.

Previous attempts of solving the problem: By the decision of Armenian government PA N 2200-Ն of 09.12.2005 in 2006 "Concept of SDW management in settlements of Armenia" was developed which after a process of revision is in the process of consideration.
By the decision of Prime Minister PA N 860 of 10.11.2006 an intergovernmental working group was formed for development of a package of legislative proposals on inductrial and domestic waste management. The following draft laws were elaborated: "On waste removal", about ammendements and addendum to laws "On waste", "On local self-governemtn bodies", "On fees for environment and nature management", "On tariffs for nature management" and codes "On administrative violations". This package of proposald has been elaborated and is at the stage of agreement with interested departments.

The law "On waste removal" includes regulations on reforms in the field of SDw management (regulations on operators, types of agreements, on licensing, concidering waste removal as public service for adjusting tariffs and other.).
It is planed that the given package will be presented to the National Assembly of Armenia in automn of 2007.

Issues of SDW management in Tbilisi were of primary importance for Municipality. In August 2006 a united SDW management body was established at the Municipality of Tbilisi – City cleaning office. This body is responsible for transportation, SDW removal and serving landfills, cleaning the streets, collecting payments and administrative penalties. Office of city cleaning announces tenders and hires private companies (Ltds) as operators, that are responsible for SDW collection and transportation, sanitary cleaning of the streets and serving containers, elimination of rodents and insects. The other contractor carries out disposal of waste at two landfills of the city.

Number of operators has reduced form 9 to one that has made the system more flexible in terms of carrying out monitoring and control. Legislative basis in regard to SDW management has also improved. In particular, amendments have been introduced to the law "On the capital of Georgia" and "On local taxes". New tariffs for both population and private sector have been developed.

Stakeholders:
1. Government bodies (Ministry of Environmental Protection, Healthcare, Town-planning, Territorial management).
2. Bodies of territorial and local self-government (regional, municipal, rural).
3. Waste disposal organization.
4. Enterprises (state, private)
5. Population.
6. Nongovernmental organizations in the field of environmental protection.

Criteria of assessment of options:

- Readiness – political will,
- Financial and technical capacity,
- Cost efficiency,
- Stable SDW management system,
- Existence and capacity of infrastructure
- Readiness of population,
- Return/self-repayment for a 5 year period

5.3. Analysis of options

Alternative ways of problem analysis: Management of a complete SDW sphere (collection, removal, disposal and recycling) or its separate technological processes can be undertaken by means of the following alternatives:

Improvement of SDW management state/local system

Contractual based management

Management based on rental agreements

System privatization

Expected results of alternatives:

Improved state system of SDW management

This option implies exclusive management of the system by the state. Management of the whole system (exploitation, maintenance and development) is carried out by government bodies, bodies of local and territorial management that are owners of the main resources.
Proposed option includes development of policy, strategy and SDW management program, tariff adjustment, crediting and administrative measures, such as introduction of taxes for SDW by enterprises and big private organizations.

Operation and management contract

Owners of main resources of system are government/bodies of self-government, whereas exploitation and maintenance functions are handed over to a private operator. Under this option, bodies of local self-government undertake only monitoring and control of operator's activities, no investments from the manager's side are made, and usually government provides subsidies for the development of system.
Private operator:

- undertakes SDW collection and sanitary cleaning of settlements,
- SDW removal,
- landfilling and recycling,
- sets up agreements with clients (population, commercial organizations) and with bodies of local self-government on cleaning of territories and public places,
- calculates tariffs and presents for approval,
- collects payment for services,
- carries out functions and obligations determined by the agreement.

Usually duration of such agreements is around 4-6 years.

Management based on rental agreements

This option implies that government/bodies of local self-government keep functions of the owner of the main resources in this sphere. It hands over functions related to exploitation, maintenance and development of system to a private manager.

Government/bodies of local self-government undertakes monitoring and control (in accordance with an agreement) as well as approves (or based on the legislation of the country presents to the relevant authorized body) tariffs, provided by manager. According to the agreement, functions and obligations of manager are the same as the ones of a manages dealing with exploitation and maintenance, however the difference is that in this case manager is committed to undertake investment for the improvement and development of system.
Duration of rental agreements is around 8-15 years.

Management based on long-term rental agreements (concession)

This option implies the same functions and obligations that the previous one. As distinct from the previous one legislation strictly determines duration of this agreement as not less that 12 years and not more than 25 years. Conclusion of this agreement is determined by Armenian legislation by the example of a special license in the field of quarrying; however conclusion of agreements by analogy of other fields is also possible.

System privatization

This option implies that government/bodies of local self-government hand over of all functions and rights of ownership of all the main sources to private companies, keeping only functions of monitoring, control and leading tariff policy.

5.4. Economic analysis of reforms of SDW management policy

Indicators of assessment: With one and the same requirements to managers, financial-economic indicators of the management process may slightly differ, provided salary fund amount and equipment rate:

- salary fund,
- expenses for staff training/retraining,
- equipment (building, office equipment, communications, office vehicles, working conditions in the office, ex. air-conditioning, heating etc.)

It should be mentioned that as a whole choice of this or that option depends on economic feasibility and not economic indicators of management of the option.

Detailed assessment of alternatives see in Attachment 3.

5.5. Recommendations

Analysis of waste management system abroad has shown that asset management has economic advantage. For example, percentage of asset management in France constitutes 68%, in Poland – 30, in Holland – 53, in Spain – 78 and in Great Britain – 88 %. Bodies of executive power commission their responsibilities to private sector only provided that higher quality services are obtained in comparison to services provided by their own services; otherwise agreement with this private company is canceled. This management does not mean denial of executive authorities to fulfill their duties and responsibilities but rather delegation of responsibilities and control of contract implementation.

Therefore, given the necessity to implement capital investments, changing management company structure and system upgrade, the most practicable type of agreement is asset management. This type of agreement will attract operators with management experience in this field that will ensure carrying out of reforms of system with less possible expenses and achievement of planned results within the defined timeframe. Particularity of this type of agreement is that operator is not an investor. He manages only those finances that are provided to the manager for carrying the reforms. The only investment made by operator is introduction of management experience for achievement of the objectives. Objectives should be set so and in such a timeframe that after date of completion of asset management system attracts investors. Therefore after completion we will have improved system of waste collection and transportation.

ATTACHMENTS

Attachement # 1

National legislation of Southern Caucasus coutries on domestic waste management

Azerbaijan

1. The law "On Ambient Air"
2. National program on ecologically stable socio-economic developement
3. The law on environmental protection
4. The law on inductrial and domestic waste, June 30, 1998
5. The law of Azerbaijan on fundamentals of town-planning
6. Integrated plan of activities on improvement of ecological conditions in Azerbaijan, September 22, 2006

By-laws:

а. Order of Ministry of Economy and Ministry of Environmental Protection and Natural Resources. № 131, 197.
б. Order of Ministry of Environmental Protection and Natural Resources. №91.
в. Order of ministry of labour and Helthcare and Social Welfare of February 24, 2003.

Georgia

1. The Law of Georgia on Environmental Protection (1996)

2. The Law of Georgia on Licenses and Permits (2005)

3. The Organic Law of Georgia on Local Self-Government (1997)

4. The Law on the Capital of Georgia-Tbilisi (1998)

5. The Law of Georgia on Transit and Import of Wastes into and out of the Territory of Georgia (1995)

6. Law of Georgia on Dangerous Chemicals (1998)

7. The Law on Nuclear and Radioactive Safety (1998)

8. The Law on Pesticides and Agrochemicals (1998)

9. The joint order №131-197 of The Minister of Economics and The Minister of Environmental Protection and Nature Resources about the rules on the liquid and solid municipal waste collection service (December 19, 1996)

10. The order №91 of The Minister of Environmental Protection and Nature Resources on legalization of the instructions concerning atmospheric air protection rules during landfill exploitation (October 23, 2001)

11. The order of the Minister of Labor, Health and Social Affairs on the establishment of sanitary rules and norms concerning municipal solid waste landfill construction and exploitation (February 24, 2003)

12. The Code of Administrative Violations of Georgia (1984)

Armenia

The law of the Republic of Armenia “On waste” (adopted 24.11.2004)

The law of the Republic of Armenia “On sanitary epidemiologic security of population” (adopted 16.11.1992)

The law of the Republic of Armenia “On local self-government bodies”(adopted 07.05.02002)

The law of the Republic of Armenia “About licensing” (adopted 30.05.2001)

The law of the Republic of Armenia “On fees for environment and nature management” (adopted 28.12.96)

The law of the Republic of Armenia “On tariffs for nature management” (adopted 20.12.2006)

Code “On administrative-legal violations” ()

RA Government Decision N 47-Ն “On Approval of the Waste Certification” (12.01.2006)

Decision of State Statistic Council N 208-Ն “Brief Report on Generation, Use and Disposal of Waste” on approval of form and order of filling in Forms N 1-Waste, state statistic report (10.09.2002)

RA Government Decision N 1343-Ն On Registration of Generation, removal (annihilation, sterilization, disposal) and use of waste” (14.09.2006)

Order of RA Minister of Nature Protection N 359-Ն On Approval of forms of registration of facilities generating and utilizing waste and running of register. (07.11.2006)

Order of RA Minister of Nature Protection N 378- On approval of order of registration of facilities generating and utilizing waste and running of register. (07.11.2006)

Order of RA Minister of Nature Protection N 500-Ն on approval of order of running register of facilities generating, recycling and utilizing waste (20.04.2006).

RA Government Decision N 1180-Ն on approval of order of running register of places of landfills (13.07.2006)

RA Government Decision N 144-Ն on approval of order of running state waste cadastre (18.01.2007)

Attachment # 2

Analysis of EU directives on waste

- COUNCIL DIRECTIVE of 15 July 1975 on waste (75/442/EEC) / Directive 2006/12/EC of the European Parliament and of the Council of 5 April on waste (this is the codified version of Directive 75/442/EEC as amended).
- COUNCIL DIRECTIVE of 19 December 2002 establishing criteria and procedures for the acceptance of waste landfills pursuant to Article 16 of and Attachment II to Directive 1999/31/EC (2003/33/EC)/

Main principles strengthened Directives.

1. ***COUNCIL DIRECTIVE of 15 July 1975 on waste (75/442/EEC)*** **Directive 2006/12/EC of the European Parliament and of the Council of 5 April on waste (this is the codified version of Directive 75/442/EEC as amended).**

Directive determines main EU policy in the sphere of waste utilization and management as a whole. However it should be mentioned that in regard to hazardous waste and its classification, as well

as certain types of "waste production" EU is guided by certain Directives. In this regard it can be stated that the above mentioned Directive basically regulates issues related to domestic waste.

- **According to this Directive the main categories of waste are:**
  - Remains of products and production
  - Products /goods/ with expired date
  - Products, material or goods that were conteminated as a result of accidental action and have lost their quality
  - Remains of prodcuction, eg. extraction of raw materials (waste water, filter reducing contemination etc.)
  - Products and good production and utilization of which if prohibited by law
- **Determines and reveals notion of "Waste disposal"**
  Process of waste disposal does not imply any further operations for utilizatio, handling and recycling. Disposal of waste should be undertaken with no harmfull impact on environment and human health.
  - waste burial at specilly allocated landfills
  - cleaning soil or conteminated sediments contained in soil**,** by mens of special biological solution
  - use special surface water reservours that gathers liquids and waste
  - biological clening by means of waste impregnation
  - physical and chemical treatment (drying, calcination)
  - waste inceneration (using different technologies)
  - temporary storage with further treatment
- **Determines and reveals notion of re-use of waste, recycling of waste, recovery of waste.**

All these processes should be carried out using methods and technologies that are safe for environment and human health.

- utilization as source of fuel and energy
- recycling of organic substancies that are not further used as dissolvents
- re-use of oil and etc.

Summarising EU approcahes in regard to domestic waste that are strengthened in COUNCIL DIRECTIVE of 15 July 1975 on waste (75/442/EEC) we may and should mention the following of them:

- Re-use of waste
- Recycling of waste
- Recovery of waste
- Use of waste as source of energy
- Incineration without energy recovery
- Landfilling

European policy also determines number of principles promoted in this sphere, which are:

- Principle of accessibility of nonexpensive technoogies (including establishing cleaning facilities)
- Principle of establishing fees for waste producers and other.

2. *COUNCIL DECISION of 19 December 2002 establishing criteria and procedures for the* acceptance of waste at landfills pursuant to Article 16 of and Attachment II to Directive 1999/31/EC(2003/33/EC)

This Directive determines criteria that waste should comply with for their further disposal at landfills, accordingly are determined restrictions in presence of which disposal is not possible. Directive also determines methods that should be used for testing waste.

Criteria is determined for each type of lanfills including criteria for disposal of waste underground.

Main requirements to characteristics of different types of waste are also determined by this Directive.

- source of formation and information about the process of waste formation
- in case of waste cleaning, description of methods and technologies

- description of waste (color, smell. physical condition)
- seperate description for hazardous waste (classification)
- classification of landfill types where this type of waste can be disposed.
- notes on re-use and recycling of waste.

Attachment # 3

Financial-economic calculations of alternatives

1. COLLECTION AND REMOVAL OF SDW

Improvement of SDW collection and removal system:

Number of communities in Armenia– 925,
Population – 3200000,
Quality of SDW generated during one year – 1 million tons,
Number of existing SDW collection and removal systems– 68,
Number of sanitation cars – 526, of which 203 are specialized,
Approximate number of yard and street containers – 20000,
Capacity of containers – 0.7m^3 – 1.7m^3,
Level of fee collection from population for SDW removal services– 46.6%,
Service price – 150 drams (0.45$)/per capita/month.

1.1. ***Renovation of waste collection capacities***. Actually, on average 2500 tons of SDW is generated daily, which makes up 0.8kg per capita. For storing such an amount of waste, taking into consideration that waste is collected on average once in 2 days, the required capacity of containers will be:

On average for 150 residents of one building a refuse room of about 4 m^3 capacity is planned, i.e. for 150x0.8x2=240 kg waste. Thus, on average for 2500 tons of waste 2500x4/0.24=41666 m^3 collection capacity is needed. This capacity corresponds to about 35000 containers and street bins (average size of which is assumed 1.2m^3).

Thus, rough cost of replacement of containers for waste collection (in case if the refuse collection room is located in the building as a closed room, means needed for obtaining containers of the required capacity will be directed to renovation of the rooms) will be: 35000piece.x150$=5250000$, where 150$ is the average cost of one container (this cost varies depending on the size of container and bin). Taking into account that according to some data, about 40% of the existing containers does not require replacement, the real cost will be about 4'000'000$.

1.2. ***Renovation of fleet of sanitation cars.*** For calculation of the required number of sanitation cars, the calculation can be done based on actual data. This means that if for waste collection from 20000 containers about 250 units of specialized machinery is needed, then far 35000 containers it will be necessary to purchase additional 200 cars. In all, it is necessary to purchase about 300 new sanitary cars. Approximate cost of renovation of fleet, thus, will be: 300x50000$=15'000'000$.

The above capital costs can be presented in summary:

Measures for improvement	Total costs, USD 1000
Renovation of waste collection capacities	4.000.000
Renovation of fleet of sanitation cars	15.000.000
Total	***19.000.000***

2. SDW DISPOSAL

"Improvement of SDW Disposal System ".

Implementation of this alternative consists of the following groups of required measures:

2.1. Organizational-technical means of improvement: providing with registration system, construction of a node for washing and disinfecting of cars. providing the service with qualified staff, providing normal, safe conditions for employees: overalls, masks, gloves, boots, etc.

Approximate cost of construction and full equipment (including washing and disinfecting) of one check-point will be 75'000$. With construction of washing with simple equipment, cost of one check-point will be on average 35'000$ (required staff– 1 person).At present for the actually existing 320 landfills (independent on their official status of registration) of the Republic 100 fully equipped check-points and 250 check-point with simple washing equipment will be needed.

Thus, costs for implementation of organizational-technical measures will be as follows:

Construction of check-point: (100x75000$) + (250x35000$) = 16'250'000$
Operation costs: 4% = 650000$/year
Staff salaries: {(100x5) + (250x1)}x250$ x12months= 2'250'000$/ year
Equipping and training of staff: 300$x750 = 225000$/year
Total: 19'375'000$

2.2. Measures for providing with technique: providing the services with appropriate mechanisms, machinery, equipment,

At present machinery is used at landfills not every day, but from time to time. Some communities have at their disposal appropriate machinery, which is used for other purposes, However, if needed, the community uses it for work at landfills. Other communities, if do not have machines, can conclude a contract with private companies for providing implementation of the necessary works at landfill. However, this is a faulty practice, since, taking into account the fact that the machines after work at landfills are not washed and disinfected, they become dangerous for use for other purposes. Therefore, for all landfills it is advisable to obtain appropriate technique and machinery.

According to expert judgments, for all landfills of Armenia bulldozers for disposal and compacting of waste will be needed, as well as graders, bulldozers and excavators for placing of ground layer (25-30cm intermediate and и 50cm the last one).

Bulldozers 350-370pieces x 75000$= 26'250'000-27'750'000$
Graders, bulldozers and excavators: 200pieces x 80000$=16'000'000$
Total machinery: 43'750'000$
Salary for drivers: 550-570чел x 300$=165000-171000$
Total amount: 43'920'000$

Total amount required for improvement of the existing landfills is $63.295.000.

3. SDW UTILIZATION AND PROCESSING

As an alternative method of SDW processing, its disposal to landfills is selected. However, we propose consideration of "Thermal shock" technology for SDW utilization, which has been developed by Russian specialists.

This technology allows solving fully ecological problems and is intended for current developing conditions of CIS countries. New technological principles are laid in the basis of processing o different types of waste.

Cost of basic equipment - Euro **6mln.**

Name of equipment	Quantity	Price (EUR)
hand sorting line	1	500'000
Drying cell	5	90'000
Heating cell	5	110'000
Crusher	5	400'000
Oxidation cell	5	900'000

Copper canalization block	5	1’350’000
Supplementary equipment, conveyers		830’000
Automatic handling system		800’000
Planning and technical documentation		520’000
Installation, starting-up and adjustment and training of personnel		500’000
TOTAL:		6’000’000

4. LEGISLATIVE REGULATION OF SDW MANAGEMENT

For both alternatives organization of works implementation is of almost the same nature, i.e., the following is necessary:

a) establishment of interministerial working group,

b) organization of workshops and round tables,

c) invitation of international experts for development of certain recommendations and guidelines for development of legislative, normative regulations,

d) organization of study tours to developed countries for the members of interministerial working group – with the purpose of study and discussion of international experience,

e) provide technical staff, which will develop certain legislative documents on the basis of the results of discussions and studies and submit them to consideration of interministerial group.

Given organizational nature of the options described above, approximated expenses for their implementation will not differ or will differ slightly. Regardless of the source of funding of these expenses total expenses for carrying out of any options can be described as follows. Formation of interministarial working does not require much effort or expenses. Agreement of relevant public servants and their chiefs should be obtained, after that, relevant authorities will draft interministerial decree or draft decision of Prime minister about formation of a working group, goals and composition of a group.

These activities may need insignificant representation expenses. However, it is important to have an initiator. Presently government is not the one and it will take some time before this reform will be considered urgent requirements. Other initiators of the process can be international financial institutions or funds. In this case it is necessary to arrange an office and hire staff minimum of 5 people. Average project life for implementation of alternative is 2 years. Therefore, expenses for arranging office will constitute:

Office rent in Yerevan – 1000$x24 = 24000$,

Maintaining one vehicle with a driver – 800$x24 = 19200$,

5 computers, 1 copier, 1 scanner, 2 printer, furniture, telephone, paper and other, i.e. everything that is required to run an office for 2 years around 35000$,

Internet – 380$x24 = 9120$

Salary of 5 specialists (average): 5x1000$x24 = 120000$

In total salaries for clauses “a” и “d” will constitute around 210000 USD for 2 years.

Development of legislative basis and normative documents will require organizing of 10 workshops and/or round table meetings. Considering average duration of a 3-day workshop, average number of participants – 20 people, expenses will constitute: 3x20x250$x10 = 150000$, 250$ represent expenses for accommodation, food, per diem, conference hall charges and transportation for one participant.

Invitation of expert is an expensive procedure. On average international expert fee is 60$ per hour, one visit of an international expert for a period of two weeks, or 80 hours will cost a minimum of:

hotel – 14x120$ = 1680$,

per diem – 14x125$ = 1750$,

tickets – 700$

work – 60$x80 = 4800$
total: 8930$

Organization of at least ten visits is required (2 or 3 experts), that will cost around 90000$.
Organizing training courses (for the period of not more that 1 week) to the developed countries is a useful process for undertaking research and discussion of international experience. If we calculate expenses for hotel, food, per diem and tickets for one participant according to the above mentioned parameters, expenses for one visit will constitute

7x120$ + 7x125 + 700 = 2415$

If we add around 1000$ - cost of training course, one course for 8 people will constitute around 28000$. Organization of a single tour in case of straitened circumstances is considered adequate for implementation of a project.
Summing up the above expenses, it can be stated that carrying out activities of reforming and revision of waste management legislative basis requires implementation of a two-year project with an average cost of 478000 USD.